Sling 4

DC - POH - 001 - X -C - 8

SERIAL NO : ____________

PILOT OPERATING HANDBOOK

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revision 1.8

THE AIRPLANE FACTORY | HANGAR 8 TEDDERFIELD AIR PARK, JHB SOUTH,EIKENHOF, 1872, SOUTH AFRICA PO BOX 308, EIKENHOF, 1872, SOUTH AFRICA
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Airplane Factory SLING 4
Pilot Operating Handbook

Aircraft model:	**Airplane Factory Sling 4**
Manufacturer:	**The Airplane Factory (Pty) Ltd**
Aircraft Serial Number:	………………………………………..
Date of Construction:	……………………………………….
Registration:	……………………………………….
Issue Date:	**2018/09/21**

PLEASE ADVISE THE AIRPLANE FACTORY ON CHANGE OF OWNERSHIP OF THE AIRCRAFT

This aircraft must be operated in compliance with information and limitations contained herein. This pilot's operating handbook must be available on board the aircraft at all times.

NOTICE

THIS MANUAL IS WRITTEN FOR THE STANDARD SLING 4, AS MANUFACTURED ON PREMISES BY THE AIRPLANE FACTORY (PTY) LTD.

AIRCRAFT WHICH DIFFER FROM THE PRODUCTION STANDARD, IN WHATEVER WAY, ARE NOT ADDRESSED IN THIS MANUAL, EXCEPT TO THE EXTENT THAT SUCH AIRCRAFT CORRESPOND WITH THE PRODUCTION STANDARD.

NOTICE

THIS EDITION OF THIS MANUAL IS APPLICABLE TO AIRCRAFT REGISTERED IN THE REPUBLIC OF SOUTH AFRICA. DEFINITIONS ARE ACCORDINGLY CONSISTENT WITH SOUTH AFRICAN REGULATIONS ONLY.

RECORD OF REVISIONS

Any revisions to this Pilots Operating Handbook must be recorded in the following table, and, where applicable, be endorsed by the responsible airworthiness authority.

Revision numbers appear at the foot of each page.

Revision No.	Affected Section	Affected Pages	Date of Issue	Approved by	Date of approval	Date inserted	Sign.
1.1	All	All	2013/12/01	M. Blyth	2013/12/01	2013/12/01	
1.2	All	All	2014/05/16	M. Blyth	2014/05/16	2014/05/16	
1.3	All	All	2014/11/10	M. Blyth	2014/11/10	2014/11/10	
1.4	All	All	2015/05/19	T. Brouard	2015/05/19	2015/05/19	
1.5	6. Weight and Balance	6-3 – 6-13	2015/09/11	A Pitman	2015/09/11	2015/05/19	
1.6	All	All	2016/10/23	A Pitman	26/11/2016	26/11/2016	
1.7	6. Weight and Balance	6-13	2017/12/13			13/12/2017	
1.8	1, 2, 4, 6, 7, 8	All	2018/09/21	A Pitman	21/09/2018	21/09/2018	

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1. GENERAL INFORMATION

1.1 Introduction to aircraft

The Airplane Factory Sling 4 is a four seat (two pairs of side-by-side seats), single engine, fixed tricycle undercarriage (with steerable nose wheel) aluminum aircraft of semi-monocoque construction with a conventional low wing design.

The aircraft design is based upon the FAA FAR 23 certification standard and has a maximum all up weight of 920 kg (2028.25 lb). Notwithstanding that the aircraft design is based upon the FAA FAR 23 certification standard, the aircraft has not been proven to comply with all the provisions of the standard.

The Sling 4 is intended chiefly for recreational and cross-country flying. It is not intended for aerobatic operation. This Pilot Operating Handbook has been prepared to provide pilots with information for the safe and efficient operation of the Sling 4.

1.2 Warnings, cautions and notes

The following definitions apply to warnings, cautions and notes in the Pilot Operating Handbook.

WARNING

Means that non-compliance to the corresponding procedure leads to immediate or important degradation of flight safety.

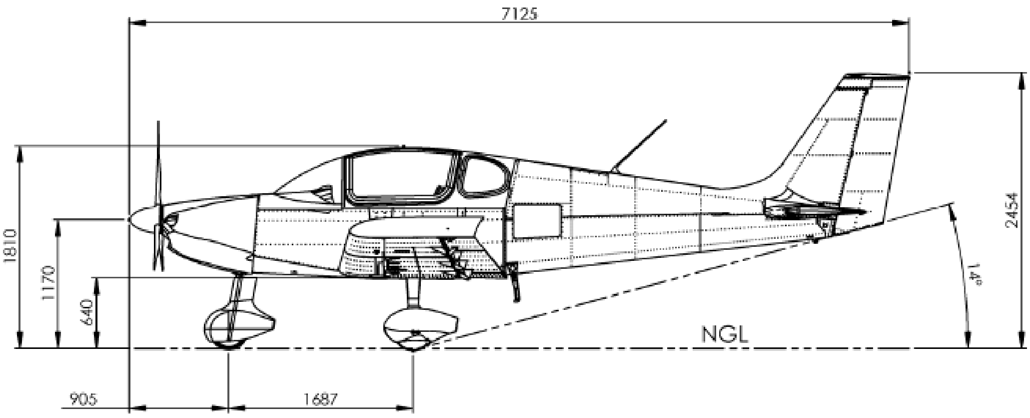
CAUTION

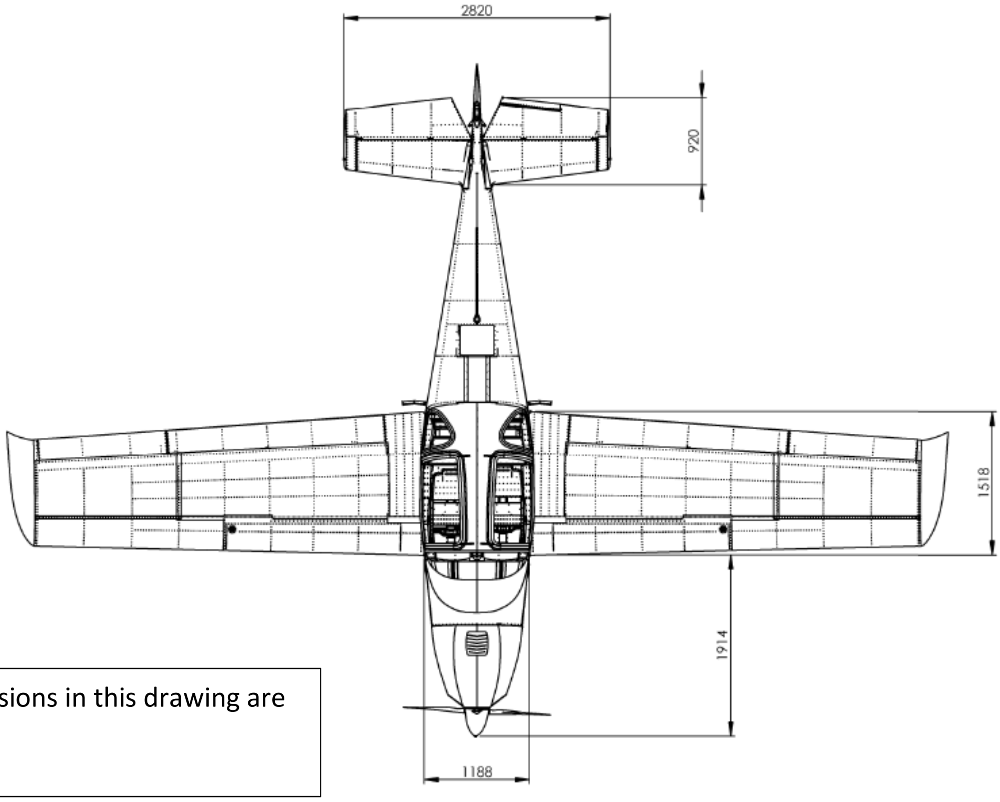
Means that non-compliance to the corresponding procedure leads to minor or possible long term degradation of flight safety.

NOTE

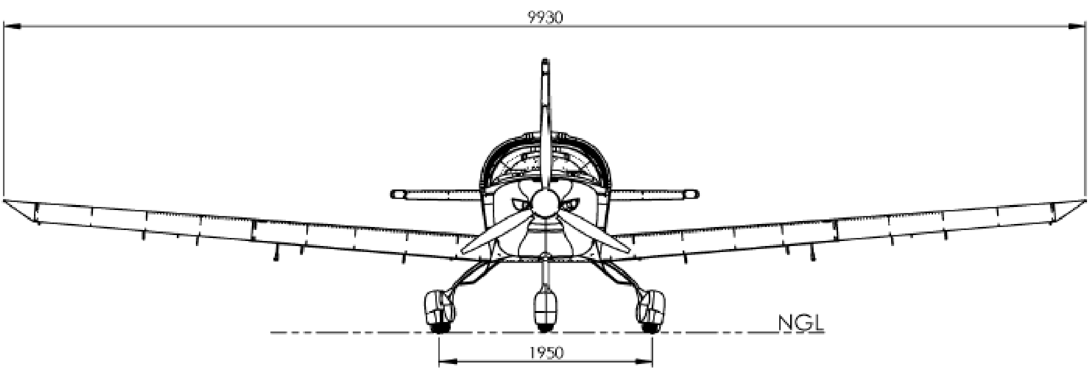
Draws attention to any special item not directly related to safety but which is important or unusual.

1.3 Aircraft 3-view drawing





Note that dimensions in this drawing are in millimetres.



1.4 Data for the Sling 4 aircraft and systems

WING

Span:	9 930 mm (32.58 ft).
Area (gross):	13.12 m² (141.22 ft²).
Aspect ratio:	7.52.
Dihedral:	5°
Tip washout:	2°
Aileron area:	0.62 m² (6.7 ft²).
Flap area:	1.26 m² (13.6 ft²).

HORIZONTAL STABILIZER

Span:	2 820 mm (9.252 ft).
Area:	1.05 m² (11.3 ft²).
Aspect ratio (with elevator):	3.69.
Angle of incidence:	-1.45°
Elevator area:	1.04 m² (11.2 ft²).

VERTICAL STABILIZER

Span:	1 325 mm (4.35 ft).
Area:	0.532 m² (5.73 ft²).
Aspect ratio (with rudder):	1.92.
Rudder area:	0.60 m² (6.5 ft²).

FUSELAGE

Length:	6 220 mm (20.41 ft).
Width:	1 188 mm (3.9 ft).
Total aircraft length:	7 125 mm (23.36 ft).

LANDING GEAR

Wheel track:	1.95 m (6.4 ft).
Wheel base:	1.68 m (5.51 ft).
Brakes:	Hydraulic.
Main gear tyres:	15x6.00-6, 6-ply (2.5 bar (36.26 psi) pressure).
Nose gear tyres:	5.00-5, 6-ply (1.8 bar (26.11 psi) pressure).

CONTROL SURFACE TRAVEL LIMITS

Ailerons:	22° up and down.
Elevator:	28° up and 20° down.
Trim tab:	5° up and 25° down.
Rudder:	25° left and right.
Flaps:	0° to 32° down.

ENGINE

Manufacturer:	Bombardier-Rotax GmbH.
Model:	914 UL.
Type:	4-Cylinder horizontally opposed, turbocharged, 1211.2 cc displacement, mixed cooling (water-cooled heads and air-cooled cylinders), twin carburettors, integrated reduction gearbox with torque damper.
Maximum power:	85.76 kW (115 hp) at 5 800 rpm (maximum 5 minutes). 74.6 kW (100 hp) at 5 500 rpm (maximum continuous).

PROPELLER

Manufacturer:	Airmaster.
Model:	AP332.
No of blades:	3 (Warp Drive or Whirlwind).
Diameter:	1.78 m (70”) or 1.83 m (72”).
Type:	Composite, constant speed.

FUEL

Fuel grade:	Minimum RON 95 / minimum AKI 91. MOGAS: EN 228 Super, EN 228 Super plus, ASTMD4814. Leaded AVGAS: AVGAS 100LL (ASTM D910). Unleaded AVGAS: UL91 (ASTM D7547). (Refer to the latest revision of the Rotax engine and operator manuals and the latest revision of Rotax service instruction SI-914-019).
Fuel tanks:	2 Wing tanks, one tank integrated within each wing leading edge, each tank equipped with finger strainers (in pick up line) and drain fittings.
Capacity of each tank:	84 litres (22.19 US gallons).
Total capacity:	168 litres (44.38 US gallons).
Total usable fuel:	164 litres (43.32 US gallons).

OIL SYSTEM

Oil system type:	Forced, with external oil reservoir.
Oil:	Automotive grade API SG (or higher) type oil, preferably synthetic or semi-synthetic. (Refer to the latest revision of the Rotax engine manuals and the latest revision of Rotax service instruction SI-914-019).
Capacity:	3.5 Litres / 7.4 pints (approximately).

COOLING

Cooling system:	Mixed air and liquid pressurized closed circuit.
Coolant:	1:1 Ethylene glycol based coolant and distilled water mixture or waterless propylene based coolant. (Refer to the latest revision Rotax engine manuals and latest revision of the Rotax service instruction SI-914-019).
Capacity:	2.5 litres / 5.28 pints (approximately).

MAXIMUM WEIGHTS

Maximum take-off weight:	920 kg (2028.25 lb).
Maximum landing weight:	920 kg (2028.25 lb).
Maximum baggage weight:	35 kg (77.16 lb).

STANDARD WEIGHTS

Standard empty weight:	490 kg (1080.27 lb).
Maximum useful load:	430 kg (947.99 lb).

SPECIFIC LOADINGS

Wing loading:	70.12 $kg.m^{-2}$ (14.3617 $lb.feet^{-2}$).
Power loading:	8.0 $kg.hp^{-1}$ (17.637 $lb.hp^{-1}$).

1.5 Terminology, symbols and conversion factors

General terminology / acronyms

AC	Alternating Current
AHRS	Attitude and Heading Reference System
AKI	Anti-Knock Index
ALT	Altimeter
API	American Petroleum Institute
ASI	Airspeed Indicator
AVGAS	Aviation gasoline
COM	Communication (radio)
EFIS	Electronic Flight Information System
FAA	Federal Aviation Authority
FAR	Federal Aviation Regulations
GLS	GPS Landing System
GmbH	Gesellschaft mit beschränkter Haftung (company with limited liability)
GPS	Global Positioning System
IFR	Instrument Flying Rules
IMC	Instrument Meteorological Conditions
LED	Light Emitting Diode
MOGAS	Automobile (car) gasoline
NGL	Normal Ground Line
NRV	Non Return Valve
POH	Pilot Operating Handbook
PTT	Push-To-Talk (button)
RSA	Republic of South Africa
RON	Research Octane Number
VFR	Visual Flying Rules
VMC	Visual Meteorological Conditions
VSI	Vertical Speed Indicator

General airspeed terminology and symbols

IAS	Indicated Airspeed.
KCAS	Calibrated Airspeed, being the indicated airspeed corrected for position and instrument error, expressed in knots.
KIAS	Indicated Airspeed, being the speed shown on the airspeed indicator, expressed in knots.
KTAS	True Airspeed, being the airspeed, expressed in knots, relative to undisturbed air, and which is KCAS corrected for altitude and temperature.
TAS	True Airspeed.
V_A	Maneuvering speed.
V_{BG}	Best Glide Speed, being the speed (at MAUW) which results in the greatest gliding distance over the ground.
V_{FE}	Maximum Flap Extended Speed, being the highest speed permissible with wing flaps deployed.
V_H	Maximum Speed in level flight at maximum continuous power.
V_{LOF}	Lift-off Speed, being the speed at which the aircraft generally lifts off from the ground during take-off.
V_{NE}	Never Exceed Speed, being the speed that may not be exceeded at any time.
V_{NO}	Maximum Structural Cruising Speed, being the speed that should not be exceeded, except in smooth air, and then only with caution.
V_{REF}	Indicated airspeed at 15 m (50 ft) above threshold, which is not less than $1.3V_{so}$.
V_{ROT}	Rotation Speed, being the speed at which the aircraft should be rotated about the pitch axis during take-off (i.e. the speed at which the nose wheel is lifted of the ground).
V_S	Stall Speed, maximum weight, engine idling, flaps fully retracted.
V_{SO}	Stall Speed in landing configuration (flaps fully extended), MAUW, engine idling.
V_X	Best Angle of Climb Speed, being the speed (at MAUW, flaps fully retracted) which results in the greatest altitude gain over a given horizontal distance (i.e. highest climb angle).

V_Y	Best Rate of Climb Speed, being the speed (at MAUW, flaps fully retracted) which results in the greatest altitude gain over a given time period.

Meteorological terminology

ISA	International Standard Atmosphere
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.
QFE	The local airfield pressure setting that if set on the subscale of an altimeter will cause the altimeter to indicate local height above airfield.

Engine terminology

CHT	Cylinder Head Temperature.
EGT	Exhaust Gas Temperature.
OHV	Overhead Valve.
RPM/ rpm	Revolutions per minute, being the number of revolutions per minute of the engine crank, being 2.4286 times the number of revolutions performed by the propeller per minute (by reason of the reduction gearbox mounted between engine and propeller).
TCU	Turbocharger Control Unit

Aircraft performance and flight planning terminology

Crosswind component	The velocity of the crosswind component for which adequate control of the aircraft during takeoff and landing can be demonstrated.
g	The acceleration / load factor.
Ground run	The distance measured during landing from actual touchdown to the end of the landing run.
Landing distance	The distance measured during landing from clearance of a 15 m (50 ft) obstacle (in the air) to the end of the landing run.
Take-off distance	The take-off distance measured from the actual start of the take-off run to clearance of a 15 m (50 ft) obstacle (in the air).
Take-off run	The take-off distance measured from actual start of the take-off run to the main wheels lift off point.
Usable fuel	The fuel available for flight planning.

Weight and balance terminology

Arm	The horizontal distance from the reference datum to the centre of gravity of an item.
CG	Centre of Gravity, being the point at which the aircraft (or equipment) would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the aircraft.
Datum	Reference datum is an imaginary vertical plane from which all horizontal distances are measured for balance purposes. (In the Sling this plane runs through the centre point of the flat front face of the engine flange of the Rotax engine).
Empty Weight	The weight of the aircraft with engine fluids and oil at operating levels.
MAC	Mean Aerodynamic Chord.
MAUW	Maximum All Up Weight.
Maximum Landing Weight	The maximum weight approved for the landing touch-down.
Maximum Take-off Weight	Is the maximum weight approved for the start of the take-off run.
Moment	The product of the weight of an item multiplied by its arm.
L_L	Left main wheel arm (aft of reference)
L_N	Nose wheel arm (aft of reference)
L_R	Right main wheel arm (aft of reference)
M_T	Total moment arm
W_E	Aircraft empty weight
W_L	Weight read from scale under left main wheel during aircraft weighing
W_{MAUW}	Aircraft maximum (allowed) all up weight
W_N	Weight read from scale under nose main wheel during aircraft weighing

W_R	Weight read from scale under right main wheel during aircraft weighing
W_T	Aircraft total weight

Useful conversion factors

1 pound	=	0.4536 kilogram
1 pound per square inch	=	6.895 kilopascal
1 inch	=	25.4 millimetres
1 foot	=	0.3048 metre
1 statute mile	=	1.609 kilometres
1 nautical mile	=	1.852 kilometres
1 millibar	=	1 hectopascal
1 millibar	=	0.1 kilopascal
1 imperial gallon	=	4.546 litres
1 US gallon	=	3.785 litres
1 US quart	=	0.946 litre
1 cubic foot	=	28.317 litres
degrees Fahrenheit	=	[1.8 x degrees Celsius] + 32
degrees Celcius	=	(degrees Fahrenheit - 32) x (5/9)

1.6 Supporting documents

The following documents are regarded as supporting documents to this Pilot Operating Handbook:

1. Latest revision / edition of the Operators Manual For Rotax® Engine Type 914 Series, Ref No.: OM-914.

2. Latest revision / edition of the Airmaster AP3 series And AP4 Series Constant Speed Propeller Operators Manual.

3. Latest revision / edition of Rotax® service instruction SI-914-019.

4. Latest revision / edition of the applicable EFIS panel operator manual.

5. Operator manuals for COM radio, transponder and any other relevant equipment fitted to the aircraft.

6. Latest revision / edition of the Stratos 07 Magnum ballistic parachute manual for mounting and use, where applicable.

Reference should be made to these documents for operational guidelines and instructions. These should be incorporated into the normal and emergency procedures for the aircraft as applicable.

2. LIMITATIONS

2.1 Introduction

This section includes operating limitations, instrument markings and basic placards necessary for the safe operation of the Airplane Factory Sling 4, its engine, systems and equipment.

2.2 Airspeed limitations

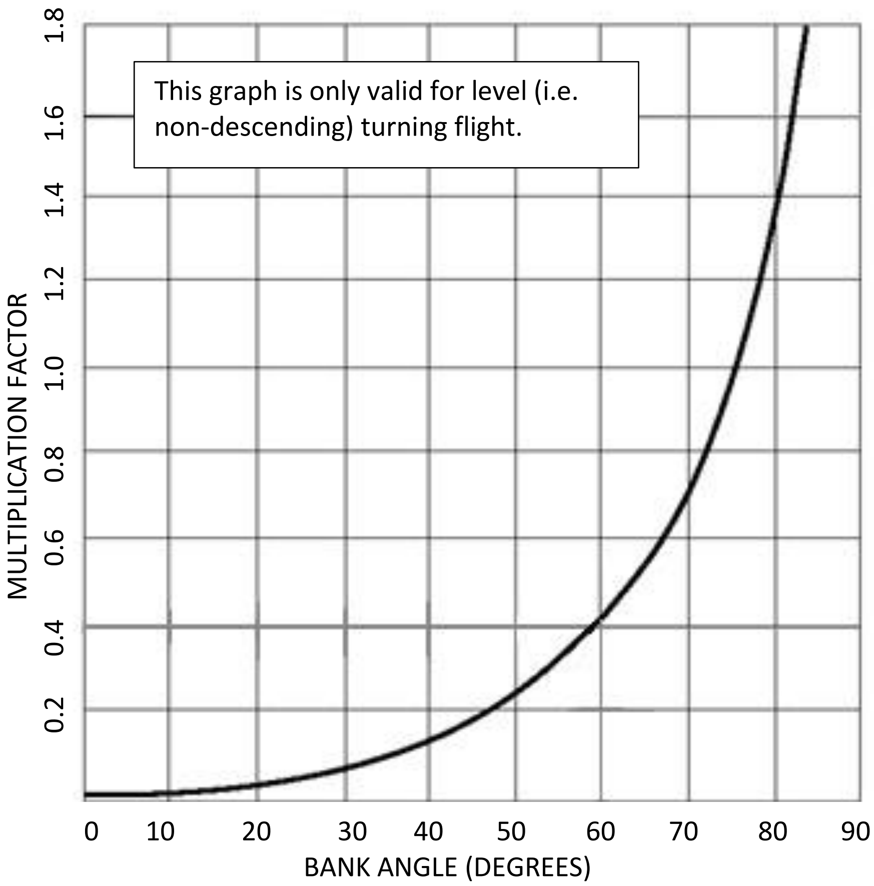
SPEED		KIAS	REMARKS
V_{NE}	Never exceed speed	135	Never exceed this speed in any operation.
V_{NO}	Maximum structural cruising speed	105	Never exceed this speed unless in smooth air, and then only with caution.
V_A	Maneuvering speed	105	Do not make full or abrupt control movements above this speed as this may cause stress in excess of limit load factor.
V_{FE}	Maximum flap extended speed	85	Never exceed this speed unless the flaps are fully retracted.
V_H	Maximum speed in level flight	116	The aircraft will not exceed this speed at MAUW in level flight, at maximum continuous power.
V_S	Stall speed (at MAUW)	54	At maximum all up weight in the most forward CG configuration, with flaps fully retracted, engine idling, the aircraft will stall if flown slower than this speed.
V_{S0}	Stall speed with flaps	48	With full flap, maximum all up weight, engine idling, the aircraft will stall if flown slower than this speed.

2.3 Airspeed indicator markings

MARKING	KIAS	SIGNIFICANCE
White arc	48-85	Flap Operating Range (lower limit is V_{SO} at maximum weight, and upper limit is the maximum speed (V_{FE}) permissible with flaps deployed).
Green arc	54-110	Normal Operating Range (lower limit is V_S at maximum weight, most forward CG with flaps retracted, engine idling; upper limit is maximum structural speed V_{NO}).
Yellow arc	110-135	Manoeuvres must be conducted with caution and only in smooth air.
Red line	135	Maximum speed for all operations.

2.4 Stall speed adjustment for turning flight and load factor

Stall speeds listed in Section 2 (this section) are listed for straight and level (non-turning) flight at load factor = 1 g and should be adjusted for turning flight or increased load factor:



$V_T = V + (V \times \text{MULTIPLICATION FACTOR})$

- V is straight and level stall speed (at load factor = 1 g).
- V_T is stall speed in turn (non-descending).

$V_{ST} = V\sqrt{N}$

- V is straight and level stall speed (at load factor = 1 g).
- V_{ST} is stall speed due to increased load factor.
- N is (positive) load factor.

2.5 Crosswind and wind limitation (demonstrated)

Maximum demonstrated cross wind component for take-off and landing:	15 kt.

2.6 Service ceiling

Service ceiling:	14 000 ft.

2.7 Load factors

Maximum positive limit load factor:	+3.8 g.
Maximum negative limit load factor:	-1.9 g.
Maximum positive load factor with flaps:	+2 g.
Maximum negative load factor with flaps:	0 g.

2.8 Weights

Maximum take-off weight:	920 kg (2028.25 lb).
Maximum landing weight:	920 kg (2028.25 lb).
Maximum luggage weight:	35 kg (77.16 lb).

2.9 Centre of gravity range

Datum	Centre of front face of engine propeller flange (without propeller extension).
Reference - longitudinal leveling	Second row of rivets down from (ie - below) the canopy frame edge, on the aircraft fuselage side, above the wing.
Reference - transverse leveling	Upper surface of centre spar cap, under pilot and passenger seats.
Forward limit	1.859 m (6.099 ft) (18% MAC) aft of datum.
Rear limit	2.034 m (6.673 ft) (31% MAC) aft of datum.

WARNING
It is the pilot's responsibility to ensure that the aircraft is properly loaded. Refer to section 6 for information on weight and balance.

2.10 Prohibited manoeuvres

The Sling 4 is approved for normal manoeuvres including the following:

- Steep turns not exceeding 60° bank.
- Lazy eights.
- Chandelles.
- Stalls (not including whip stalls).

WARNING
Aerobatics and intentional spins are prohibited.

WARNING
Limit load factor would be exceeded by moving flight controls abruptly to their limits at a speed above V_A (105 KIAS – maneuvering speed).

2.11 Flight crew

Minimum crew for flight is one pilot seated on the front left or right side.

2.12 Passengers

Only three passengers are allowed on board the aircraft (in addition to the pilot, <u>and in accordance with CG limit requirements</u>).

2.13 Kinds of operation

The Sling 4, in standard configuration, is approved only for day VFR operation.

Minimum equipment required is as follows-

- Altimeter with adjustable subscale pressure setting
- Airspeed indicator.
- Compass.
- Fuel gauges.
- Oil pressure indicator.
- Oil temperature indicator.
- Cylinder head temperature indicator.
- Outside air temperature indicator.
- Tachometer.
- Chronometer.
- First aid kit (compliant with national legislation).
- Fire extinguisher.

Subject to the legal requirements applicable in the country of registration, Sling 4 aircraft fitted with the following additional equipment may also be operated at night, provided that operations are at all times conducted in VMC and in accordance with VFR -

- Rotating beacon or strobe lights
- Navigation lights
- Landing and taxi light/s (two separate lights or a single light with two independently powered filaments)
- Instrument panel lighting

NOTE
Additional equipment may be required to fulfill national or specific requirements and, provided these do not interfere with other aircraft instrumentation, they may be fitted.

WARNING
Notwithstanding that installed equipment may include GPS and other advanced flight and navigational aids, such equipment may not be used as the sole information source for purposes of navigation or flight, save where specifically permitted by law. The aircraft instrumentation is typically not certified and applicable regulations should be complied with at all times.

NOTICE

Provided that the aircraft is appropriately equipped, the aircraft may also be safely flown in IMC and in accordance with IFR. The equipment required by and referred to in this Pilot Operating Handbook, however, anticipates only VFR flight in VMC. Pilots intending to fly in IMC and in accordance with IFR should ascertain the legal and practical requirements of the jurisdiction within which they will be operating the aircraft and must ensure that all required systems and instrumentation are fitted. It is the responsibility of the aircraft operator to ensure that all legal and safety requirements are met for IFR and/or IMC flight.

2.14 Engine operating limits

Instruments indicating engine parameters should in each case be marked / set to reflect the minimum and maximum values. Always refer to the latest edition/revision of the engine Operators Manual for the latest information regarding operating limitations.

ENGINE START AND OPERATION TEMPERATURE LIMITS	
Maximum	50 °C (122 °F) (ambient temperature)
Minimum	-25 °C (-13 °F) (oil temperature)

ENGINE LOAD FACTOR (ACCELERATION) LIMITS	
Maximum	5 seconds at maximum -0.5 g.

ENGINE OPERATING AND SPEED LIMITS			
Engine Model:			ROTAX 914 UL
Engine Manufacturer:			Bombardier-Rotax GmbH
Power		Maximum take-off	85.76 kW (115 hp) at 5800 rpm, maximum 5 minutes
		Maximum continuous	74.6 kW (100 hp) at 5500 rpm
Engine RPM		Maximum take-off	5800 rpm (maximum 5 minutes)
		Maximum continuous	5500 rpm
		Idle	1 500 rpm
Temperature	EGT	Maximum	950 °C (1742 °F)
	Cylinder head	Minimum	50 °C (122 °F)
		Maximum	135 °C (275 °F)
		Normal	90 to 110 °C (194 to 230 °F)
	Oil	Minimum	50 °C (122 °F)
		Maximum	130 °C (266 °F)
		Normal	90 to 110 °C (194 to 230 °F)
	Coolant	Minimum	50 °C (122 °F)
		Maximum	120 °C (248 °F)
		Normal	80 to 100 °C (175 to 210 °F)

<table>
<tr><td rowspan="7">Pressure</td><td rowspan="3">Oil</td><td>Minimum</td><td colspan="2">0.8 bar (12 psi) - below 3500 rpm</td></tr>
<tr><td>Maximum</td><td colspan="2">7 bar (102 psi) - permissible for short period on cold engine start</td></tr>
<tr><td>Normal</td><td colspan="2">2 to 5 bar (29 to 73 psi) - above 3500 rpm</td></tr>
<tr><td rowspan="2">Fuel</td><td>Minimum</td><td colspan="2">1.15 bar (16.7 psi)</td></tr>
<tr><td>Maximum</td><td colspan="2">1.85 bar (26.8 psi)</td></tr>
<tr><td rowspan="2">Manifold</td><td>Maximum take-off</td><td>1.35 bar (19.58 psi)</td><td rowspan="2">NOTE
Overshoot of manifold pressure is allowed, but has to stabilize within limits within 2 seconds.</td></tr>
<tr><td>Maximum continuous</td><td>1.2 bar (17.4 psi)</td></tr>
</table>

2.15 Other limitations

- No smoking is allowed on board of the aircraft.
- VFR flights only are permitted in aircraft equipped in accordance with the provisions of this POH.

WARNING
IFR flights and intentional flights under icing conditions are prohibited unless the provisions of the notice below have been met!

2.16 Flight in rain

When flying in rain no additional actions / procedures are required. Aircraft qualities and performance are not substantially altered. However, VMC should be maintained.

2.17 Limitation placards

The following limitation warning placards must be placed in the aircraft and positioned in plain view of the pilot, passenger(s) or third person(s), as required.

On the instrument panel:

OPERATE UNDER VMC ONLY **MAXIMUM PERMISSIBLE AIRSPEED 135 KIAS** **MAXIMUM PERMISSIBLE RPM 5 800 RPM FOR 5 MINUTES** **MAXIMUM CONTINUOUS RPM 5 500** **MAXIMUM PERMISSIBLE MASS 920 KG/2 028 LB**

In a place visible to pilot and passenger(s):

WARNING **NON-TYPE CERTIFIED AIRCRAFT** **THIS AIRCRAFT IS NOT REQUIRED TO COMPLY WITH ALL THE REGULATIONS FOR TYPE CERTIFIED AIRCRAFT** **YOU FLY IN THIS AIRCRAFT AT YOUR OWN RISK**

NO SMOKING

WARNING **AEROBATICS AND INTENTIONAL SPINS ARE PROHIBITED**

On the outside of the baggage door:

MAX TOTAL BAGGAGE WEIGHT – 35 KG/77 LB

Adjacent to the fuel filler caps:

AVGAS **OR** **MOGAS** **84 LITRES**

On the inboard upper wing flap surface:

NO STEP

On a fireproof metal plate attached to the aircraft:

##-### **CONSTRUCTOR – THE AIRPLANE FACTORY** **MODEL – SLING 4** **AIRCRAFT SERIAL NUMBER – ###** **ENGINE ROTAX 914 UL – 115 HP** **MANUFACTURED – ###**

Note: ### represents the information applicable to the specific aircraft.

The aircraft must be placarded to show the identity of:

- All fuses/circuit breakers.
- Starter and ignition (magneto) switches.
- All other switches.
- Choke.
- Trim control: NOSE UP and DOWN.
- Flap control: UP and DOWN (and intermediate positions).
- Park brake valve: ON and OFF.
- Canopy handle CLOSED and OPEN positions.
- Ballistic parachute deployment handle.

3. EMERGENCY AND ABNORMAL PROCEDURES

3.1 Introduction

This section provides checklists and amplified procedures for coping with various emergencies that may arise.

Emergencies caused by aircraft or engine malfunction are extremely rare if proper pre-flight inspections and maintenance are practiced. However, should an emergency arise, the basic guidelines described in this section should be considered and applied as necessary to correct the problem.

In case of emergency the pilot should remember the following priorities:

1. Keep control of and continue to fly the aircraft.
2. Analyze the situation.
3. Apply applicable procedures.
4. Inform air traffic control of the situation if time and conditions permit it.

3.2 Speeds for emergency operations

SPEED		KIAS	REMARKS
V_{BG}	Best Glide Speed	65	The speed (at MAUW, flaps fully retracted) which results in the greatest gliding (horizontal) distance. Horizontal distance travelled in still air is approximately 3 795 m (12 450 ft) per 1000 ft descent (i.e. glide ratio of 12.5 : 1).
	Speed for in-flight engine start	> 75	Recommended speed.

3.3 Engine related emergencies

Reference should also be made to the operator’s manual for the Rotax 914 UL engine for operational guidelines and instructions. These should be incorporated into the normal or emergency procedures as applicable.

3.3.1 Engine failure during take-off run

1. Throttle - idle.
2. Brakes - as required.
3. Magnetos / ignition - off.

With the aircraft under control:

4. Radio communication as required.
5. Master switch - off.
6. Electric fuel pumps (both) - off.
7. Fuel selector valve - off.
8. Other electrical system switches - off.

3.3.2 Engine failure immediately after take-off

1. Speed / trim - best glide speed (65 KIAS).
2. Find a suitable / safe location to land. The landing should be planned straight ahead, with only small changes in direction not exceeding 45 degrees to either side.
3. Flaps - as required (plan to land as slowly as possible).
4. Throttle - closed.

Before touch-down:

5. Radio communication as required.
6. Magnetos / ignition - off.
7. Master switch - off.
8. Electric fuel pumps (both) - off.
9. Fuel selector valve - off.

WARNING
Flaps and elevator trim cannot operate with master switch OFF. Make final flap selection before turning master switch off.

3.3.3 Engine irregularities in flight

3.3.3.1 Irregular engine rpm

1. Verify magneto switches - both on.
2. Verify throttle position.
3. Verify engine and fuel quantity indicators.
4. Switch auxiliary electric fuel pump on.

If engine continues to run irregularly:

5. Change fuel selector valve to tank not in use (if not empty).

If engine continues to run irregularly:

6. Change fuel selector valve to fullest tank.
7. Land as soon as possible.

3.3.3.2 Low fuel pressure (1.15 bar/16.68 psi or less)

1. Check fuel quantity indicator.
2. Switch auxiliary electric fuel pump on.

If fuel pressure remains low:

3. Change fuel selector valve to tank not in use (if not empty).

If fuel pressure remains low:

4. Change fuel selector valve to the fullest tank.
5. Decrease throttle setting if viable to do so.

If fuel pressure remains low:

6. Land as soon as possible.

3.3.3.3 Low oil pressure (0.8 bar/12 psi or less)

1. Check oil temperature.

If oil temperature is high or increasing:

2. Set throttle to a setting which gives an aircraft speed of 75 KIAS (most efficient speed).
3. Reduce engine power to minimum required to maintain flight.
4. Land as soon as possible / carry out a precautionary landing and remain vigilant for impending engine failure.

3.3.3.4 Turbocharger Control Unit (TCU) lights indication

Refer to the table (**TCU LIGHT INDICATIONS**) relating TCU indicator light mode of indication to probable causes and suggested pilot action in paragraph 7.23.

NOTE

Refer to the applicable parts (**Caution Lamps**) of the section on **Abnormal Operation** in the Rotax 914 UL engine operator manual.

3.3.3.5 Sudden drop in boost pressure

Possible causes may be the turbocharger fracturing or the waste gate not closing.

Fractured turbocharger: A loud bang may be heard as a result of and indicating turbocharger fracture. Flight with reduced performance may be possible. Monitor oil pressure. Land as soon as possible.

Waste gate not closing: The TCU CAUTION light may be flashing, indicating equipment failure. Limited flight operation (waste gate not responding).

NOTE

Refer to the applicable parts of the section on **Abnormal Operation** in the Rotax 914 UL engine operator manual.

3.3.3.6 Sudden increase in boost pressure

A possible cause might be that the waste gate is fully closed. The TCU CAUTION light may be flashing, indicating equipment failure. The BOOST lamp will illuminate continuously when admissible boost pressure is exceeded.

Immediately reduce engine speed / rpm until boost pressure is within limits.

NOTE

Refer to the applicable parts of the section on **Abnormal Operation** in the Rotax 914 UL engine operator manual.

3.3.4 In-flight engine restart

1. Both electric fuel pumps - on.
2. Fuel selector - switch to unused / fullest tank.
3. Throttle - set to middle position.
4. Master switch - on.
5. Magnetos / ignition - on (both).
6. Starter - engage.
7. Auxiliary fuel pump - off (after positive start).

If engine should fail to restart:

8. Apply the forced landing without engine power procedure according to paragraph 3.5.1.

NOTE

It is possible that the propeller may continue to rotate if the airspeed remains above approximately 75 KIAS. In such circumstances no application of the starter switch may be required. If the propeller stops rotating increasing airspeed may result in it again starting to do so.

3.4 Smoke and fire

3.4.1 Engine fire on ground during start

1. Starter - release.
2. Fuel selector - close.
3. Electric fuel pumps (both) - off.
4. Throttle - idle.
5. Magnetos / ignition - off.
6. Master switch - off.
7. Retrieve fire extinguisher if possible.
8. Exit the aircraft.
9. Extinguish the fire by fire extinguisher or call for fire services if unable to do so.

3.4.2 Engine fire on ground with engine running

1. Cabin heat - close.
2. Fuel selector - close.
3. Electric fuel pumps (both) - off.
4. Throttle - idle.
5. Magnetos / ignition - off.
6. Master switch - off.
7. Retrieve fire extinguisher if possible.
8. Exit the aircraft.
9. Extinguish the fire by fire extinguisher or call for fire services if unable to do so.

3.4.3 Engine fire during take-off run

1. Throttle - idle.
2. Brakes - stop the aircraft.
3. Cabin heat - close.
4. Fuel selector - close.
5. Electric fuel pumps (both) - off.
6. Magnetos / ignition - off.
7. Master switch - off.
8. Retrieve fire extinguisher if possible.
9. Exit the aircraft.
10. Extinguish the fire by fire extinguisher or call for fire services if unable to do so.

3.4.4 Engine fire in flight

1. Cabin heat - close.
2. Electric fuel pumps (both) - off.
3. Fuel selector - close.
4. Throttle - full power.
5. Magnetos - switch off after the fuel in carburettors is consumed and engine has shut down.
6. Choose landing area - select an emergency landing area.
7. Emergency landing - perform according to 3.5.1.
8. Retrieve fire extinguisher if possible.
9. Exit the aircraft.
10. Extinguish the fire by fire extinguisher or call for fire services if unable to do so.

NOTE
Estimated time to empty carburettors after fuel selector valve is closed is 30 seconds.

WARNING
Do not attempt to re-start the engine!

3.4.5 Electrical fire in flight

An electrical fire is often characterized by white smoke and an acrid smell.

1. Auxiliary fuel pump - on (see WARNING below).
2. Master switch - off (see NOTE below).
3. Cabin heat - close.
4. Use the fire extinguisher (if possible).
5. Ventilate cabin if required / applicable (open air vents on instrument panel).
6. If fire is extinguished consider executing a precautionary landing / land as soon as practical.
7. If fire does not extinguish land immediately.

NOTE: If the location of the electrical fire can be determined and electrical power can be removed from that system / location by isolating / switching the system off, do so. This may alleviate the need to switch off the master switch.

The EFIS and associated equipment (iBox, RDAC etc.) can still be powered (to provide engine monitoring) from the EFIS back-up battery circuit when the master switch is off, provided that the EFIS system is not the location / source of the electrical fire.

WARNING

If the alternator / charge system has failed and the master switch is switched OFF (i.e. disconnecting the remaining power source (main battery) from main bus) both fuel pumps will be inoperative (and the engine will cease running due to fuel starvation)!

3.4.6 Cabin fire

If the fire is electrical in nature follow the procedure for electrical fires in flight (paragraph 3.4.5).

Alternatively:

1. Cabin heat - close.
2. Use the fire extinguisher (if possible).
3. Ventilate cabin if required / applicable (open air vents on instrument panel).
4. If fire is extinguished consider executing a precautionary landing / land as soon as practical.
5. <u>If fire does not extinguish land immediately</u>.

3.5 Emergency landings

Emergency landings are generally carried out in the case of engine failure during which the engine cannot be re-started. Other reasons for an emergency landing may, however, arise.

3.5.1 Engine inoperative emergency landing

1. Speed	- best glide speed (65 KIAS).
2. Trim	- for best glide speed.
3. Landing location	- locate most suitable landing location, free of obstacles and preferably into wind.
4. Safety harness	- secure, tighten.
5. Engine restart	- if time permits, and if appropriate, attempt to identify the cause for the engine failure and attempt a restart.
6 Propeller	- if windmilling consider feathering to extend glide range (refer to emergency feather procedure below).
7. Flaps	- extend as required.
8. Communications	- report your location to third parties if possible.
9. Passenger(s)	- brief.

Immediately before touchdown-

10. Electric fuel pumps (both)	- off.
11 Fuel selector	- off.
12. Magnetos / ignition	- off.
13. Master switch	- off.

WARNING

Flaps and elevator trim cannot operate with master switch OFF. Make final flap selection before turning master switch off.

EMERGENCY PROPELLER FEATHER PROCEDURE

1. Select AUTO / FEATHER.
2. Actuate feather engage switch to initiate automatic feathering cycle.

CAUTION

The pilot should be aware that a feathered propeller is less likely to break if it hits the ground, as it is stronger in this orientation. In this a situation, the impact of the propeller with the ground may cause the aircraft to tip over. In the event of a forced landing where a propeller blade may dig into the landing surface due to an undercarriage failure or the like, consideration should be given to leaving the propeller unfeathered.

NOTE

The automatic feather cycle takes 20 to 40 seconds depending on what pitch the propeller is at when the cycle is commenced and at what pitch the feather pitch limit is set at.

NOTE

The propeller may be unfeathered at any time by simply selecting any other position on the propeller control selector (i.e. the hold speed governing mode or one of the pre-set speed governing modes). The propeller will then automatically move to the flight range and constant speed governing will commence as soon as a controllable engine/propeller speed is achieved.

3.5.2 Precautionary landing

A precautionary landing is generally carried out in cases where the pilot may be disorientated, the aircraft has no fuel reserve or possibly in bad weather conditions.

1. Choose landing area, determine wind direction.
2. Report your intention to land and the landing location.
3. Perform a low altitude pass into wind, over the right-hand side of the selected area, with flaps extended as required and thoroughly inspect the landing area.
4. Perform a circuit pattern.
5. Perform approach at increased idle with flaps fully extended.
6. Reduce power when flying over the runway threshold and touch-down at the very beginning of the selected area.
7. After stopping the aircraft switch off all switches, shut off the fuel selector, lock the aircraft and seek assistance.

NOTE
Observe the selected area steadily during precautionary landing.

3.5.3 Landing with a flat tyre / damaged wheel

1. If a main landing gear tyre is flat or a wheel is damaged, perform touch-down at the lowest practical speed with the aircraft slightly banked towards the serviceable tyre / wheel. Maintain directional control during the landing run and keep the flat tyre / damaged wheel off the ground, just above or very lightly on the ground, until the lowest speed possible.
2. If the nose wheel is damaged perform touch-down at the lowest practical speed and hold the nose wheel off the ground as long as possible (via elevator control).

3.6 Recovery from an unintentional spin

WARNING
Intentional spins are prohibited!

The aircraft is unlikely to enter an unintentional spin unless extreme inputs are applied.

Unintentional spin recovery technique:

1. Throttle - idle.
2. Lateral control - ailerons neutral.
3. Rudder pedals - full rudder in direction opposite to spin
4. Rudder pedals - neutralize rudder immediately when rotation stops.
5. Longitudinal control - neutralize control column or push forward if necessary to lower nose, then recover from dive ensuring V_{NE} and load factor limitations are not exceeded.

In the unlikely event that applied control inputs result in the aircraft entering a flat spin and the steps listed above do not result in recovery (following their application for a sustained period), the following technique may be implemented:

1. Throttle - set to full power.
2. Lateral control - ailerons neutral.
3. Rudder pedals - full rudder in direction opposite to spin.
4. Rudder pedals - neutralize rudder immediately when rotation stops.
5. Throttle - reduce to idle.
6. Longitudinal control - as per step 5 (longitudinal control) above.

3.7 Ballistic parachute deployment

1. Observe ballistic parachute operational parameters (refer to paragraph 7.7.1).
2. Throttle - close.
3. Fuel pump(s)(both) - off.
4. Fuel selector lever - off.
5. Magneto / ignition switches - off.
6. Deploy the parachute by pulling the T-shaped activation handle (situated in the centre front) positively.
7. Master and avionics switch - as dictated by radio communication requirements - off before impact with ground.
8. Other electrical equipment switches - off.

3.8 Other emergencies

3.8.1 Vibration

If any abnormal aircraft vibration occurs:

1. Set engine speed to a setting where the vibration is minimized, if viable.
2. Land at the nearest airfield or perform a precautionary landing (according to 3.5.2) if vibration is severe.

3.8.2 EFIS system failure

If the EFIS system freezes, otherwise fails or reacts incorrectly in flight:

1. Maintain straight and level flight utilizing other instruments and ground references.
2. Switch the EFIS back-up battery and the EFIS main switch off (i.e. remove power from the EFIS).
3. Following a 3 second delay, apply power to the EFIS, maintaining straight and level flight at all times.
4. Maintain straight and level for at least another 15 seconds while the system boots up (during reboot, the navigation system should remain active and any active routes (preceding the failure) should continue to be shown / active).

If the system fails to reboot properly:

5. Execute a precautionary landing at the first safe opportunity and have the instrument repaired.

3.8.3 Carburettor icing

Carburettor icing is evidenced through a decrease in engine power and an increase of engine temperatures.

The following procedure is recommended for recovering engine power:

1. Speed - 75 KIAS.
2. Throttle - 1/3 power.
3. If possible, leave the (icing) area.
4. After 1 to 2 minutes gradually increase the engine power to cruise settings.

Upon failure to recover engine power land on the nearest airfield (if possible) or (depending on the circumstances) perform a precautionary landing according to 3.5.2.

3.8.4 Alternator / charge system failure

Alternator failure is evidenced by the illumination of the (red) alternator / charge warning light.

> **WARNING**
> The engine will continue to run after an alternator failure, until the battery voltage is low (approximately 30 minutes if all ancillary equipment is switched off and provided that the battery was fully charged at the time of alternator failure). The engine will cease running due to fuel starvation (due to electrical pump(s) stopping) when the battery is depleted.

1. EFIS main switch - off.
2. All non-critical electrical equipment - off.
   (navigation, strobe, taxi, landing lights etc.).
3. Auxiliary fuel pump - off.
4. Autopilot - off.
5. Propeller - AUTO / CLIMB (or as desired).
6. When propeller governs at climb setting - MAN (manual)
7. Propeller switch - off.
8. Set EFIS brightness to minimum.
9. Restrict / avoid use of the elevator trim control. Restrict radio <u>transmission</u> to minimum / only that which is absolutely necessary.
10. Land as soon as possible.

NOTE

When landing with adequate battery power remaining (to power both the propeller motor and the fuel pump(s)) the propeller can be re-energized and selections made as applicable. The auxiliary fuel pump is switched off / verified to be off to conserve battery charge. If required, the auxiliary pump can still be operated from the main bus provided that the master switch is on, there is no failure of power supply to the main bus and the charge system relay remains energized / is not failed.

3.8.5 Main bus power failure

Refer to paragraph 7.19 under **Main bus** for a list of equipment affected by a loss of power to the main bus.

1. Auxiliary fuel pump on.
2. Use the throttle lever to set / control engine speed and boost pressure to within operating limits (at least maximum continuous values).
3. The EFIS should automatically switch over to the EFIS back-up battery supply , provided that the EFIS battery back-up switch is on (if not, switch on EFIS battery back-up switch) and the back-up battery contains adequate charge.
4. Switch off all main bus connected equipment / switches. Refer to paragraph 7.19.2.
5. Land as soon as possible.

CAUTION

Power loss to the main bus will result in the main fuel pump stopping and the starter motor becoming unavailable / non-operational. If the engine is allowed to run dry and stop before switching over to the auxiliary fuel pump the engine will have to be restarted via airstream driven propeller rotation (windmilling).

The TCU and waste gate servo is not powered and automatic boost pressure control is not available.

3.8.6 Propeller control failure

The propeller / propeller controller can fail in a variety of modes / ways. The pilot(s) should completely familiarize him or herself with the parts of the Airmaster propeller operator's manual which deals with **Emergency Operation** and **Failure Modes**.

The following immediate actions should be followed in the event of any propeller control failure:

6. If required, immediately reduce throttle to avoid exceeding engine speed limitations.
7. Select manual mode (MAN).
8. If manual control of the propeller pitch is still available:

    - set propeller pitch and engine throttle to give desired power and engine speed combination.

CAUTION

Selection of too fine a propeller pitch for the engine throttle setting will result in an over-speed situation.

Selection of too coarse a propeller pitch may result in the engine being unable to maintain the desired engine speed, even at full throttle.

9. If manual control of the propeller pitch is not available:

- If propeller control failed with the propeller pitch set inside the flight range, continued flight is possible, but with caution. Use the engine throttle to control engine / propeller speed, as with a fixed pitch propeller.
- Propeller switch - off.

CAUTION

If failure occurred with propeller pitch set at any other pitch than the fine pitch limit, full power from the engine / propeller combination may not be available at low speeds. **Consideration should be given to this during approach and landing.**

4. NORMAL PROCEDURES

4.1 Introduction

This section provides checklists and recommended procedures for normal operation of the aircraft.

4.2 Speeds for normal operation

Unless otherwise noted, the following speeds are based on the maximum weight of 920 kg (2028.25 lb).

SPEED		KIAS	REMARKS
V_x	Best Angle of Climb Speed	65	The speed (at MAUW, flaps fully retracted) which results in the greatest altitude gain over a given horizontal distance (i.e. largest climb angle). **NOTE:** the resultant climb angle is approximately 3.7°.
V_Y	Best Rate of Climb Speed	75	The speed (at MAUW, flaps fully retracted) which results in the greatest altitude gain over a given time period.
V_{ROT}	Rotation Speed	50	The speed at which the aircraft should be rotated about the pitch axis during take-off (i.e. the speed at which the nose wheel is lifted off the ground).
V_{LOF}	Lift-off Speed	60	The speed at which the aircraft generally lifts off from the ground during take-off.
	Cruise Climb	85 to 100	
	Approach speed - long finals	65 to 75	
V_{REF}	Threshold crossing speed	≥ 63	Indicated airspeed at 15 m (50 ft) above threshold, which is not less than $1.3V_{so}$.

4.3 Use of taxi, landing, strobe and navigation lights

Refer to paragraph 7.25.

Taxi lights should be used as appropriate and their use should be incorporated in the applicable (taxi and before take-off) procedures as required. Give consideration to taxi lights as an aid to enhancing the aircraft's visibility to other traffic / pedestrians / wildlife.

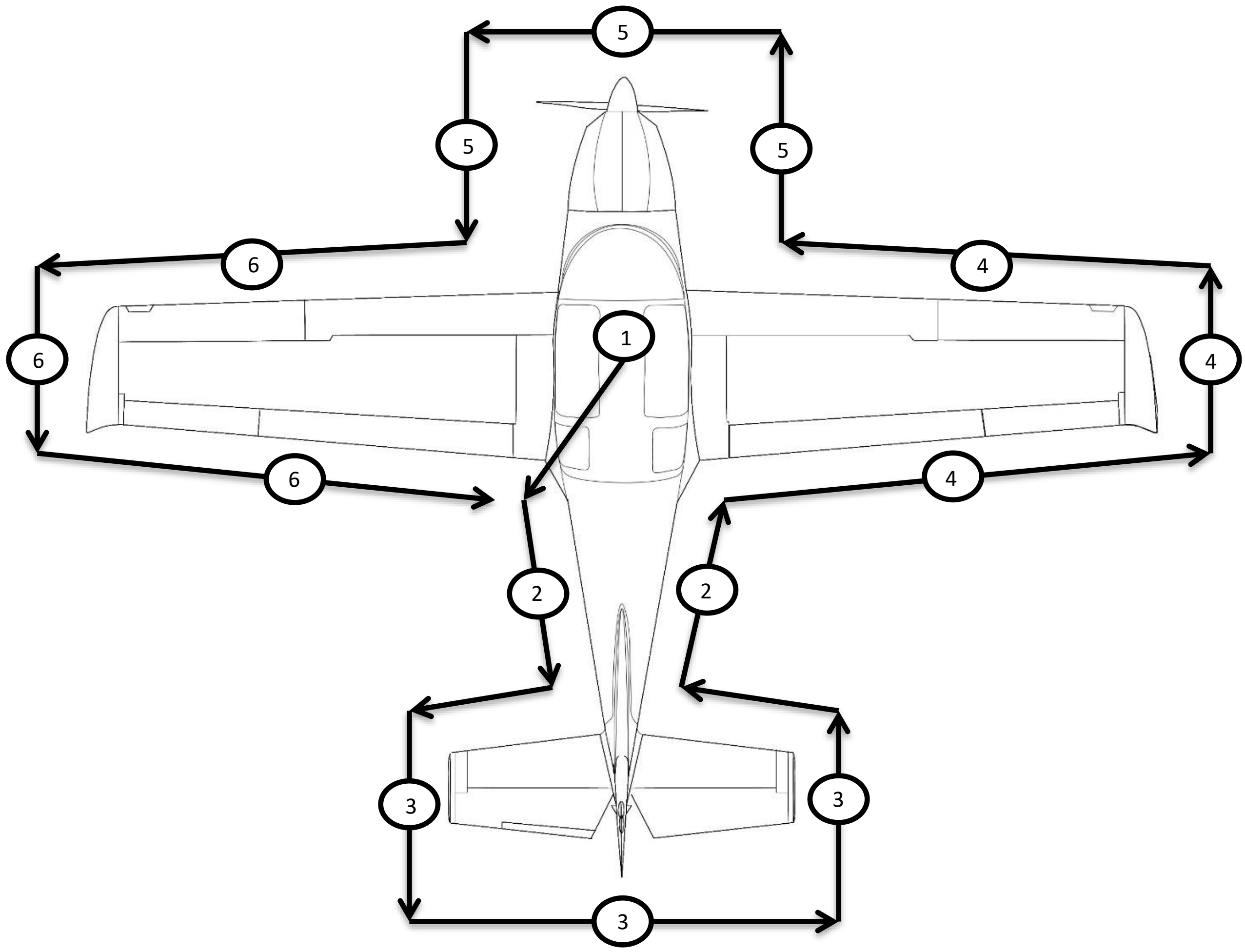
Landing lights should be used as appropriate and their use should be incorporated in the applicable (before take-off, take-off, climb, approach and landing) procedures as required. Give consideration to landing lights as an aid to enhancing the aircraft's visibility to other traffic / pedestrians / wildlife.

Strobe and navigation lights should be used as appropriate and their use should be incorporated in the following (normal) procedures as required. Give consideration to using the strobe light as an indicator / warning of imminent engine start (i.e. switch on the strobe before starting the engine).

4.4 Pre-flight check

Carry out the pre-flight inspection every day prior to the first fight. Pre-flight inspections must also be performed after any accident, incident, maintenance activity, assembly of any aircraft component or suchlike. Incomplete or careless inspection can result in an accident. Carry out the inspection following the instructions in the Inspection Check List.

NOTE
The word "condition" in the instructions means a visual inspection of surface for damage deformations, scratching, chafing, corrosion or other damage which may lead to flight safety degradation.



Inspection Check List

1. Cabin

- Ignition	- off.
- Master switch	- on.
- EFIS switch	- on.
- Fuel level indicator	- check fuel quantity (both tanks).
- Flaps	- select full down position.
- EFIS switch	- off.
- Master switch	- off.
- Avionics	- check condition.
- Control system	- visual inspection, free movement up to stops, check function.
- Safety harnesses	- verify condition, security of attachment and operation of buckles.
- Seats	- verify security of attachment and correct operation of adjustment mechanism (ensure front seat mechanisms lock correctly after adjustment).
- Canopy	- attachment condition, clean.
- Cockpit	- check for loose objects.
- Fire extinguisher	- check present and valid.
- Documentation	- check present and valid.

2. Fuselage

- surface condition	- check.
- Cowling attachment	- check.
- Wing /fuselage fairings	- check.
- Empennage fairings	check.
- Antenna / antennae	- check condition and security.
- Luggage compartment door	- closed and locked.

3. **Empennage**

- Tie-down rope	- removed.
- Horizontal and vertical stabilizers	- check condition.
- Elevator and tab	- condition and movement.
- Rudder	- condition and movement.
- Hinges, control horns, bolts, pushrod	- condition and secure.

4. **Right wing and main gear**

- Wheel fairing	- security, cracks.
- Leading edge condition	- check.
- Taxi / landing lights and lens	- check for cracks and condition.
- Wheel and brakes	- fluid leaks, security, general condition, tyre condition, inflation, wear.
- Wheel strut	- condition, cracks.
- Fuel vent (underside)	- unobstructed.
- Wing trailing edge	- check condition.
- Aileron	- freedom of movement, attachment, surface condition.
- Aileron hinges, control horn, bolts, pushrod	- secure, condition.
- Flap hinges, control horn, bolts, pushrod	- secure, condition.
- Wing tip	- check condition.
- Strobe/navigation light and lens	- check for cracks and condition.

5. **Nose section and nose gear**

- Engine cowling condition	- check.
- Propeller and spinner condition	- check.
- Air intakes	- check
- Radiator	- check.
- Engine mount and exhaust manifold condition	- check.
- Oil and coolant quantity	- check
- Visual inspection of fuel and electrical system	- check

Other actions according to the engine manual

- Tyre	- condition, inflation, wear
- Wheels	- security, general condition
- Chocks and tie-down ropes	- remove
- Suspension and undercarriage	- check and test

CAUTION

In case of long-term parking it is recommended to turn the engine over several times (ignition/magnetos OFF!) by turning the propeller in order to prime the lubrication system. Always handle the propeller blade area with the palm of your hand i.e. do not grasp only the blade edge with your fingers.

6. **Left wing**

- Wheel fairing	- security, cracks.
- Leading edge condition	- check.
- Taxi / landing lights and lens	- check for cracks and condition.
- Wheel and brakes	- fluid leaks, security, general condition, tyre condition, inflation, wear.
- Wheel strut	- condition, cracks.
- Fuel vent (underside)	- unobstructed.
- Wing trailing edge	- check condition.
- Aileron	- freedom of movement, attachment, surface condition.
- Aileron hinges, control horn, bolts, pushrod	- secure, condition.
- Flap hinges, control horn, bolts, pushrod	- secure, condition.
- Wing tip	- check condition.
- Strobe/Navigation light and lens	- check for cracks and condition.
- Pitot tube	- security, unobstructed, remove cover.

4.5 Engine start

Reference should be made to the operator's manual for the Rotax 914 UL engine for operational guidelines and instructions. These should be incorporated into the normal or emergency procedures as applicable.

CAUTION
Observe temperature limits for engine start as specified in paragraph 2.14.

4.5.1 Before starting engine

1. Pre-flight inspection - completed.
2. Emergency equipment - on board.
3. Passenger(s) - briefed.
4. Seats, seatbelt(s) and harnesses - adjust and secure.
5. Brakes - on.

CAUTION
In case of long term parking it is recommended to turn the engine over several times (IGNITION/MAGNETOS OFF!) by turning the propeller, in order to prime the lubrication system. Always handle the propeller blade area with the palm of your hand, i.e. do not grasp only the blade edge with your fingers.

4.5.2 Engine start

1. Master switch - on.
2. When system voltage is applied (Master switch is switched on) both TCU lights should illuminate for approximately 1 to 2 seconds (TCU self-test) and then extinguish. If not, this indicates a deficiency (refer to Rotax 914 maintenance manuals).

> **WARNING**
> **Do not put the engine into operation before having rectified the cause of the deficiency.**

3. EFIS back-up battery - on, verify EFIS on and verify back-up battery voltage.
4. Propeller switch - on
5. Propeller - AUTO.
6. Magneto / ignition switches - on.
7. Throttle - closed if choke used, cracked just open if not.
8. Fuel selector - emptiest tank (if not empty).
9. Electric fuel pumps (both) - on.
10. Choke (cold engine) - pull to open and gradually release after engine start.
11. Propeller area - clear of people and obstructions.
12. Starter - hold activated to start engine (maximum 10 seconds).

Immediately after start-up (as soon as engine runs):

13. Throttle adjust for smooth running (approximately 2000 rpm).

14. Oil pressure - increase within 10 seconds.
15. EFIS switch - on and verify battery charging.
16. Avionics switch - on.
17. Warm engine - 2 000 rpm for 2 minutes, then 2 500 rpm until oil temperature is 50 °C (122 °F).

CAUTION

The starter should be activated for a maximum of 10 seconds, followed by a 2 minute pause to allow for starter cooling.

Verify the oil pressure, which should increase within 10 seconds. Increase the engine speed only if oil pressure is steady above 2 bar (29 psi).

At an engine start with low oil temperature continue to watch the oil pressure as it could drop again due to the increased resistance in the suction line. Increase engine rpm only as required to keep oil pressure steady.

To avoid shock loading, start the engine with the throttle lever set for idle or at maximum 10% open, wait 3 seconds to establish constant engine speed before engine acceleration.

4.5.3 Engine warm up, engine check

Prior to an engine check, block the main wheels with wheel chocks or ensure that the brake is firmly on.

Initial engine warm-up is at 2 000 rpm for approximately 2 minutes, then increase to 2 500 rpm until the oil temperature reaches 50 °C (122 °F). The warm-up period depends on the ambient air temperature.

Check both ignition circuits at 4 000 rpm. The engine speed drop when either ignition circuit is switched off should not exceed 300 rpm. The maximum engine speed reduction (drop) difference between magnetos / ignition circuits should not exceed 115 rpm.

NOTE
Only one magneto / ignition circuit (at a time) should be switched on/off during an ignition/magneto check.

Set maximum power for the verification of maximum speed with given propeller and engine parameters (temperatures and pressures).

Verify engine acceleration from idle to maximum power.

If necessary, cool the engine (for approximately 3 minutes) at 3 000 rpm before shutdown.

CAUTION
The engine check should be performed with the aircraft heading upwind and not on loose terrain (the propeller may disturb grit which can damage the leading edges of blades).

4.6 Taxi

1. Fuel selector - to fullest tank.
2. Flaps - up.
3. Brakes - off (carefully check brake stop-valve is off).
4. Controls - neutral position or as required for wind.
5. Power and brakes - as required.
6. Brakes - verify correct operation.
7. Instruments - check.

Apply power and brakes as needed. Apply brakes to control movement on ground. Taxi carefully when wind velocity exceeds 15 knots. Hold the control column in neutral position or as required, using conventional techniques.

4.7 Normal take-off

4.7.1 Before take-off

1. Controls - full and free movement, correct deflection / directions.
2. Trim - neutral.
3. Choke - off.
4. Flaps - as required (typically 1 notch).
5. Fuel quantity - confirm.
6 Fuel pumps (both) - on.
7. Fuel selector - fullest tank.
8. Circuit breakers - all in.
9. Instruments - verify all.
10. Altimeter - set QNH / QFE.
11. Switches - verify, as required.
12. Power and ignition - verify magnetos at 4 000 rpm, maximum difference 115 rpm, maximum drop 300 rpm.
13. Propeller - set 4000 engine rpm, select MAN, set fully coarse and verify rpm reduction/coarse indicator illuminates orange, set fully fine and observe rpm increase/fine indicator illuminates orange.
14. Propeller - AUTO / TO.
15. Engine parameters - verify temperatures, pressures, current/voltage.
16. Canopy - closed and latched (both doors).
17. Safety harnesses - on, secure and tightened.
18. Ballistic parachute activation handle lock pin - remove.

4.7.2 Take-off

1. Propeller - AUTO / TO.
2. Take-off power - throttle fully forward, past detent if required (max. 5 800 rpm for 5 minutes).
3. Engine speed - check rpm (5 500 to 5 800 rpm).
4. Engine parameters within limits - verify.
5. Rotate - 50 KIAS.
6. Airplane lift-off - 60 KIAS.
7. Wing flaps - retract when speed of 65 KIAS is reached, at altitude of minimum 300 ft.
8. Auxiliary electric fuel pump - off (at 300 ft minimum).
9. Brakes - apply briefly to stop wheel rotation.
10. Transition to climb.

WARNING

Take-off is prohibited if:

- The engine is running unsteadily or intermittently.
- The engine parameters (instrument indications) are outside operational limits.
- The crosswind velocity exceeds permitted limits (see 2.5).

CAUTION

Ensure that engine oil temperature is above 50 °C prior to take off.

Climbing with engine at 5 800 rpm is permissible for 5 minutes. Thereafter a maximum continuous engine rpm of 5 500 applies.

4.8 Climb

1. Propeller	- AUTO / CLIMB.
2. Throttle	- maximum take-off power (5 800 rpm) (for maximum 5 minutes).
	- maximum continuous power (5 500 rpm).
3. Airspeed	- V_X = 65 KIAS.
	- V_Y = 75 KIAS.
	- cruise climb = 85 to 100 KIAS.
4. Trim	- trim the aircraft.
5. Instruments	- check.
	- oil temperature and pressure.
	- cylinder head temperatures within limits.

CAUTION

If the cylinder head temperatures or oil temperature approach their limits, reduce the climb angle to increase airspeed (to increase cooling and remain within the limits).

CAUTION

Climbing with engine at 5 800 rpm / maximum power (115% throttle) is permissible for 5 minutes. Thereafter a maximum continuous power (throttle) setting / engine rpm of 5 500 applies.

4.9 Cruise

Refer to section 5 for recommended cruise figures/settings.

WARNING

If a fuel lift pipe is exposed to air, the pump will suck air into the engine (from the empty tank) and engine failure will result. When one tank is empty, or close to empty, the fuel selector valve should be switched to the fullest tank.

Avoid operation below the normal operational oil temperature (90 to 110 °C / 194 to 230 °F).

4.10 Descent

Optimum glide speed - 65 KIAS.

WARNING

The fuel lift pipe in each fuel tank is situated adjacent to the lower inside wall of the tank. The aircraft should at **no time** be subjected to a sustained side slip towards a near empty fuel tank (i.e. wing with near empty tank down) as, despite the baffling, this may lead to fuel running towards the outer edge of the tank and exposing the fuel lift pipe to suck air, thereby starving the engine of fuel and leading to an engine stoppage. This poses a particular threat when at low altitude, typically prior to landing.

WARNING

It is not advisable to reduce the engine throttle control lever to minimum on final approach or when descending from very high altitude. In such cases the engine can become over-cooled, although unlikely, and a loss of power may occur. Descent at increased idle (approximately 3000 rpm), speed between 65 to 75 KIAS and verify that the engine instruments indicate values within the permitted limits.

4.11 Approach

1. Approach speed:
   Long final - 65 KIAS to 75 KIAS.
   Short final - ≥ 62 KIAS.

2. Auxiliary electric fuel pump - on.
3. Fuel selector - fullest tank.
4. Throttle - as required.
5. Wing flaps - extend as required.
6. Trim - as required.
7. Brakes - off (carefully check that the brake stop-valve is off).

WARNING

It is not advisable to reduce the engine throttle control lever to minimum on final approach or when descending from very high altitude. In such cases the engine can become over-cooled, although unlikely, and a loss of power may occur. Descent at increased idle (approximately 3000 rpm), speed between 65 to 75 KIAS and verify that the engine instruments indicate values within the permitted limits.

WARNING

If a fuel lift pipe is exposed to air, the pump will suck air into the engine (from the empty tank) and engine failure will result. When one tank is empty, or close to empty, the fuel selector valve should be switched to the fullest tank.

4.12 Normal landing

4.12.1 Before landing

1. Propeller	- AUTO/ TO.
2. Throttle	- as required.
3. Airspeed	- ≥ 62 KIAS.
4. Wing flaps	- extend as required.
5. Trim	- as required.
6. Brakes	- off (carefully check that the brake stop-valve is off).

4.12.2 Landing

1. Throttle	- as required.
2. Controls	- flare to minimum flying speed, touch-down on main wheels.
3. Nose wheel	- gently lower to ground.
4. Apply brakes	- as required (after the nose wheel touch-down) for controlled slowing down.

4.12.3 After landing

1. Engine speed	- as required for taxi.
2. Wing flaps	- retract.

CAUTION

Rapid engine cooling should be avoided during operation. This especially happens during aircraft descent, taxi, low engine rpm or at engine shutdown immediately after landing. Under normal conditions the engine temperatures stabilize during descent and taxi at values suitable to stop the engine (by switching the ignition off) as soon as aircraft is stopped. If necessary (elevated engine operating temperatures), cool (for minimum 2 minutes) the engine at approximately 3 000 rpm to stabilize the temperatures prior to engine shut down.

4.13 Baulked landing procedures

1. Throttle - full power (5 800 rpm, max. 5 minutes).
2. Trim - as required.
3. Wing flaps - retract to 50% as soon as possible. Retract fully when reaching 65 knots (at a minimum height of 300 ft).
4. Auxiliary electrical fuel pump - off (300 ft minimum).
5. Propeller - AUTO / CLIMB (minimum 300 ft).
6. Trim - adjust.
7. Repeat circuit pattern.

4.14 Short field take-off and landing procedures

Standard short field procedures may be used if the pilot deems it appropriate.

4.15 Engine shutdown

1. Engine speed - idle.
2. Instruments - engine parameters within limits.
3. Avionics switch - off.
4. Magnetos / ignition - off.
5. Electric fuel pumps (both) - off.
6. Switches - off.
7. EFIS - off, battery back-up off.
8. Master switch - off.
9. Fuel selector - off.

CAUTION

Rapid engine cooling should be avoided during operation. This especially happens during aircraft descent, taxi, low engine rpm or at engine shutdown immediately after landing. Under normal conditions the engine temperatures stabilize during descent and taxi at values suitable to stop the engine (by switching the ignition off) as soon as aircraft is stopped. If necessary (elevated engine operating temperatures), cool (for minimum 2 minutes) the engine at approximately 3 000 rpm to stabilize the temperatures prior to engine shut down.

4.16 Aircraft parking and tie-down

1. Site - park the aircraft on as level an area as possible.
2. Magnetos / ignition - verify off.
3. Master switch - verify off.
4. Fuel selector - off.
5. Parking brake - apply as necessary.
6. Canopy - close, lock as necessary.
7. Secure the aircraft.

NOTE

It is recommended that the parking brake (shut-off valve) be utilized for short-period parking only. If the aircraft is to be parked for long periods it is advisable to use not only the parking brake, but also wheel chocks.

NOTE

Use anchor eyes on the wings and fuselage rear section to secure the aircraft. Move the control column forward and secure it together with the rudder pedals if high winds are expected. **Make sure that the cockpit canopy panels are properly closed and locked.**

5. PERFORMANCE

5.1 Introduction

The presented data has been computed from actual flight tests, with the aircraft and engine in good condition and applying average piloting techniques.

If not stated otherwise, the performance stated in this section is valid for maximum take-off weight (920 kg / 2028.25 lb) under ISA conditions.

The performance stated in this section is valid for SLING 4 aircraft fitted with a ROTAX 914 UL 85.76 kW (115 hp) engine and an Airmaster AP332 propeller.

5.2 Take-off and landing distance

Take-off distances:

50 ft ISA (MAUW)		
Surface	Take-off run	Take-off distance over 15 m (50 ft) obstacle
Concrete	270 m / 886 ft	450 m / 1476 ft

7000 ft Density altitude (MAUW)		
Surface	Take-off run	Take-off distance over 15 m (50 ft) obstacle
Concrete	355 m / 1165 ft	600 m / 1969 ft

Landing distances:

50 ft ISA (MAUW)		
Runway	Landing run distance (braked)	Landing distance over 15 m (50 ft) obstacle
Concrete	150 m / 492 ft	350 m / 1148 ft

7000 ft Density altitude (MAUW)		
Runway	Landing run distance (braked)	Landing distance over 15 m (50 ft) obstacle
Concrete	250 m / 820 ft	425 m / 1394 ft

5.3 Rate of climb

Conditions: Max. continuous power: 5500 rpm Weight: 920 kg / 2028.25 lb	Best rate of climb speed (V_Y)	Rate of climb
	KIAS	fpm
0 ft ISA	75	435
3 000 ft ISA	75	390
6 000 ft ISA	75	345
9 000 ft ISA	75	300

5.4 Cruise speeds

Constant speed propeller with cruise setting.

Altitude [ft ISA]	Throttle position	Engine rpm	Cruise Speed [KIAS]
100	75%	5 000	108
	85%	5 000	109
	100%	5 000	113
3 000	75%	5 000	101
	85%	5 000	105
	100%	5 000	109
6 000	75%	5 000	95
	85%	5 000	101
	100%	5 000	107
9 000	75%	5 000	92
	85%	5 000	97
	100%	5 000	102

5.5 Fuel consumption

With constant speed propeller.

Altitude	[ft ISA]	3 000		
Fuel quantity	[l]	168		
	US gallons	44.38		
Engine speed	[rpm]	5750	5450	5000
Propeller setting		Take-off	Climb	Cruise
Throttle setting		115%	100%	85%
Fuel consumption	[l/h]	34	29	24
	US gal / h	8.98	7.66	6.34
Airspeed	[KIAS]	118	116	112
Endurance	[hours]	N/A	5.6	6.8
Range	[nm]	N/A	700	800

5.6 Airspeed indicator system calibration

IAS [knots]	CAS [knots] (average)	CAS [knots] (This aircraft)
25	28	
30	33	
35	38	
40	44	
45	45	
50	50	
55	55	
60	60	
65	65	
70	70	
75	75	
80	80	
85	85	
90	90	
95	95	
100	100	
105	105	
110	110	
115	115	
120	120	
125	125	
130	130	
135	135	

6. WEIGHT AND BALANCE

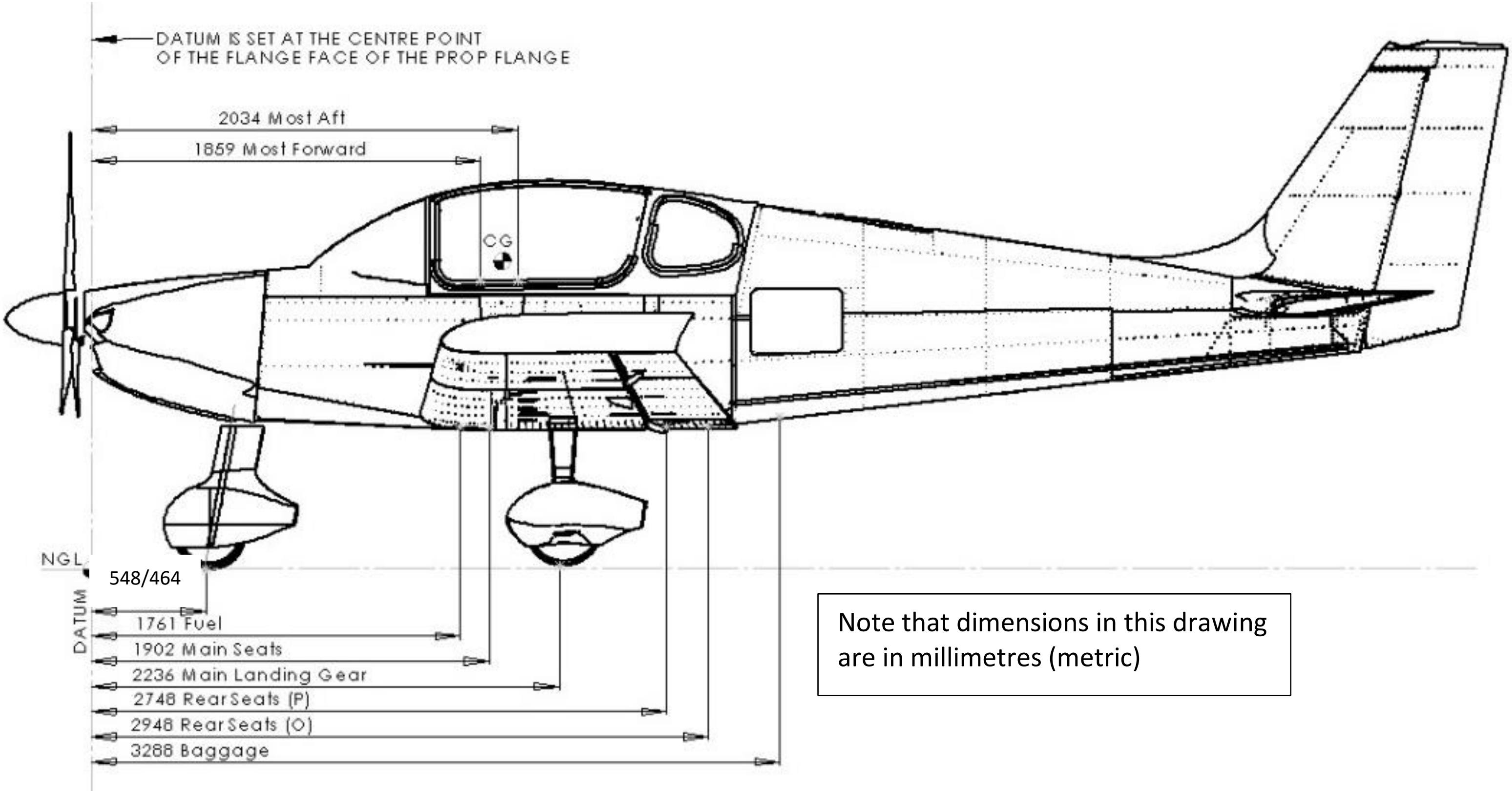
6.1 Introduction

This section contains weight and balance records and the payload range for safe operating of the Sling 4 aircraft.

6.2 Installed equipment (standard) list

- Multifunction glass cockpit instrument - typically a Garmin G3X EFIS with associated ancilliary equipment.
- Garmin GTR200 COM radio or equivalent.
- Mode S transponder.
- PM 1000-II 4-place intercom.
- Analogue altimeter, airspeed indicator, ball type slip indicator or second EFIS.
- Magnetic compass.
- USB charge port.
- 12 Power port / socket.
- Airmaster AP332 propeller controller.
- Electric trim system / motor on elevator.
- Electric flap actuator.
- Stratos 07 Magnum ballistic parachute recovery system (optional).

6.3 Center of gravity (CG) range

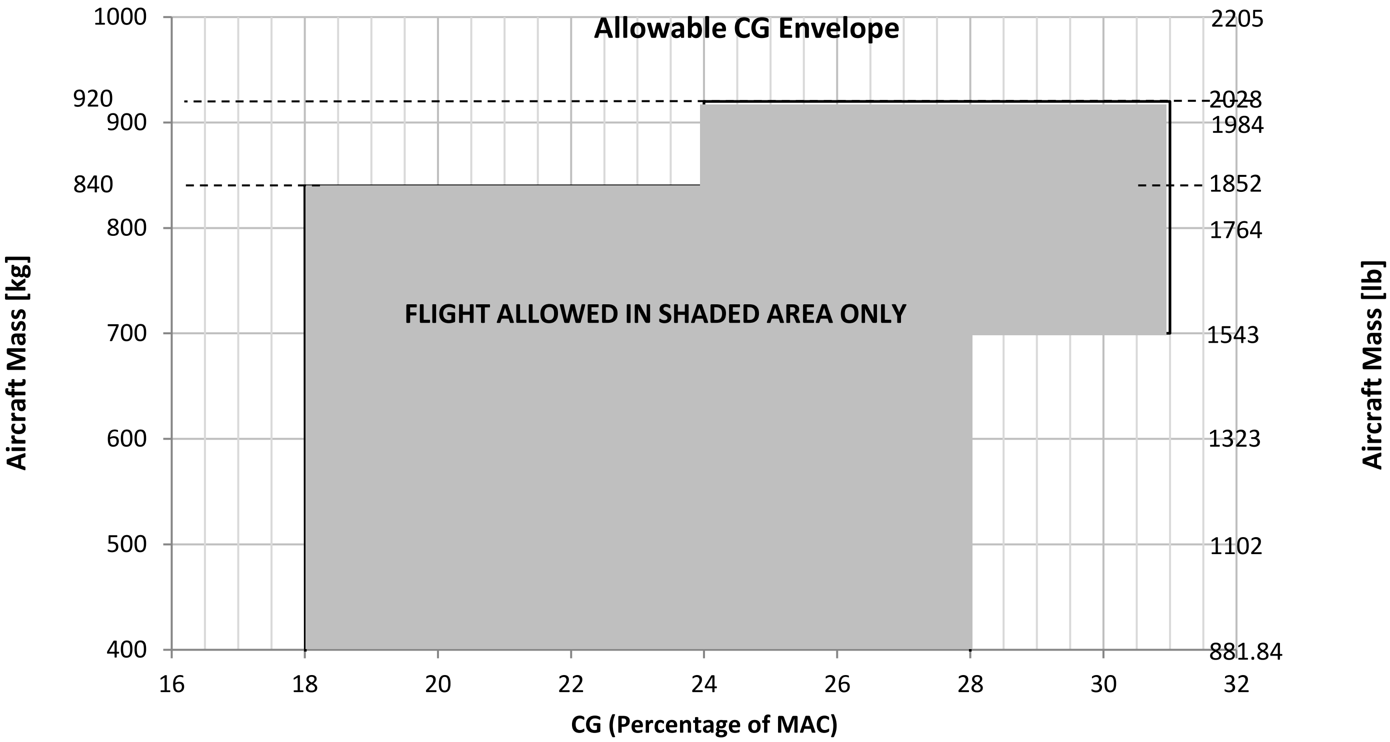


Operating CG range and allowable GC envelope

CG range is 1 859 mm / 6.099 ft to 2 034 mm / 6.673 ft aft of the reference datum (18 to 31 % of MAC).

- The leading edge of the MAC is 1 616 mm / 5.301 ft aft of the reference datum.
- The MAC is 1 349 mm / 4.425 ft.

WARNING
Aircraft CG and MAUW limitations must be adhered to at all times.



NOTE

The arm length diagram above indicates that there are two position for the nose wheel. The nose wheel position for Sling 4 aircraft with a serial number below 116 will have a nose wheel arm length of 548 mm. The nose wheel position for Sling 4 aircraft with a serial number higher than 116 will have a nose wheel arm length of 464 mm. Both these values have been used in the weight and balance sample calculations later in this section. If there is any uncertainty about the position of the nose wheel, a measurement from the datum point to the centre point where the nose tyre makes contact with the ground must be performed.

NOTE

There are two different positions at which the rear seat may be fitted. All Sling 4 aircraft with serial numbers sn 001 to sn 120 have the rear seats in the original ("O") position (2 948 mm). A limited number of Sling 4 aircraft with serial numbers higher than sn 120 have the rear seats in a slightly forward ("P") position (2 748 mm). Ensure that you are familiar with the rear seat position of your aircraft.

REAR SEAT POSITION OF SLING 4 SN _________ - _________________ MM

WARNING

Aircraft CG and MAUW limitations must be adhered to at all times.

WARNING

For each flight the most forward CG (i.e. with take-off fuel) and the most rearward CG (i.e. with landing fuel) must be calculated (to be within aircraft CG range / limits).

6.4 Determining aircraft CG

Weight and balance report lists:

- Empty CG check.
- Forward CG check (example).
- Rear CG check (example).
- Blank CG form.

CG formulae:

$$\mathrm{CG} = \frac{\mathrm{Total\ Moment}}{\mathrm{Total\ Weight}}$$

$$\%\mathrm{MAC} = (\mathrm{CG} - 1616\ \mathrm{mm})\ \mathrm{x}\ \frac{100}{1\ 349\ \mathrm{mm}}$$

$$\%\mathrm{MAC} = (\mathrm{CG} - 5.301\ \mathrm{ft})\ \mathrm{x}\ \frac{100}{4.425\ \mathrm{ft}}$$

WARNING
For each flight the most forward CG (i.e. with take-off fuel) and the most rearward CG (i.e. with landing fuel) must be calculated (to be within aircraft CG range / limits).

The aircraft empty CG is determined in a conventional manner by weighing the aircraft whilst it is standing level. (Refer to the aircraft maintenance manual for instructions on aircraft leveling and weighing).

6.5 Empty CG determination

	ITEM	WEIGHT [kg (lb)]	ARM [mm (ft)]	MOMENT (weight x arm) [kg.mm (lb.ft)]
Aircraft Empty CG	Right Main Wheel	W_R =	L_R = 2 236 (7.335)	
	Left Main Wheel	W_L =	L_L = 2 236 (7.335)	
	Nose Wheel	W_N =	L_{NO} = 548 (1.797) L_{NN} = 464 (1.522)	
	Computed empty CG	Empty weight: W_E = …………..kg (lb)	CG = ……….. mm (ft) (…………% MAC)	Aircraft moment :

NOTE

L_{NO} – Old nose wheel arm length
L_{NN} – New nose wheel arm length

Maximum take-off weight = 920 kg (2028.25 lb).

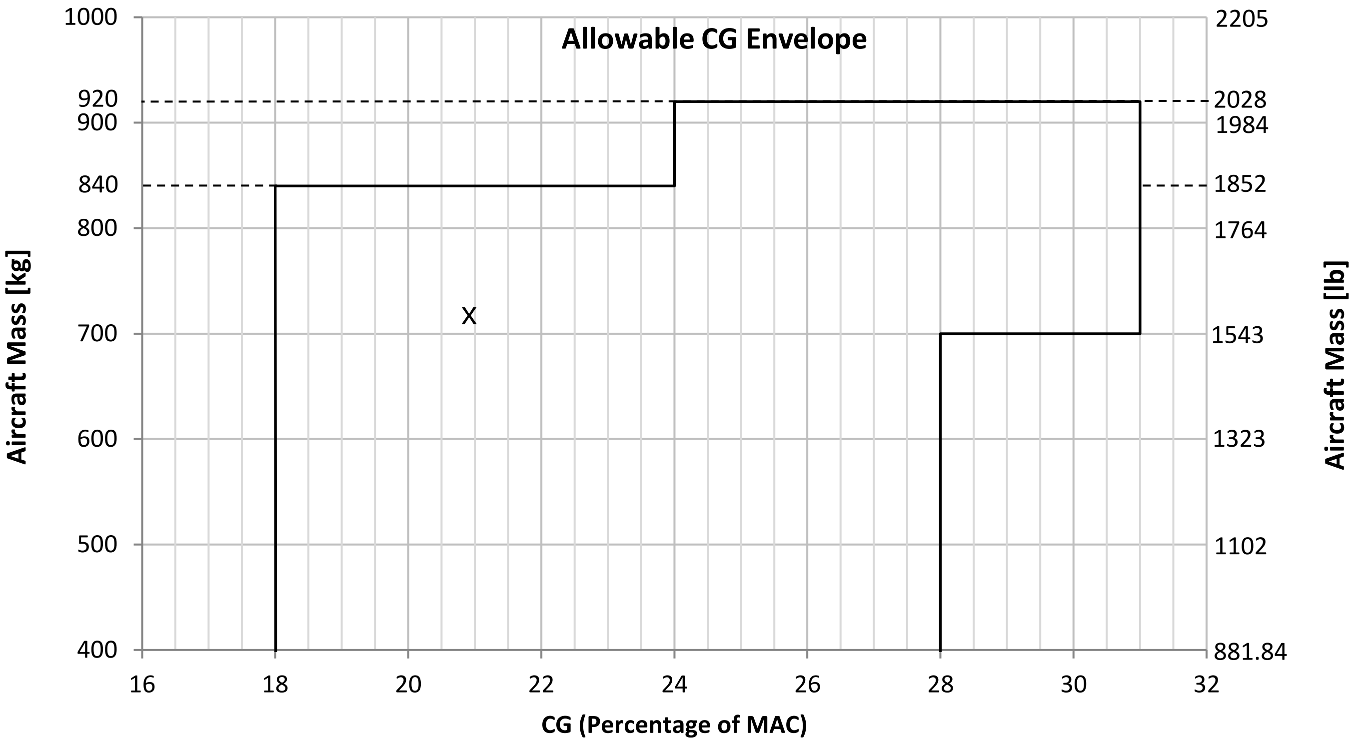
Maximum useful load (<u>example</u>):

$W_{max\ useful}$ = W_{MAUW} - W_E.
= 920 kg (2028.25 lb) - 490 kg (1080.27 lb)
= 430 kg (947.99 lb)

6.6 Forward CG check (<u>example</u>)

	WEIGHT [kg (lb)]	ARM [mm (ft)]	MOMENT (weight x arm) [kg.mm (lb.ft)]
CREW (FRONT)	120 (264.554)	1 902 (6.24)	228 240 (1650.817)
PASSENGERS (REAR)		2 748 (9.016) (or 2 948 (9,672))	
BAGGAGE		3 288 (10.787)	
FUEL	121 (266.759)	1 761 (5.777)	213 081 (1541.066)
ADD EMPTY VALUES	490 (1080.27)	1 927 (6.322)	944 230 (6829.467)
TOTAL			
	W_T = 731 (1161.58)	1895 (8.63)	M_T = 1 385 551 (10 021.35)
			CG = 20.7 %MAC

Forward CG position on graph

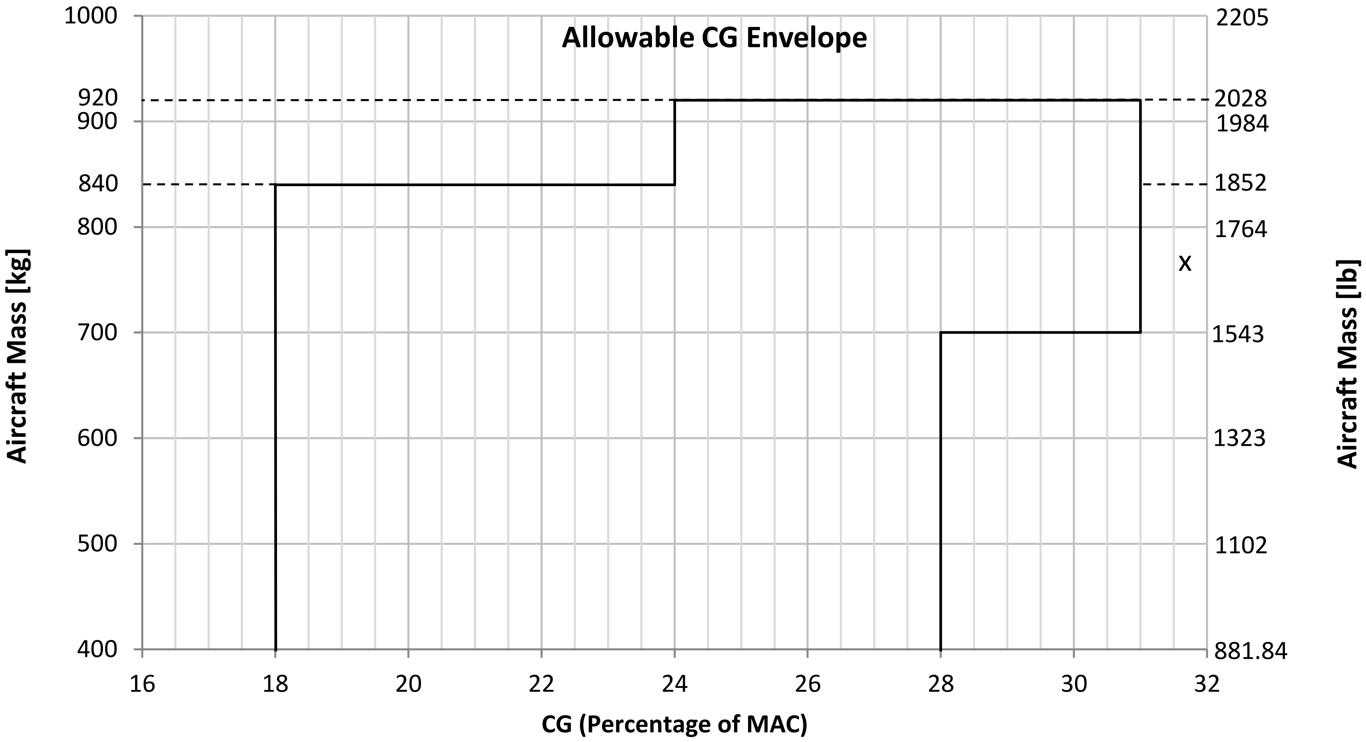


6.7 Rear CG check (example)

	WEIGHT [kg (lb)]	**ARM** [mm (ft)]	**MOMENT** (weight x arm) [kg.mm (lb.ft)]
CREW (FRONT)	160 (352.739)	1 902 (6.24)	304 320 (2201.091)
PASSENGERS (REAR)	100 (220.462)	2 748 (9.016) (or 2 948 (9,672))	274 800 (1987.685)
BAGGAGE	10 (22.046)	3 288 (10.787)	32 880 (237.81)
FUEL	10.8 (23.809)	1 761 (5.777)	19019 (137.544)
ADD EMPTY VALUES	490 (1080.27)	1 927 (6.322)	944 230 (6829.467)
TOTAL			
	W_T = 770.8 (1699.32)	2043 (6.705)	M_T = 1 575 249 (11 393.597)
			CG = 31.7 %MAC

NOTE: THIS EXAMPLE SHOWS AN OUT OF ENVELOPE CG !!!!!

Rear CG postion on graph



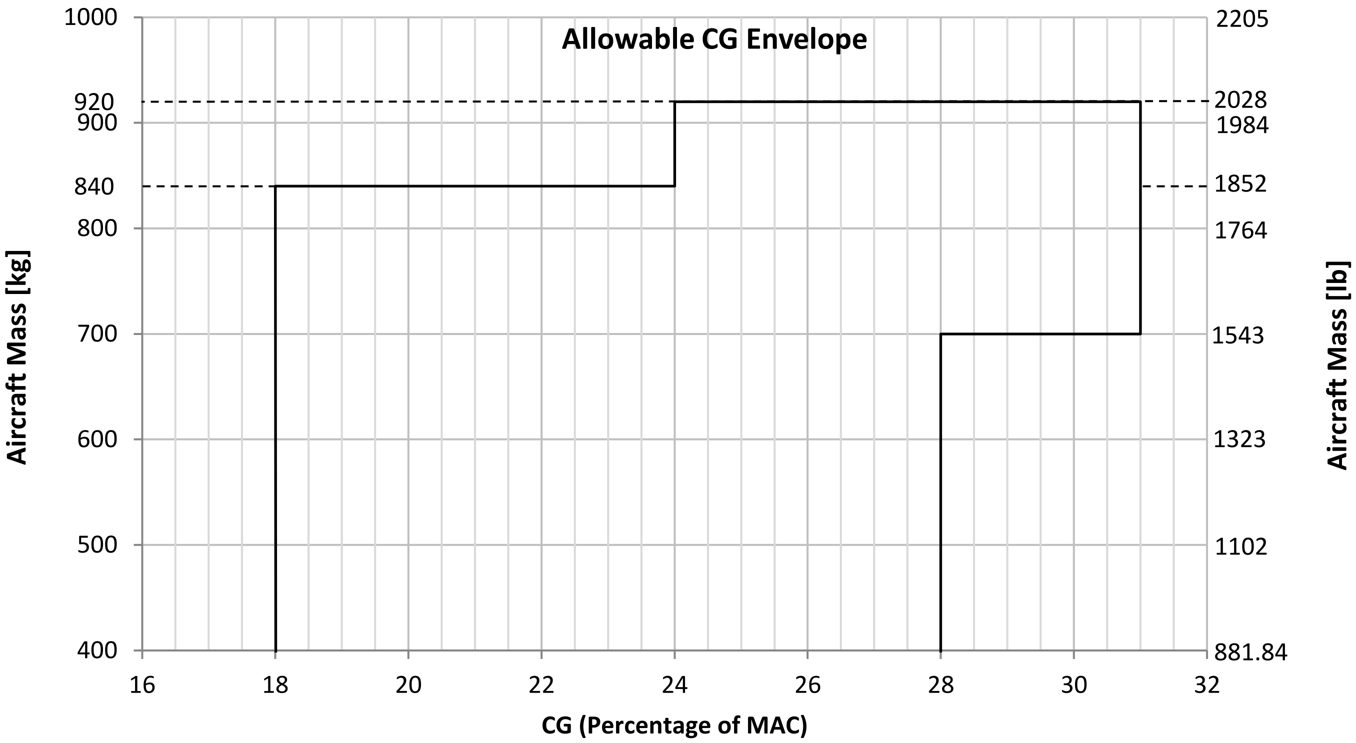
NOTE: THIS EXAMPLE SHOWS AN OUT OF ENVELOPE CG !!!!!

6.8 Blank form and graph

	WEIGHT [kg (lb)]	ARM [mm (ft)]	MOMENT (weight x arm) [kg.mm (lb.ft)]
CREW (FRONT)		1 902 (6.24)	
PASSENGERS (REAR)		2 748 (9.016) (or 2 948 (9,672))	
BAGGAGE		3 288 (10.813)	
FUEL		1 761 (5.777)	
ADD EMPTY VALUES			
TOTAL			
	W_T =		M_T =
			CG = %MAC

WARNING
Aircraft CG and MAUW limitations must be adhered to at all times.

WARNING
For each flight the most forward CG (i.e. with take-off fuel) and the most rearward CG (i.e. with landing fuel) must be calculated (to be within aircraft CG range / limits).



WARNING
Aircraft CG and MAUW limitations must be adhered to at all times.

WARNING
For each flight the most forward CG (i.e. with take-off fuel) and the most rearward CG (i.e. with landing fuel) must be calculated (to be within aircraft CG range / limits).

7. SYSTEMS

7.1 Introduction

This section provides information applicable to the various systems found on the Sling 4 aircraft.

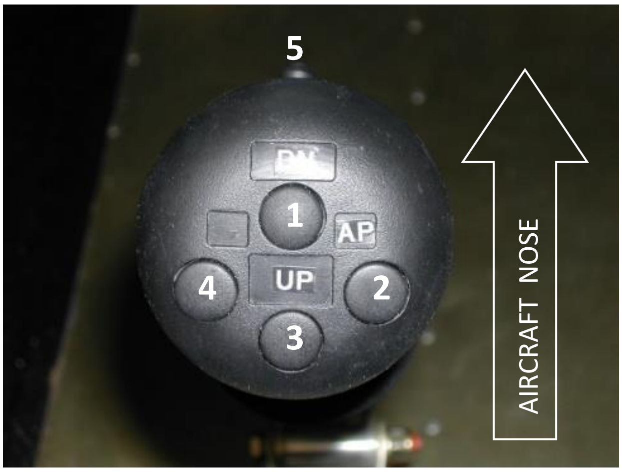
7.2 Airframe

The aircraft has an all-metal construction with single curvature stressed aluminum alloy skins riveted to stiffeners. Construction is of 6061-T6 aluminum alloy sheet metal riveted to aluminum alloy angles with high quality blind rivets. This high strength aluminum alloy construction provides long life and low maintenance costs due to its durability and corrosion resistant characteristics. The wing has a high lift airfoil (NACA 4415) and is equipped with semi-slotted Fowler type flaps.

7.3 Control system / pilot controls

Control stick(s)

The aircraft is equipped with dual control sticks. Refer to paragraph 7.11. The control sticks operate in the standard pitch and roll (elevator and aileron) configuration. See the picture below for control stick button allocation:



Button	Function
1	Trim down
2	Autopilot control
3	Trim up
4	Not allocated
5	Radio PTT

Rudder pedals / nose wheel steering

The aircraft is fitted with dual rudder pedals, which control the rudder and steer the nose wheel.

Brake lever and park brake shut-off valve

Refer to paragraphs 7.5 and 7.11.

Throttle lever and choke knob

Refer to paragraphs 7.11 and 7.17.

Fuel selector valve

Fuel tank feed selection is enabled by a red coloured, three-position (LEFT, LEFT, RIGHT, OFF) rotary fuel selector valve, located at the bottom centre of the instrument panel / front of centre console. Refer to the instrument panel layout in paragraph 7.12.

An additional knob must be activated to move the selection lever through a detent to the OFF position, preventing inadvertent closure (OFF selection) of the valve.

Ballistic parachute activation lever (if fitted)

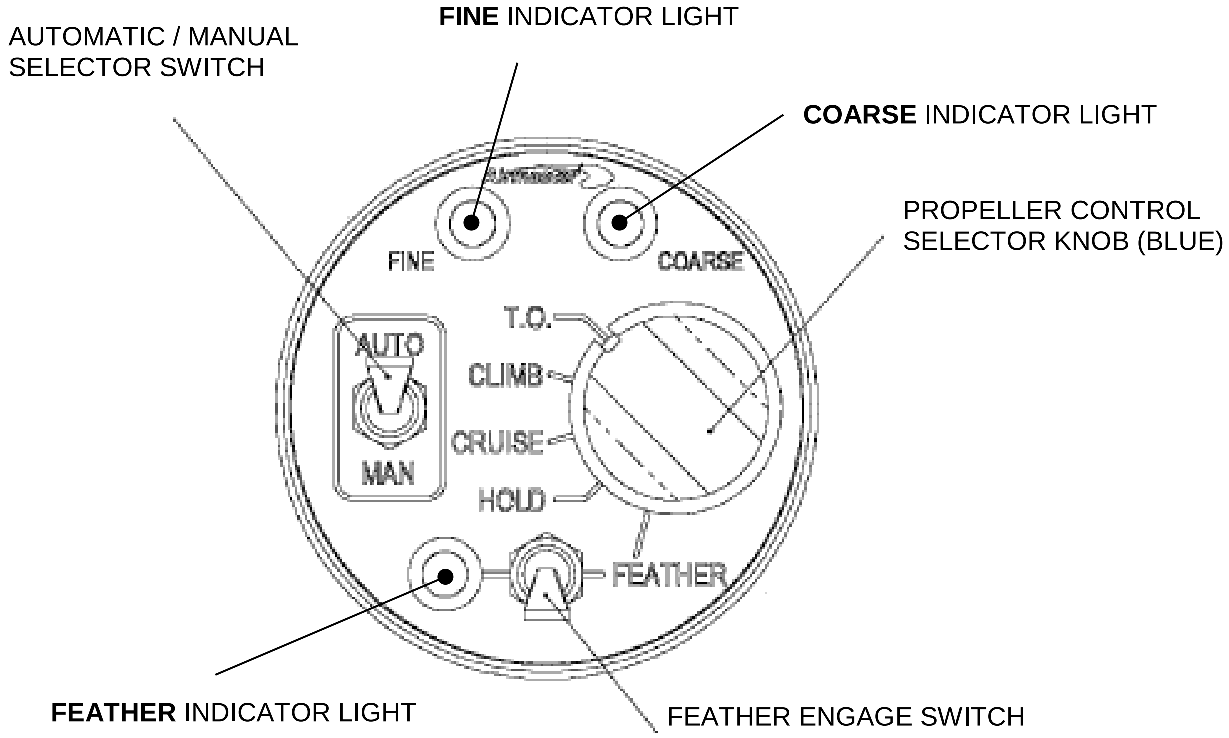
The red coloured activation lever is located at the bottom centre of the instrument panel. Refer to the instrument panel layout in paragraph 7.12.

Inadvertent operation of the lever is prevented by a lock pin (tagged with a red flag). THIS PIN MUST BE REMOVED BEFORE FLIGHT.

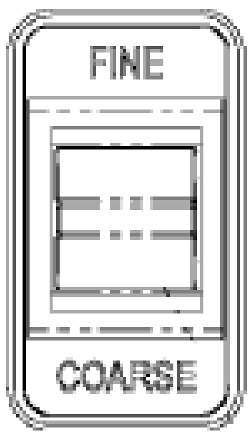
Electrical equipment selection / control switches

SWITCH / LABEL	FUNCTION	POSITION
IGNITION / STARTER KEY SWITCH	Both magnetos off.	OFF
	Select left magneto.	L
	Select right magneto.	R
	Select both magnetos.	BOTH
	Activates starter motor (if there is power on main bus).	START
EFIS	Switch power (from main bus) to EFIS system on / off.	UP (ON) DOWN (OFF)
EFIS BKUP	Connects EFIS system to EFIS back-up battery supply.	
MAIN PUMP	Switch main fuel pump on / off.	
AUX PUMP	Switch auxiliary fuel pump on / off.	
LAND	Switch landing lights on / off.	
TAXI	Switch taxi lights on / off.	
NAV	Select position (navigation) lights.	
STROBE	Select anti-collision (strobe) lights.	
AVIONICS	Switch power to radio and transponder on / off.	
PROP	Switch power to propeller motor and controller on / off.	
AUTOPILOT	Switch power to autopilot servos on / off.	
MASTER	Switch power to main bus on / off.	

Propeller



PROPELLER CONTROLLER



MANUAL PROPELLER CONTROL SWITCH

Pilot operable controls related to the constant speed propeller system are the following:

- Power switch (labelled PROP), located on the instrument panel. This switch activates / deactivates the power supply to the propeller controller unit and to the propeller motor.

- Automatic / Manual Selector switch, located on the propeller controller. This switch selects between propeller automatic (AUTO) and manual (MAN) control modes:

    - Automatic mode (AUTO) operation includes constant speed governing in pre-set (take-off, climb, cruise) and hold modes, and feathering.

    - In manual mode (MAN) the Manual Propeller Control switch exercises direct control over propeller pitch, allowing the propeller to be used as an in-flight adjustable variable pitch propeller.

- Propeller Control Selector knob. This rotary (blue) knob has no function when manual mode (MAN) is selected on the Automatic / Manual Selector switch. With automatic (AUTO) mode selected, the knob is used to select between the various pre-set propeller modes:

    - **TO**. This selection is used for take-off and landing.

- **CLIMB**. Used for climbing and any other operations where continuous higher power settings are required.

- **CRUISE**. This selection is used for normal cruise operation.

- **HOLD**. Provides constant speed propeller governing at a pilot selected speed.

- Feather Engage switch. With automatic (AUTO) mode selected with the Automatic / Manual Selector switch and the Propeller Control Selector knob set to FEATHER, engaging this switch will initiate automatic feathering of the propeller. This setting should only be used in an emergency.
- Manual Propeller Control switch, located separately from the propeller controller unit on the instrument panel. The Manual Propeller Control switch provides for:

    - Direct control of the propeller pitch when manual mode (MAN) is selected with the Automatic / Manual Selector switch. Moving the switch up changes propeller pitch in the fine direction. The Fine indicator light should indicate orange during the operation. Moving the switch down changes propeller pitch in the coarse direction. The Coarse indicator light should indicate orange during the operation.

    - With the Automatic / Manual Selector switch set to AUTO and the Propeller Control Selector knob selected to HOLD mode, the Manual Propeller Control switch is used to set a pilot selected propeller governing speed. Operate the switch up or down to change propeller pitch in the direction desired. When the desired speed (rpm) is reached, release the switch. The engine / propeller speed will be governed to that speed. Finally, set desired power with the throttle.

NOTE

When power is initially applied to the propeller controller, the speed setting at which the HOLD mode will govern the propeller is set equal to the pre-set CRUISE mode governing speed, until altered by pilot selection.

Information conveyed to the pilot(s) by the propeller system is provided by three lights located on the propeller controller, namely the Coarse indicator light, Fine indicator light and Feather indicator light. The following table lists the various propeller status indications provided by said lights in automatic (AUTO) mode and, where applicable, manual (MAN) mode:

PROPELLER STATUS	INDICATOR LIGHT		
	FINE	COARSE	FEATHER
Pitch decreasing	Orange		
Pitch increasing		Orange	
Pitch increasing in feather			Orange
No speed signal	Orange flashing		
Fine pitch limit	Green		
Coarse pitch limit		Green	
Feather pitch limit			Green

Driving at fine pitch limit	Green flashing		
Driving at coarse pitch limit		Green flashing	
Driving at feather pitch limit			Green flashing
Over-current while pitch decreasing	Red		
Over-current while pitch increasing		Red	
Over-current while pitch increasing in feather			Red
Open circuit failure	Red flashing	Red flashing	Red flashing
Controller software fault	Rapid red flashing	Rapid red flashing	Rapid red flashing

EFIS operation and control

EFIS function selection and control mechanisms are described in detail in the EFIS manufacturer supplied documentation. Please refer to such. Refer to paragraph 7.12 for additional information on operational use of the EFIS system.

Elevator trim

Elevator trim is electrically controlled by buttons on the control column. Refer to **Control stick(s)** for button allocation.

Flap selection knob

Wing flaps are electrically controlled and selected (for position) by a four-position rotary knob located on the instrument panel (refer to paragraph 7.12).

Selector Position	Degrees flap deflection
0	0°
1	11°
2	20°
3	32°

Cabin heat

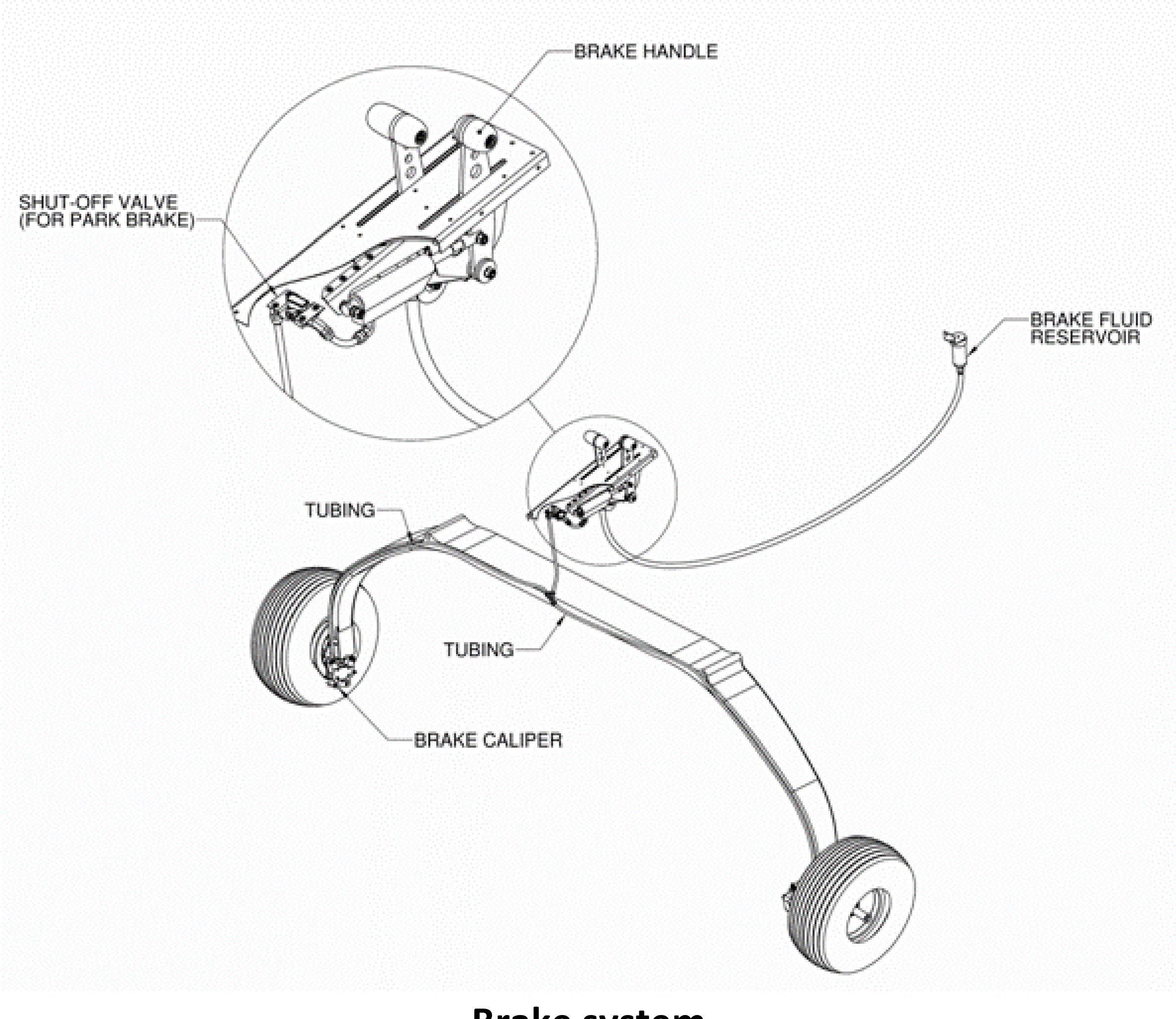
Heated air (warmed by heat exchange with engine exhaust) can be selected via a selection knob located on the instrument panel. Refer to the instrument panel layout in paragraph 7.12. Hot air is selected by pulling out the knob.

7.4 Landing gear

The landing gear is a tricycle landing gear with a steerable nose wheel. The main landing gear uses a single continuous composite spring section.

7.5 Brake system

The aircraft braking system is typically a single hydraulic system acting on both wheels of the main landing gear via disk brakes. Activation is via a lever located on the cabin centre console. Refer to paragraph 7.11. An intercept valve acts as a parking brake (by stopping pressure relief). For braking to be operational the brake intercept valve must be off and the brake lever activated. The arrangement is shown in the diagram below:



Brake system

A conventional, differential, foot controlled braking system may also be fitted as an option. In such cases each brake caliper is separately actuated by way of a master hydraulic brake servo fitted to the rudder pedal on the side of the aircraft corresponding to the wheel on which the applicable caliper is located. The parking brake arrangement operates in the same manner as with the hand actuated system.

7.6 Safety harness

The aircraft has side-by-side seats. Conventional spool type, inertial three point safety belts are provided for the front seats. Lap straps are provided for the rear occupants. The front seats can be adjusted backwards and forwards for comfort, with forward movement slightly raising the seat height.

IMPORTANT: Ensure that the seat(s) is (are) securely locked into position after adjustment.

WARNING
Prior to each flight, ensure that the seat belts are firmly secured to the airframe, and that the belts are not damaged.

7.7 Ballistic rescue parachute

1. The Sling 4 is designed specifically for convenient fitment of a Magnum 901 ballistic parachute recovery system. The system is manufactured by Stratos 07 and designed to enable the pilot or passenger to deploy the parachute in case of emergency in such a manner that the aircraft structure is carried under the parachute to the ground, on the basis that the occupants will not be injured and the aircraft structure suffers minimal damage.
2. Use of a ballistic parachute system involves inherent risks and the system should be properly understood by the pilot prior to use.
3. The pilot must ensure that he/she is familiar with the operating procedure for the Magnum 901 ballistic parachute recovery system and adhere to all specified procedures as per the manufacturer's user manual.
4. The ballistic rescue parachute is housed in a dorsal bay in the rear fuselage, immediately behind the rear right passenger seat.
5. The ballistic rescue parachute activation handle is located on the bottom centre of the instrument panel (refer to paragraph 7.12).
6. A removable safety pin prevents accidental activation of the ballistic rescue parachute activation handle when not in flight. <u>This pin must be removed before take-off and replaced after flight.</u>

7.7.1 Ballistic rescue parachute operational parameters

PARAMETER	
Limit speed	320 km.h^{-1} / 172.8 kt
Recommended minimum deployment height (above ground)	1000 ft.
Deployment time (at limit speed)	8 Seconds.
Pull force required on activation handle (handle must move 2 cm outward before parachute activates)	5 kg / 11.023 lb.

Maximum permitted mass	950 kg / 2094.39 lb.
Descend rate (maximum permitted mass)	7.2 $m.s^{-1}$

7.8 Baggage compartment

The baggage compartment is positioned behind the rear seats and is designed to carry up to 35 kg (77.16 lb) in total. It is the obligation of the pilot to ensure that the aircraft CG is within the allowed limits. All baggage must be properly secured.

The baggage compartment can be accessed via a door in the port (left) side if the rear fuselage.

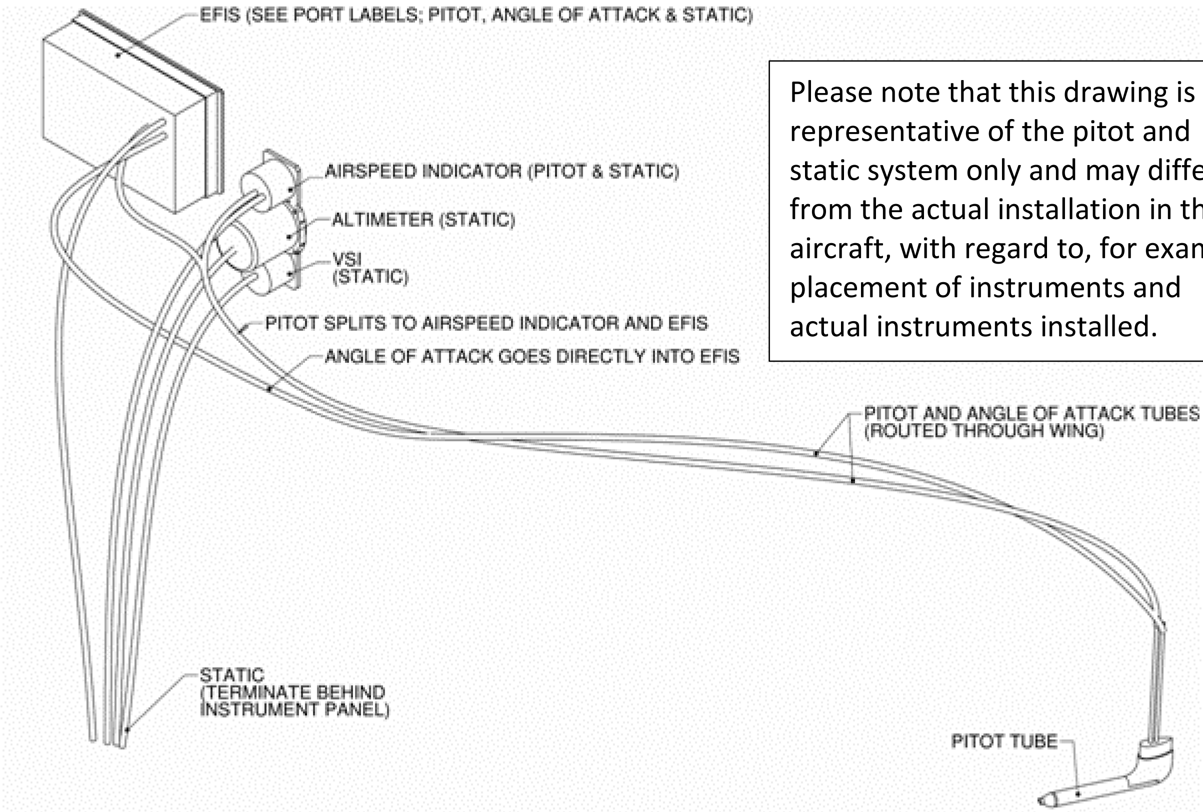
7.9 Canopy

The aircraft is equipped with a two part / panel hinged, upward opening canopy mechanism. External access to the cabin is from either side. Operating levers for the canopy latching mechanisms are provided on the inside and outside of the canopy panels (in the centre of the bottom edge of each panel).

> **WARNING**
> Ensure that the canopy doors are securely latched into position before operating the aircraft.

7.10 Pitot and static system

A pitot tube is located below the left wing. Pressure distribution to the instruments is through flexible plastic hoses. The tube incorporates a second inlet for measurement of angle of attack. The static port is located behind the instrument panel. Keep the pitot head clean to ensure proper functioning of the system. <u>Ensure that the pitot tube cover is removed prior to every flight and that it is replaced after every flight.</u>

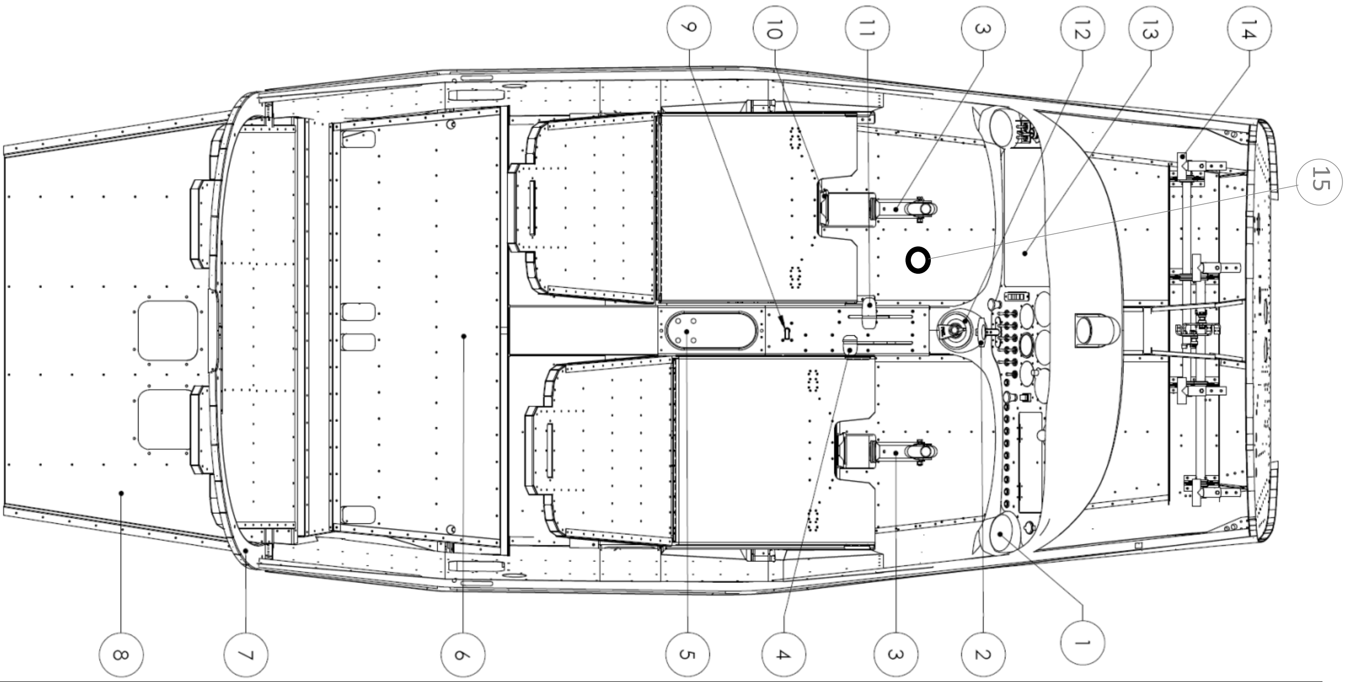


Please note that this drawing is representative of the pitot and static system only and may differ from the actual installation in the aircraft, with regard to, for example, placement of instruments and actual instruments installed.

Pitot - static system

7.11 Cockpit layout

The basic cockpit layout is the same for all Sling 4 aircraft, notwithstanding that instrumentation may differ substantially. All Sling 4 aircraft contain the minimum instrumentation, but particular aircraft may contain substantial additional instrumentation. The basic cockpit layout is configured as in the diagram below.



1	Air vent	8	Luggage compartment
2	Ballistic parachute activation lever	9	Brake shut-off valve (park brake)
3	Control column	10	Seat adjustment handle / lever
4	Brake lever	11	Throttle
5	Headset connection sockets	12	Fuel selector
6	Rear seat(s)	13	Instrument panel
7	Rear headphone connection sockets	14	Rudder pedals
15	Fire extinguisher		

Cockpit layout

If differential footbrakes are fitted the hand operated brake actuator on the centre console will be absent.

Seats have a slide mechanism with a forward moving unlocking lever / handle in the centre front of each seat, in order to move the seat for comfort and to ensure that the rudder pedals can be reached easily by all pilots. The rudder pedals may be adjusted via removal of the locking bolt(s).

Air vents are located on the lower right and left sides of the instrument panel.

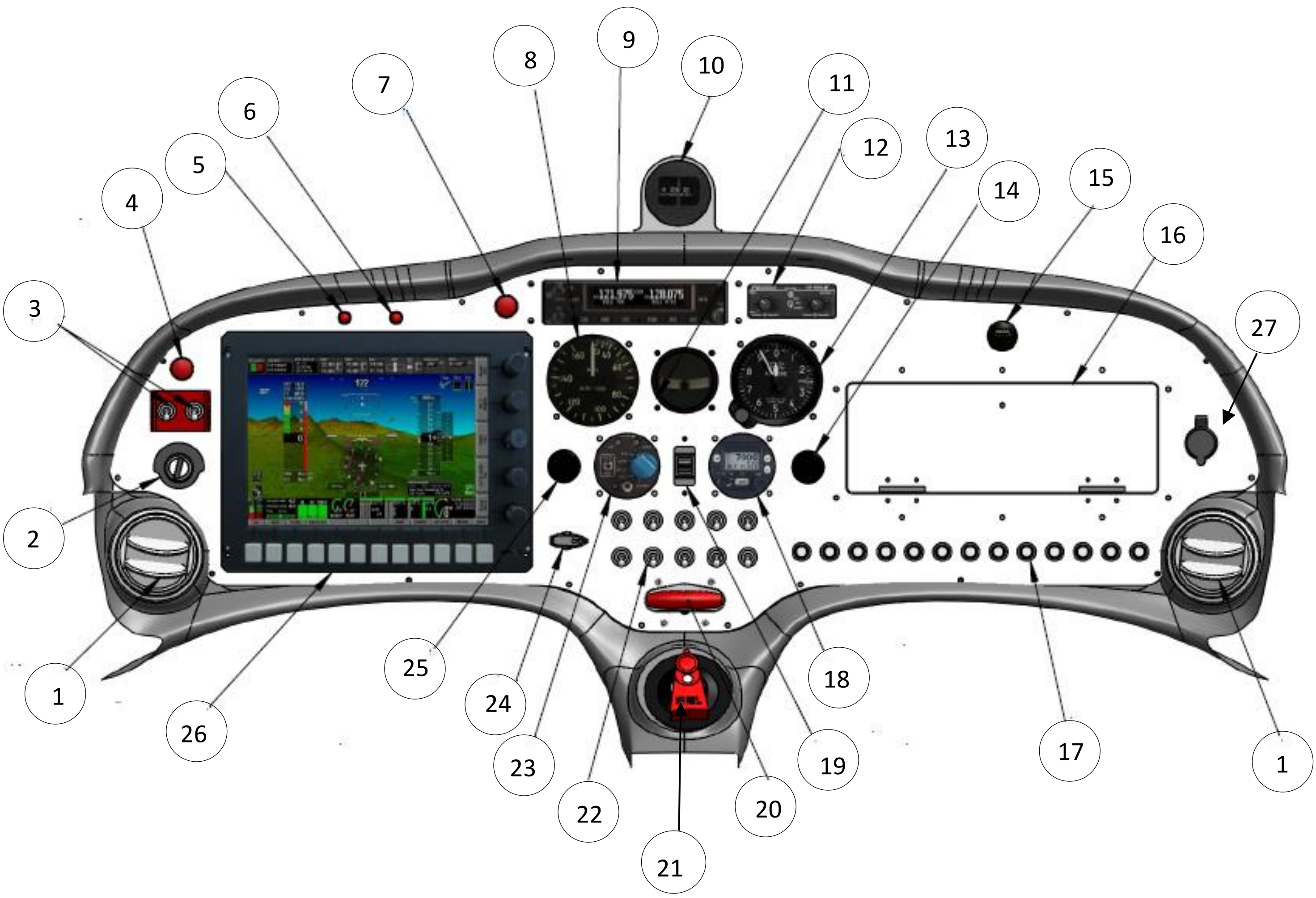
Baggage space is immediately behind the rear seat(s).

A fire-extinguisher (Halon type) is held in place against the centre console side wall, close to the pilot's right knee.

Two adjustable red interior cockpit lights are positioned behind and between the pilot and front passenger's heads, on the cockpit rollover structure.

7.12 Instruments and avionics

The diagram below represents a standard instrument panel containing typical fitted instrumentation, together with typical back-up and additional instrumentation supplied with the aircraft. The instrument panel in any particular aircraft may differ from that illustrated in the diagram. It is the responsibility of the pilot to ensure that s/he is familiar with the instrumentation in the aircraft, its layout and its operation.



Standard instrument panel (refer to key on next page)

1	Air vent(s)	18	Transponder
2	Magneto and start switch	19	Manual propeller pitch control switch
3	Fuel pump switches	20	Ballistic rescue parachute activation handle
4	Charge warning light	21	Fuel selector valve handle
5	TCU boost warning light	22	Switches: EFIS, EFIS back-up battery, propeller, avionics, taxi lights, landing lights, strobe lights, navigation lights, external alternator (if fitted), autopilot, etc.
6	TCU caution warning light		
7	EFIS warning light	23	Propeller controller
8	Airspeed indicator		
9	Garmin GTR 200 radio	24	Flap position control knob (rotary)
10	Compass	25	Choke control knob
11	Ball type slip indicator	26	EFIS
12	Intercom (PM 1000-II)	27	12 V Power port / socket.
13	Altimeter		
14	Cabin heat control knob		
15	USB charge port		
16	Cubby hole		
17	Circuit breakers		

Standard instrument panel key

Radio and Transponder

Power to the radio and transponder is provided via the main bus, through a circuit breaker and activated via a single switch (for both) labeled AVIONICS, located on the instrument panel. Refer to paragraph 7.19.2.

EFIS

EFIS instruments, typically the Garmin G3X or equivalent are multifunction “glass cockpit” instruments and typically incorporate a range of different instruments and functions. Although only the minimum specified instrumentation is required (see paragraphs 2.13 and 7.14 of this Pilot Operating Handbook), the full instrumentation provided by the EFIS will typically include:

- ASI (IAS as well as TAS and ground speed).
- ALT (and typically also height above ground).
- VSI.
- Compass.
- Attitude indicator.
- Turn coordinator.
- G meter (load factor meter).
- Clock, stopwatch and flight time record.
- GPS.
- Comprehensive mapping and navigation software and data, including GLS (GPS Landing System) capability.
- Autopilot (if servos are fitted).
- Full engine monitoring and management capacity including :
    - RPM indicator.
    - CHT and EGT indicators.
    - Oil temperature and oil pressure indicators.
    - Fuel level, fuel flow and fuel pressure indicator.
    - Hobbs and flight time recorder.
    - Voltmeter.

The EFIS installed in the aircraft is typically powered by two separate power sources:

- From the main bus, through a circuit breaker and a main selection switch (labeled EFIS) mounted on the instrument panel. Refer to paragraph 7.19.2.

- From a battery back-up circuit, via a selection switch (labeled EFIS BKUP) mounted on the instrument panel. Refer to paragraphs 7.19.2 and 7.19.3.

Operational use of the EFIS and EFIS back-up battery system

Use and set-up of the EFIS features are extensively described in the documentation supplied with the unit and will not be dealt with in this handbook. Refer to the supplied EFIS documentation.

Autopilot functionality is incorporated in the EFIS. Refer to paragraph 7.24 for additional information.

The EFIS is operated during flight with the EFIS back-up battery selection switch on at all times. This will ensure automatic switch-over of the EFIS to the EFIS back-up battery in the event that power is lost to the main bus.

In the event of a charge system failure:

- Switch the EFIS main switch off. This will allows the EFIS to switch over to (and be powered from) the EFIS back-up battery supply (provided that the EFIS battery back-up switch is on and the EFIS back-up battery contains adequate charge). Leaving the EFIS main switch on will cause the EFIS to be powered from the main bus, contributing (unnecessarily) to the discharge of the main battery.

- Set the EFIS screen brightness to the minimum acceptable for readability (to reduce current drain on the back-up battery).

WARNING

Users should refrain from entering the EFIS set-up pages during flight, as changes to the set-up may result in incorrect readings and/or warnings resulting in safety degradation.

7.13 Flap and elevator trim systems

The aircraft is equipped with electric flaps and an electric elevator trim system. The flap motor is located in the cabin centre console. The two wing flaps are interconnected via a torque tube, which is driven at a single point by the flap motor. Bar a failure in the linkage system, this prevents the flaps from being deployed (driven) to asymmetrical positions. Pilot control of the flap system is via a four position rotary knob (electronic controller) located on the instrument panel. Refer to paragraphs 7.3 and the instrument panel layout in paragraph 7.12.

The flap controller is powered from the main bus. The flap controller in turn powers the flap motor, via a circuit breaker located on the instrument panel (refer to paragraph 7.19.2).

The trim motor is located in the port elevator and drives a trim tab (via a pushrod system) located on the elevator trailing edge. Pilot control is via buttons located on the control stick(s). Refer to paragraph 7.3 for button allocation.

The elevator trim system is powered (via a circuit breaker located on the instrument panel) directly from the charge system output (refer to paragraph 7.19.1) and / or from the battery / main bus (provided the charge relay is energized / not failed).

WARNING

The flap system becomes non-operational with loss of power to the main bus. Elevator trim will still be available with a loss of power to the main bus, provided that the charge system is still operational.

7.14 Standard fitted and minimum required instruments and equipment

The following minimum instrumentation and equipment is required for day VFR flight:

- Altimeter.
- Airspeed indicator.
- Tachometer.
- Outside air temperature indicator.
- Chronometer.
- Compass.

The following additional instrumentation and equipment is fitted as standard on all Sling 4 aircraft:

- EFIS incorporating-
  - Full flight information.
  - Fuel system information.
  - Electrical system information.
  - Engine information
- First aid kit (compliant with national legislation).
- Fire extinguisher.

NOTE
Additional equipment may be required to fulfill national or specific requirements and may be fitted.

WARNING
Notwithstanding that installed equipment may include GPS and other advanced flight and navigational aids, such equipment may not be used as the sole information source for purposes of navigation or flight, except where specifically permitted by law. The aircraft instrumentation is not certified and applicable regulations should be complied with at all times.

7.15 Engine

The Rotax 914 UL engine is a 4-stroke, 4-cylinder, horizontally opposed, turbocharged spark ignition engine with one central camshaft-push-rod-OHV. The engine features liquid cooled cylinder heads with air cooled cylinders. It utilizes dry sump forced lubrication and has a dual contactless capacitor discharge ignition system. The engine is fitted with an electric starter, AC generator (alternator) and two electrical fuel pumps (for redundancy). Propeller drive is via reduction gear with integrated shock absorber.

7.16 Cooling system

Cylinders are air cooled.

Cylinder heads are liquid cooled via a closed circuit system with an expansion tank. A camshaft driven coolant pump circulates coolant from a radiator through the cylinder heads, then an expansion bottle and back to the radiator.

The expansion tank is closed by a pressure cap.

At temperature rise of the coolant an excess pressure valve in the expansion tank opens and coolant flows (via a hose) at atmospheric pressure to an overflow bottle mounted on the firewall. When cooling down the coolant in the overflow bottle is sucked back into the cooling circuit.

Refer to the latest revision / edition of the Rotax 914 UL engine operator and maintenance manuals.

Coolant type

Either water-free propylene glycol based coolant concentrate or the conventional ethylene glycol based coolant and distilled water mixture (1:1 mix) can be used (refer to the latest edition / revision of the ROTAX 914 UL engine Operator Manual).

Refer to the latest revision of the Rotax service instruction SI-914-019.

> **WARNING**
> Waterless coolant (propylene glycol based) may not be mixed with conventional (ethylene glycol/water) coolant or with additives! Non observance can lead to damage to the cooling system and engine.

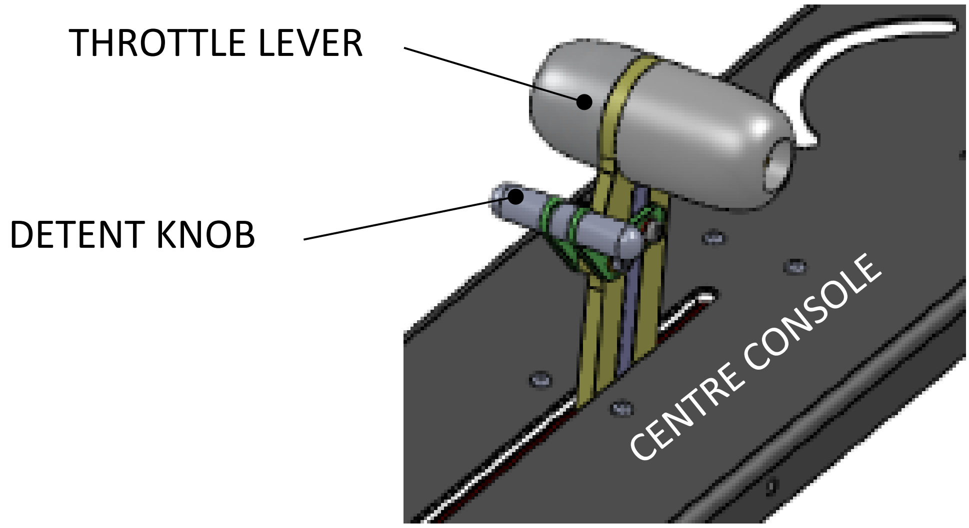
Coolant system volume

Coolant system volume is approximately 2.5 litres (0.66 US gallons).

7.17 Throttle and choke

Engine power output is controlled by means of a hand operated throttle lever situated on the centre console. Refer to paragraph 7.11. Forward movement of the throttle lever increases engine power and backward movement decreases engine power.

The throttle lever incorporates a detent mechanism which stops the lever at the 100% throttle selection position. Moving the throttle lever past the 100% throttle selection requires the manipulation of a detent control / enabling knob located on the throttle lever. Operation of the throttle is related to turbocharger / boost control. Refer to paragraph 7.23.



A choke knob is positioned in the left centre of the instrument panel. Refer to paragraph 7.12. Pulling out the choke knob activates the choke mechanism.

Both controls (throttle and choke) are mechanically connected via cables to activators (levers) on the carburettors.

7.18 Carburettor pre-heating/anti-ice

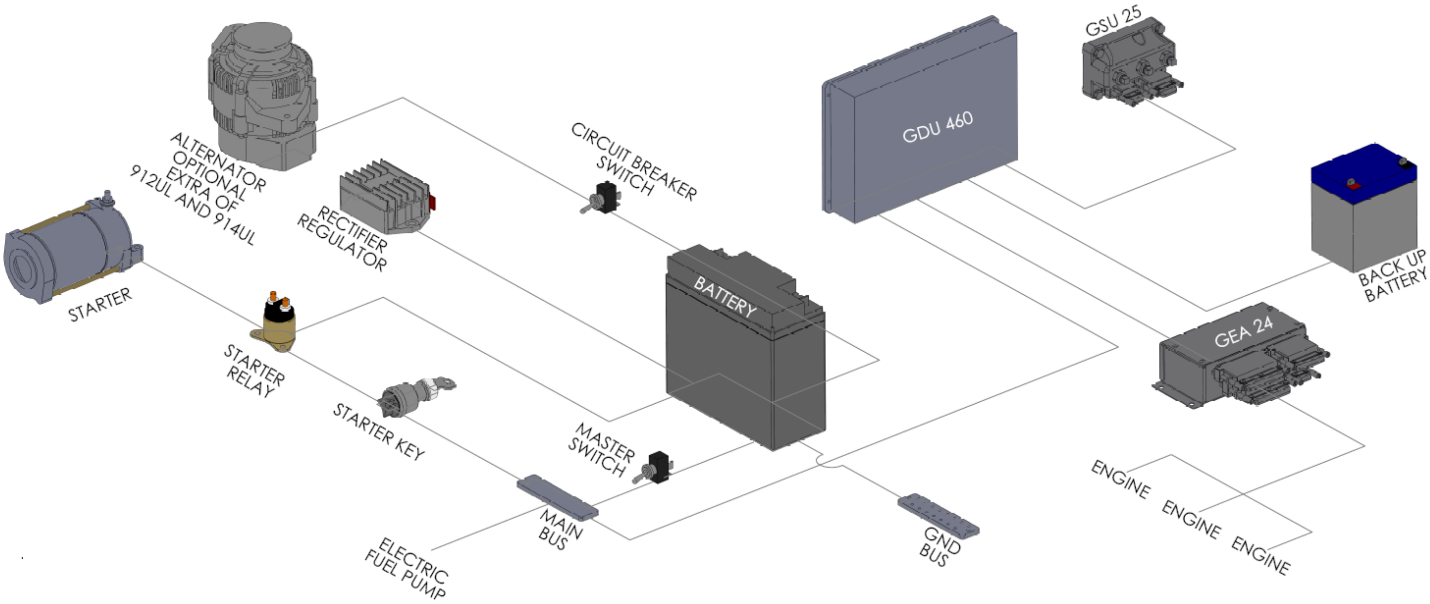
N/A. The turcharger effectively acts to prevent carburettor icing.

7.19 Electrical system (include garmin systems)

Included are circuit / wiring diagrams for those parts of the aircraft's electrical system which are relevant / can aid the pilot / operator's understanding of the aircraft's systems and their use with respect to the operational procedures described in this manual.

Refer to paragraphs 7.19.1 to 7.19.3.

The drawing below provides an overview of the electrical system.



For information about the engine's integral electrical system (alternator, ignition etc.) please refer to the applicable Rotax 914 UL documents.

Charge system

Refer to paragraph 7.19.1. The alternating current (AC) output of the engine driven alternator is routed to a rectifier / regulator where it is converted (rectified) and regulated, to provide direct current (DC) output available to the aircraft systems (e.g. to charge the main battery). Charge system output is approximately 13.5 to 14 V DC (from 1000 ±250 rpm and higher).

If the master switch is switched to off then the main bus will cease to obtain power and the battery will no longer charge.

Alternator failure indication

The electrical system incorporates an AC generator (alternator) / charge light located on the upper left side of the instrument panel (refer to paragraph 7.12). The light will illuminate if there is an AC generator (alternator) failure.

Main battery

The 12 V main battery is mounted on the engine side of the firewall.

Main bus

Refer to paragraphs 7.19.1 and 7.19.2.

When power to the main bus is lost / fails / is removed (i.e. Master switch turned off, or alternator fails and battery is flattened) the following equipment becomes non-operational:

1. Auxiliary fuel pump.
2. Flaps.
3. Autopilot (i.e. the autopilot servos).
4. Propeller control.
5. Radio and transponder.
6. Strobe, navigation and taxi lights.
7. Starter.
8 EFIS (<u>unless powered by the EFIS battery back-up circuit</u>).
9. The charge system relay is de-energized and disconnects the charge system from the battery and main bus.
10. TCU (Turbocharger Control Unit) / waste gate servo.

With regard to the above:

1. The main fuel pump is operated via the charge system output and will continue to operate provided that the alternator / charge system remains operational.
2. The EFIS and related equipment can be operated via the EFIS back-up battery circuit, provided that the circuit is switched on.
3. The propeller controller and propeller pitch actuator motor are not powered and the propeller essentially becomes a fixed pitch propeller at the last pitch setting it was commanded to (by the propeller controller). Continued safe flight is possible at all ordinarily used operational settings

4 With loss of power to the TCU, the waste gate servo is not powered and will remain in its last commanded position. Boost pressure control is not available and limited flight operation is applicable.

EFIS back-up battery / circuit

The 12 V EFIS back-up battery is mounted on the cabin side of the firewall, under the instrument panel. The EFIS back-up circuit can be operated independently from the main bus (i.e. with the master switched off).

Master switch

The master switch connects the electrical system / main bus to the 12 V main battery and charge (regulator / rectifier output) system (via the charge system relay). Refer to paragraph 7.19.1.

Ignition/magneto and starter switches

Ignition / magneto switches and starter switch are incorporated into a key switch mounted on the instrument panel. Refer to paragraphs 7.12, 7.19.1 and 7.19.2.

Both ignition / magneto switches should be ON (key in BOTH position) to operate the engine.

NOTE

The engine ignition system is independent of the aircraft electrical system and will operate even with the master switch and / or any circuit breaker(s) off. The engine requires adequate power supply to at least one fuel pump to remain operational (to prevent stoppage due to fuel starvation).

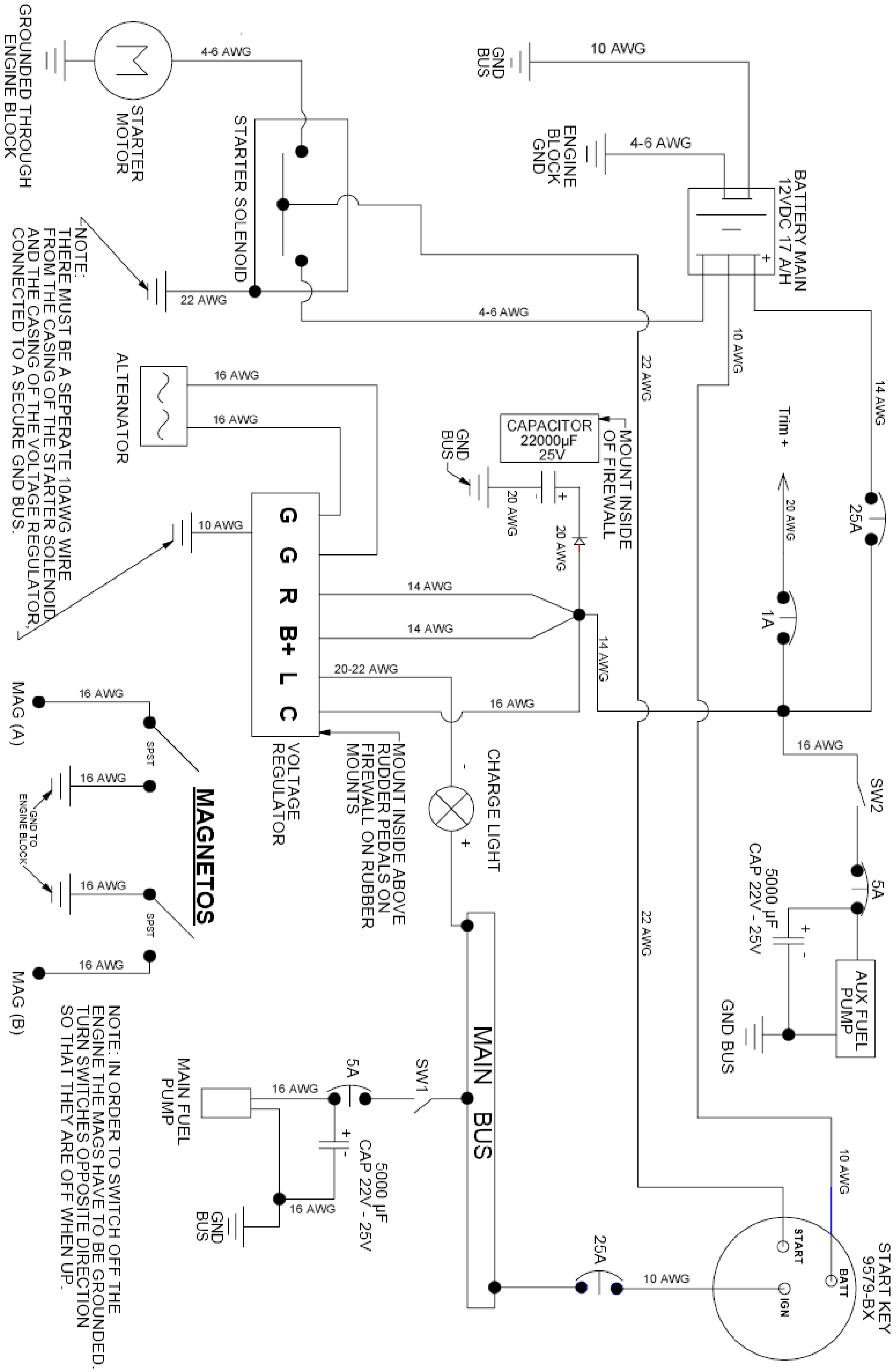
Avionics / equipment switches

Refer to paragraph 7.19.2. Lever type switches are switched UP for activation (i.e. ON). Optional equipment, switches and / or fuses are subject to change or installed as requested. Refer to the Aircraft Equipment List.

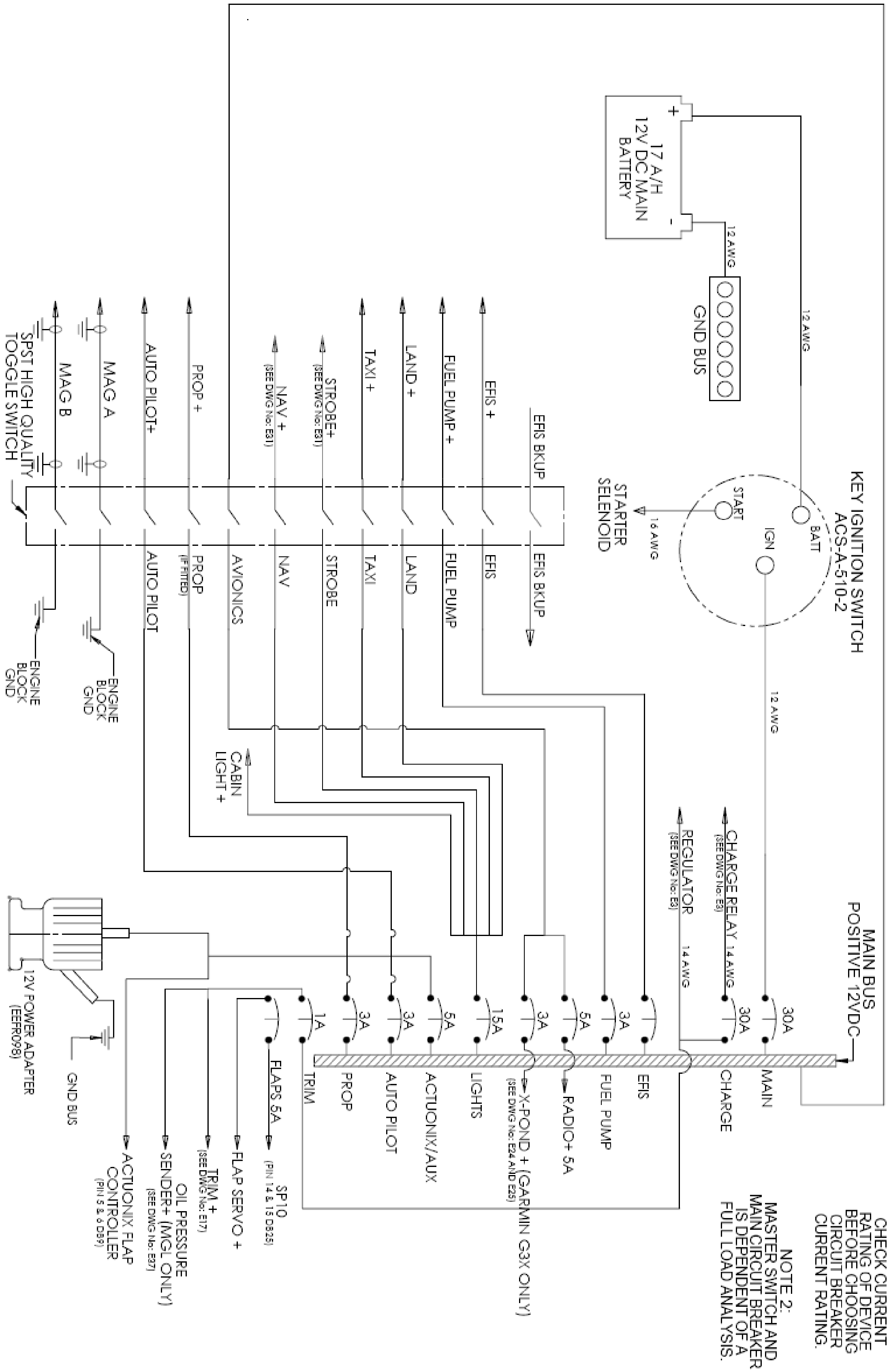
Circuit breakers

Circuit breakers are push-to-reset (i.e. push in) for restoring / supplying electrical power to their corresponding electrical circuits. Refer to paragraphs 7.19.1 and 7.19.2. Circuit breakers are located on the instrument panel. Refer to paragraph 7.12.

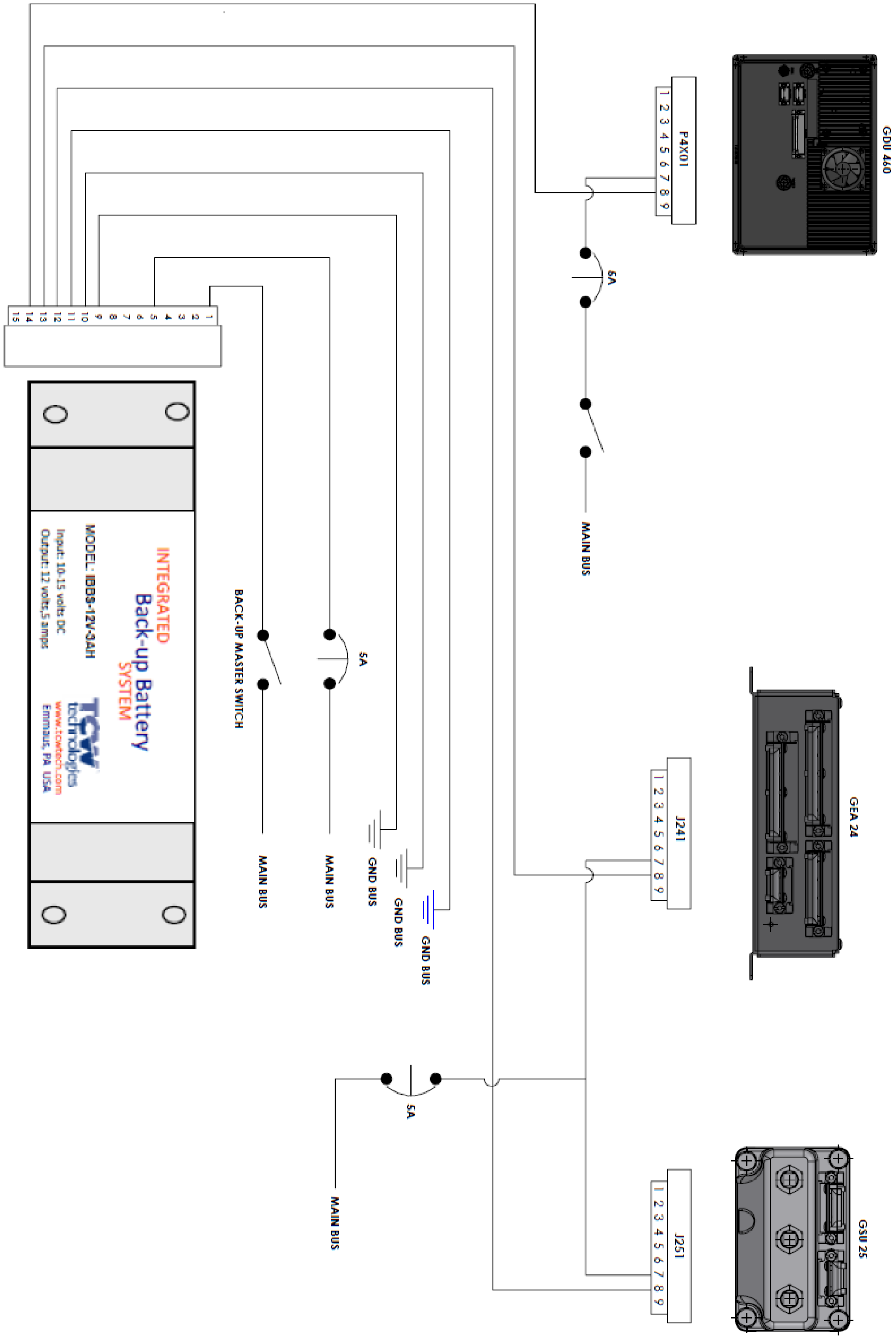
7.19.1 Charge system / start system / fuel pump wiring diagram



7.19.2 Switches and circuit breakers wiring diagram



7.19.3 EFIS back-up circuit / back-up battery wiring diagram



7.20 Propeller

1.83 m (72”) Airmaster AP332 3-blade constant speed propeller with composite blades.

Propeller control is via an electronic control unit mounted on the instrument panel.

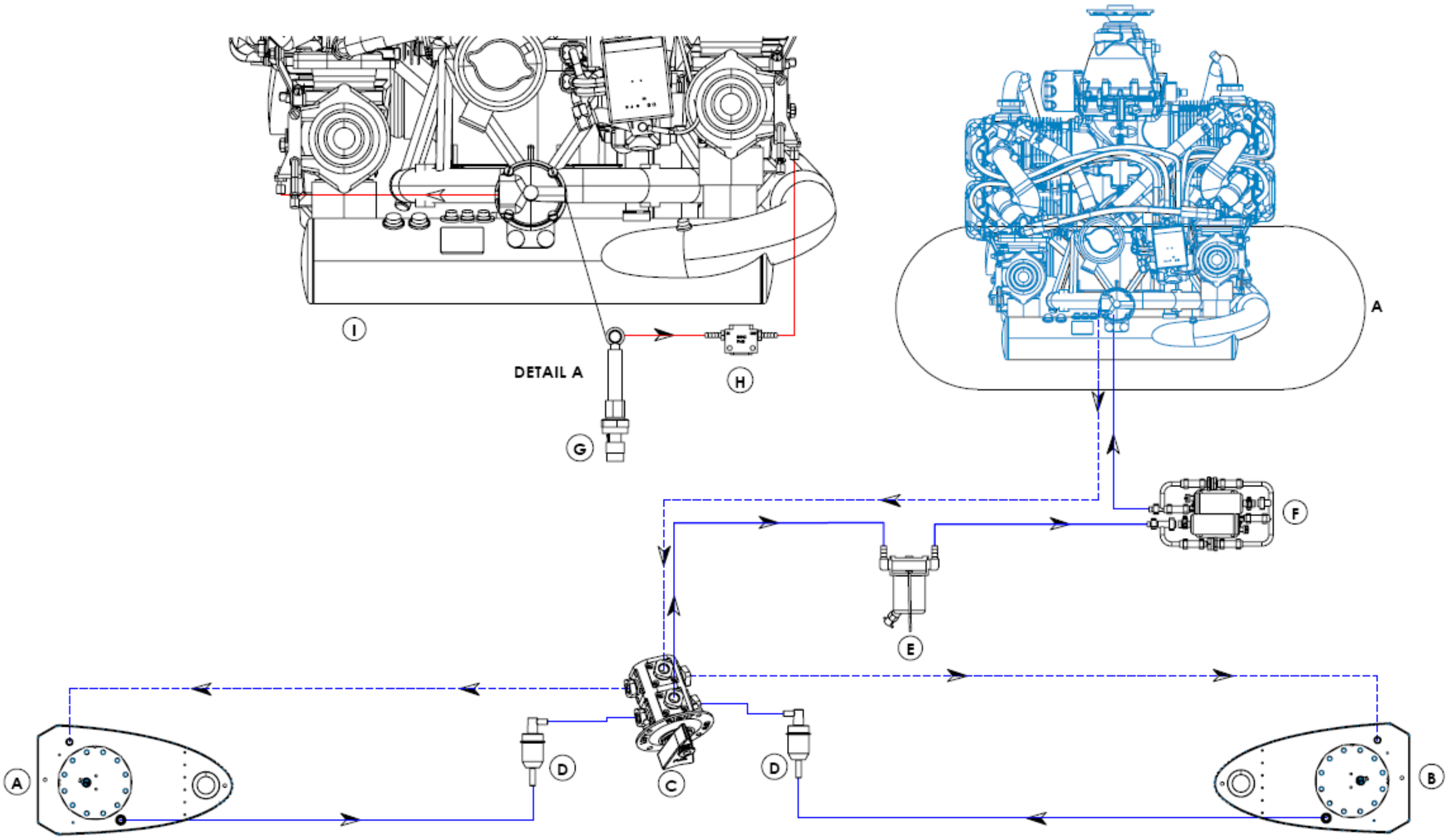
Power to the propeller / propeller controller is provided via the main bus, through a circuit breaker and is activated by a switch labeled PROP, located on the instrument panel. Refer to paragraph 7.19.2.

NOTE

For propeller technical data refer to documentation supplied by the propeller manufacturer.

Reference should be made to the operator’s manual for the Airmaster AP332 propeller for operational guidelines and instructions. These should be incorporated into the normal and emergency procedures for the aircraft, as applicable.

7.21 Fuel system



A	Left fuel tank	F	TAF Fuel pump sensor
B	Right fuel tank	G	Garmin fuel pressure sensor
C	Fuel selector	H	Fuel flow sensor
D	90° Fuel filter	I	914 UL Engine
E	Gascolator		
——— (solid blue line)	8mm Fuel hose SAE J30R7		
- - - - (dashed blue line)	8mm Fuel hose SAE J30R7 return		
——— (red line)	Existing Rotax engine pipes		

The aircraft has two fuel tanks, one located in the inside leading edge of each wing.

Volume of wing tanks: 2 x 84 (22.19 US gallons) litres (168 litres (44.38 US gallons) total, 164 (43.32 US gallons) litres useable).

Each tank is equipped with a vent outlet. A drain valve is located in the lowest point of the each tank. A tank outlet / fuel pick-up is located at the lowest point of the inboard sidewall of each tank. A finger screen is fitted to each fuel pick-up. An inline mesh fuel filter is fitted in the fuel line from each tank to the fuel tank selector valve, which is mounted on the lower centre instrument panel (in the cockpit, refer to paragraph 7.12).

Fuel feed is through two electric pumps. Each pump has a parallel installed check valve (NRV).

The fuel feed from the fuel pumps enters a fuel pressure controller mounted on the engine, where after it splits into two separate branches, one for each carburettor. A fuel pressure sensor is connected to one fuel pipe branch. A fuel flow sensor is connected in the one fuel pipe branch. The sensors are connected to the EFIS via the RDAC unit.

Fuel return lines return excess fuel supplied by the fuel pump(s) to the fuel tank in use.

Main fuel pump

Refer to paragraphs 7.19.1 and 7.19.2. The main fuel pump is connected to the output of the charge system / rectifier and via the charge system relay to the main battery and main bus (as long as the main bus is powered (i.e. the master switch is on) and the charge system relay is energized / not failed). The pump is protected by a circuit breaker located on the instrument panel.

If the charge system fails the main fuel pump will operate via power from the main bus, provided that the charge system relay remains energized / is not failed, the master switch is on and there is no failure of the power supply to the main bus.

If power is removed from the main bus (i.e. the master switch is switched off) or there is a failure of the power to the main bus, or the charge system relay fails, the charge system is disconnected from the main bus and battery. In this case the main pump will operate from the output of the charge system / rectifier, provided that the charge system remains operational.

Auxiliary fuel pump

Refer to paragraphs 7.19.1 and 7.19.2. The auxiliary fuel pump is connected to the main bus. The pump is protected by a circuit breaker located on the instrument panel. The pump cannot be operated when power to the main bus is removed (i.e. the master switch is switched off) or there is a failure of the power supply to the main bus.

Fuel type and considerations regarding the operational use of the fuel system

FUEL (914 UL) **Minimum RON 95 / Minimum AKI 91**			
Grade	**MOGAS**		DIN EN 228 Super, DIN EN 228 Super Plus, ASTM D4814.
	AVGAS	**Leaded**	AVGAS 100LL ASTM D910.
		Unleaded	UL91 ASTM D7547.

Refer to the latest revision of the Rotax 914 UL engine and operator manuals and the latest revision of Rotax service instruction SI-914-019.

WARNING

The fuel lift pipe in each fuel tank is situated adjacent to the lower inside wall of the tank. The aircraft should at no time be subjected to a sustained side slip towards a near empty fuel tank (i.e. wing with near empty tank down) as, despite the baffling, this may lead to fuel running towards the outer edge of the tank and exposing the fuel lift pipe to suck air, thereby starving the engine of fuel and leading to an engine failure. This poses a particular threat when at low altitude, typically prior to landing.

WARNING

If a fuel lift pipe is exposed to air, the pump will suck air into the engine (from the empty tank) and engine failure will result. When a tank is empty, or close to empty, the fuel selector valve should be switched to the fullest tank.

WARNING

At least one fuel pump must be operational at all times during flight for the engine to be operational!

7.22 Lubrication system

The engine is provided with a dry sump forced lubrication system with a camshaft driven main pump with integrated pressure regulator and additional suction pump. The main pump delivers oil from the oil reservoir, through an oil cooler (radiator) and oil filter to points of lubrication.

Surplus oil emerging from the points of lubrication gathers at the bottom of the crankcase from where it is returned to the oil reservoir via piston blow-by gasses.

Oil temperature is sensed by a sensor located on the oil pump housing.

The lubrication circuit is vented at the oil reservoir.

The turbocharger is supplied with oil via a separate oil line from the main pump. Return oil from the turbocharger is collected in a stainless steel sump and is sucked back to the suction pump and then pumped back to the oil reservoir via a return line.

Refer to the latest revision / edition of the Rotax 914 UL engine operator and maintenance manuals.

The lubrication system volume is approximately 3.5 litres (7.4 pints).

Oil type

Automotive grade API SG (or higher) type oil, preferably synthetic or semi-synthetic.

Refer to the latest revision of the Rotax 914 UL engine and operator manuals and the latest revision of Rotax service instruction SI-914-019.

7.23 Turbocharger Control Unit (TCU)

The applicable sections in the Rotax 914 UL operator's manual should be carefully read in conjunction with this section.

A throttle arm position sensor is mounted on one carburetor. The sensor measures (throttle) position linearly from 0% to 115%, corresponding to engine idle and engine full (100%) power respectively. The TCU (Turbocharger Control Unit) utilizes throttle position in conjunction with aircraft ambient pressure, airbox pressure, engine rpm and airbox temperature to actuate an electronically controlled flap (waste gate) to regulate the speed of the turbocharger / boost pressure in the engine airbox.

The TCU starts adding full boost from the 108% throttle position onward.

The throttle lever (in cabin) is equipped with a detent at the 100% throttle lever position. A lever on the throttle lever is activated to move the throttle lever past the detent position to allow movement up to the 115% throttle position. Note that 115% throttle position equates to 100% engine power (full take-off power).

Relationship between throttle position and engine power		
Throttle position	Engine power	
115%	100%	**Maximum 5 minutes!** (take-off power)
100%	85%	Maximum continuous power

NOTE

Throttle position from 108% to 110% result in a rapid rise in boost pressure. Avoid constant throttle settings in this range, as it may result in boost pressure control fluctuations (surging). To avoid unstable boost pressure the throttle should be moved smoothly through this range to full power (115% throttle position), or on a power reduction, to maximum continuous power (100% throttle position).

The TCU controls two indicator lights mounted on the instrument panel (refer to paragraph 7.12), labeled BOOST and CAUTION.

When supply voltage is supplied to the TCU (master switch is switched on) the TCU is subjected to a self-test. Both the BOOST and CAUTION lights should illuminate for 1 to 2 seconds and then turn off. <u>If not, this is indicative of a deficiency and the engine should not be taken into operation before the problem has not been identified and rectified</u>.

TCU LIGHT INDICATIONS			
POSSIBLE CAUSE	Maximum admissible boost pressure exceeded.	Full throttle (115%) operation exceeded maximum duration of 5 minutes.	Sensor failure, wiring failure, TCU failure, possible airbox leak.
BOOST LIGHT INDICATION	Illuminates steadily.	Blinks.	
CAUTION LIGHT INDICATION			Blinks.
NOTE	<u>Boost pressure will not be reduced automatically.</u> Limited operation as boost control may be unavailable or insufficient.	<u>Boost pressure will not be reduced automatically.</u>	Limited operation as boost control may be unavailable or insufficient.
ACTION	Use throttle lever to boost pressure manually to within operating limits.	Use throttle lever to reduce boost pressure manually to within operating limits (at least maximum continuous values). The BOOST light resets when the throttle setting is below the 108% position for a minimum of 5 minutes.	Use throttle lever to reduce boost pressure manually to within operating limits.

When supply voltage to the TCU fails the waste gate servo (and thus the waste gate flap) will remain in its last commanded position. Boost pressure control is not available and limited flight operation is applicable.

7.24 Autopilot system

The autopilot system is integrated into / with the EFIS unit.

Please refer to the latest revisions of the EFIS manual for detailed instructions on autopilot operation and functionality.

The EFIS / autopilot inputs data from an electronic compass and AHRS, and controls two servos (one for pitch and one for roll) linked to the aircraft control system.

Power to the servos is controlled via a switch labeled AUTOPILOT, located on the instrument panel (refer to paragraph 7.19.2). This switch must be on for the autopilot / EFIS outputs to have any effect on aircraft attitude.

The autopilot can be engaged in several ways:

- The autopilot engage / disengage button on the control stick(s) (refer to paragraph 7.3).
- Via the EFIS keypad.

The autopilot can be disengaged in several ways:

- The autopilot engage / disengage button on the control stick(s) (refer to paragraph 7.3).
- Via the EFIS keypad.
- In certain systems, if a servo reports (to the autopilot / EFIS) a slipping clutch or torque overdrive for a number of seconds, i.e. the pilot persistently overrides the autopilot via mechanical force on the control stick.
- Removing power to the autopilot servos (switching off the AUTOPILOT switch), effectively removing the EFIS / autopilot's control / actuation of the servo motors.

7.25 Position, anti-collision, taxi and landing lights

The aircraft is equipped with a landing light and taxi light in each wing leading edge. Each pair of landing lights is activated by a switch (labeled LAND) located on the instrument panel. Likewise each pair of taxi lights is activated by a switch (labeled TAXI) located on the instrument panel.

Combination navigation / position lights (red, green and white) and anti-collision lights (white) are fitted to the wing tips, in the standard configuration (red left, green right). A combination position / anti-collision light (white) is fitted on top of the rudder.

The white lights on the wingtips and rudder are dual function lights that can either be on continuously (position light), flash (anti-collision / strobe light) or flash at a higher brightness level superimposed on continuous operation (i.e. combination position and anti-collision / strobe light).

Position and anti-collision light function is dependent on switch selection:

SWITCH		RED AND GREEN WINGTIP LIGHTS	WHITE WINGTIP LIGHTS	WHITE LIGHT ON RUDDER
NAV	STROBE			
ON	OFF	On (continuous illumination)	On (continuous illumination)	Off
OFF	ON	Off	On (flashing)	On (flashing)
ON	ON	On (continuous illumination)	On (continuous illumination) and flashing (with higher intensity) superimposed on continuous illumination.	On (continuous illumination) and flashing (with higher intensity) superimposed on continuous illumination.

8. AIRCRAFT GROUND HANDLING AND SERVICING

8.1 Introduction

This section contains factory-recommended procedures for proper ground handling and servicing of the aircraft. It also identifies certain inspection and maintenance requirements, which should be followed at all times. Full details for servicing and maintenance appear in the aircraft maintenance manual. This document does not replace the maintenance manual. Reference should always be made to the maintenance manual.

8.2 Servicing fuel, oil and coolant

Refer to the appropriate chapters in the Rotax 914 UL engine maintenance and operator manuals and the Sling 4 Aircraft Maintenance Manual.

8.3 Towing and tie-down / mooring instructions

Towing

If you wish to move the aircraft on the ground other than under its own power, it is best to pull the aircraft forwards or push it backwards by hand holding one or more propeller blades, close to the spinner. The rear fuselage may be pushed down directly above a bulkhead or the horizontal stabilizer may be pushed down close to the root, directly over the front spar at the point where it attaches to a rib, in order to lift the nose of the aircraft for maneuvering purposes. It is best to press down on both points at once to spread the load. It is also acceptable to push the aircraft carefully backwards by putting pressure on the wing leading edges close to the root, directly on a nose rib, or on the horizontal stabilizer leading edge next to the root over a rib.

CAUTION

Avoid excessive pressure on the aircraft airframe - especially at or near control surfaces. The skins are very thin and minimum pressure should be placed on them. Maintain all safety precautions, especially in the propeller area.

Tow Bar

The aircraft can be towed by making use of a tow bar that is hooked to the nose wheel of the aircraft. The aircraft can be steered by rotating the nose wheel through the tow bar. The nose wheel is fully rotated once the pedal control stops have been engaged. For installation of the tow bar refer to the Sling 4 Maintenance Manual.

WARNING

When steering the aircraft with the tow bar, care should be taken to not rotate the nose wheel too violently or too far. This could cause the rudder pedal stops to slip.

Tie-down

The aircraft should be tied down when parked outside a hangar. Mooring is necessary to protect the aircraft against possible damage caused by wind and gusts.

For this reason the aircraft is equipped with mooring eyes located on the lower surfaces of the wings and (one) under the tail.

Mooring procedure:

1. Check: Fuel selector shut off, circuit breakers and Master switch switched off.
2. Check: Magnetos switched off.
3. Secure the control column(s) (using for example a safety harness).
4. Close air vent.
5. Close and lock canopy.
6. Moor the aircraft to the ground by means of a mooring rope passed through the mooring eyes located on the lower surfaces of the wings and below the rear fuselage.

NOTE

In the case of long term parking, especially during winter, it is recommended to cover the cockpit canopy, or possibly the whole aircraft, by means of a suitable tarpaulin attached to the airframe.

8.4 Parking

It is advisable to park the aircraft inside a hangar, or alternatively inside any other suitable space (garage), with stable temperature, good ventilation, low humidity and a dust-free environment.

When parking for an extended period, cover the cockpit canopy, and possibly the whole aircraft, by means of a suitable tarpaulin.

8.5 Jacking

Since the empty weight of the aircraft is relatively low, two persons are usually able to lift the aircraft.

It is possible to lift the aircraft in the following manner:

- By pushing the fuselage rear section down above a bulkhead, the fuselage front section may be raised and then supported under the firewall. The same effect can be achieved by pressing down on the horizontal stabilizer as described under **Towing**.
- By lifting the rear fuselage under a bulkhead the rear fuselage may be raised and then supported under that bulkhead. The support should comprise a large, flat surface area to avoid damage to the under-fuselage skin. The wings should also be gently supported to prevent the aircraft from rolling.
- To lift a wing, push from underneath the wing **only** at the main spar area and again using a support that has a large surface area. Do not lift up a wing by handling the wing tip.
- A single wheel can be lifted by jacking carefully under the end of the wheel strut.

8.6 Road transport

The aircraft may be transported after loading on a suitable trailer. It is necessary to remove the wings before road transport. The aircraft and dismantled wings should be attached securely to protect against possible damage.

8.7 Cleaning and care

Use efficient cleaning detergents to clean the aircraft surface. Oil spots on the aircraft surface (<u>except for the canopy!)</u> may be cleaned with petrol / gasoline.

The canopy may only be cleaned by washing it with a sufficient quantity of lukewarm water and an adequate quantity of detergents. Use either a soft, clean cloth sponge or deerskin. Then use suitable polishers to clean the canopy.

Upholstery and covers may be removed from the cockpit, brushed and washed in lukewarm water with an adequate quantity of detergents. Dry the upholstery thoroughly before insertion into the cockpit.

CAUTION
<u>Never</u> clean the canopy under dry conditions and **<u>never</u>** use petrol or chemical solvents.

CAUTION
In the case of long term parking, cover the canopy to protect the cockpit interior from direct sunlight.

8.8 Assembly and disassembly

Refer to the aircraft maintenance manual and the aircraft construction manual for assembly and disassembly instructions.

8.9 Aircraft inspection / servicing periods

Periods of checks and contingent maintenance depend upon operating conditions and overall condition of the aircraft.

Inspections and servicing should be carried out according to (at least) the following periods:

After the first	25 flight hours,
Thereafter after every	100 flight hours or annually, whichever is soonest,

and as stipulated in the latest revision of the applicable engine manufacturer and propeller manufacturer documentation.

Refer to the engine operator's manual for engine maintenance.

Maintain the propeller according to the manual supplied with the unit.

Comprehensive aircraft maintenance procedures are set out in the aircraft maintenance manual.

8.10 Aircraft modifications and repairs

It is recommended that you contact the aircraft manufacturer prior to making any modifications to the aircraft, to ensure that the airworthiness of the aircraft is not affected. Always use only original spare parts produced by the aircraft (or engine/propeller) manufacturer, as the case may be.

If the aircraft weight is affected by a modification, a new mass and balance calculation is necessary. This should be completed comprehensively and new data / figures should be recorded in all relevant documentation.

9. SUPPLEMENTARY INFORMATION

This section contains the appropriate supplements necessary to safely and efficiently operate the aircraft when equipped with various optional systems and equipment not provided with the standard aircraft.

List of inserted supplements

Date	Supplement No.	Title of supplement
08/12/17	05/2017	Operation of Sling 4 Aircraft fitted with a Glider and Banner Tow Hook Mechanism with Quick Release

SUPPLEMENT 05/2017
OPERATION OF SLING 4 AIRCRAFT FITTED WITH A GLIDER AND BANNER TOW HOOK MECHANISM WITH QUICK RELEASE

The Sling 4 aircraft is approved for the optional fitment of a glider tow hook which may be used for purposes of glider tugging and/or banner towing. The aircraft manufacturer has designed, tested and approved the fitment of a Tost E22 series glider hook with a maximum load capacity of 700kg. This mechanism has been extensively tested in a Sling 4 aircraft with a 914 UL engine and Airmaster AP332 constant speed propeller.

This supplement provides information relating to the operation of the Sling 4 aircraft fitted with the Tost E22 glider hook mechanism with quick release when used for glider and banner towing.

This supplement must be contained in the Pilot Operating Handbook during operation of the aircraft with such mechanism fitted.

Information contained in this supplement adds to or replaces information from the standard Sling 4 Pilot Operating Handbook in regard only to the specific sections addressed herein. Limitations, procedures and information not addressed in this supplement remain as set out in the Sling 4 Pilot Operating Handbook.

NOTE

Glider and/or banner towing and use of the tow hitch should be undertaken only by appropriately rated pilots with the required endorsement in their pilot logbook and license. Special care is required when performing tugging and towing operations which, by their nature, present a number of risks and challenges to the pilot.

This supplement is NOT intended to address all operational considerations applicable to the tugging of gliders or the towing of banners in aircraft. Pilots are expected to be familiar with all normal procedures applicable to such operations and are expected to comply with all safety, operating and emergency procedures which would ordinarily be applicable in such circumstances. This supplement is intended only to provide abbreviated material to the pilot who is familiar with tugging and towing operations as well as the Sling 4 aircraft type, who wishes to understand in what manner the operation of the Sling 4 for tugging and towing operations may differ from normal Sling 4 operations, or in what manner the operation of the Sling or tugging and towing operations may differ from tugging and towing operations in other aircraft types.

Specifications:

Tow hook weight	1 kg
Moment	5.979 kg.m
Tug and tow operating speeds	50-90 KIAS, as required
Maximum tugged glider weight	700 kg
Max. permissible cable Load	10.7 kN (1090 kg)
Max. permissible release lever force	140 N (14 Kg)
Max. release lever restoring force	50 N (5 Kg)

NOTE

The addition of the tow hitch does affect the CG of the aircraft. The CG of the aircraft moves towards the rear of the aircraft. The CG range mentioned in Section 6 of this document continues to apply and following fitment of a tug mechanism the empty CG of the aircraft should be measured and appropriately recorded.

Flight performance:

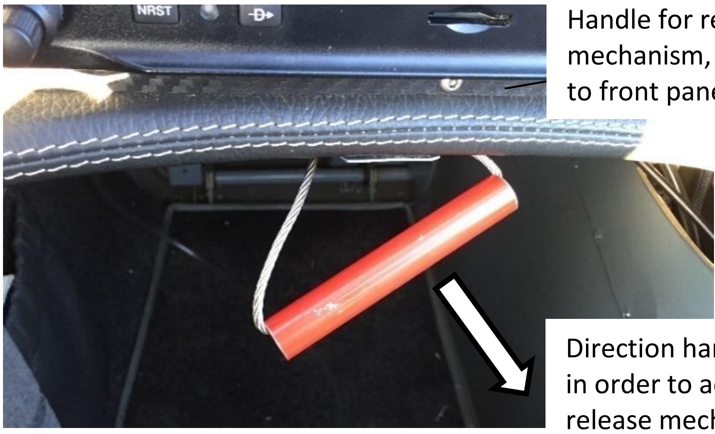
There is no noticeable change in flight performance between an aircraft fitted with the tow hook mechanism and without. The change in overall mass is considered insignificant and the change in dimensions in the aircraft has no noticeable effect on performance.

A Sling 4 aircraft fitted with a glider tow mechanism can accordingly be safely flown by a pilot without a tow rating or experience, provided that it is not used for any tug or towing activities.

Installation of hook and release mechanism

The glider tow hook is fitted to an aluminum structure attached to the lower rear fuselage. Since the rearward extent of the hook attachment mechanism is forward of the rearmost extent of the rudder, there is no change in overall aircraft length. The installation does, however, extend closer to the ground than fuselage without the mechanism, and the tie down point is accordingly marginally extended with fitment of the tow hook, so that in the event of a tail strike the tie down point it strikes the ground before the tow hook mechanism itself. This is in order to protect the tow hook mechanism in the case of a tail-strike. A tail-strike with tow mechanism installed will accordingly occur at a slightly lower angle than without the mechanism. This is not, however, considered to be of any significance.

The tow hook installation design provides for the fitment of a red release handle immediately beneath the lower edge of the instrument panel and between the pilot’s knees. The release handle is connected to a cable that runs from the panel, along the centre of the fuselage to the lever on the release mechanism. When the handle is pulled, the release mechanism will be activated.



Pilots using the aircraft for glider tugging and banner towing purposes should familiarize themselves with the tension in the release lever spring and accordingly the force required to activate the release prior to operation. Very little difference in force is required to activate the release when there is a load on the hook and when there is none.

Operations and precautions:

Operational instruction on glider tugging and banner towing is considered beyond the scope of this POH. The following considerations, however, should at all times be borne in mind –

- Glider tugging and banner towing are inherently unpredictable and high risk activities. They should be performed only by experienced persons operating in accordance with clear guidelines and in accordance with good aviation practices.
- Engine and airframe monitoring is especially critical during glider tug and banner tow operations as additional stress is placed upon the aircraft. Operate at all times within the limits applicable to the engine, airframe and propeller and, if this is not possible in any particular configuration or at any particular time, discontinue operations immediately.
- Pilots should at all times operate in accordance with the provisions of the Tost E22 series Operating Manual and good aviation practice.
- The lighter the aircraft during any tugging or towing operation the better the performance is likely to be.
- The responsibility of ensuring that the aircraft performance and parameters in any tug or tow configuration are satisfactory and manageable is entirely the pilot’s. Tug and tow operations are by their nature complex systems and the aircraft manufacturer takes no responsibility for aircraft performance and behavior when used for such purposes.
- The manufacturer’s approval of the Sling 4 aircraft for glider tugging and banner towing purposes assumes and aircraft fitted with-
  - the manufacturer’s design attachment mechanism housing a Tost E22 series tow hook with quick release mechanism;
  - a Rotax 914 UL engine;
  - an Airmaster AP322 propeller.

- Although the aerodynamic responses of the aircraft are likely to be similar where other hook, engine and propeller combinations are used, each pilot flying such a combination is responsible for ensuring that the aircraft performance is sufficient for the operational requirements and that applicable limitations are met at all times.
- It is assumed that at all times pilots and support crew will comply with good aviation practices applicable to the kinds of operations engaged in. Provided that these guidelines are followed, testing has demonstrated that the Sling 4 aircraft in the configuration referred to in this supplement 05/2017 may be safely operated for purposes of –
    - Tugging gliders of a weight of up to 700kg
    - Towing banners of a size of up to 20m x 30m.