BushCat

by SkyReach

Pilots' Operating Handbook

For BushCat Nose-wheel and Tail-dragger LSA

Note: This document must be kept in the aircraft during operation

SkyReach

PILOT'S OPERATING HANDBOOK

BushCat

NOSE-WHEEL AND TAIL-DRAGGER
FITTED WITH ROTAX 912UL/ULS ENGINE

APPROVED FLIGHT MANUAL PART NUMBER	BCPH-NT-012-002
AIRCRAFT TYPE	CHEETAH XLS / BUSHCAT*
AIRPLANE REGISTRATION NUMBER	
AIRPLANE SERIAL NUMBER	
DATE OF ISSUE	11 October 2019

NOTE: THIS DOCUMENT MUST BE KEPT IN THE AIRCRAFT DURING OPERATION
**Refer to section 1.2 for more information on aircraft type.*

ISSUES AND REVISIONS

This operating manual may be revised and amended periodically and as a result new issues and revisions will be made and published. Revisions will be made to rectify small changes or errors with this manual which do not change page numbering. Corrected pages simply replace existing pages. New issues will be released if major changes to this manual are made and many or all page numbers change. If this manual has been shipped with an aircraft it will be suitable for the aircraft and subsequent issues will not be required for it to be complete - i.e., a later issue operating manual will only be applicable to aircraft shipped after that particular issue. If revisions are published you will be notified by SkyReach or by your distributer as they will apply to the correctness of your manual. The part number of your manual (shown on the front cover) will have the following format:

BCPH-NT-aaa-bbb

The first two parts show that it is a BushCat pilot operating manual for nose-wheel and tail-dragger variants. The numbers replacing 'aaa' show the issue number of your manual, and the numbers replacing 'bbb' indicate the latest revision which has been included in this manual. If you receive a revision to your manual, your manual number will change in the 'bbb' section.

A record of issues and revisions are given on the following page.

RECORD OF ISSUES AND REVISIONS

The following issues have led to this current issue:

Issues Number	**Date Published**	**Notable Changes**
001	24/10/2013	Original
002	05/12/2013	Chapter 11 (Aircraft specific supplement) separated
003	07/07/2014	New Zealand distributer address added
004	08/07/2014	Several changes
005	01/01/2015	Maximum take-off weight increased
006	01/04/2015	Placard changed
007	19/07/2016	Canada distributor address added
008		Maximum take-off weight listings modified
009	01/04/2017	Format change, A/C supplement re-added, several other changes
010	14/07/2017	Minor procedure changes, Australian distributer address added.
011	14/06/2018	Changes to stall speeds and mass and balance. Minor procedure changes.
012	10/08/2018	Changes to speeds and mass limitations based on installation of vortex generators.

The following revisions have been included in this issue. Please document further revisions in the blank spaces provided:

Revision Number	**Date Published**	**Notable Changes**
000		Original (No revisions)
001	11/10/2019	New Zealand Specific Manual (Aircraft 3 View, Units, CG Envelope, Speeds)
002	11/10/2019	Tail Upgrade (Aircraft 3 View, CG Envelope, Speeds)

FEEDBACK FORM

Please use the following form to notify us of any improvements or corrections needed, as well as for continued operational safety reporting or for an owner's change of address notice. After completing the form please fax or email it to the relevant contact shown on the next page. In addition, please keep a copy of the completed form in your POH.

Name:
Email:
Phone Number:
Date:
BushCat Serial Number:
Registration number:
Feedback information:

Email or fax to:

South African Address:	USA Address:	New Zealand Address:
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Ecuadorian Address: Use South African contact details	**Namibian Address:** Use South African contact details	**Polish Address:** Use South African contact details
Brazilian Address: Use South African contact details		

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CHAPTER 1. GENERAL

1.1. INTRODUCTION TO THE MANUAL

Thank you for purchasing a BushCat Light Sport Aircraft.

The BushCat represents the best value in a light sport aircraft without any compromise in quality and safety.

In order to extract maximum safety and performance from your BushCat please familiarize yourself with the entire contents of this operating manual.

This manual conforms to ASTM F2746-14 standard – Standard Specification for Pilots Operating Handbook (POH) for Light Sport Airplane.

This aircraft is equipped with a non-certified engine which meets the ASTM F2339 engine standard. All new engines should meet the latest revision, i.e. the F2339-19a version.

All factory-built aircraft have been manufactured by Rainbow SkyReach (PTY) LTD – a part 148 approved manufacturing organisation, approved by the South African Civil Aviation Authority. All aircraft are manufactured in accordance with Light Sport Aircraft airworthiness standards and do not conform to standard category airworthiness requirements.

1.2. INTRODUCTION TO THE CHEETAH SERIES

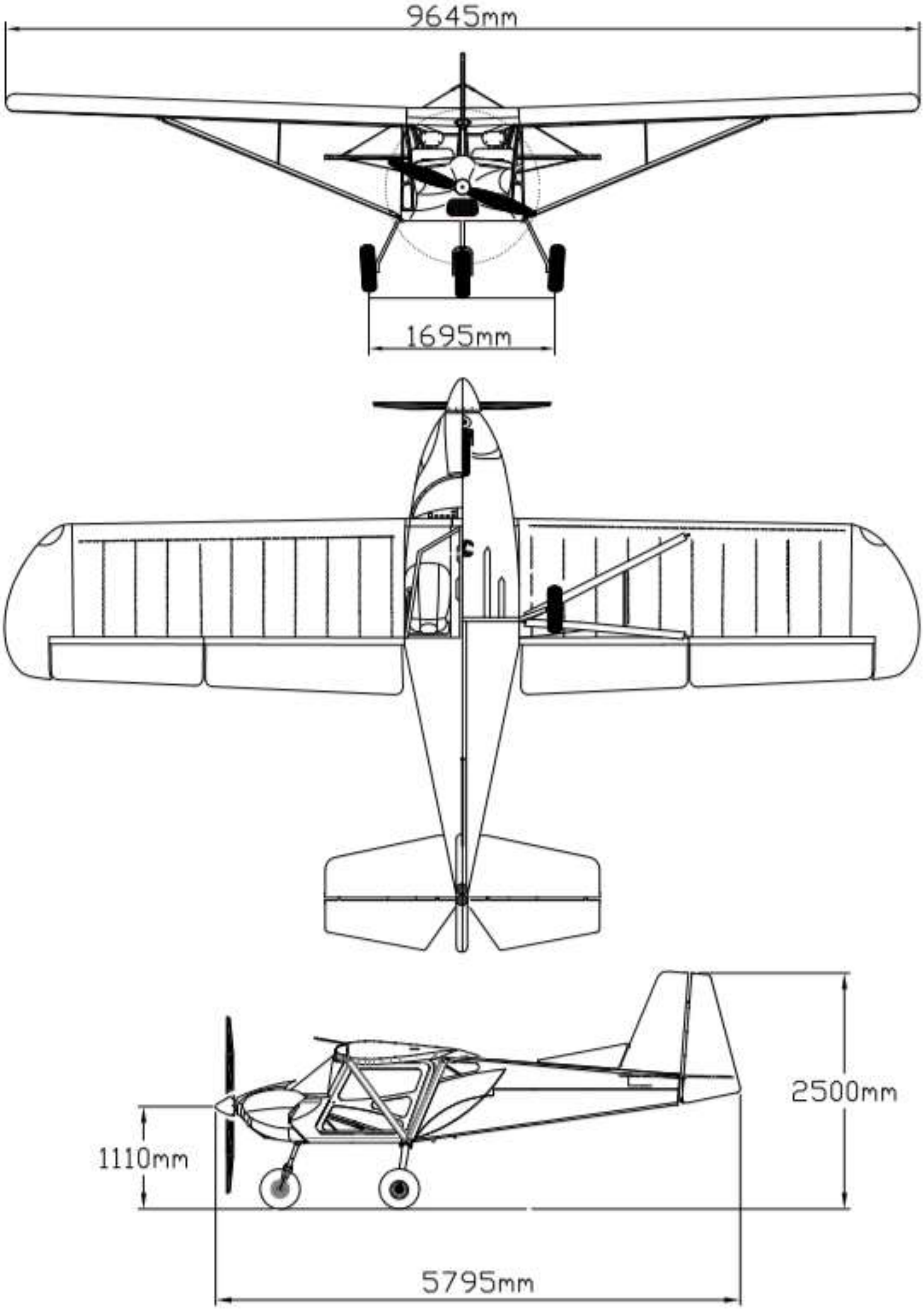
The term “BushCat” is marketing term that refers to later models of the Cheetah-XLS which is the second generation Cheetah aircraft and a development from the original Cheetah. As such, this manual may be used for Cheetah-XLS / BushCat aircraft, but not the original Cheetah model. The aircraft identification plate will also bear the Cheetah-XLS name.

1.3. A NOTE ON STANDARD UNITS

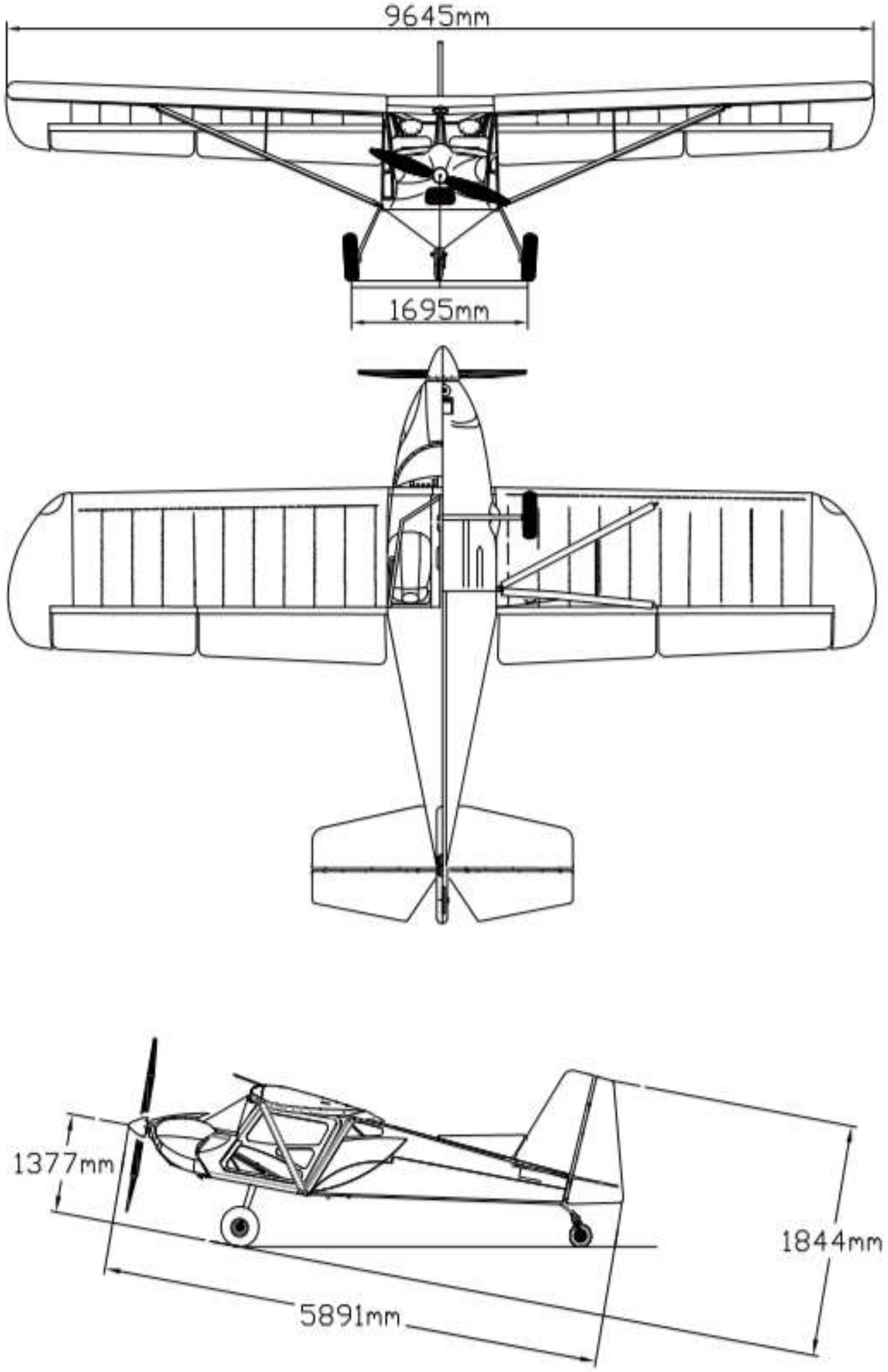
Aircraft manufacturers traditionally present figures in the standard units adopted by the country of manufacturer. The BushCat is a South African designed and manufactured aircraft and as such it presents metric units as default. However, Rainbow SkyReach (PTY) LTD makes efforts to present both Metric and Imperial units in all published documentation where practical. The operator should bear this in mind to avoid errors from using figures with incorrect units, in cases where speeds have been tabulated in MPH as well as KTS the KTS columns have been made darker and the headings are presented in a contrasting colour, however not all speeds in this manual have been presented in KTS, operators wishing to operates in KTS are advised to consult safety alert SA 011-08-2019.

1.4. DIMENSIONS

1.4.1. BUSHCAT NOSE-WHEEL



1.4.2. BUSHCAT TAIL-DRAGGER



1.5. SYMBOLS AND TERMINOLOGY

1.5.1. ABBREVIATIONS AND ACRONYMS

ASTM American Society for Testing and Materials International

AULA Advanced ultra-light aeroplane

EAB Experimental amateur-built

E-LSA Experimental light-sport aircraft

FAA Federal Aviation Administration

GPS Global positioning system

LSA Light-sport aircraft

RPM Revolutions per minute

SACAA South African Civil Aviation Authority

S-LSA Special light-sport aircraft

1.5.2. DEFINITIONS OF SPEEDS

IAS	**Indicated airspeed**	Airspeed as shown by the airspeed indicator.
CAS	**Calibrated airspeed**	Indicated airspeed of the aircraft corrected for pitot probe position and instrument error.
EAS	**Equivalent airspeed**	Calibrated airspeed of the aircraft corrected for the error created by compressibility effects.
TAS	**True airspeed**	Equivalent airspeed of the aircraft corrected for the error created by pressure altitude and temperature effects.
GS	**Ground speed**	Speed of the aircraft relative to the ground.
V_A	**Manoeuvring speed**	The maximum speed at which the aircraft will stall before exceeding the structural limitations during positive pitch manoeuvres. Multiple large control inputs in one axis or single control inputs in multiple axes may endanger the structure even below Va.
V_F	**Maximum flap speed**	The highest speed at which the aircraft may be flown with flaps deployed and the highest speed at which the flaps may be operated.
V_R	**Rotation speed**	The speed at which rotation should be executed in nose-wheel variants.
V_{Ref}	**Final approach reference speed**	The speed at which final approach should be flown to obtain $1.25V_{S0}$ to $1.3V_{S0}$.
V_{NE}	**Never exceed speed**	The maximum speed at which the aircraft may fly due to both structural and aero-elastic

		limitations.
V_{NO}	**Maximum structural cruising speed**	The maximum speed at which flight in turbulent air is permissible. Flight beyond this speed should only be conducted in smooth air and with caution as gusts could overstress the airframe.
V_S	**Stall speed**	The speed at which stall will occur with 0° flap (flaps up – cruise configuration)
V_{S1}	**Stall speed in a specific configuration: Take-off**	The speed at which stall will occur with 17° flap (flaps at the first position – take off configuration)
V_{S0}	**Stall speed in the landing configuration**	The speed at which stall will occur with 26° flap (flaps at the second position – landing configuration)
V_X	**Best angle of climb speed**	Climbing at this speed will produce the greatest gain in altitude while covering the shortest possible horizontal distance, while still maintaining at least $1.1V_{S1}$.
V_Y	**Best rate of climb speed**	Climbing at this speed will produce the greatest gain in altitude in the shortest possible time.
V_{be}	**Best endurance speed**	The speed at which power required is the lowest, and hence fuel burn is lowest. Flight at this speed will provide the best endurance time.
V_{br}	**Best range speed**	The speed at which the speed to drag ratio is the lowest. Flight at this speed will provide the longest range.
V_{bg}	**Best power-off glide speed**	The speed at which the speed to rate of descent ratio is the highest. Flight at this speed allows the aircraft to glide the furthest distance with the smallest loss in altitude.

1.6. DESCRIPTIVE DATA

1.6.1. ENGINE OPTIONS

The BushCat is available with a choice of two engines that are ASTM compliant:

1. Rotax 912UL (80HP at maximum RPM), or
2. Rotax 912ULS (100HP at maximum RPM).

Both engines are part of the Rotax 912 series of engines and have the following basic specifications:

- 4-stroke, 4 cylinders horizontally opposed, spark ignition engine, with single central cam-shaft – push-rods – OHV
- Liquid cooled cylinder heads
- Ram air cooled cylinders
- Dry sump forced lubrication
- Dual breaker-less capacitor discharge ignition
- 2 constant depression Bing carburettors
- Mechanical fuel pump
- Electrical starter (12V 0.9 kW)
- Integrated AC generator with external rectifier-regulator

1.6.2. PROPELLER

The standard propeller used on the BushCat with either engine option is a Kiev-Prop with the following data:

Make:	Kiev Prop
Model:	#283
Construction:	Composite (glass fibre reinforced plastic)
Pitch:	Ground adjustable
Number of blades:	3
Disk diameter:	1800mm (70.9”)

1.6.3. MAXIMUM APPROVED WEIGHTS

Please refer to section 2.4 for the list of approved maximum masses.

1.6.4. BAGGAGE SPACE

The aircraft is fitted with two storage areas as standard:

Upper baggage area behind seats:	Capacity:	59 litres (2 ft^3)
	Maximum load:	23.2 kg (51 lbs)
Lower luggage area behind seats:	Capacity:	150 litres (5.3 ft^3)
	Maximum load:	20 kg (44.1 lbs)

This combination results in a maximum baggage weight of 43.2kg (95.1lbs).

1.6.5. CABIN AND ENTRY DIMENSIONS

Door width:	900 mm (35.4 inches)
Door height:	800 mm (31.5 inches)

1.6.6. SPECIFIC LOADINGS

<table>
<tr><th colspan="2"></th><th>Minimum*</th><th colspan="2">Maximum</th></tr>
<tr><td colspan="2" rowspan="2">Wing loading</td><td rowspan="2">23.56 kg/m^2
(4.83 lbs/ft^2)</td><td>560 kg
(1230 lbs)
MTOW</td><td>41.24 kg/m^2
(8.45 lbs/ft^2)</td></tr>
<tr><td>600 kg
(1320 lbs)
MTOW</td><td>44.18 kg/m^2
(9.05 lbs/ft^2)</td></tr>
<tr><td rowspan="4">Power loading</td><td rowspan="2">Rotax 912 UL</td><td rowspan="2">4.0 kg/HP
(8.81 lbs/HP)</td><td>560 kg
(1230 lbs)
MTOW</td><td>7.0 kg/HP
(15.40 lbs/HP)</td></tr>
<tr><td>600 kg
(1320 lbs)
MTOW</td><td>7.5 kg/HP
(16.52 lbs/HP)</td></tr>
<tr><td rowspan="2">Rotax 912 ULS</td><td rowspan="2">3.2 kg/HP
(7.05 lbs/HP)</td><td>560 kg
(1230 lbs)
MTOW</td><td>5.6 kg/HP
(12.33 lbs/HP)</td></tr>
<tr><td>600 kg
(1320 lbs)
MTOW</td><td>6.0 kg/HP
(13.22 lbs/HP)</td></tr>
</table>

* Assuming empty mass of 320kg (705lbs)

1.6.7. TYRE PRESSURES

The following list of tires and pressures applies to standard tires used on the BushCat nose-wheel and tail-dragger. For more information on the tire combinations please refer to section 8.7.

Tyre make and size	**Recommended pressure**
Trac-Gard 2.80 x 2.50 – 4 (4 ply) tail wheel	1.3 – 2.0 bar (20 – 30 psi)
Air Trac 6.00 – 6 (6 ply)	1.0 – 1.3 bar (15 – 20 psi)
Carlisle 8.00 – 6 (4 ply)	0.7 – 0.9 bar (10 – 13 psi)
Air Trac 8.50 – 6 (6 ply)	0.5 – 0.8 bar (8 – 12 psi)
Aero Classic 27.5 x 10.0 – 8 (4 ply)	As required for operation

1.6.8. GROUND TURNING CLEARANCE

Radius for wingtip: 20.1 meters (66 feet).

CHAPTER 2. LIMITATIONS

2.1. AIRSPEED LIMITS

The stall speeds given below are referenced to the standard aircraft in the idle power condition for the centre of gravity envelope as shown in Chapter 7. Indicated airspeeds applicable for factory standard installation of pitot static system and when verified with calibration (see Chapter 6).

NOTE:All SPEEDS APPICABLE ONLY TO AIRCRAFT WITH SKYREACH APPROVED VORTEX GENERATOR INSTALLATION, PITOT-STATIC SYSTEM MOUNTED ON THE WING-TIP, LARGER EMPENNAGE AND LARGER ELEVATOR TRIM TAB.

Speed		CAS (MPH)	IAS (MPH)		CAS (KTS)	IAS (KTS)
		600kg	600kg		600kg	600kg
V_S	Stall speed (clean)	50	51		43	44
V_{S1}	Stall speed (flaps in take-off position)	46	47		40	41
V_{S0}	Stall speed (flaps in landing position)	43	45		37	39
V_F	Maximum flap extended speed	86	83		75	72
V_O	Maximum operating manoeuvring speed	84	81		73	70
V_{NO}	Maximum structural cruise speed	93	89		81	77
V_{NE}	Never exceed speed	108	103		94	89

2.2. WIND SPEED LIMITS

Maximum demonstrated wind speed components for take-off and landing:

- Maximum demonstrated headwind component: 10 KTS
- Maximum demonstrated crosswind component: 10 KTS

Crosswind take-offs and landings require training and experience. A greater crosswind component requires a greater degree of skill. Do not fly without proper experience and training when the wind speeds are near the maximum allowed wind component. Avoid takeoffs and landings with a tail wind. The takeoff and landing runs and rolls will be considerably longer than the demonstrated numbers.

2.3. CEILING LIMITS

- Rotax 912UL: 11,500 ft
- Rotax 912ULS: 11,500 ft

2.4. MASS AND BALANCE LIMITS

The maximum gross mass of the BushCat varies depending on the country of the individual registration, and the category of aircraft under which the individual aircraft is registered. The following table details the maximum allowable masses for each of the legislation groups in which the BushCat is approved.

Country	**Authority**	**Operated as**[1]	**Max. Mass**[1]
South Africa	South African Civil Aviation Authority (SACAA) / Recreational Aircraft Association of South Africa (RAASA)	NTCA	560 kg (1230 lbs)
		Microlight	450 kg (992 lbs)
USA	Federal Aviation Administration (FAA)	S-LSA	600 kg (1320 lbs)
		E-LSA	
		EAB	
New Zealand	Civil aviation authority of New Zealand (CAANZ)	Class 2 Microlight	600 kg (1320 lbs)
Australia	Australian Civil Aviation Safety Authority (CASA)	LSA	600 kg (1320 lbs)
Canada	Transport Canada (TC)	AULA	560 kg (1230 lbs)
		BULA	544 kg (1200 lbs)
Israel	Civil Aviation Authority of Israel (CAAI)	LSA	560 kg (1230 lbs)
Ecuador	Dirección General de Aviacón Civil (DGAC)	LSA	560 kg (1230 lbs)
Poland	Urząd Lotnictwa Cywilnego (ULC)	LSA	560 kg (1230 lbs)
Namibia	Namibian Directorate of Civil Aviation (NDCA)	LSA	560 kg (1230 lbs)
Brazil	Agência Nacional de Aviação Civil (ANAC)	LSA	560 kg (1230 lbs)

[1]*Revised maximum masses which correspond to maximum allowable stall speeds for operation category.*

The centre of gravity position limits are given below as distances aft from the wing leading edge.

	Forward limit	Aft limit
485kg	404mm (26.8%MAC)	482mm (32.0%MAC)
515kg	414mm (27.5%MAC)	568mm (37.7%MAC)
600kg	444mm (29.5%MAC)	588mm (39.0%MAC)

2.5. LIMIT STRUCTURAL LOAD FACTOR LIMITS

Positive:

Flaps up: +4.0G
Flaps down: +2.0G

Negative:

Flaps up: -2.0G
Flaps down: 0.0G

2.6. MANOEUVRE LIMITS

This aircraft is not approved for aerobatic manoeuvres. Intentional spins and aerobatics are strictly prohibited.

2.7. GLIDE RATIO

This aircraft has a maximum glide ratio of 10: 1. This glide ratio is achieved at a speed of 64MPH IAS (600kg, clean).

2.8. LEGAL OPERATION LIMITS

The aircraft is limited the daytime VFR flight in the country of manufacture. The manufacturer does, however, allow the aircraft to be used for VFR night operation in other locations, provided that the local certifying authority has approved such operations in the specific aircraft. It would also be required that both the aircraft and pilot meet the minimum requirements for these operations, as specified by the local authority's regulations. It is the operator's responsibility to ensure that all legal obligations are met.

2.9. ENGINE LIMITATIONS

The following engine limitations have been taken from the Rotax 912UL/ULS operating manual, edition 4, revision 0. All performance figures are given for ISA conditions.

	Rotax 912UL	Rotax 912ULS
2.9.1. POWER AND SPEED LIMITATIONS:		
Take-off power	59.6 kW (80 HP) at 5800 RPM	73.5 kW (99 HP) at 5800 RPM
Max. continuous power	58.0 kW (78 HP) at 5500 RPM	69.0 kW (93 HP) at 5500 RPM
Take-off speed	5800 RPM (max. 5 min)	
Max. continuous speed	5500 RPM	
Idle speed	1400 RPM min.	
2.9.2. LOAD FACTOR LIMITATIONS:		
Max. Negative load factor	-0.5g	
Max. duration	5 seconds	
2.9.3. OIL PRESSURE:		
Maximum value	7 bar (102 psi)	
Minimum value	0.8 bar (12 psi) (below 3500 RPM)	
Normal range	2.0 to 5.0 bar (29-73 psi) (above 3500 RPM)	
2.9.4. OIL TEMPERATURE:		
Maximum value	140°C (258°F)	130°C (258°F)
Minimum value	50°C (120°F)	
Normal range	90°C to 110°C (190°F -230°F)	
2.9.5. EXHAUST GAS TEMPERATURE:		
Maximum value	880°C (1616°F)	
2.9.6. CYLINDER HEAD TEMPERATURE:		
Maximum value*	150°C (330°F)	135°C (330°F)
2.9.7. COOLANT TEMPERATURE:		
Maximum value*	120°C (248°F)	
2.9.8. FUEL PRESSURE:		
Maximum value	0.4 bar (5.8 psi) 0.5 bar (7.26 psi)**	
Minimum value	0.15 bar (2.2 psi)	
2.9.9. STARTING & OPERATING TEMPERATURE:		
Maximum value	50°C (120°F)	
Minimum value	-25°C (-13°F)	

*For installations with conventional coolant, permanent monitoring of both coolant temperature and cylinder head temperature are required, except for engines with serial number suffix '-01' in

which case permanent monitoring of only coolant temperature is required, as long as coolant temperature is measured in the cylinder head. For installations with waterless coolant, permanent monitoring of only cylinder head temperature is required.
**Applicable only for fuel pumps from S/N 11.0036

2.10. FUEL SYSTEM LIMITATIONS

2.10.1. FUEL SYSTEM CAPACITIES

Total fuel tank capacity:	94 Litres*	24.8 US Gallons
Total useable fuel:	88 Litres*	23.2 US Gallons

*Assuming an average fuel density of 0.734kg/L (6.126lbs/US Gallon)

2.10.2. APPROVED FUELS

Fuel Type	Rotax 912UL	Rotax 912ULS
Knock Resistance	Min. RON90 (Min. AKI87)	Min. RON95 (Min. AKI91)
MOGAS	EN 228 Normal EN 228 Super EN 228 Super plus	EN 228 Super EN 228 Super plus
AVGAS*	AVGAS 100LL* (ASTM D910)	

*The use of AVGAS has an adverse effect on engine maintenance procedures including, but not limited to) a 50 hour maintenance interval. Please refer to the Rotax SI-912-016 (latest revision) document for more information.

2.11. OIL SYSTEM LIMITATIONS

For more information on approved oil types please refer to section 8.3.3 and the Rotax SI-912-016 (latest revision) document.

For temperature and pressure limitations please refer to section 2.9.

2.12. COOLING SYSTEM LIMITATIONS

For more information on approved coolant types please refer to section 8.3.4 and the Rotax SI-912-016 (latest revision) document.

For temperature and pressure limitations please refer to section 2.9.

CHAPTER 3. EMERGENCY PROCEDURES

Procedure Design Philosophy

The Pilot's Operating Handbook contains the procedures for Emergency, Abnormal and Normal operation of the aircraft. The procedures in the POH are followed by detailed explanations to assist in understanding the logic behind them. The pilot is encouraged to commit these procedures to memory. A Quick Reference Handbook (QRH) has been provided and contains only the procedures (without the detailed explanations) in a format which can be easily referenced in flight or for revision. Finally, a Normal Procedures Checklist is provided which **only contains the most critical items of the Normal Procedures**. This checklist should be kept at hand and the applicable section of it completed only once the pilot has run through the procedures from memory. It is merely a check to ensure that the most important parts of the POH procedure have not been omitted, and **is not a substitute for the procedures.**

3.1. GENERAL INFORMATION

This section contains the emergency procedures that have been designed to address various critical situations as required by ASTM F2746-14 (Pilot's Operating Handbook for Light Sport Airplane). The procedures presented apply to the standard factory produced aircraft fitted with a Rotax 912ULS engine. Pilots are advised to read through these procedures carefully and take note of any differences that may be applicable to owner specific aircraft with different instruments, equipment or engine type.

The abbreviated procedures for emergency situations are presented first and are intended as an action sequence to be completed for the applicable critical event. The second section contains amplified forms of the procedures which should be read to provide a more thorough understanding of the procedures. Some procedures applicable to the operation and management of the Rotax 912ULS have been taken directly from the Rotax 912ULS Operators Manual (Edition 3/Rev. 0). The operator is strongly advised to review the procedures contained in the manual supplied with the specific engine of their aircraft and note any differences.

These procedures are suggested as a best course of action for the described situation. However, they are not a substitute for sound judgement and common sense. Emergencies are rare and may not occur in the manner implied by these procedures and the procedures contained herein are not meant as a substitute for pilot training. Rather, these procedures should be seen as a supplement to pilot training and should be reviewed regularly.

Action items are denoted by the name of the item, followed by the action in capital letters with dotted separations. (E.g. Item........ACTION). Where it is necessary to highlight a consideration to be made, the consideration is noted in plain text without an action following. (E.g. Avoid crosswind landings). The items shown in **BOLD** should be committed to memory.

3.2. AIRSPEEDS FOR EMERGENCY PROCEDURES

The airspeeds given below are referenced to the standard aircraft in the clean configuration. Indicated airspeeds applicable for factory standard installation of pitot static system and when verified with calibration. The speeds referenced throughout this section refer to the indicated airspeeds in the table below.

	CAS (MPH)	IAS (MPH)	CAS (KTS)	IAS (KTS)
	600kg	**600kg**	**600kg**	**600kg**
V_{bg} (Best glide speed):	65	64	56	56

3.3. EMERGENCY PROCEDURES

3.3.1. ENGINE FIRE DURING START

Starter .... CRANK ENGINE

Magnetos .... OFF

Throttle .... OPEN

Fuel selector .... OFF

Fuel pump .... OFF

Evacuate aircraft with fire extinguisher and use if necessary.

3.3.2. ENGINE FAILURE DURING TAKEOFF

Below V_R

Throttle .... IDLE

Brakes .... AS REQUIRED

ATC/Traffic .... INFORM

If an overrun is imminent:

Fuel .... OFF

Magnetos .... OFF

Master .... OFF

Airborne with enough runway to land back

Flaps .... AS REQUIRED

Airborne without enough runway to land back

Airspeed .... 64MPH (CLEAN, 600kg)

Field/landing area .... SELECT

If time/altitude permits, the following fault finding procedures should be accomplished:

Fuel pump .... ON

Fuel selector .... ON

Fuel quantity .... CHECK

Magnetos .... ON

Starter .... START

<u>If unable to restart engine</u>

ATC/Traffic .... DECLARE EMERGENCY

Flaps .... SET ONCE ASSURED FIELD CAN BE MADE

If time permits shut down aircraft.

Fuel pump .... OFF

Fuel selector .... OFF

Magnetos .... OFF

Start/master .... OFF

3.3.3. LOSS OF ENGINE POWER DURING FLIGHT

Airspeed .... 64MPH (CLEAN, 600kg)

Field/landing area .... SELECT

Fault find .... ACCOMPLISH

Fuel pump .... ON

Fuel selector .... ON

Fuel quantity .... CHECK

Magnetos .... ON

Start/master .... START

Engine instruments .... CHECK FOR CAUSE OF FAILURE

If unable to restart engine, accomplish **Emergency landing without engine power** procedure.

3.3.4. EMERGENCY LANDING WITHOUT ENGINE POWER

Airspeed .... 64MPH (CLEAN, 600kg)

Field/landing area .... SELECT

Turns should only be made to avoid obstacles.

If time permits:

ATC/Traffic .... DECLARE EMERGENCY

Transponder .... SQUAWK 7700

ELT .... ACTIVATE

Passenger .... BRIEF

Flaps .... SET ONCE ASSURED FIELD CAN BE MADE

Armrest .... LIFT FOR QUICK EGRESS

If time permits, shut down aircraft.

Fuel pump .... OFF

Fuel selector .... OFF

Magnetos .... OFF

Start/master .... OFF

3.3.5. PRECAUTIONARY LANDING WITH ENGINE POWER

Suitable field .... SELECT

Fuel pump .... ON

Flaps .... TAKEOFF

Field assessment .... OVER FLY AT 70MPH

Once suitable field found and over flown.

ATC/Traffic .... INFORM

Passenger .... BRIEF

Execute short field or soft field landing procedure, as applicable.

3.3.6. FIRE IN FLIGHT

Source of fire .... CHECK

Engine fire

Fuel selector .... OFF

Magnetos .... OFF

Throttle .... CLOSED

Fuel pump .... OFF

Cabin heat .... CLOSED/OFF

Sideslip as necessary to keep flames away from the cabin.

Accomplish **Emergency landing without engine power** checklist and land as soon as possible.

Electrical fire

Master switch .... OFF

Vents .... OPEN

Cabin heat .... CLOSED/OFF

All other switches .... OFF

Fire extinguisher .... DISCHARGE AS REQUIRED

Land as soon as possible, bearing in mind that the fire may not have been fully extinguished.

3.3.7. LOSS OF OIL PRESSURE

Throttle .... REDUCE TO MINIMUM NECESSARY

Oil temperature .... CHECK

If oil temperature is not within limits, carry out **Precautionary landing with engine power** procedure, but expect the engine to fail.

If engine fails, carry out **Emergency landing without engine power.**

Refer to Rotax 912ULS Maintenance Manual upon landing.

3.3.8. HIGH OIL PRESSURE

Throttle .... REDUCE

Engine instruments .... MONITOR (OIL TEMP. IN PARTICULAR)

Land as soon as practicable.

Refer to Rotax 912ULS Maintenance Manual upon landing.

3.3.9. HIGH OIL TEMPERATURE

Throttle .... REDUCE TO MINIMUM NECESSARY

Oil pressure .... MONITOR

Carry out **Precautionary landing with engine power** procedure.

Refer to Rotax 912ULS Operators Manual upon landing.

3.3.10. ENGINE OVER SPEED

Throttle .... REDUCE

Ensure that engine speed remains below 5800 RPM

Refer to Rotax 912ULS Operators Manual upon landing.

3.3.11. HIGH CYLINDER HEAD TEMPERATURE

Throttle .... REDUCE TO MINIMUM NECESSARY

Carry out **Precautionary landing with engine power** procedure.

Refer to Rotax 912ULS Operators Manual upon landing.

3.3.12. HIGH ENGINE COOLANT TEMPERATURE

Throttle .... REDUCE TO MINIMUM NECESSARY

Carry out **Precautionary landing with engine power** procedure.

Refer to Rotax 912ULS Operators Manual upon landing.

3.3.13. EMERGENCY DESCENT

Rough air:

Throttle .... IDLE

Airspeed .... 83 MPH

Flaps .... TAKEOFF

Descend at 83 mph. Care should be taken to not exceed 83 mph with flaps extended to the takeoff setting. Note that if the air is extremely turbulent and there is a chance of exceeding the maximum load factors with flaps extended (+2.0g, -0), then the flaps should be retracted and descent made below $V_{o.}$

Smooth air:

Throttle .... IDLE

Flaps .... UP

Airspeed .... 103 MPH

3.3.14. ALTERNATOR FAILURE

Electrical load .... REDUCE

Charge switch .... CYCLE

If charge indications do not return, reduce electrical load as much as possible and land within 20-30 minutes. Be prepared to follow the lost communications procedures if the battery is depleted of charge.

3.3.15. OVERVOLTAGE

If voltmeter shows excessive voltage;

Charge switch .... OFF

Radios .... OFF

Master switch .... CYCLE

Radios .... ON

Charge switch .... ON

If excessive voltage still indicated;

Charge switch .... OFF

Master .... OFF

Electrical load .... REDUCE

Land within 20-30 minutes. Continued use of the battery in an overcharge condition may cause a battery fire.

3.3.16. INADVERTENT STALL

Control stick .... FORWARD, AILERONS NEUTRAL

Rudder .... AS NEEDED TO CENTRALISE BALL

Throttle .... ADVANCE GRADUALLY

Airspeed .... ACCELERATE TO 55-65 MPH

If in landing configuration

Flaps .... RETRACT TO TAKEOFF SETTING

Positive climb achieved

Flaps .... RETRACT

Airspeed .... V_X OR V_Y

The aircraft is not fitted with a stall warning, but in most instances, aerodynamic buffet should precede the stall.

3.3.17. INADVERTENT SPIN

Throttle .... IDLE

Ailerons .... NEUTRAL

Rudder .... FULL OPPOSITE TO DIRECTION OF SPIN

Elevator .... NOSE DOWN

When rotation stops, neutralise rudder and execute a smooth pull-out manoeuvre.

3.3.18. INADVERTENT ICING ENCOUNTER

Throttle .... OPEN

Flaps .... RETRACT

Course .... ALTER TO EXIT ICING

Ice accretion on the aerodynamic surfaces will cause an increase in stall speed and reduce aircraft performance. Reduced control effectiveness and haphazard handling qualities may also be encountered. Plan to land at a higher speed and keep the use of flaps and controls to a minimum.

3.3.19. LOSS OF PRIMARY FLIGHT INSTRUMENTS

- Keep control of the aircraft using external visual reference.
- The transponder may be used to determine pressure altitude.
- The GPS may be used as a reference for speed, if fitted.
- Consider landing at an airspeed that feels slightly higher than normal.
- If an EFIS is installed, refer to the operating manual for indications of malfunction and built in redundancies.

3.3.20. LOSS OF FLIGHT CONTROLS

Elevator:

- Control pitch primarily using throttle.
- The trim tab may provide limited pitch control.
- Attempt to find an airspeed at which the aircraft can be trimmed.
- Avoid using flaps unless nose down pitching moment absolutely necessary for control.

Ailerons:

- Use rudder to induce roll as necessary.
- Avoid crosswind landing.

Rudder:

- Avoid crosswind landing.

NOTE: It is recommended that the use of the ballistic airframe parachute be limited to situations for which there is absolutely no other option for recovering the aircraft, or structural failure.

3.3.21. UNLATCHED DOOR IN FLIGHT

Rudder .... APPLY IN DIRECTION OF DETACHED DOOR

Control .... MAINTAIN SIDESLIP AND MONITOR AIRSPEED

Detached door..**ATTEMPT TO CLOSE OR LET FALL AWAY**

NOTE: If door separates and gets stuck between strut and fuselage with a hinge broken, put the aircraft into a sideslip in the opposite direction in an attempt to reduce the air pressure on the door and let it fall away. A jammed door may create a significant amount of drag on one side of the aircraft, reducing controllability and performance.

NOTE: Due to differential pressure between the cabin and outside airflow that can be created with a detached door, the door on the other side may be blown off. Always side slip AWAY from detached door until it can be closed or jettisoned.

3.3.22. ACTIVATION OF BALLISTIC RECOVERY SYSTEM (BRS)

Magnetos.. **OFF TO KILL ENGINE**

BRS handle .... **PULL HARD, CONTINUOUSLY**

Restraint system...**SECURE**

Doors ....**OPEN, IF TIME**

Emergency landing position ....**ASSUME**

Aircraft.. SHUTDOWN/CONFRIM SHUTDOWN

Note: These *memory items* are contained in the BRS owner's manual. The BRS manual takes precedence and should be referred to for more detail.

3.4. EXPANDED EMERGENCY PROCEDURES

3.4.1. ENGINE FIRE DURING START

If an engine fire becomes apparent during the engine starting sequence, attempt to start the engine to draw the fire into the engine. If the fire becomes apparent before the engine has started, continue to crank the engine with the starter and open the throttle. If the engine does not start and draw the fire in, turn the magnetos and fuel selector to the OFF position and confirm that the fuel pump is OFF. Evacuate the aircraft and fight the fire using external means.

3.4.2. ENGINE FAILURE DURING TAKEOFF

The appropriate action to take after an engine failure on takeoff is largely dependent on the circumstances. If there is sufficient runway to land back, the aircraft should be landed straight ahead. The pilot should be acutely aware of the speed during the return to land, as the aircraft may have been in a nose high attitude while climbing out and will tend to bleed off speed very quickly without power if the nose is not lowered soon after the failure. The use of flaps is left to the discretion of the pilot.

If there is not enough runway to land back on, the airspeed to obtain the best glide ratio (64 mph IAS – clean, 600kg) should be obtained first before a suitable landing field is selected. If flaps are still in the takeoff position, the best glide speed will be slightly lower than the clean configuration. Large heading changes should be avoided, and the aircraft should only be manoeuvred to avoid obstacles. Once a suitable landing field has been selected and the pilot has begun to set the aircraft up on an approach to the field, fault finding can be attempted if there is enough time. The most likely cause of engine failure is fuel starvation, and so the fuel pump and selector should be checked ON first, followed by the ignition system (magnetos and start switch). If time permits, operation on either the L or R magneto bank can be attempted, a mayday call should be made and the ELT activated.

3.4.3. LOSS OF ENGINE POWER DURING FLIGHT

The primary difference between the procedures associated with a loss of power during takeoff and during cruise flight is the time associated with each event. Generally, there should be more time to address a power failure in flight as the aircraft will generally have more height above the ground. The primary actions do, however, remain the same. The priority is still to establish the aircraft at the airspeed that will provide the best glide ratio and to select a suitable field for a forced landing. More time can be devoted to selecting a suitable field if altitude permits. The pilot should consider factors such as wind direction, obstacles, size of field, slope, overshoot, undershoot and field surface.

The fault finding procedures should then be accomplished once the pilot is satisfied that the selected field can be made even if the fault finding and attempted restarts are unsuccessful. The fuel selector should be confirmed as ON, the fuel pump switched ON and the ignition system (magnetos and start switch) checked ON. If time permits, operation on either the L or R magneto bank can be attempted. If a restart is unsuccessful, a mayday call should be made, the transponder should be set to 7700 and the ELT (if installed) activated.

3.4.4. EMERGENCY LANDING WITHOUT ENGINE POWER

Once it has been established that the aircraft is committed to land at the selected field, the aircraft should continue to be flown at the best glide speed while manoeuvring for the field. Flaps should only be selected once the aircraft is assured of being able to make the field, as flaps will reduce the glide ratio of the aircraft. If time permits, a mayday call should be made stating the aircraft type, nature of the emergency, location, intentions and number of persons on board. The transponder should also be set to 7700 if in an area of radar coverage and the ELT (if installed) activated. The aircraft should be shut down to prevent any potential firing of the engine which may cause the aircraft to overshoot the landing area. Shutting down consists of turning the fuel pump OFF, the fuel selector OFF, the magnetos OFF and the start/master switch to OFF. If time permits, the passenger should be briefed on the emergency landing before the start/master switch is turned OFF.

The use of the ballistic airframe recovery parachute should be limited to structural failures or catastrophic control issues, for which an unsurvivable crash is highly likely. This is due to the fact that the ballistic parachute has never been tested on the BushCat in flight, and so a safe airspeed/altitude envelope for deployment has not been established. It is recommended that the aircraft be flown to a forced landing area wherever possible. If the parachute is deployed, ensure that the engine has been shut down and the propeller is not windmilling prior to deployment.

3.4.5. PRECAUTIONARY LANDING WITH ENGINE POWER

A precautionary landing may be executed if the aircraft is lost, low on fuel, there is reason to suspect that an engine failure is imminent, night fall is imminent, an encounter with IMC is imminent, or any other situation which puts the flight into a situation of urgency. Once a suitable landing area has been selected, an over flight should be done to ensure that the field is long enough to land and that the initial assessment was accurate. The over flight should be done at the takeoff flap setting (17 degrees) and at an airspeed of 70mph with the fuel pump ON. 70mph is used to provide a significant speed margin to the V_{S1} to allow for some manoeuvring, but is still lower than the V_F of 83mph. The pilot should be aware of the obstacles and terrain that could influence the climb away from the field after the over flight, or should the precautionary landing be aborted.

Once the over flight is complete, the normal before landing procedures are accomplished for a soft or short field landing, as applicable.

3.4.6. FIRE IN FLIGHT

The source of the fire should be established before any action is taken. Electrical fires will generally be accompanied by a smell of burning insulation. Engine fires may be accompanied by higher than normal CHT or oil temperatures, as well as the presence of trailing smoke.

An engine fire, if confirmed, is cause for an immediate shutdown of the engine, first by turning the fuel selector to OFF and retarding the throttle to IDLE. The fuel pump should be confirmed OFF and the magnetos switched OFF to prevent any potential firing of the engine during intended shut down. If a cabin heater is installed it should be switched OFF and an emergency landing made at a suitable landing area. Time is of great importance as there is no way to directly extinguish a fire in the engine bay, and so a forced landing should be made in the immediate vicinity of the aircraft to save time. Sideslip as necessary to keep the flames away from the cabin.

Electrical fires should be dealt with by turning the master switch to OFF to cut power to the electrical system. All other switches should also be selected OFF. The air vents in the doors should be OPENED if it is difficult to breathe or visibility is obstructed by smoke, bearing in mind that the additional air may fuel the fire. The cabin heater, if installed, should be switched OFF/CLOSED and fire extinguisher used if the source of the fire can be seen and control can be maintained while fighting the fire. A landing should be made as soon as possible, even if it appears that the fire has been extinguished.

3.4.7. LOSS OF OIL PRESSURE

The loss of oil pressure in flight is usually accompanied by an increase in oil temperature. At first indication, power should be reduced to a MINIMUM REQUIRED to sustain flight to a suitable precautionary landing area. If the oil temperature increases notably, prepare for an engine failure and a forced landing.

3.4.8. HIGH OIL PRESSURE

An oil pressure rise out of the specified limits should be taken as an indication that an abnormality is occurring in the engine and power should be REDUCED to bring the oil pressure back within limits. If the aircraft is in a climb attitude, lower the nose. A landing should be made as soon as practicable, but the engine instruments should be closely monitored. The Rotax 912ULS Operators Manual should be consulted upon landing.

3.4.9. HIGH OIL TEMPERATURE

A high oil temperature could be indicative of a cooling system abnormality or an oil leak. The throttle should be reduced to MINIMUM NECESSARY to sustain flight to a precautionary landing area. If the aircraft is in a climb attitude, lower the nose. If the rise in temperature is accompanied by a drop in oil pressure, it is likely that an engine failure and forced landing is imminent.

3.4.10. ENGINE OVER SPEED

An engine over speed condition may occur in a dive with power on, or if the propeller blade angle has been adjusted incorrectly. Power should be REDUCED to bring the engine back within limits and the Rotax 912ULS Operators Manual consulted upon landing.

3.4.11. HIGH CYLINDER HEAD TEMPERATURE

The throttle should be reduced to the MINIMUM NECESSARY to sustain flight to a suitable precautionary landing area. If the aircraft is in a climb attitude, lower the nose. Monitor the other engine instruments for any abnormalities that may point to an impending failure. The Rotax 912ULS Operators Manual should be consulted upon landing.

3.4.12. HIGH ENGINE COOLANT TEMPERATURE

The throttle should be reduced to the MINIMUM NECESSARY to sustain flight to a suitable precautionary landing area. If the aircraft is in a climb attitude, lower the nose. Monitor the other engine instruments for any abnormalities that may point to an impending failure. The Rotax 912ULS Operators Manual should be consulted upon landing.

3.4.13. EMERGENCY DESCENT

An emergency descent may be required for a medical emergency, the avoidance of weather or other traffic, an on board fire, or any other circumstance that requires the aircraft to be descended in an expeditious but safe manner.

For emergency descents in rough air, the throttle should be reduced to IDLE, the aircraft slowed to 83 MPH, takeoff flap (17 degrees) SELECTED, and a descent carried out at the V_F of 83 mph. Care should be taken to not exceed 83mph with takeoff flaps extended. This procedure will provide the highest rate of descent while keeping the speed well above stall and below V_O. A higher rate of descent may be achieved by diving the aircraft at a higher speed with flaps retracted, but speeds higher than V_O and V_{NO} should not be used in turbulent conditions. Note that if the air is extremely turbulent and there is a chance of exceeding the maximum load factors with flaps extended (+3.8g, -0), then the flaps should be retracted and descent made below V_O.

For emergency descents in smooth air, the throttle should be reduced to IDLE and the aircraft flown at 103 MPH with the flaps RETRACTED. This will allow a higher rate of descent to be obtained. The pilot is reminded that full control deflection cannot be applied for pull out manoeuvres from dives exceeding V_O, and that the aircraft will take some time to bleed off additional speed once levelled from the descent before the V_F of 83 mph is reached and flaps can be used to further slow the aircraft.

3.4.14. ALTERNATOR FAILURE

An alternator failure would likely be indicated by the low charge light and a drop in voltage on the voltmeter. The electrical load should be REDUCED to a minimum and a landing planned within 20-30 minutes. The charge switch can be CYCLED once in an attempt to reenergise the alternator field. A new battery will only power the aircraft for about 30 minutes, but this depends greatly on the load drawn. If a flight longer than 30 minutes away from a suitable airport is planned, it is recommended that the lost communication procedures for the state of operation be reviewed.

3.4.15. OVERVOLTAGE

An overvoltage condition is indicative of a failure of the voltage regulator. No automatic system is in place to disconnect the alternator to protect the electrical equipment and battery. The voltmeter should be checked regularly in flight and if an overvoltage condition is detected, the charge switch, radios and master should be turned OFF in that order. The master switch, radios and charge switch can then be cycled back to ON, respectively. If an over voltage condition still exists, the charge switch should be selected OFF and all non-essential electrical equipment switched OFF to reduce current draw from the battery. The flight should be terminated as soon as practicable.

3.4.16. INADVERTENT STALL

The first indication of a stall will likely be aerodynamic buffet or uncharacteristic aircraft handling qualities at low indicated airspeed. The nose should be lowered to unstall the wings, ball centred, and power gradually applied to begin recovery. The aircraft should be accelerated to 55-65mph. If the stall occurred in the landing configuration, the flaps should retracted to TAKEOFF position at around 60mph. Once a positive rate of climb is established and obstacles have been cleared, flaps can be retracted FULLY. The aircraft should then be flown at V_X or V_Y as appropriate to the situation.

3.4.17. INADVERTENT SPIN

Spin recovery should be initiated by NEUTRALISING the ailerons, retarding throttle to IDLE, applying FULL OPPOSITE rudder to the spin and some NOSE DOWN elevator. Once the rotation stops, neutralise the rudder and smoothly pull out of the dive, keeping the ball centralised as power is applied. Airspeed can increase drastically in recovery from a spin and caution should be taken when exercising the controls above V_O.

3.4.18. INADVERTENT ICING ENCOUNTER

An icing encounter in a light aircraft is an extremely hazardous situation. Ice can build up on the leading edges of the wings and empennage, propeller blades, engine air filter and radiators. These factors act to reduce the performance of the engine, increase stall speed and reduce overall aircraft performance. It is recommended that icing conditions be exited immediately by reversing course or descending to find warmer air. If icing is unavoidable, the throttle should be OPENED to increase the airspeed to retain some margin above stall speed. It is also recommended that flaps be RETRACTED as soon after the first signs of icing as possible, as they act to produce additional drag and cause the aircraft to fly at a lower angle of attack, which can cause ice build up over a larger area of the wing. However, if ice accretion is only noticed after significant build up and the flaps are extended, it is likely that the best thing to do would be to leave the flaps extended, as the aircraft may be below the clean stalling speed. Changes in aerodynamic configuration may cause unpredictable effects in the presence of ice and controls should be used with minimum deflection while escaping icing conditions. Icing could also obstruct the pitot tube making the pitot static system unreliable.

3.4.19. LOSS OF PRIMARY FLIGHT INSTRUMENTS

As the BushCat is a VFR ONLY aircraft, the loss of airspeed or altitude indications should not adversely affect the immediate safety of the flight.

In the absence of altitude, pressure altitude readings may be taken from the transponder.

In the absence of airspeed, the pilot may want to consider landing at speeds that feel slightly higher than normal, or with power on, to provide a safer margin to stall speed in the absence of reliable airspeed. If a GPS is fitted, ground speed can be used as a reference.

If the aircraft is equipped with an EFIS, the operators manual for the EFIS should be consulted.

3.4.20. LOSS OF FLIGHT CONTROLS

The loss of elevator control is perhaps the most critical. In this instance, it is recommended that pitch control is attempted through the use of throttle primarily. It is likely that the aircraft will oscillate in pitch and airspeed. These oscillations could likely be dampened by applying power as speed begins to decay, and reducing power as speed begins to increase. The use of elevator trim may provide some margin of pitch control, and the pilot may be able to find a trim point at which the right trim and power setting will produce more controllable flight. The use of flaps should be avoided due to the nose down pitching moment they create, unless this is absolutely necessary to prevent a stall.

The loss of aileron control can be compensated for by using the secondary effect of rudder to induce a roll in the aircraft. Landing in a crosswind should be avoided and it is recommended that the aircraft is set up on a long final approach so that it can be well stabilised before touchdown. If the ailerons are free floating (i.e. if a cable has snapped) avoid higher speeds.

Loss of rudder control should not immediately endanger the flight, but the aircraft should be landed into a direct headwind if possible. If the rudder is free floating (i.e. if a cable has snapped) avoid higher speeds. Take note that failure of any of the lateral directional controls may make spins easier to enter and irrecoverable.

If an irrecoverable situation arises, the ballistic airframe recovery system may be used. It is recommended that this is only considered when there is absolutely no other means of avoiding an unsurvivable crash. The system has never been tested in flight on a BushCat and thus no airspeed or altitude deployment envelope exists to assure safe deployment. Note that the handle for the BRS needs to be pulled a significant distance for activation of the system.

3.4.21. ULATCHED DOOR IN FLIGHT

A door may unlatch in flight if it has not been secured at all three latch locations, or if pressure is applied to the inner face of the door causing it to bend. The latches may slip out of their respective channels if this occurs. Care should be taken to avoid leaning on the door in flight, particularly if the armrest is stowed in its vertical position. If a door unlatches, the aircraft should be side slipped in such a way as to shelter the door from the air stream as much as possible. To do this, rudder input should be applied in the direction of the unlatched door, putting the side of the aircraft with the closed door into the oncoming airflow. Apply opposite aileron control accordingly to maintain a sideslip. This should assist in disrupting the airflow hitting the open door thereby making it easier to close. Additionally, this assists in protecting the remaining door from detachment due to pressure differentials that may exist between the cabin and outside air flow.

If the door cannot be secured, or is partially detached and jammed against a wing strut, attempt to separate the door and let it fall away from the aircraft. An exaggerated sideslip manoeuvre may make this easier. Note that a jammed door may create a significant amount of drag on one side of the aircraft. This additional drag may yaw the aircraft in the direction of the detached door anyway, so **caution should be taken when applying rudder input to assist the situation**. Once the door detaches completely, maintain a slight sideslip to keep pressure on the remaining door and land as soon as is practical. Do not exceed 70mph.

3.4.22. ACTIVATION OF BALLISTIC RECOVERY SYSTEM (BRS)

The activation of the BRS is recommended only in situations for which there is no other option for recovery of the aircraft. Where possible, the aircraft should always be flown to a suitable landing site. The BRS installation on the BushCat has been approved by the BRS manufacturer and has completed several successful ground extraction tests, however, no in-flight deployments have been carried out, and as a result no guarantee of successful operation exists with the airframe and no deployment envelope, other than that given by the manufacturer for a particular BRS model, has been laid out. The following information is obtained from the BRS owner's manual and is provided here in summary for convenient reference. The information in the BRS owner's manual takes precedence to that provided below and the operator must read the BRS owner's manual thoroughly.

A decision to activate the system must be made quickly and if it is decided that activation is the best course of action, DO NOT WAIT to activate the system. The BRS has an airspeed, load factor and altitude envelope for deployment beyond which it may fail. The BRS-6, Model 1350 usually installed on the BushCat has a maximum allowable aircraft weight of 612kg (1350 lbs) and a maximum deployment speed of 138mph. This is only 30mph in excess of the aircraft V_{NE} of 108mph CAS. In certain emergencies such as structural failures, the aircraft may pick up speed rapidly, thus emphasising the need for expeditious deployment.

BRS suggests the use of the system in the following circumstances;

- Mid-air collision
- Structural failure
- Loss of control
- Stall/spin at low altitude*
- Engine-out over hostile terrain
- Pilot incapacitation (activation by passenger – briefing required)

*Note: no minimum altitude for deployment has been set as there is no simple answer for this. Activation of the system at low altitudes may not give the parachute enough time to fully deploy. However, in cases where there is not enough altitude for recovery from a spin, for example, it may be the only option.

Once the decision is made to activate the system, the Magnetos should be switched off, if time permits, to KILL THE ENGINE. This is done to minimise the risk of the straps being entangled in, or severed by the propeller as the system deploys. Grasp the entire handle firmly and PULL vigorously away from the handle holder to activate the system. **The handle cannot be pulled too far**. The handle may need to be pulled **at least 6 inches (150 mm) away from the holder** to activate the system. Typical **pull forces can range from 30lb to 70lb** (14kg to 32kg) to activate the system. Descent rates are approximately 14-17mph and the aircraft may oscillate during the descent. After deployment, the occupant restraints should be SECURED properly in anticipation of impact. If time permits, the doors should be OPENED to assist egress on the ground. An emergency landing position should be ADOPTED in an attempt to minimise the risk of injury during impact. The recommended position while in a harness restraint is to place hands behind the neck and interlock fingers. Arms and elbows will help protect the face and head.

CHAPTER 4. ABNORMAL PROCEDURES

Procedure Design Philosophy

The Pilot's Operating Handbook contains the procedures for Emergency, Abnormal and Normal operation of the aircraft. The procedures in the POH are followed by detailed explanations to assist in understanding the logic behind them. The pilot is encouraged to commit these procedures to memory. A Quick Reference Handbook (QRH) has been provided and contains only the procedures (without the detailed explanations) in a format which can be easily referenced in flight or for revision. Finally, a Normal Procedures Checklist is provided which **only contains the most critical items of the Normal Procedures**. This checklist should be kept at hand and the applicable section of it completed only once the pilot has run through the procedures from memory. It is merely a check to ensure that the most important parts of the POH procedure have not been omitted and **is not a substitute for the procedures**

4.1. GENERAL INFORMATION

The procedures detailed in the abnormal checklists have been compiled with reference to the Rotax 912ULS Operators Manual (Edition 3, Rev. 2) and are provided here as a convenient reference for the pilot. The Rotax 912ULS Operators Manual provided with a specific engine still takes precedence to this section and should be referred to as the primary source of reference.

4.2. ABNORMAL PROCEDURES

4.2.1. ENGINE NOT STARTING

Starter .... CHECK

Fuel selector .... CHECK

Fuel quantity .... CHECK

Fuel type .... CONFIRM CORRECT

Battery condition .... CHECK

If cold atmospheric conditions exist, complete cold start procedure.

Refer to Rotax 912ULS Operators Manual for detailed troubleshooting instructions.

4.2.2. ENGINE IDLING ROUGH AFTER WARM-UP PERIOD, SMOKY EXHAUST EMISSION

Choke .... CLOSE

If rough running persists, shut down and consult the Rotax 912ULS Maintenance Manual.

4.2.3. ENGINE KEEPS RUNNING WITH IGNITION OFF

This condition may be caused by overheated engine.

Let engine cool down while idling at 2000rpm. Position nose into wind to assist cooling.

4.2.4. KNOCKING UNDER LOAD

This condition may be due to the octane rating of the fuel used being too low.

Use fuel with higher octane rating.

4.2.5. LOW OIL PRESSURE ON GROUND

Shut down engine immediately.

This condition may be caused by insufficient oil or oil that is too hot.

Check oil quantity and let oil cool before attempting restart.

Refer to Rotax 912ULS Operators Manual for detailed troubleshooting instructions.

4.2.6. AIRSTART

If propeller wind milling, but speed is insufficient for start;

Start switch .... START

Note: It is not necessary to wait for the propeller to stop before attempting to start engine.

CHAPTER 5. NORMAL PROCEDURES

Procedure Design Philosophy

The Pilot's Operating Handbook contains the procedures for Emergency, Abnormal and Normal operation of the aircraft. The procedures in the POH are followed by detailed explanations to assist in understanding the logic behind them. The pilot is encouraged to commit these procedures to memory. A Quick Reference Handbook (QRH) has been provided and contains only the procedures (without the detailed explanations) in a format which can be easily referenced in flight or for revision. Finally, a Normal Procedures Checklist is provided which **only contains the most critical items of the Normal Procedures**. This checklist should be kept at hand and the applicable section of it completed only once the pilot has run through the procedures from memory. It is merely a check to ensure that the most important parts of the POH procedure have not been omitted and **is not a substitute for the procedures**

5.1. GENERAL INFORMATION

This section contains the recommended procedures that have been designed for normal operation of the aircraft as required by ASTM F2746-14 (Pilot's Operating Handbook for Light Sport Airplane). The procedures presented apply to the standard factory produced aircraft fitted with a Rotax 912ULS engine. Pilots are advised to read through these procedures carefully and take note of any differences that may be applicable to owner specific aircraft with different instruments, equipment or engine type. These procedures are intended as a source of reference and the pilot should become familiar with them in order to be proficient in the normal operation of the aircraft and systems. They are not intended to replace common sense or sound judgement, but are rather intended to provide the pilot with a means of operating the aircraft systems in a safe manner.

The abbreviated procedures for the normal operation of the aircraft are presented first. The second section contains amplified forms of the procedures which should be read to provide a more thorough understanding of the procedures. The last section contains a normal procedures checklist which only has the most critical items. The pilot is encouraged to commit these procedures to memory and carry out the checklists at each phase of flight, as applicable, to catch any critical omissions. Some procedures applicable to the operation and management of the Rotax 912ULS have been taken directly from the Rotax 912ULS Operators Manual (Edition 3/Rev. 0). The operator is strongly advised to review the procedures contained in the manual supplied with the specific engine of their aircraft and note any differences.

Action items are denoted by the name of the item, followed by the action in capital letters with dotted separations. (E.g. Item........ACTION). Where it is necessary to highlight a consideration to be made, the consideration is noted in plain text without an action following.

5.2. AIRSPEEDS FOR SAFE OPERATION

The speeds given below are referenced to the standard aircraft within the new centre of gravity envelope given in Chapter 7, at sea level ISA. Indicated airspeeds applicable for factory standard installation of pitot static system (see Chapter 6). The speeds referenced throughout this section refer to the indicated airspeeds in the table below.

	CAS (MPH)	IAS (MPH)	CAS (KTS)	IAS (KTS)
	600kg	**600kg**	**600kg**	**600kg**
V_R:	55	55	48	48
$V_{X\ (TAKE\ OFF\ FLAP)}$:	55	55	48	48
$V_{Y\ (CLEAN)}$:	68	67	59	58
V_O:	84	81	73	70
V_{NO}:	93	89	81	77
V_F:	86	83	75	72
V_H:	103	98	89	85
V_{REF} (1.3xVso):	56	56	49	49
Max. crosswind component:	10 KTS			

5.3. NORMAL PROCEDURES

5.3.1. INTERIOR PRE-FLIGHT CHECK

Cabin

Flaps .... UP

Forward wing tube attachment .... CHECK

Aileron cables and pulleys .... CHECK

Magnetos .... OFF

Master .... OFF

Fuel pump .... OFF

All other switches .... OFF

Nose wheel support tube bolts .... CHECK

Brake lines .... CHECK

Brake fluid .... CHECK

Fuel selector .... OFF

BRS safety pin .... REMOVED

Park brake .... SET

Trim tab .... NEUTRAL

Control cables .... CHECK

Fuel quantity .... CHECK

BRS rocket expiry date (as applicable)* .... CHECK

BRS rocket (as applicable)* .... SECURED

BRS parachute container (as applicable)* .... SECURED, NUTS IN PLACE

BRS activation cable (as applicable)* .... CHECK CONDITION

Aft wing tube attachment .... CHECK

Windscreen condition .... SECURE AND UNCRACKED

Requisite paperwork .... ON BOARD

Aft baggage area

Fuel cap .... SECURE

Baggage .... SECURED

BRS parachute expiry date (as applicable)* .... CHECK

BRS parachute container Velcro flap (as applicable)* .... SECURED

Fuel breather tubes .... UNOBSTRUCTED AND SECURE

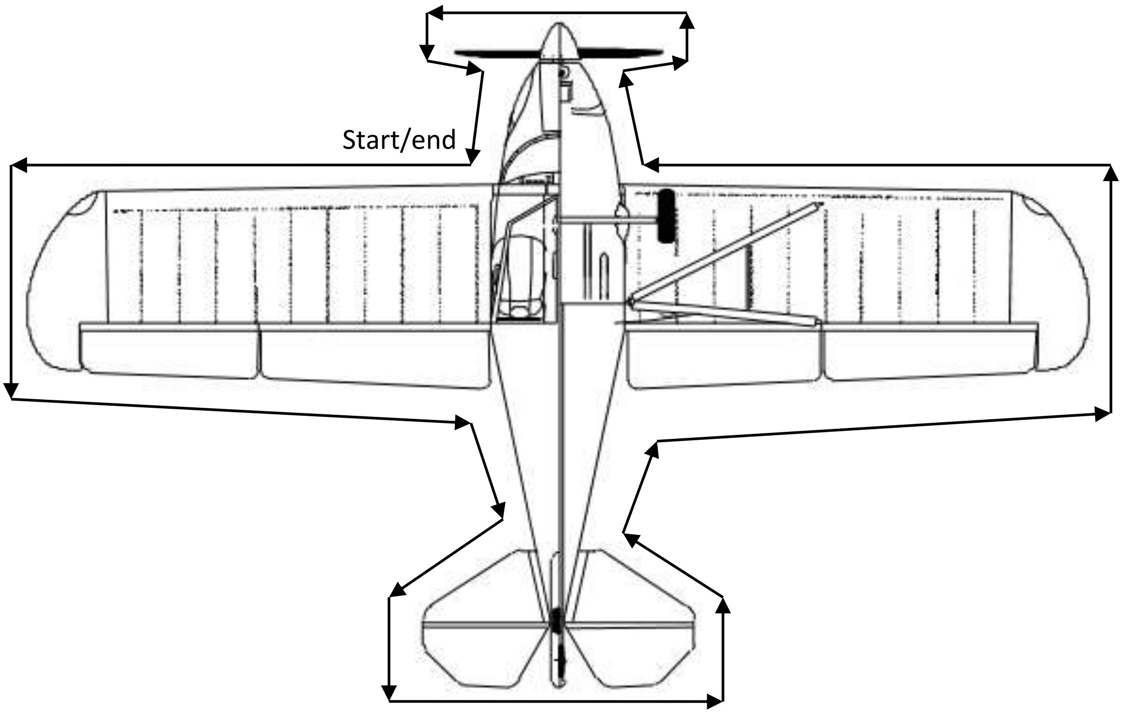
BRS activation cable (as applicable)* .... CHECK CONDITION

Control cables .... UNOBSTRUCTED

Baggage area floor .... CHECK FOR LOOSE NUTS

*It is recommended that the BRS owner's manual be checked for details on pre-flight inspection of the system.

5.3.2. EXTERIOR PRE-FLIGHT CHECK



The following checklist is presented in the order in which the walk around occurs as per the figure above.

Exterior lights .... CHECK

Wing strut bolt and attachment bracket .... CHECK

Jury strut .... CHECK

Jury strut attachment brackets .... CHECK

Aileron bell crank .... CHECK

Wing strut upper attachments .... CHECK

Door hinges .... SECURED

Wing leading edge .... CHECK

Pitot cover .... REMOVED

Tie down .... REMOVED

Wing zips .... CLOSED

Wing tip .... NO CRACKS, LIGHT UNDAMAGED

Aileron hinges and bolts .... CHECK

Aileron movement .... FREE AND CORRECT

Flap hinges and bolts .... CHECK

Antennae .... CHECK

BRS straps (as applicable) * .... CHECK

BRS tie-wraps (as applicable) * .... CHECK

Aft wing tube attachment .... CHECK

Landing gear leg .... CHECK CONDITION

Landing gear leg attachment bolts .... CHECK

Brakes .... CHECK CONDITION

Tyre .... CHECK CONDITION

Fuel strainers .... CHECK FUEL

Baggage compartment zip .... CLOSED

Aft fuselage .... CHECK

Horizontal tail attachment bolt and nut .... CHECK

Vertical tail attachment bolt and nut .... CHECK

Empennage bracing wires .... CHECK TIGHT, SAFETY WIRE LOCKED

Elevator hinges and bolts .... CHECK

Elevator movement .... FREE AND CORRECT

Trim tab .... SAFETY WIRE LOCKED, SPRING CHECKED

Elevator bell crank .... CHECK FOR CRACKS

Ventral strake..SECURE

Tail tie down.. REMOVED

Rudder hinges and bolts .... CHECK

Tail wheel (as applicable)... CHECK

Tail wheel springs and linkages (as applicable) .... CHECK

The procedure up to this point is mirrored for the other side of the aircraft.

Windscreen attachment screws .... CHECK

Oil quantity .... CHECK

If low oil quantity indicated, the oil cap and dipstick should removed and the propeller turned through multiple compression strokes of the engine with the magnetos OFF to get an accurate oil level reading. Refer to Rotax 912ULS Operators Manual for more detail.

Oil cap .... SECURED

Throttle ....EXERCISE AND OBSERVE CABLE

Choke ....EXERCISE AND OBSERVE CABLE

Engine mount... CHECK FOR CRACKS

Cowling..SECURE

Overflow pipes ....CHECK SECURE

Radiators...CHECK UNOBSTRUCTED

Air filter ....CHECK UNOBSTRUCTED

Coolant..CHECK SUFFICIENT

Propeller blades .... CHECK

Spinner ....SECURE

Nose gear leg (as applicable) .... CHECK

Nose wheel and tyre (as applicable)... CHECK

Exhaust.. CHECK

Bottom of main fairing... CHECK

Bottom of cowling.. CHECK FOR LEAKS

*It is recommended that the BRS owner's manual be checked for details on Pre-Flight inspection of the system.

5.3.3. NORMAL (WARM) START

Park brake .... RESET

Chocks .... REMOVED

Fuel selector .... ON

Master .... ON

Nav lights .... ON

Magnetos .... ON

Instrument switch .... ON

Fuel pump .... CYCLE AND OBSERVE PRESSURE

Throttle .... IDLE

Area .... CLEAR

Starter .... START

Starter cycle: 10s ON, 2 minutes OFF

Once engine has started:

Throttle .... SET ENGINE TO 2500 RPM

Oil pressure .... WITHIN LIMITS

If oil pressure has not risen 10s after start, shut down IMMEDIATELY.

5.3.4. <u>COLD START</u>

Park brake .... RESET

Chocks .... REMOVED

Fuel selector .... ON

Master .... ON

Nav lights .... ON

Magnetos .... CONFIRM OFF

Instrument switch .... ON

Fuel pump .... CYCLE AND OBSERVE PRESSURE

Throttle .... IDLE

Area .... CLEAR

Starter .... ENGAGE UNTIL OIL PRESSURE RISE

Starter .... RELEASE

Magnetos .... ON

Choke .... ACTIVATE

Area .... CLEAR

Starter .... START

Once engine has started:

Oil pressure .... WITHIN LIMITS

Choke .... SLOWLY DEACTIVATE

Throttle .... SET ENGINE TO 2500 RPM

5.3.5. AFTER START/TAXI

Throttle .... SET ENGINE TO 2500 RPM

Engine instruments .... WITHIN LIMITS

Charge switch .... ON

Voltage .... IN LIMITS

Magnetos .... CYCLE INDIVIDUALLY

Fuel pump .... OFF

Flaps .... SET FOR TAKEOFF

Avionics/Radios .... SET

Transponder .... SBY, SQUAWK SET

Altimeter .... SET

Lights .... AS REQUIRED

Circuit breakers .... CHECKED

Brakes .... CHECKED

Instruments (as applicable) .... TRACKING

Rudder .... CHECK WHEN MOVING

5.3.6. BEFORE TAKE-OFF

Engine run-up

Brakes .... SET

Oil temperature .... MINIMUM 50°C (120°F)

If oil temperature below minimum, warm up engine at 2000 RPM for 2 minutes, and 2500 RPM thereafter.

Oil pressure .... CHECK

Throttle .... SET TO 4000 RPM

Magnetos .... CHECK (300 RPM MAX DROP, 150 RPM DIFFERENCE)

Engine instruments .... CHECK

Throttle .... IDLE

Minimum idle speed of 1400 RPM.

Airframe and systems

Controls..FREE AND CORRECT

Trim tab..SLIGHT NOSE UP

Magnetos..BOTH ON

Master..ON

Oil pressure..IN LIMITS, STABLE

Pitot cover..OFF

Fuel pump..ON

Fuel quantity..CHECK

Fuel selector..ON

Flaps..CONFIRM AT TAKEOFF POSITION

Instruments..RADIOS/ALTIMETER SET

Harnesses..SECURED

Doors..LATCHED AT ALL 3 POINTS

Circuit breakers/Annunciators..CHECK

Entering runway

Transponder..ALT

Strobes..ON

Landing lights..ON WHEN CLEARED FOR TAKEOFF

5.3.7. SHORT FIELD TAKE-OFF PROCEDURE

Flaps..CONFIRM AT TAKEOFF POSITION

Brakes..APPLY AND HOLD

Throttle..SET FULL POWER

Minimum full power setting of 5200 RPM must be obtained.

Brakes..RELEASE

Rotate..56 MPH

Airspeed..V_X (55 MPH, 600kg, take-off flap)

Obstacles cleared..V_Y (67 MPH, 600kg, clean)

Accomplish **After takeoff** checklist

5.3.8. SOFT FIELD TAKE-OFF PROCEDURE

Flaps..COFIRM AT TAKEOFF POSITION

Brakes..RELEASE

Throttle ....GRADUALLY APPLY FULL POWER

Minimum full power setting of 5200 RPM must be obtained.

Control stick .... MODERATE BACK PRESSURE

Rotate.. 55 MPH

Airspeed ....V_X (55MPH, 600kg, take-off flap)

Obstacles cleared.. V_Y (67 MPH, 600kg, clean)

Accomplish **After takeoff** checklist

5.3.9. AFTER TAKE-OFF

Brakes.. CYCLE

Throttle .... SET 5500 RPM MCP

Fuel pump ....OFF

Fuel quantity .... CHECK

Flaps ....RETRACT

Engine instruments .... CHECK

Lights .... AS REQUIRED

5.3.10. CRUISE

Fuel quantity .... CHECK

Radios.. SET

Engine instruments .... CHECK

Altimeter .... SET

5.3.11. DOWNWIND

Brakes.. CHECK

Throttle ....REDUCE TO ACHIEVE 80 MPH

Fuel pump ....ON

Fuel quantity .... CHECK

Flaps ....TAKEOFF

Engine instruments .... CHECK

Lights .... AS REQUIRED

5.3.12. FINAL APPROACH

Airspeed .... 56 MPH (landing flap)

Fuel selector .... ON

Fuel pump .... CONFIRM ON

Flaps .... LANDING

5.3.13. SHORT FIELD LANDING PROCEDURE

Flaps .... LANDING

Airspeed .... 56 MPH

Flare .... 3-6 FT AGL

Nose .... LOWER ONCE MAIN WHEELS ON GROUND

Brakes .... FULL WITHOUT LOCKING WHEELS

Tail-dragger aircraft should be landed in the 3 point attitude.

Caution should be exercised when flying at low speeds in gusty conditions. The BushCat will bleed off speed quickly and high sink rates may occur if the flare is initiated too high.

5.3.14. SOFT FIELD LANDING PROCEDURE

Flaps .... LANDING

Airspeed .... 56 MPH

Nose wheel .... KEEP RAISED

Once nose wheel contacts ground:

Control stick .... CONTINUE TO APPLY BACK PRESSURE

Brakes .... AS REQUIRED

Tail-dragger aircraft should be landed in the 3 point attitude.

5.3.15. BALKED LANDING

Throttle .... FULL POWER

Pitch attitude .... ARREST DESCENT

Airspeed 55MPH

Flaps .... SET TAKEOFF

Airspeed .... V_X or V_Y

Accomplish **After takeoff** checklist.

5.3.16. AFTER LANDING

Once clear of runway:

Strobes .... OFF

Transponder .... 1200/2000 SBY

Fuel pump .... OFF

Flaps .... RETRACT

5.3.17. SHUTDOWN

Park brake .... SET

Radios/avionics .... OFF

Engine .... 2 MINUTE COOLING RUN

Throttle .... IDLE

Magnetos .... CHECK INDIVIDUALLY

Lights .... OFF

Charge switch .... OFF

Instrument switch .... OFF

Magnetos .... OFF

Fuel selector .... OFF

Master switch .... OFF

BRS safety pin (as applicable) .... INSERTED

5.3.18. POST FLIGHT

Aircraft hours .... NOTED

Pitot cover .... IN PLACE

Tie downs/chocks .... IN PLACE

Exterior inspection .... COMPLETED

5.4. EXPANDED NORMAL PROCEDURES

5.4.1. INTERIOR PRE-FLIGHT CHECK

The interior pre-flight check has been designed as a flow from the top of the cabin, down the front, along the middle and up the aft of the cabin. Starting from the top of the cabin, the flaps should be in the retracted position for the exterior check. The mechanism should be checked for loose nuts and springs. The forward wing tube attachment should be checked to ensure that the nut is not loose and there are no signs of cracking in the tubes or the bracket. Moving down along the front of the cabin, the aileron cables and pulley should be checked. The condition of the cables around the pulley should be checked to ensure that no fraying is taking place, that the cables are running along the pulley and that the pulley is not loose. Moving down to the instrument panel, the magnetos should be confirmed OFF, along with the master and all other switches.

Inspections in the foot-well should consist of checking that the nuts of the pedal and nose steering assemblies are not loose and that the brake system displays no sign of wear or leaks (as applicable). The fuel selector should be checked in the OFF position and the trim lever set to neutral. The centre console should then be removed to check the condition of the control cables and ensure that no fraying is occurring. The cables should be running smoothly in the pulleys. The wing attachment points at the top of the cabin should be checked for cracks or loose bolts. If a BRS is installed, the rocket expiry date and the mounting of the entire system should be checked for loose nuts or damage. The activation cable should be checked for kinks and correct attachment to the rocket. Avoid pulling sharply on the cable housing. Lastly, the requisite documents for the flight should be checked to ensure that they have been completed and stowed in the flight folder in the baggage compartment.

The aft baggage area should be inspected once the baggage has been loaded. This is to ensure that the baggage has not obstructed the fuel breather lines and control cables that run though the compartment. The baggage should be secured in such a way so as to prevent the obstruction of these critical components due to in flight shifting. The fuel cap should be checked to ensure that it is CLOSED and the floor of the baggage compartment checked for detached components that may have rolled down the fuselage from the tail area. The portion of the BRS activation cable that runs behind the fuel tank should be checked for kinds, and the BRS parachute pack expiry date checked and the Velcro cover on top of the pack secured.

5.4.2. EXTERIOR PRE-FLIGHT CHECK

The lights should be checked by switching on the master before switching on all the lights and conducting an exterior inspection. The master should then be turned OFF for the rest of the pre-flight. The wing strut attachment bolts should be checked and the bracket inspected for cracks. Moving up the strut, the jury struts should be checked for any damage and that the nuts are secure. Unzip the trilam cover to inspect the jury strut attachment brackets. It is recommended that aileron bell cranks, control lines and strut attachment brackets also be checked by unzipping the trilam covering. The pitot cover should be removed and the pitot tube checked for security and obstruction. The zips on the wing trilam covering should be checked to ensure that they are closed. The wing leading edge tube should be checked for any dents that may have occurred during operation, and the fibreglass tip should also be checked for damage. The condition of the light should be checked to ensure no damage. On the trailing edge of the wing, the control gap covers should be pulled down to inspect the hinges and pins holding the control surfaces and flaps in place.

The ailerons should be checked for free and correct movement while observing that the other aileron moves in opposition.

The antennae on top of the fuselage should be checked for damage and the BRS straps checked to make sure that no wear or chafing is occurring, and that the cable ties have not broken. The landing gear legs should be checked for cracks, loose bolts or any damage. The brakes should be inspected for any signs of leaks, and the tyres should be checked for the correct inflation, flat spots or ballooning. The fuel strainers can be found under the fuel tank just aft of the fibreglass main fairing. Fuel should be strained from both strainers until all sediment and water has been removed from the system. The baggage compartment zips should be CLOSED and the aft fuselage inspected for damage to the trilam or tubes.

The empennage of the aircraft should be checked by ensuring that the attachment bolts at the leading edge roots of the horizontal and vertical tail are SECURE, the bracing wires are taut and that there is no play in the tail surfaces. The locking wire securing the bracing wires should be checked to ensure that it has not come loose. The elevator and rudder hinges should be checked to ensure that the bolts and nuts/pins are securely in place. Note that the rudder on a nose-wheel configured aircraft will not move when the aircraft is stationary on the ground. The trim tab should be checked for loose locking wire and the correct operation of the spring chord. Finally, the tail wheel assembly or ventral strake, as applicable, should be checked for any excessive play, loose fastenings or damage. The procedure is repeated for the other side of the aircraft and is then followed by checking the front of the aircraft.

Moving around the front right of the aircraft, the oil quantity should be checked as sufficient for flight and the dipstick and filler cap secured in place. Note that the difference between the upper and lower oil quantity limits in the Rotax 912 ULS is 0.45 litres. If a low quantity is indicated, the oil cap should removed and the propeller turned through multiple compression strokes to return oil in the engine to the tank in order to get an accurate reading. After all the oil has returned to the tank, the sound of air bubbling up through the oil will be heard from the oil tank (usually only audible with the cap off).

The throttle lever should be moved from the cockpit while observing the mechanism through the opening in the cowling. There should be no interference or chafing. The same should be done with the choke, and repeated for the other side of the engine (so that the actions of the carburettor valves on each side of the engine are checked).

The condition of the cowling and DZUS fasteners should be checked for damage or play. The overflow pipes on the bottom left and right of the cowling should be checked to ensure that they are not obstructed and have not slipped up through the cowling back into the engine compartment. The radiators and air filters should be clear of obstructions and checked for damage. The propeller blades should be checked for FOD damage and there should not be any play between the blades and the hub. The spinner should be secured and all the screws fastened tightly. The coolant fluid level in the overflow bottle should be checked and replenished if necessary. Moving underneath the cowling, the exhausts should be checked for any damage and should not have any play. If the aircraft has flown recently, the exhausts may still be hot, and CAUTION should be taken when checking them. The condition of the nose landing gear, as applicable, should be checked for cracks, bends or loose connections, with the tyre being checked for flat spots and correct inflation. Finally, the bottom of the main fairing should be checked for any bolts that may be coming loose, and the bottom cowling should be checked for signs of leaks.

5.4.3. NORMAL (WARM) START

The normal start is generally accomplished if the engine has already been run that day and the use of the choke is unnecessary. The fuel selector, master switch, magnetos and instrument switch should be switched ON. The radios and EFIS/avionics (as applicable) should be left OFF for the start. The fuel pump should be switched ON for about 3s to observe the rise in fuel pressure. This ensures that the pump is working and that fuel is being delivered to the engine. Ensure that the throttle is positioned at IDLE and that the area is clear before engaging the starter. The starter cycle limit is 10s on (continuous) and 2 minutes off (to cool). Once the engine has fired, set the throttle to achieve 2500 RPM and observe the oil pressure. If the oil pressure has not risen within 10s, shut down the engine immediately. Not that the engine instrumentation may not receive power if the instrument switch is off. If the oil temperature before start was low, continue to observe the oil pressure as it could drop due to increased flow resistance in the suction line. The RPM should only be increased when the oil pressure remains steady.

The Rotax 912 ULS Operators Manual should be consulted if there is trouble starting the engine. Note that a spark only occurs at a minimum engine speed of 220 RPM (about 90 RPM on the propeller). This implies that it is basically impossible to start the engine by hand swinging the propeller.

5.4.4. COLD START

The cold start procedure is generally done for the first start of the day, or in cold weather conditions. Note the temperature limitations for starting and operating the engine:

Max: 50°C (based on ambient temperature)
Min: -25°C (based on oil temperature)

The fuel selector, master switch and instrument switches should be switched ON. Confirm that radios and other avionics, as applicable, are turned OFF. The magnetos should be OFF, as initially the engine will be cranked through a few rotations with the starter to get oil flowing around the system. Cycle the fuel pressure pump and ensure that there is a pressure rise. With the throttle at idle, engage the starter and turn the engine until the oil pressure begins to rise. Ordinarily, this will occur rather quickly. Switch the magnetos back on, engage the choke and start the engine observing the starter cycle limit of 10s ON, 2 minutes OFF. Ensure that the throttle handle is completely closed; otherwise the choke is rendered ineffective. Once the engine has started, slowly deactivate the choke and set the throttle for 2500 RPM. Check that the oil pressure has stabilised. The maximum permissible oil pressure for a short period of time after a cold start is 7 bar (102 psi).

5.4.5. AFTER START/TAXI

After start, the engine should be set to 2500 RPM with the engine parameters within limits. Switch the charge switch ON and check for normal voltage indications. The magnetos (ignition circuits) should be CYCLED individually to confirm that they are both grounded. The fuel pump should remain off for taxi and run up to check for correct functioning of the engine driven fuel pump. The flaps should be set to the takeoff position, the radios and transponder set and the correct QNH set on the altimeter. Nav/position lights should be on for taxi to signal intentions to other aircraft, if fitted. At this point, all the electrical equipment should be on, so a check of the circuit breakers should be made to ensure that none have popped. Shortly after beginning the taxi, the brakes should be checked. During taxi, the pedals should be cycled to their full left and right stops while observing the movement of the rudder. CAUTION should be taken when doing this and the aircraft should be on a wide taxiway with plenty of space ahead of it. Finally, the instruments (EFIS and compass) should be checked for correct functionality during turns.

5.4.6. BEFORE TAKE-OFF

The before takeoff procedure is broken into three critical phases; engine run-up, airframe and systems and runway entry.

Engine run-up:
Before the engine is run up, the minimum oil temperature of 50°C (120°F) MUST be obtained. Before the oil is at this temperature, the viscosity may be high enough to cause it to bypass the oil filter. This may bring contaminants into the engine and cause damage. If the oil temperature is below minimum, warm up engine at 2000 RPM for 2 minutes, and 2500 RPM thereafter. Once the oil is above the minimum temperature and the oil pressure is within the green arc, the engine should be run up to 4000 RPM. Monitor the engine instrumentation for the correct operating parameters while operating at this RPM. Select each magneto individually. There should be no more than a 300 RPM drop and a 150 RPM difference between the two magnetos. The throttle should be reduced to IDLE to observe a minimum of 1400 RPM. Rotax recommends a short full power check during the runup to check throttle response. To minimise FOD damage to the propeller, the throttle response can be checked during the application of full power for takeoff and the engine parameters observed.

Airframe and systems:
The controls should be checked for free and correct movement and the trim tab should be set in a slight nose up position. The flaps should be confirmed as being in the TAKEOFF position, and a cursory glance to ensure that pitot cover has indeed been removed should be done. The magnetos, master and fuel pump and fuel selector should be confirmed as ON for takeoff, before a final check of engine instrumentation, fuel quantity, doors and harnesses is done.

Entering runway:
As per international standards, the transponder should be set to ALT when entering an active runway, along with switching ON the strobe lights. The landing lights, if fitted, are switched ON when the aircraft is cleared for takeoff.

5.4.7. SHORT FIELD TAKE-OFF PROCEDURE

A short field takeoff is accomplished with takeoff flaps and is initiated by applying full power against the brakes. A minimum of 5200 RPM should be obtained. The RPM achieved will vary depending on the pitch setting of the propeller blades and density altitude. Courser pitch settings and higher density altitudes will REDUCE the maximum obtainable RPM. The aircraft is rotated at 55 MPH IAS and flown at V_X of 55 MPH IAS (600kg, take-off flap) until all obstacles cleared.

5.4.8. SOFT FIELD TAKE-OFF PROCEDURE

A soft field takeoff is accomplished with takeoff flaps and is initiated by gradually applying power. Full power is only taken once the aircraft is rolling to minimise the risk of FOD damage on the propeller. A minimum of 5200 RPM should be obtained. Apply light aft pressure on the stick to keep weight off the nose and rotate the aircraft at 55MPH IAS (600kg, take-off flap). Climb out at V_X or V_Y, as needed.

5.4.9. AFTER TAKE-OFF

After takeoff actions consist primarily of reducing the power to the maximum continuous power setting of 5500 RPM if needed and switching off the fuel pump. When the pump is switched OFF, the fuel pressure gauge should be monitored for a stable fuel flow. The flaps should be retracted once clear of all obstacles.

5.4.10. CRUISE

The cruise procedure should be accomplished upon reaching the top of climb and every 15 – 30 minutes during cruise, or upon reaching a waypoint (whichever sooner). The fuel quantity should be CHECKED to ensure that a sufficient amount remains for the intended flight and that the engine is consuming the expected amount. The radio frequencies should be CHECKED and the engine instrumentation CHECKED to ensure all temperatures and pressures are within limits. Finally, the altimeter should be checked to confirm the correct setting (QNH/QNE) is being used.

5.4.11. DOWNWIND

On downwind, the brakes should be CHECKED for resistance to ensure that they are working. Airspeed should be reduced to 80 MPH in preparation for the deployment of takeoff flaps. The fuel pump should be ON and the fuel quantity CHECKED as sufficient. Lights should be set AS REQUIRED and the engine instruments CHECKED.

5.4.12. FINAL APPROACH

Once an airspeed of 56-60MPH IAS (600kg) is obtained, the flaps should be SET to the landing setting. Confirm that the fuel pump is ON and that the fuel selector is ON.

5.4.13. SHORT FIELD LANDING PROCEDURE

A short field landing should be accomplished with landing flaps SELECTED at a final approach speed of 56 MPH IAS. This speed should be held until the aircraft is 3-6 ft above the runway, at which point the aircraft should be FLARED. Hold the aircraft at 3-6ft above ground. The speed will bleed off quickly and the aircraft will sink to the runway. CAUTION should be taken when approaching at lower speeds, as the aircraft has a tendency to bleed off speed and sink quickly. A hard landing may cause the aircraft to bounce and cause a subsequent loss of control. If the aircraft bounces, hold the control stick AFT and apply power as necessary to arrest the descent. Once the main wheels are firmly on the ground, lower the nose and apply heavy braking without causing the wheels to lock up. Tail-dragger aircraft should be approached at the same speed and landed in a 3-point configuration.

5.4.14. SOFT FIELD LANDING PROCEDURE

A soft field landing is accomplished at a final approach speed of 56 MPH IAS (600kg) with landing flaps SET. If necessary, extra speed can be carried to allow the pilot more time to judge the flare and execute a smoother touchdown. The nose wheel should be held off the ground for as long as possible. When the nose wheel contacts, apply brakes as necessary.

5.4.15. BALKED LANDING

A balked landing should only be undertaken if there is an immediate danger in continuing the landing. The rate of climb that is obtainable will be severely limited if the flaps are in the landing position, the aircraft is near its maximum weight and a high density altitude prevails. Once the decision is made to abort the landing, the throttle should be opened to select FULL power and the nose RAISED to arrest the descent. Wait for the aircraft to accelerate to 55 MPH IAS and retract the flaps to the TAKEOFF position. The climb out should then be accomplished at V_X or V_Y as applicable.

5.4.16. AFTER LANDING

Once the runway has been vacated, the strobes should be turned OFF, the transponder set to SBY and the code cycled to the VFR setting, as applicable. The fuel pump should be switched OFF and the flaps RETRACTED.

5.4.17. SHUTDOWN

Before shutdown, the park brake should be SET, the avionics/radios turned OFF and the engine CHTs and oil temperature observed. If the engine is running at elevated temperatures, a 2 minute cooling run should be made (usually, taxiing at a low power settings will provide a sufficient cooling period). The magnetos should be checked individually to ensure that they are properly grounded, before the charge switch and instrument switches are switched OFF. The engine can then be shut down by turning OFF both magnetos and turning the fuel selector to OFF. The master switch is turned OFF last. If the engine does not stop when the magnetos are switched off, refer to the **Engine keeps running with ignition off** abnormal procedure.

It is recommended that the BRS safety pin, as applicable, be reinserted BEFORE exiting the aircraft. The position of the handle is such that it may catch on a belt loop or a pocket causing the system to activate while exiting the aircraft.

5.4.18. POST FLIGHT

Once the pitot cover has been inserted and the aircraft tied down and chocked, the airframe should be inspected for any signs of damage that may have occurred during the flight. This may include loose locking wire, holes/tears in trilam, cracks in composite parts, tyre damage etc.

5.5. CHECKLIST OF CRITICAL ITEMS

A printable checklist of critical items is given on the next page.

NORMAL CHECKLIST

Before start

Cockpit preparation ....COMPLETE

Chocks/pitot cover.......................................REMOVED

Doors and hatches .... CLOSED & LOCKED

Park brake .... RESET

Fuel selector ....ON

Fuel quantity..SUFFICIENT

Master ....ON

Instrument switch..ON

Avionics..OFF

After start

Engine instruments...................................... CHECKED

Magnetos...CYCLED

Electrics...SET & CHECKED

Radios/avionics...SET

Before takeoff

Flight instruments..SET

Engine run-up .... COMPLETED

Oil temperature .... MIN. 120°F

Oil pressure.. CHECKED

Flight controls .... CHECKED

Harnesses/doors...SECURE

Magnetos.. BOTH ON

Fuel selector ....ON

Fuel pump...ON

Flaps..TAKEOFF

After takeoff

Fuel pump...OFF

Flaps..UP

Climb power...SET

Cruise

Fuel quantity .... CHECKED

Radios...SET

Engine instruments .... CHECKED

Altimeter ....SET

Landing

Fuel selector... ON

Fuel pump .... ON

Flaps .... LANDING

Shutdown

Fuel pump .... OFF

Flaps ....UP

Park brake ....SET

Electrics .... OFF

Magnetos .... OFF

Master .... OFF

Fuel selector .... OFF

BRS safety pin...............................INSERTED

Indicated Airspeeds (600kg Sea Level)

V_R .... 55 MPH

$V_{X\ (TAKE\text{-}OFF\ FLAP)}$ .... 55 MPH

$V_{Y\ (CLEAN)}$ .... 67 MPH

V_O... 81 MPH

V_{NO} .... 89 MPH

V_F .... 83 MPH

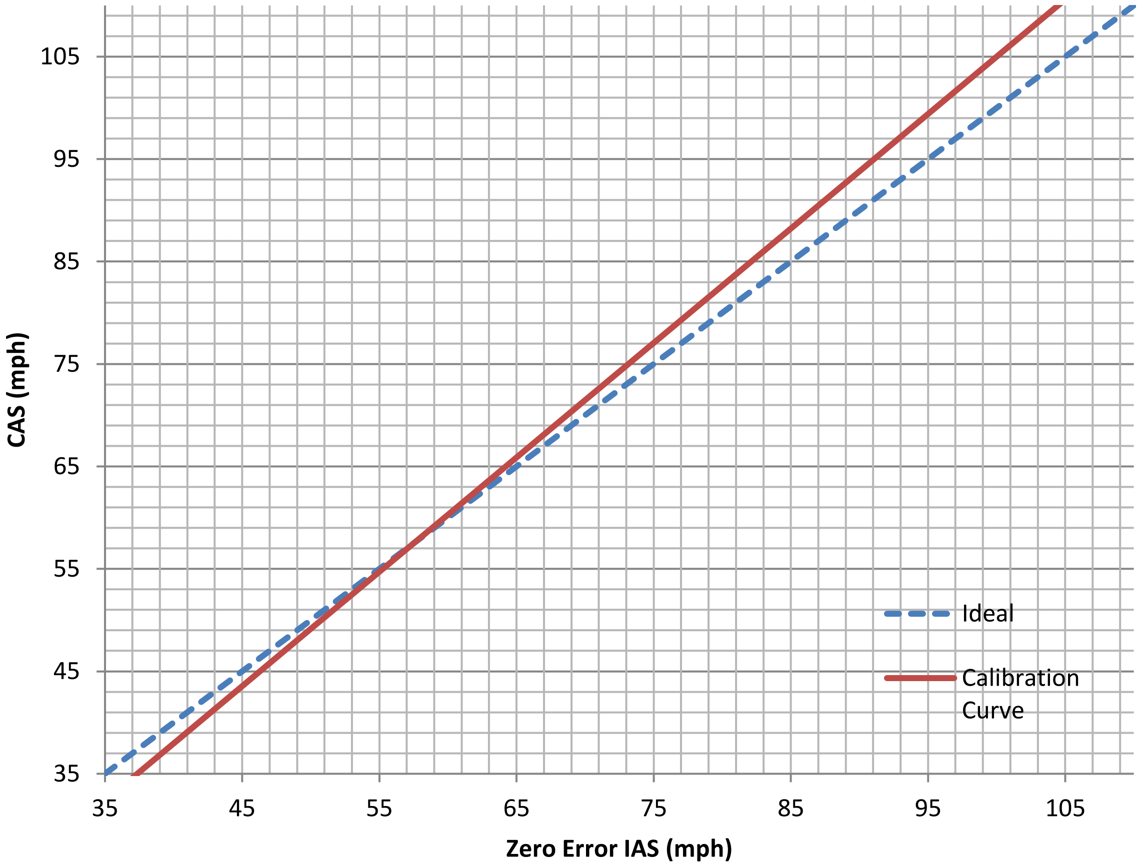
V_{REF}.. 56-60 MPH

All information is this manual is subject to change at the manufacturers discretion.

CHAPTER 6. PERFORMANCE

6.1. AIRSPEED INDICATOR CALIBRATION

The relationship between IAS and CAS given below is for the factory standard installation of the pitot-static system. It has been determined on an aircraft with an ASI which has **no instrument error** and is thus representative of **position (pressure) error only**. Instrument error calibration should be carried out on your aircraft to ensure that there are no leaks and that the instrument error is negligible. If it is found that the instrument error is not negligible, refer to the SkyReach Technical Guidance Material.



6.2. FLIGHT SPEEDS

The speeds given in the table below are for the factory standard aircraft rigged as per the kit manual (see Section 6.1 for the applicability of these indicated airspeeds). Speeds given are applicable for the centre of gravity range shown in Chapter 7. Climb performance speeds, V_X and V_Y, are given for sea-level, ISA conditions corresponding to the limiting mass.

Note: V_{S1} denotes take-off flap stall speed.

		V_S:		V_{S1}:		V_{SO}:		V_R*:		V_{Ref}:		V_g (clean):			
Mass (kg):	**Mass (lb):**	**CAS (mph):**	**IAS (mph):**	**CAS (mph):**	**IAS (mph):**	**CAS (mph):**	**IAS (mph):**	**CAS (mph):**	**IAS (mph):**	**CAS (mph):**	**IAS (mph):**	**CAS (mph):**	**IAS (mph):**	**Mass (lb):**	**Mass (kg):**
600	1322	50	51	46	47	43	45	55	55	56	56	65	64	1322	600

Note: V_{S1} denotes take-off flap stall speed.

Sea-level, ISA		V_X (take-off flap)*:		V_Y (clean):	
Mass (kg):	**Mass (lb):**	**CAS (mph):**	**IAS (mph):**	**CAS (mph):**	**IAS (mph):**
600	1322	55	55	68	67

6.3. PERFORMANCE SUMMARY

	Rotax 912 ULS
Gross Weight	Refer to section 2.4
Max fuel range	300nm + 45min reserve
Total fuel capacity	24.8 Gallons (94 litres)
Total Usable Fuel	23.2 Gallons (88 Litres)
Fuel Consumption	5.3Gallons/hour @ 5000RPM
Maximum Engine Output	100HP @ 5800 RPM

	Rotax 912 ULS
Top Speed (Sea Level)	98 MPH
Cruise Speed (75% power)	85MPH
Max Speed V_{NE}	103MPH

	Rotax 912 UL	Rotax 912 ULS
Rate of Climb @ V_x	780FPM	950FPM
Rate of Climb @ V_y	1000FPM	1200FPM

6.4. TAKEOFF AND LANDING DISTANCES

The takeoff and landing distances used here are based on sea level at 15°C (59°F) with no wind. Your actual numbers will vary based on the current weather and wind conditions, as well as on the propeller installed. Note, distances are for the aircraft without vortex generators fitted.

Engine	Take Off	Landing Roll
Rotax 912ULS	262 ft	328 ft

6.5. RATE OF CLIMB

The rate of climb figures shown below are based on sea level at 15°C (59°F) with no wind. Your actual numbers will vary based on the current weather and wind conditions, as well as on the propeller installed.

Engine	Rate
Rotax 912ULS	1200 FPM

6.6. CRUISE SPEEDS

The cruise speeds shown below are based on 75% power at sea level, 15°C (59°F) with no wind. Your actual numbers will vary based on the current weather and wind conditions, as well as on the propeller installed.

Engine	CRUISE
Rotax 912ULS	85 MPH

6.7. FUEL CONSUMPTION

Engine	75% POWER	RPM
Rotax 912ULS	5.3 Gallons/ hour	5000 RPM

CHAPTER 7. MASS AND BALANCE

7.1. EQUIPMENT LIST

Equipment fitted to this aircraft is listed in section 12.4. It should be noted that no additional equipment may be installed without written authorisation from the manufacturer. A 'Request for change' form is found in the BushCat maintenance manual, APPENDIX I.

7.2. CENTRE OF GRAVITY LIMITS

The centre of gravity position limits are given below as distances aft from the wing leading edge:

	Forward limit	Aft limit
485kg	404mm (15.9in) (26.8%MAC)	482mm (19.0in) (32.0%MAC)
515kg	414mm (16.3in) (27.5%MAC)	568mm (22.3in) (37.7%MAC)
600kg	444mm (17.5in) (29.5%MAC)	588mm (23.1in) (39.0%MAC)

7.3. PREAMBLE TO THE CENTRE OF GRAVITY DETERMINATION PROCEDURE

Careful calculation of mass and balance is vital to the continued safety of your BushCat aircraft. The examples and forms provided below will help you to determine your aircraft empty mass and empty centre of gravity position (hereafter CG). These calculations can then be used to calculate your useful load and loading schedule to ensure that you operate your aircraft within the centre of gravity envelope.

Staying within the CG range and gross mass limitations is essential to safe flight. Exceeding the aircraft’s gross mass means that you are reducing the margins of safety built into the design of the aircraft and exposing yourself to possible dangers associated with overloading the aircraft. Exceeding the CG range will alter the stability of the aircraft and may change its handling characteristics. If the CG is too far forward the elevator may not have enough authority to carry out certain manoeuvres. If the CG is too far aft, the aircraft may become unstable in pitch and could enter an irrecoverable stall and the aircraft may become more prone to spinning.

The basic process of determining your aircraft's mass and balance involves levelling and weighing the aircraft and doing some calculations to find the empty mass and empty CG range. With those figures in hand the useful load and loading schedule can be determined.

The aircraft must be weighed in its final flight configuration. This mass includes everything needed for the aircraft to take to the sky, except the pilot, passenger, useable fuel and baggage.

Levelling the aircraft is done by means of a spirit level placed on the cabin floor.

The **Datum** is the imaginary vertical plane from which all horizontal measurements are taken for balance purposes with the aircraft in level attitude. The Datum for all measurements is the wing leading edge at the point where the bottom of the door will intersect the wing's leading edge when the door is fully opened.

Weighing points are the aircraft's main landing gear and nose wheel, or tail-wheel for tail-dragger configuration.

Centre of Gravity of the aircraft (**CG**) may be defined as the point where negative and positive moments are in equilibrium. If the aircraft is suspended at that point it would have no tendency to pitch its nose up or down and would remain balanced. The mass of the aircraft is assumed to be concentrated at its **CG**.

CG Range is the allowable variation in the CG location. CG location can be affected by variations in loading of aircraft: e.g. weight of occupants, fuel and baggage. Since CG limits define the range of allowable variation of the CG without making the aircraft unstable and unsafe to fly, the CG of a loaded aircraft must remain within these limits.

Forward and Aft CG is the most forward and the most rearward allowable CG limits of the aircraft. These limits are defined by the design of the aircraft and should never be exceeded under any circumstances.

Mean Aerodynamic Chord (MAC) is the mean chord of the wing. For mass and balance purposes MAC is used to determine the CG range of the aircraft. Mean Aerodynamic Chord for BushCat aircraft is 1508mm.

Maximum Gross weight of the aircraft is the maximum weight of the aircraft and its "contents" authorized for flight by its design limitations and applicable regulations.

Empty weight of the aircraft includes all operating equipment which is permanently fitted in the aircraft. Engine oil and unusable fuel must be included in empty weight calculation.

Useful load is calculated by subtracting the empty weight from the maximum allowable gross weight of the aircraft. This load consists of occupants, fuel and baggage.

Arm (Moment Arm) is the horizontal distance in mm, from the datum to the centre of gravity of various items. A positive arm indicates the item is located aft of datum. A negative arm indicates the item is located forward of datum.

Moment is the product of the weight (in kg) and of the arm (in mm).

Tare is the weight of equipment used in levelling and weighing the aircraft, which is reflected on the scale reading but does not form of the actual weight of the aircraft. For example shims placed under the wheels in order to level the aircraft, support beam placed under tail-wheel for tail-dragger variant levelling, etc.

The centre of gravity determination procedure can be found in the BushCat maintenance manual.

MASS AND BALANCE FORM

It is a legal requirement that a mass and balance calculation be performed before each flight for the particular load case of the aircraft. The following form should be used, in conjunction with the empty aircraft data in section 12.5. Once completed, fill in the table below and ensure that the 'total' values fall within the allowable range shown in figure 7.3. It is recommended that the operator keep photocopies of this page for regular operational use.

Item		**Mass**	**x**	**Arm**	**=**	**Moment**
Empty aircraft			x		=	
Pilot and passenger			x		=	
Fuel:	Litres x 0.734 = kg US Gal x 6.126 = lbs		x		=	
Upper baggage			x		=	
Lower baggage			x		=	
		Add column				Add column
TOTAL						

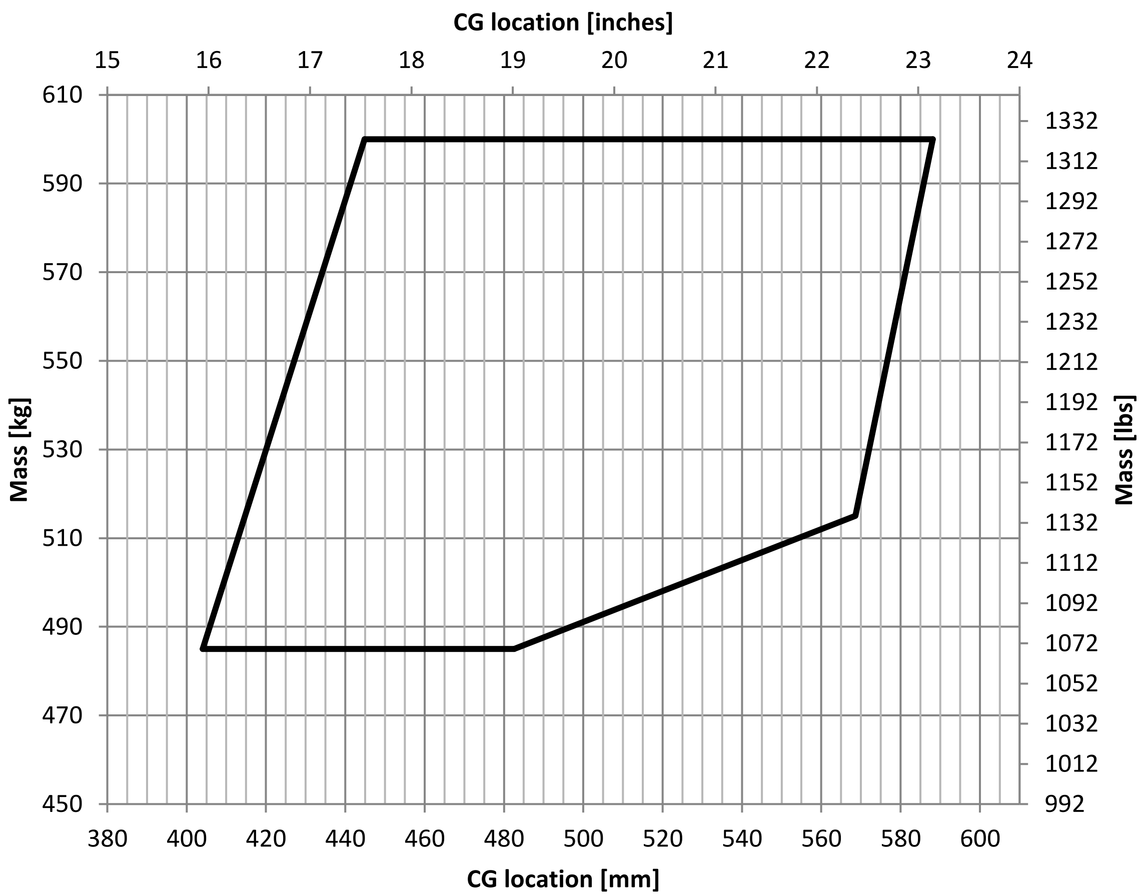


Figure 7.1 - Mass vs. CG location go/no-go graph

CHAPTER 8. SYSTEMS DESCRIPTION

8.1. AIRFRAME

The BushCat is a fabric covered high wing monoplane, with an aluminium tubular space frame, fixed undercarriage, and a conventional horizontal and vertical stabilizer.

The space frame consists of anodised aluminium tubes bolted to stainless steel brackets. The aluminium tubes used are predominantly 6082-T6 and T8 alloy, with some exceptions. The stainless steel brackets are manufactured from laser-cut stainless steel 304 sheet pieces, which have been welded together using rigid jigs.

The semi-cantilevered wings on the BushCat consist of a main spar located along the leading edge, as well as a secondary spar, located just forward of the control surfaces. The main spar, or leading edge spar, provides the leading edge geometry of the wing. The secondary spar, or trailing edge spar, is the aft most boundary of the main wing structure (excluding the control surfaces). In addition to load carrying, it provides a mounting point for the control surfaces and acts as a securing node for the aircraft skin. The cross-sectional profile of the wing is established with the use of bent aluminium tubes, which are stitched into chord-wise pockets along the wing span, forming a rudimentary rib. The leading and trailing edge spars are connected to each other via two chord-wise aluminium tubes, triangulated with two diagonal cables, making the assembly rigid in all directions. The wing assembly is attached to the aircraft by non-moment carrying bolted joins on the leading and trailing edge spars. In addition, a set of two struts triangulate the assembly, connecting to the lower portion of the fuselage, and the wing at approximately the half span position. The two struts which make up the pair are fitted with four jury struts to mitigate strut buckling during negative-g load cases.

The outer surface of the aircraft features a combination of both tightened fabric covering and rigid composite parts. The material skin which covers the wings, fuselage, empennage, and control surfaces is made from Trilam Gitte, which is a German made sail material commonly used on sailing spinnakers. The material is favourable for its strength, its UV resistance, and its integrated stitching which prevents and tears from propagating. The skins (referred to as “sails”) are pre-stitched with one or two edges open, analogous to an envelope. The sails are then pulled over the underlying frame structure before being tightened along the open edges using polyester string tied along the edge length in a manner similar to a shoe lace. The composite parts which make up the wing tips, engine cowlings, fuselage area, and wheel spats (if fitted) are manufactured from glass fibre reinforced plastics.

Vortex generators installed on the upper wing surface increase the maximum attainable angle of attack in flight and have been shown to reduce stall/minimum flight calibrated airspeeds by about 9mph at 600kg. Note that the type of vortex generator, location, method of mounting as well as the angle and spacing of installation can significantly affect the performance of the vortex generators. Any deviation from the SkyReach approved installations can adversely affect the stall speeds and handling qualities of the aircraft.

8.2. FLIGHT CONTROLS

8.2.1. PRIMARY FLIGHT CONTROLS

The flight controls of the BushCat consist of conventional elevator, aileron, rudder, and flap control surfaces which are physically connected to the aircraft with eyebolts and pin hinges. The elevator and rudder systems operate via control cables routed though the centre console and fuselage and are directly connected to their respective surfaces. The aileron system operates via a combination system making use of control cable from the control stick routed along the leading edges of the wings to a butterfly assembly mounted in each wing. Each butterfly assembly operates each aileron with a pushrod linkage. The control stick is situated on the centre console and is accessible to both occupants. An optional Y-stick is available for instances where both occupants require hands-on control of the aircraft. Rudder pedals are provided for both occupants. In most BushCat aircraft, toe brakes are located above the rudder pedals.

8.2.2. TRIM SYSTEMS

The elevator system is equipped with a single trim tab located on the left elevator. The tab is attached to the elevator via a length of piano hinge. It is controlled by the pilot via two cables routed through the fuselage. Moving the trim lever in the cockpit forward moves the trim tab up, resulting in a nose down pitching moment and vice versa.

The aileron system is equipped with balance tabs on both ailerons which automatically adjust as the aileron position changes. The balance tabs are ground adjustable and should only be adjusted by qualified personnel and only before a test flight.

The rudder system is equipped with a anti-balance tab designed to increase rudder forces. This is a tab which should only be adjusted by qualified personnel and only before a test flight, the neutral position should be set (as with a fixed tab) to allow the aircraft to require no rudder force during the cruise phase of flight. (In general the tab should be deflected slight left of centre when viewed from the rear with the rudder centralised, but each aircraft may differ)

8.2.3. FLAP SYSTEM

The BushCat is equipped with a conventional flap system, which operates via a series of pushrods from the flap lever located on the central upper cabin structure. The flap lever has three positions:

Position	Flap angle	Flight phase
1	0°	Normal flight
2	17°	Take-off
3	26°	Landing

Lowering the flaps in flight will produce the following effects:

- Attitude: Nose down
- Airspeed: Reduced
- Stall speed: Lowered

Caution should be taken when raising the flaps from landing and takeoff position during flight as it will have an immediate effect on the aircraft attitude.

8.3. ENGINE

8.3.1. ENGINE DESCRIPTION

Two engine options are available for the BushCat aircraft:

1. Rotax 912ULS
2. Rotax 912UL

The Rotax 912 ULS and UL are 4-stroke, 4-cylinder horizontally opposed, spark ignition engines. Both feature a single central cam-shaft with pushrods and overhead valves. Cooling is achieved using RAM air for the cylinder bodies, while the cylinder heads are liquid cooled. The engines feature 2 constant depression Bing carburettors and make use of a dual breaker-less capacitor discharge ignition system (different to the typical dual magneto system used on other aircraft engines). A mechanical fuel pump is also fitted which provides constant pressure in the fuel system. The Rotax 912 series feature a 12V 0.7kW starter motor, however most BushCat models are equipped with the optional 12V 0.9kW high power starter motor.

8.3.2. ENGINE CONTROLS

The throttle is operated by counter-lever T-handles situated in each of the flip down arm-rests. Pushing either of the levers toward the firewall increases engine RPM. A friction mechanism controls the ease with which the throttle will slide. Both handles work simultaneously. The choke is actuated by a small lever located on the side of the centre console.

8.3.3. OIL COOLING & LUBRICATION SYSTEM

The Rotax 912 series of engines feature a dry sump forced lubrication system. As a result, an external oil tank is fitted to the aircraft on the right side of the firewall. Oil cooling is achieved though two radiators connected in series – one above and one below the engine. The second radiator allows the BushCat to be operated in climates where the ambient temperate reaches the maximum operating temperature of the Rotax 912 series engines. The additional cooling of the second radiator means that operations in colder climates might require blanking strips to be installed which cover some of the radiator surface area to prevent oil temperatures which are too low. The flow of oil through the system is shown in the exploded schematic view in figure 8.1 below.

The entire oil system contains between 3.5 and 3.6 litres (0.92 to 0.95 U.S. Gallons) of oil – this includes all oil in the engine, oil filter, oil hoses, both radiators, sufficient oil to reach midway on the oil dipstick when the engine is hot. The quantity of oil which is defined by the marked region on the dipstick is 0.45 litres (0.95 liq. pt). As per Rotax recommendations, the ideal oil level is between the middle and upper mark on the dipstick.

Several oil types have been approved for the Rotax 912 series of engines. The most favourable type of oils are synthetic or semi-synthetic automotive or motorcycle oils. Motorcycle oils often include gearbox anti-wear additives which makes them most favourable. If Synthetic oils are used, the engine must run unleaded autogas at least 70% of the time, with no more than 30% use of Avgas. The use of Avgas with synthetic oils causes a lead paste build up in the engine. Generally petroleum/mineral based oils (dinosaur) oils work well if Avgas is used as the primary fuel type, however it should be noted that maintenance intervals are adversely affected by the use of Avgas. Ashless dispersant type aircraft oils are not acceptable.

The guidelines given above are general limitations. All oils which are permitted have been documented and published by Rotax. This document is regularly updated as new oils are tested. The reader is therefore referred to Rotax SI-912-016 document for approved oil types, and maintenance procedures for each oil and fuel type.

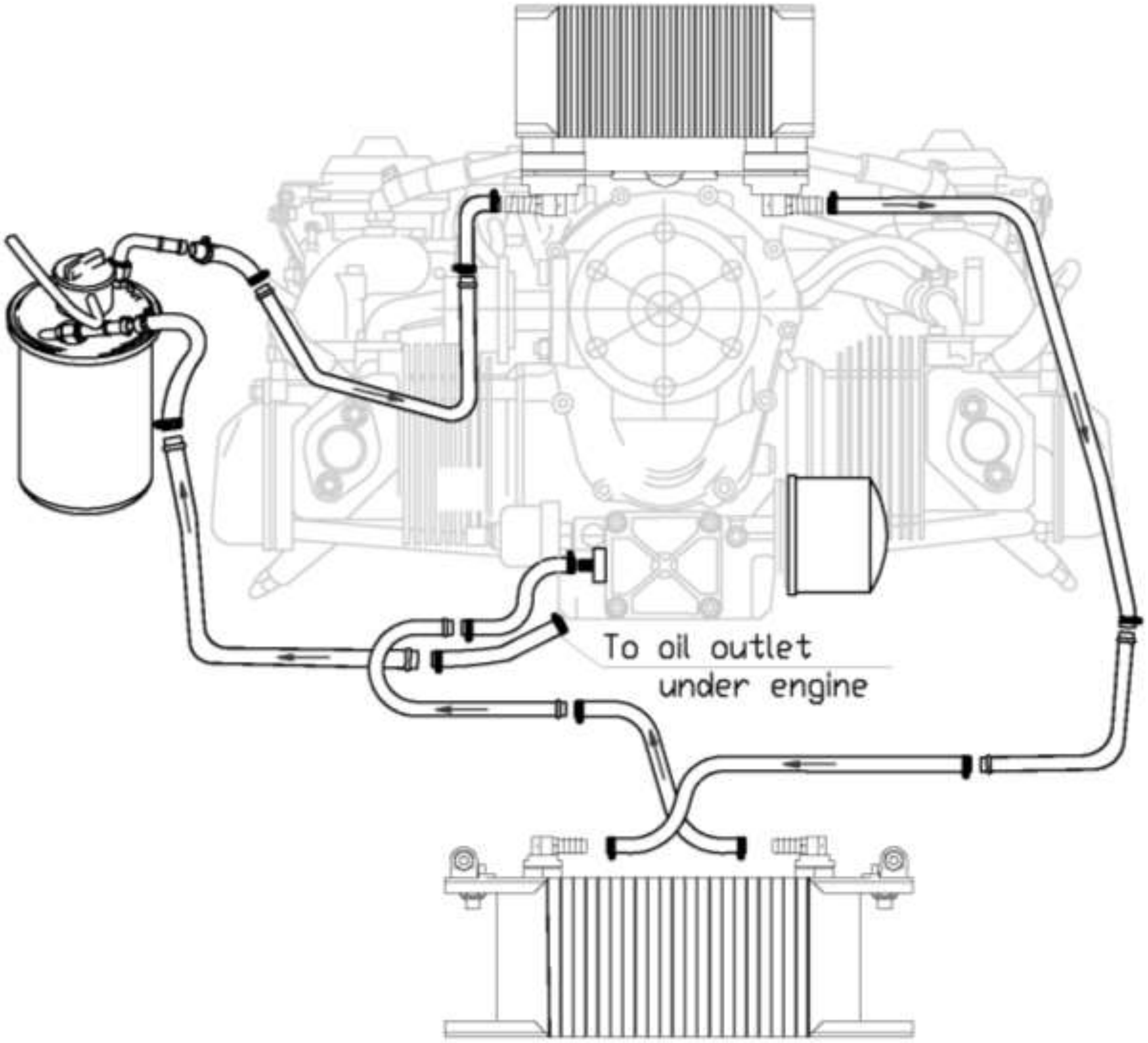


Figure 8.1

8.3.4. LIQUID COOLING SYSTEM

Cylinder head cooling is achieved thought a liquid cooling system which makes use of one large radiator. The system is based on the standard Rotax 912 liquid cooling system with a modification to incorporate the carburettor heat system, which is detailed in section 8.3.5 below. The flow of coolant fluid through the system is shown in the exploded schematic view in figure 8.2 below.

Several cooling fluids have been approved for use in the Rotax 912 series of engines, and have been detailed in the service instruction document SI-912-016. It should be noted that if the operator has chosen to use Evans Waterless Coolant fluid (as opposed to conventional coolant), only Evans Waterless Coolant can be used to top up the system. In installations where conventional coolant has been used, the operator may top up the system with conventional coolant or distilled water.

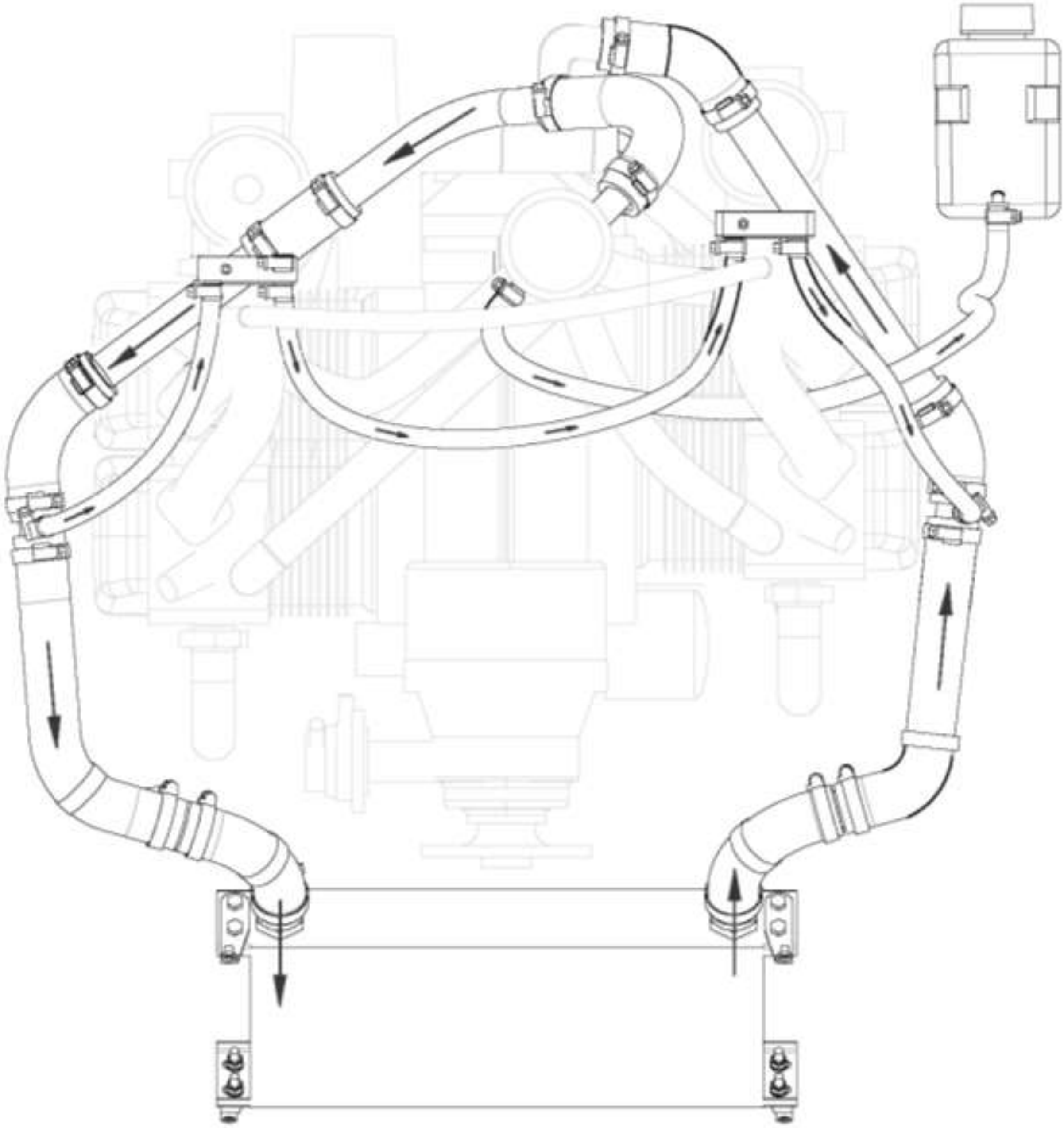


Figure 8.2

8.3.5. CARBURETTOR HEAT

The Rotax 912 series of engines are installed with a water jacket type carburettor heat system, which allows warm water bled off the engine liquid cooling system to pass though aluminium jackets around the carburettor intake manifolds. This system provides heat to the butterfly valve and venturi which reduces the chance of ice formation in these critical areas. As a result, the Rotax 912 series engine carburettor heat system requires no input from the pilot as it is “always on”.

8.4. PROPELLER

The BushCat is fitted with three-bladed, ground adjustable propeller manufactured by Kiev Prop, with the following technical details:

Make:	Kiev Prop
Model:	#283
Construction:	Composite (glass fibre reinforced plastic)
Pitch:	Ground adjustable
Number of blades:	3
Disk diameter:	1800mm (70.9”)

8.5. ELECTRICAL

The BushCat makes use of the 12V electrical system as provided by the Rotax 912 series engines. The 12V 18Ah battery is the heart of the system which acts as the buffer between energy supplied from the engine system and energy consumed by the aircraft systems. Further information is detailed below:

8.5.1. ROTAX 912 SERIES ENGINE ELECTRICAL SUPPLY SYSTEM

The Rotax 912 series engine is equipped with a 14.2 (±0.3) V, 22 Amp charging system (maximum continuous). Energy is extracted from the fly-wheel via an electro-mechanical pickup which feeds alternating current to a rectifier/regulator unit. This unit rectifies the current into a 14.2V DC output and can provide up to 22 A during maximum RPM, approximately 16 A at cruise RPM, and 1 A at idle RPM. More information on the energy generation of the Rotax 912 series system, as well as a current/RPM graph can be found in the Rotax 912 pilot operating manual.

8.5.2. BUSHCAT ELECTRICAL SYSTEM

The BushCat electrical system is based on the recommended electrical system outline provided by Rotax, which continues the logic of the Rotax supply system and meets installation requirements set out by the Rotax installation guidelines. For ease of understanding, the aircraft electrical system can be broken split into two sub-systems; a charging system, and consuming system. The 12V 18Ah battery acts as a buffer between the two systems. This is shown more clearly in the electrical system logic schematic in figure 8.3 below. A detailed wire-for-wire schematic can be found in the BushCat maintenance manual.

The battery is located in the centre of the system. The charging system (shown above the battery) provides charging current to the battery/consuming system through a 30A “charging system” circuit breaker. It should also be noted that a 22000µF 25V capacitor is also included in this system to flatten out sudden voltage fluctuations, as per Rotax requirements. The amount of current which the engine charging system can produce is proportional to the engine RPM. At an ambient temperature of 20°C and a voltage of 13.5V the current output of the engine is shown in figure 8.4.

The consuming system is shown below the battery and draws current from the battery/charging system through a 30A “master” circuit breaker. This system directly feeds a master solenoid activated by the master switch or master key before supplying current to the master bus and starter solenoid.

If fitted, an ammeter will be connected in series to the battery showing the net current flow in or out of the battery. A positive indication will show surplus flow into the battery and a negative indication will show current being drawn from the battery. If fitted, a voltmeter will be connected in parallel to the battery showing the potential difference of the battery.

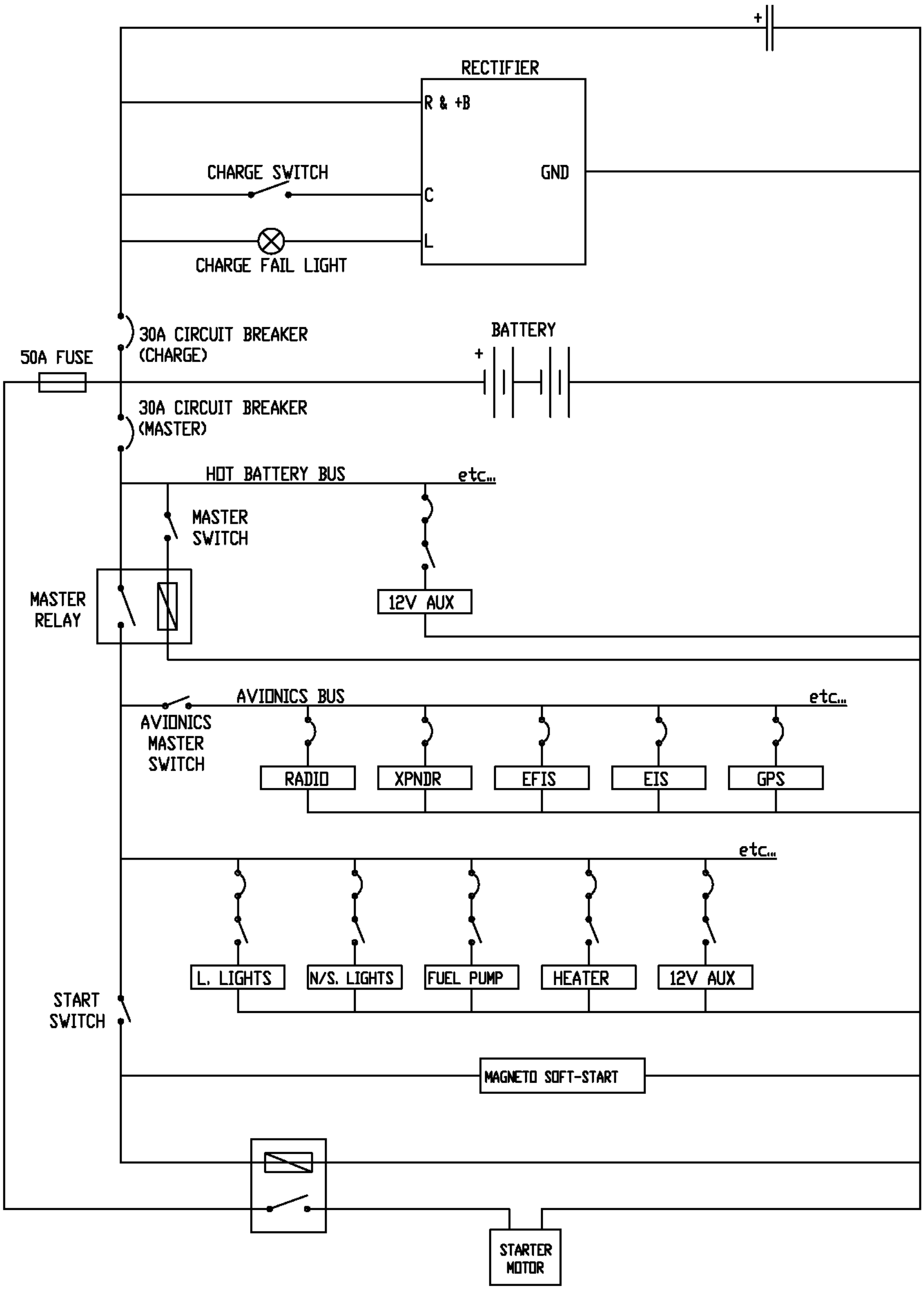


Figure 8.3

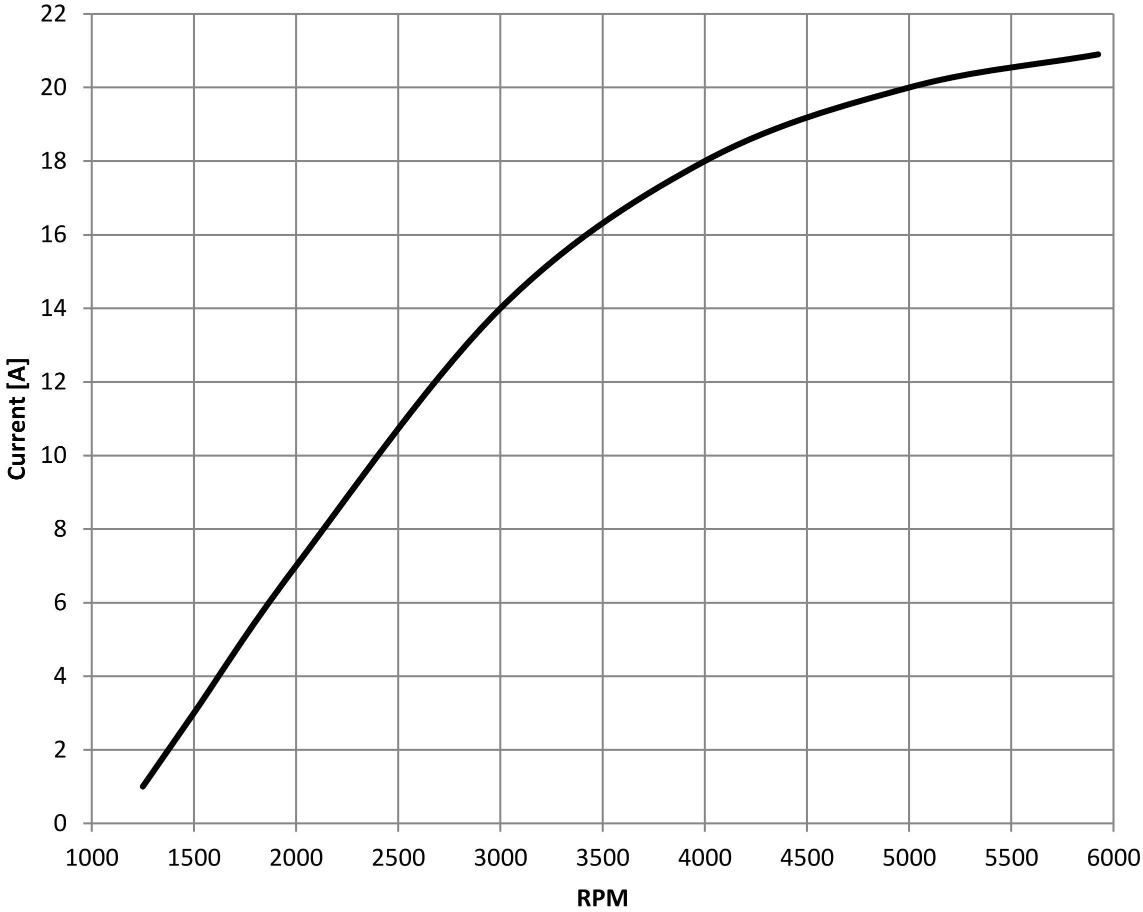

Current [A]
RPM
0
2
4
6
8
10
12
14
16
18
20
22
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000

Figure 8.4

8.5.3. PANEL ELECTRICAL SYSTEMS

BushCat instrument panels vary from aircraft to aircraft, although only one distinct engine electrical control option is used. It makes use of a key switch for “master” and “start” functions and is accompanied by two toggle switches which serve as the “magneto L” and “magneto R” switches. It should be noted that Rotax 912 series engines do not have a left and right magneto in the traditional sense, but rather two electric ignition systems which are physically located above each other. The use of the terms “left” and “right” is a merely a naming convention which makes the system feel more familiar to the operator.

8.5.4. PANEL SWITCH FUNCTIONS

BushCat instrument panels vary from aircraft to aircraft, although certain equipment is commonly used. A list of common switch labels is shown below:

Master	Provides power to the master solenoid, which energises the master bus. When activated or deactivated a click may be heard from the master solenoid.
Charge	Enables the rectifier/regulator to provide output power to the aircraft charge system.
Fuel pump	Provides power to the electric fuel pump.
Avionics	Provides power to the avionics bus.
Nav / Strobe	Provides power to the navigation / strobe lights (if equipped). In some cases this may be a three way switch with positions: off – navigations lights only – navigation and strobe lights.
Landing lights	Provides power to the landing lights. In some cases this may be a three way switch with positions: off – landing lights on – landing lights in wig-wag mode.
Cabin light	Provides power to the cabin light (where equipped).

8.5.5. EFIS BACKUP BATTERY

If your aircraft is equipped with an EFIS, it may have an internal backup battery that must be turned on at all times during operation. In the event of an aircraft electrical failure, the backup battery will provide power for a limited amount of time to the device.

8.6. FUEL SYSTEM

The BushCat fuel system makes use of a single 94 litre (25 US gallons), of which 88 litres (23 gallons) are useable. The tank is located aft of the crew seats and is equipped with dual pickups and dual fuel filters. As the tank is lower than the engine, an electric booster pump is also fitted for use during the critical phases of flight. The electric booster pump is located under the fuel tank against the fuel tank support tube. A fuel shut-off valve is located on the pilot-side floor board. It has two positions: On and off. To move the selector to the off position the spring loaded lock must be pulled upward while turning the selector. The fuel system schematic is shown in figure 8.5 below.

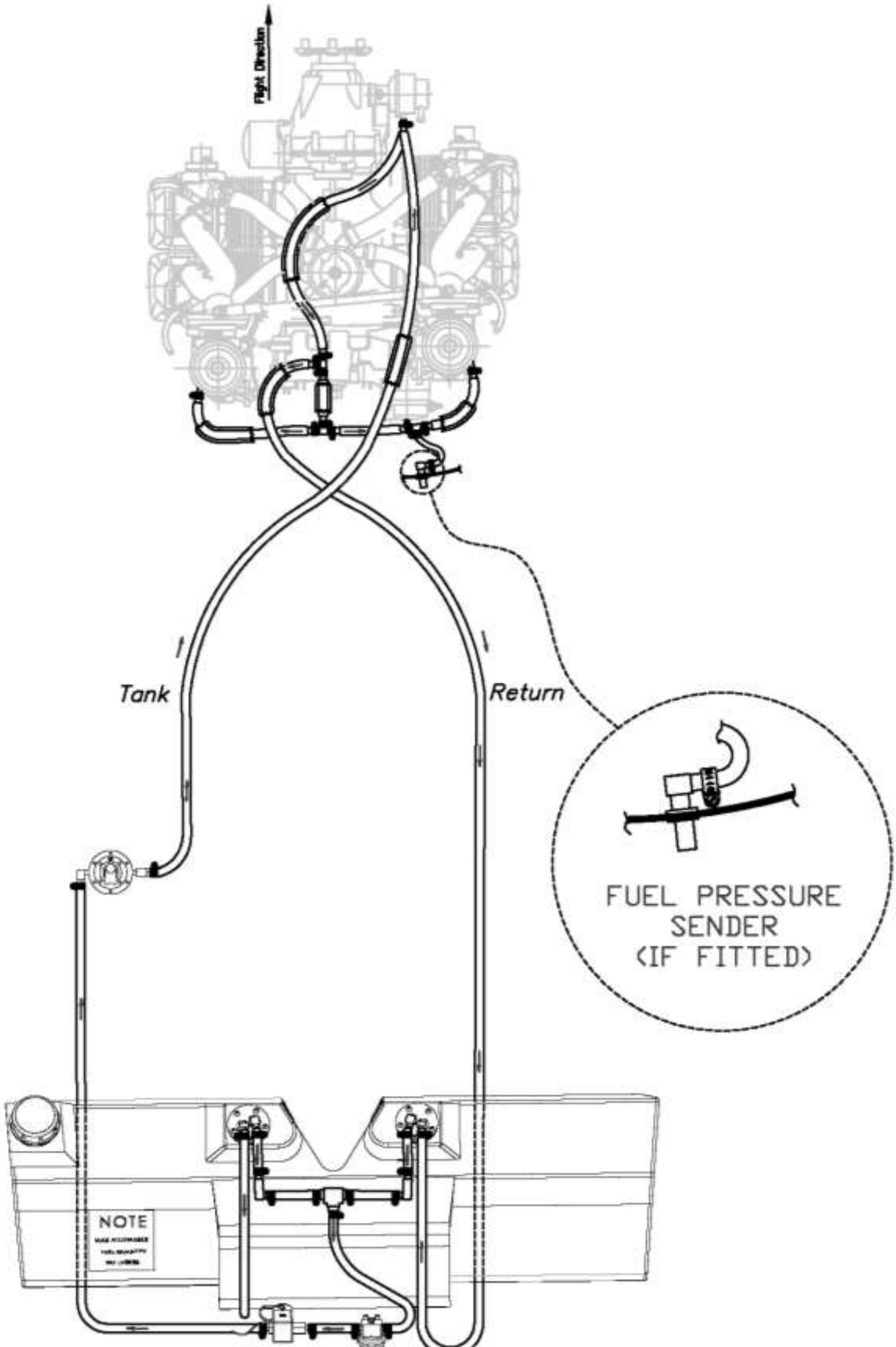

Flight Direction
Tank
Return
FUEL PRESSURE
SENDER
(IF FITTED)
NOTE

Figure 8.5

The fuel tank is placarded in two areas; a set of placards are provided on the forward face of the tank, which can be seen between and behind the two seats. These placards provide information on the fuel quantity when the aircraft is level. This implies that these placards will under read if used on tail-dragger variants while the aircraft is on the ground. The second placard is located on the left side of the tank. This placard features a curved graduated line which shows correct readings for both nose-wheel and tail-dragger variants while on the ground, assuming that the aircraft is parked level (laterally).

It should be noted that the fuel tank has a raised section in the centre to allow control cables to pass under it. If the fuel quantity is less than 6 litres (1.6 gallons) the fuel cannot move from one side of the tank to the other, and the redundancy provided by two fuel pickups is lost. While this is not a major concern in most cases, care should be taken when operating with fuel quantities less than those mentioned above and fuel quantity checks should include symmetry checks to confirm that a fuel pickup or filter is not blocked. It should be noted that 45 minutes of flight time requires approximately 15 litres of fuel. Operating below this quantity is considered a fuel emergency by most aviation authorities.

The allowable fuel types have been tabulated in section 2.10.2. The use of AVGAS has an adverse effect on engine maintenance procedures including, but not limited to) a 50 hour maintenance interval. Please refer to the Rotax SI-912-016 (latest revision) document for more information.

8.7. UNDERCARRIAGE & WHEELS

The BushCat is fitted with a single piece Aluminium spring gear. The gear leg is attached to the underside of the aircraft with a bolted bracket, which can be removed to facilitate gear removal. This might be necessary for maintenance or conversions to/from amphibious floats. The cantilevered tail wheel on tail-dragger variants is attached to the aircraft via a stacked leaf spring suspension system.

Several tyre options are available for the BushCat. These are tabulated below:

Tyre make and size	Tube	Wheel hub size	Variants which allow size:
Air Trac 6.00 – 6 (6 ply)	Tubed	6”	Nose-wheel & tail-dragger
Carlisle 8.00 – 6 (4 ply)	Tubed	6”	Nose-wheel & tail-dragger
Air Trac 8.50 – 6 (6 ply)	Tubed	6”	Tail-dragger only
Aero Classic 27.5 x 10.0 – 8 (4 ply)	Tubeless	8”	Tail-dragger only

Wheel spats (pants) are available for use on tail-dragger variants using the Air Trac 6.00 – 6 (6 ply) tyres only. Wheel spats (pants) are not approved for use with any other tyre sizes on tail-dragger variants, or for use on nose-wheel variants.

The tail wheel on tail-dragger variants is described below:

Tyre make and size	Tube	Wheel hub size
Trac-Gard 2.80 x 2.50 – 4 (4 ply) tail wheel	Tubed	6”

For information on tyre pressures please refer to section 1.6.7.

8.8. BRAKE SYSTEM

The BushCat is equipped with toe-brakes attached to the top of the rudder pedals. Some models may have toe-brakes on both the pilot and co-pilot side, however some models may only have toe-brakes on the pilot side. In both cases the master cylinders are located on the pilot side pedals and in the case of the former these are plumbed in series to the co-pilot side pedals, before continuing to the brake callipers. A brake fluid reservoir is located against the firewall just forward of the co-pilot's pedals and is plumbed to the master cylinders. Some nose-wheel variants of the BushCat may have a hand operated master cylinder located on the control stick as opposed to toe brake pedals. In this case, the brake fluid reservoir is built into the hand operated brake lever assembly. All systems (regardless of actuation method) are equipped with a park brake valve located on the pilot-side floorboard. The valve is a resettable check valve meaning that when open (off position) it allows hydraulic fluid to move freely. When closed it allows flow in one direction only. The park brake can be set either by applying pressure to the brake pedals and then shutting the valve or by first shutting the valve and then applying pedal pressure. It is recommended that the park brake should only be disengaged when pressure is applied to the pedals – first apply pressure to the brake pedals, then disengage the park brake. This recommendation was made by the valve manufacturer and will help to increase the operating life of the valve. A schematic of the entire brake system is shown in figure 8.6 below.

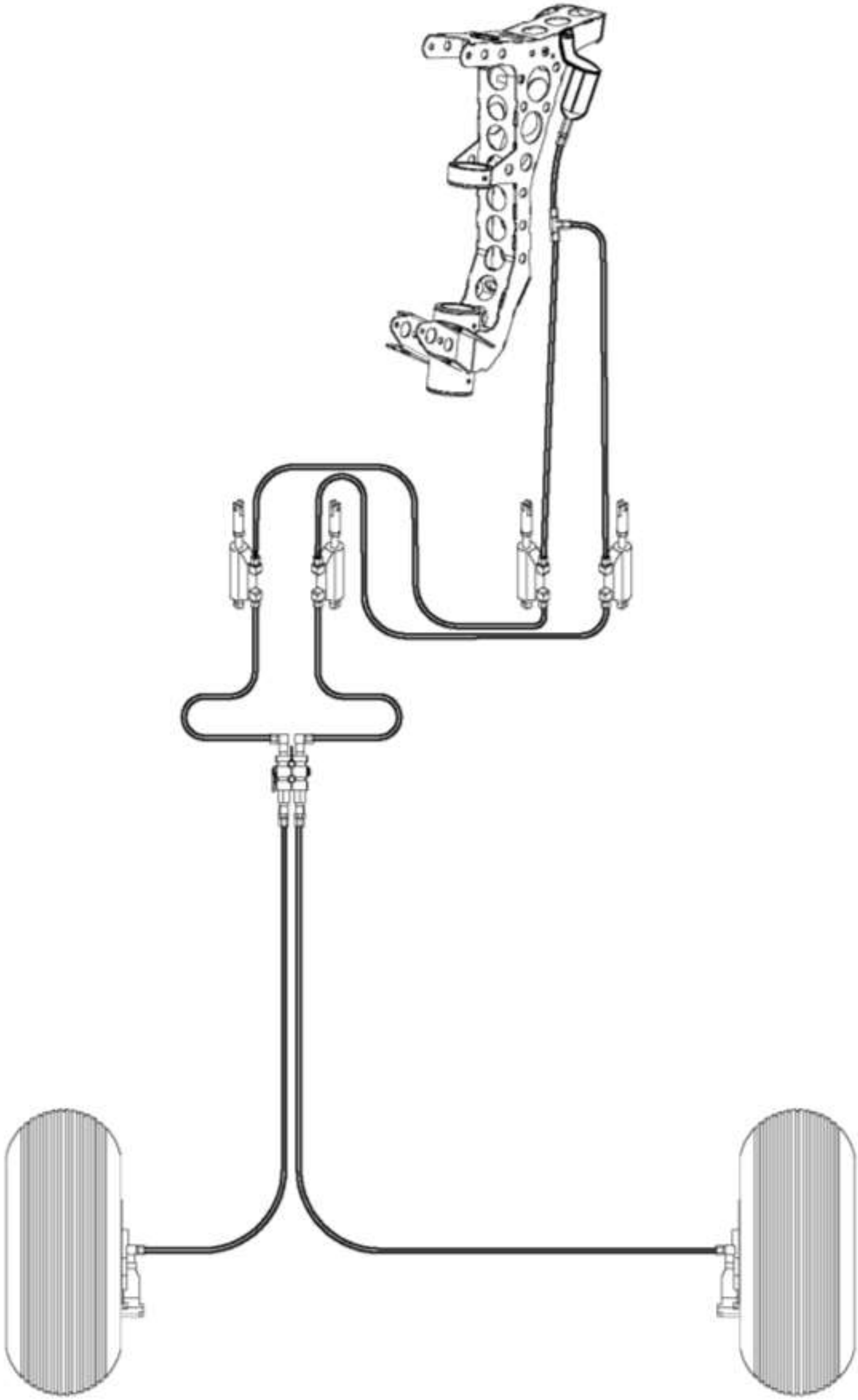


Figure 8.6

8.9. STEERING SYSTEM

Nose wheel steering in nose-wheel variants is achieved by means of a direct linkage between the rudder pedals and front fork. Tail wheel steering in tail-dragger variants is achieved via cables which branch off from the rudder control cables. The cables provide a direct connection to the tail wheel steering arms up to a deflection of 41° after which the tail wheel will disengage and caster freely.

8.10. INSTRUMENT PANEL LAYOUT

While BushCat instrument panels vary from aircraft to aircraft, 11 panel layouts are considered to be standard. These are shown in the subsections below. The panel fitted to this aircraft is shown in chapter 12.6.

The following list of instruments and avionics makes reference to the standard panels shown in the following subsections. If numbered items are omitted on the panels, they are not equipped on the associated panel.

1. Airspeed indicator
2. Altimeter
3. Vertical speed indicator
4. MGL ALT-3 Altimeter
5. Slip indicator
6. Garmin G5 EFIS display
7. MGL xTreme EFIS
8. MGL iEFIS Explorer
9. Dynon SV-HDX800 7" SkyView Display
10. Dynon SV-Intercom-2S audio panel
11. Dynon SV-COM-C25 radio
12. TRIG TY-91 VHF radio
13. MGL V6 VHF radio
14. TRIG TT-22 transponder
15. AirGizmo bracket for Garmin Aera 660
16. Artex ELT345
17. Hobbs hour meter
18. Tachometer
19. Oil pressure gauge
20. Oil temperature gauge
21. Coolant temperature gauge
22. Fuel pressure gauge
23. MGL TP-2 Engine monitor
24. MGL E-1 Engine monitor
25. MGL ALT-3 warning light
26. MGL TP-2 warning light
27. MGL E-1 warning light
28. 12V aux receptacle
29. Start key switch
30. Ignition system (magneto) switch 1
31. Ignition system (magneto) switch 2
32. Charge fail light
33. Master and charge switch
34. Avionics master switch

35. Fuel pump switch
36. Landing light switch
37. Navigation / strobe light switch
38. 12V auxiliary switch
39. Cabin heater switch
40. Master circuit breaker
41. Charge system circuit breaker
42. Fuel pump circuit breaker
43. Landing light circuit breaker
44. Navigation / strobe light circuit breaker
45. 12V auxiliary circuit breaker
46. Cabin heater circuit breaker
47. MGL ALT-3 circuit breaker
48. MGL TP-2 circuit breaker
49. MGL E-1 circuit breaker
50. Radio circuit breaker
51. Transponder circuit breaker
52. GPS circuit breaker
53. Garmin G1 EFIS display
54. MGL xTreme EFIS system circuit breaker
55. MGL iEFIS Explorer system circuit breaker
56. Dynon SV-HDX800 7” SkyView system circuit breaker
57. ADSB unit circuit breaker
58. Instrument circuit breaker

8.10.1. STANDARD PANEL 1A & 1B

Note: Panel 1A does not include the GPS dock and GPS circuit breaker. Panel 1B includes both GPS dock and GPS circuit breaker.

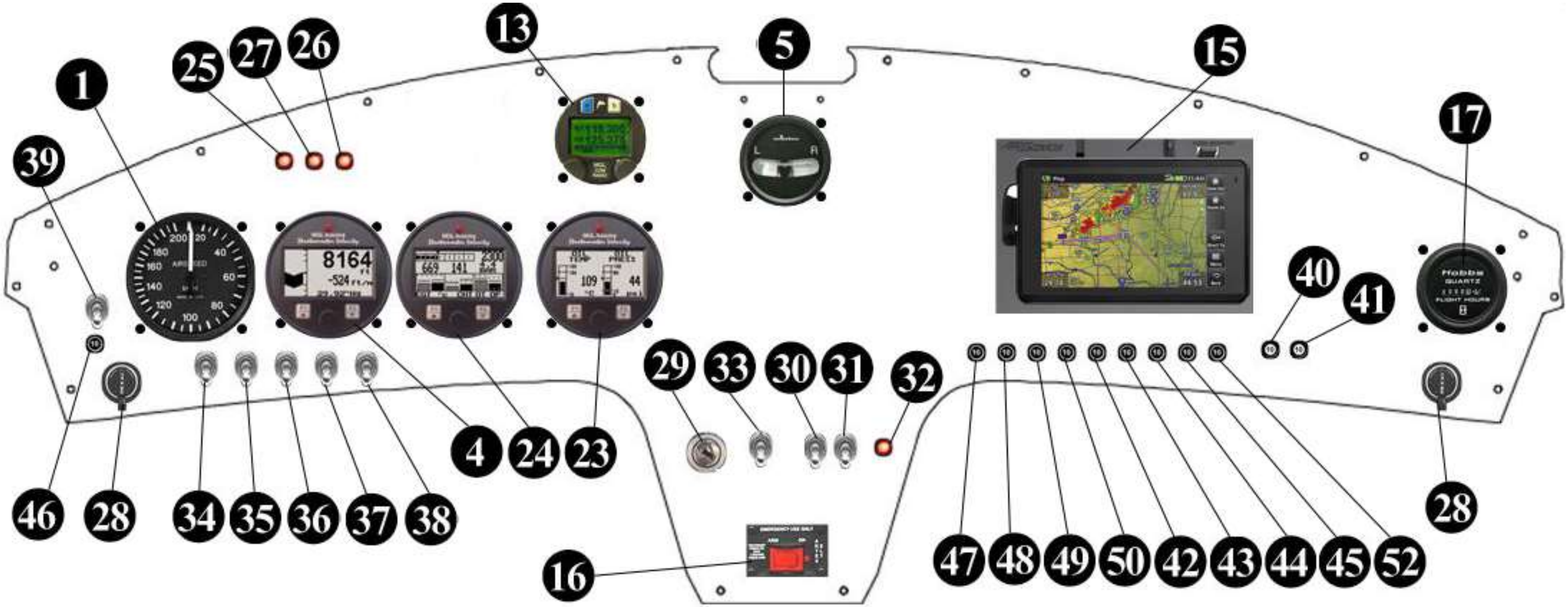


Figure 8.7 – BushCat standard panel 1

8.10.2. STANDARD PANEL 2A & 2B

Note: Panel 2A does not include the GPS dock and GPS circuit breaker. Panel 2B includes both GPS dock and GPS circuit breaker.

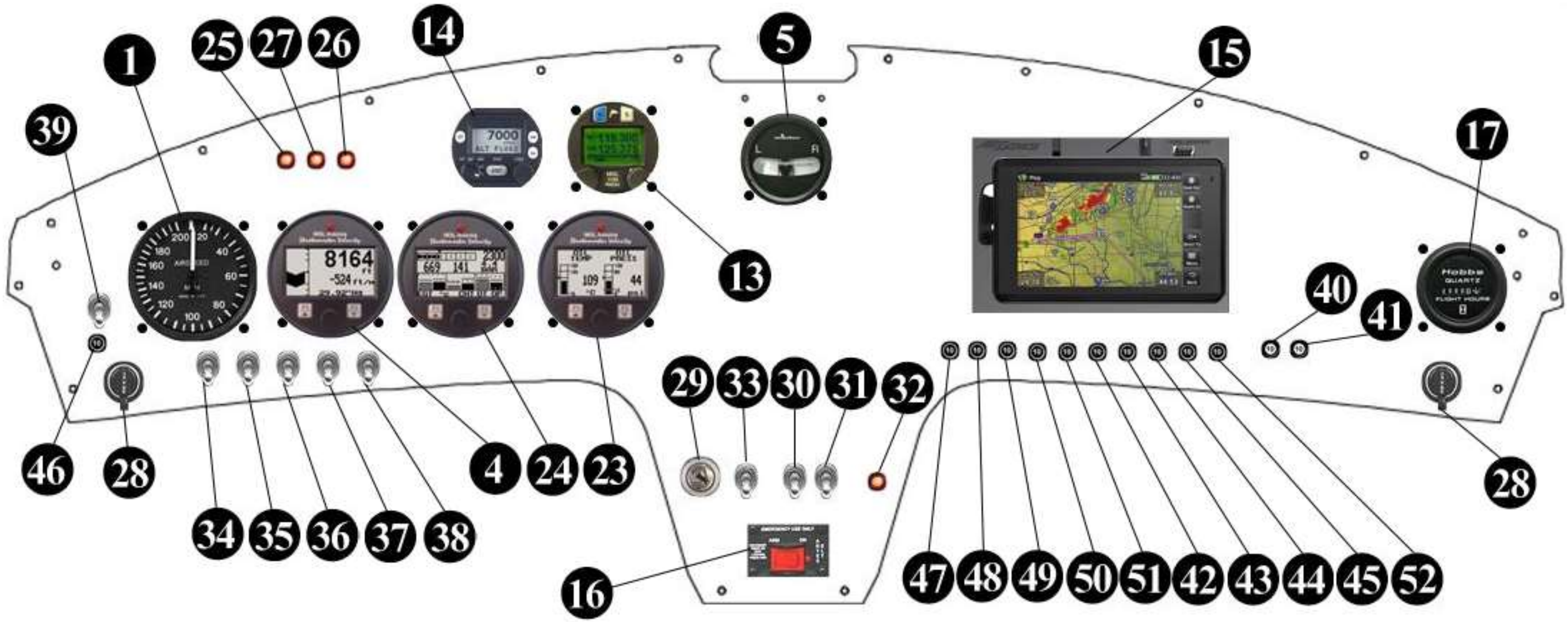


Figure 8.8 – BushCat standard panel 2

8.10.3. STANDARD PANEL 3A & 3B

Note: Panel 3A does not include the GPS dock and GPS circuit breaker. Panel 3B includes both GPS dock and GPS circuit breaker.

Figure 8.9 – BushCat standard panel 3

8.10.4. STANDARD PANEL 4

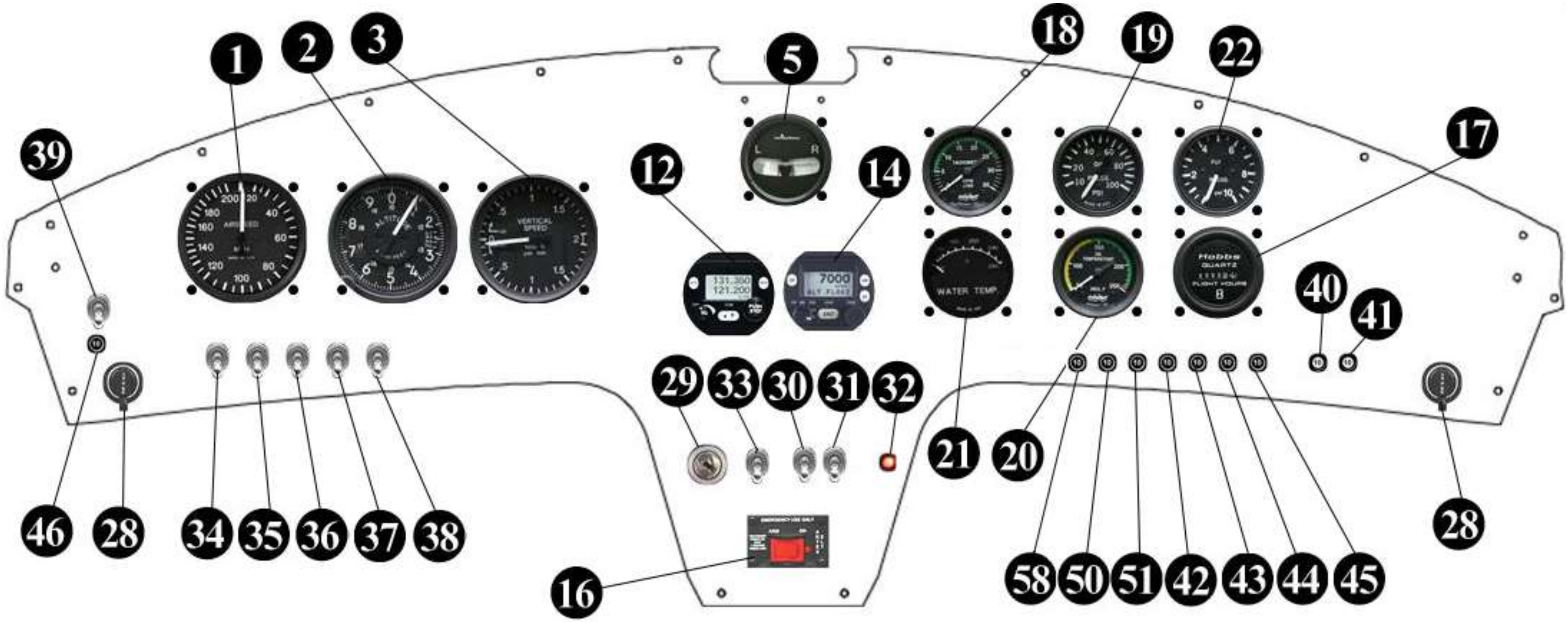


Figure 8.10 – BushCat standard panel 4

8.10.5. STANDARD PANEL 5A & 5B

Note: Panel 5A does not include the GPS dock and GPS circuit breaker. Panel 5B includes both GPS dock and GPS circuit breaker.

Figure 8.11 – BushCat standard panel 5

8.10.6. STANDARD PANEL 6A & 6B

Note: Panel 6A does not include the GPS dock and GPS circuit breaker. Panel 6B includes both GPS dock and GPS circuit breaker.

Figure 8.12 – BushCat standard panel 6

8.10.7. STANDARD PANEL 7A & 7B

Note: Panel 7A does not include the GPS dock and GPS circuit breaker. Panel 7B includes both GPS dock and GPS circuit breaker.

Figure 8.13 – BushCat standard panel 7

8.10.8. STANDARD PANEL 8

Figure 8.14 – BushCat standard panel 8

8.10.9. STANDARD PANEL 9

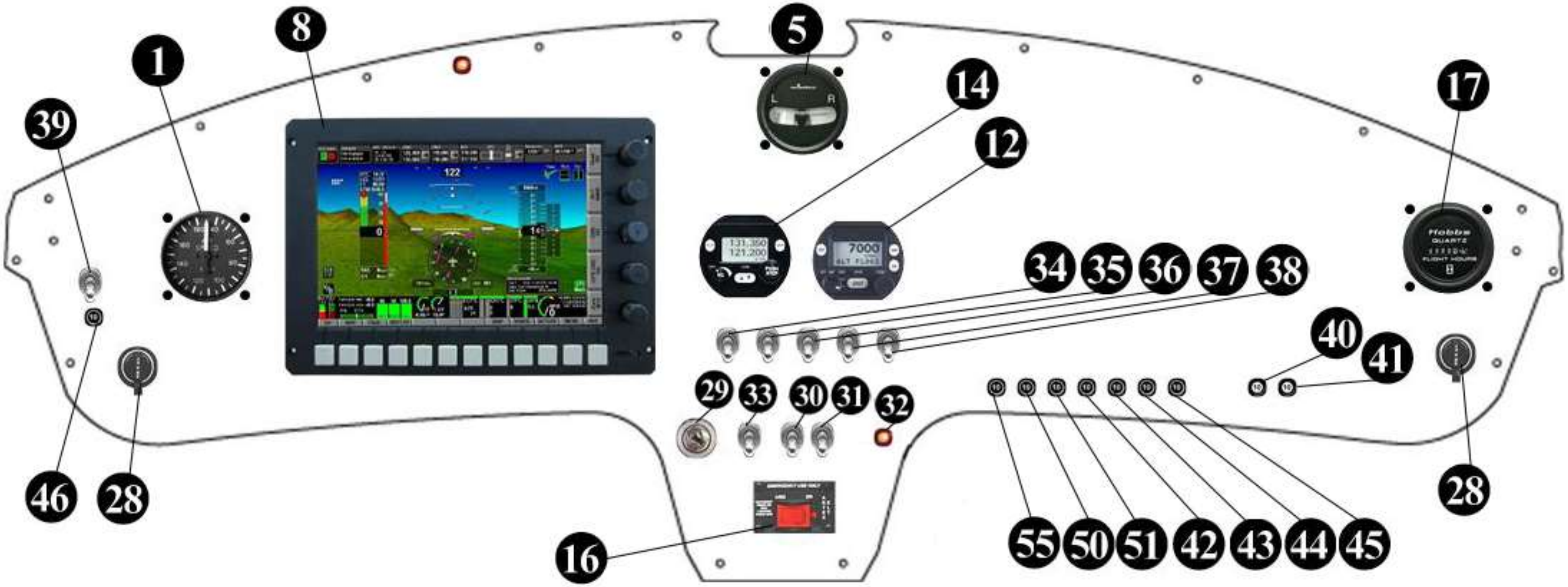


Figure 8.15 – BushCat standard panel 9

8.10.10. STANDARD PANEL 10

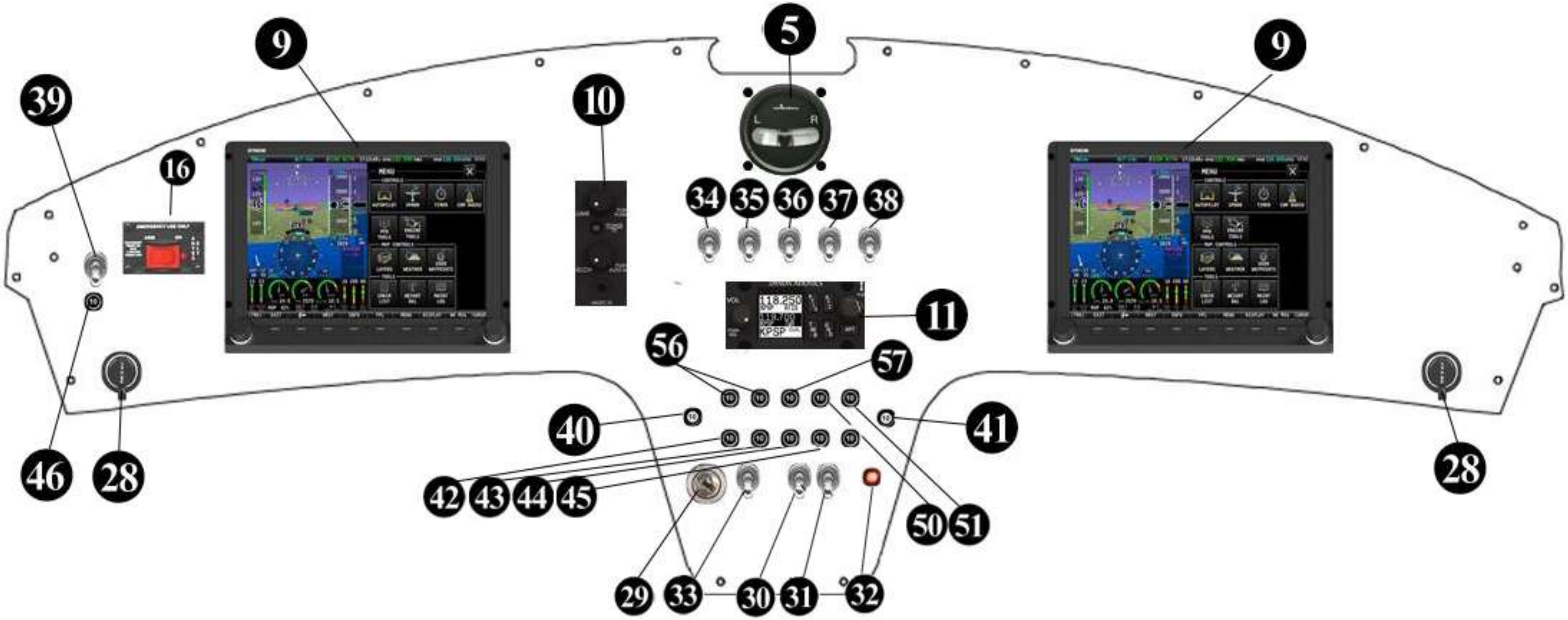


Figure 8.16 – BushCat standard panel 10

8.10.11. STANDARD PANEL 11

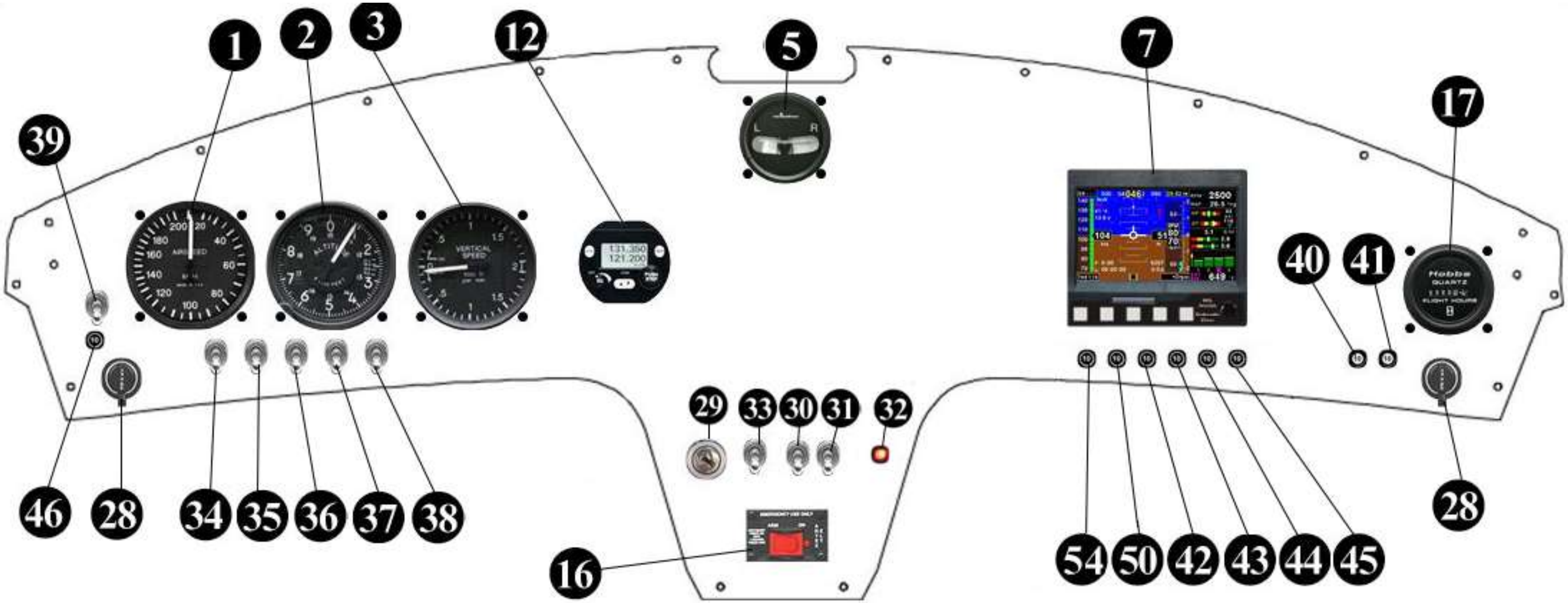


Figure 8.17 – BushCat standard panel 11

8.11. SEATING

The BushCat offers seating for two people seated side by side. The aircraft is not approved to carry more persons through any other means.

8.12. SEAT BELTS

Four point seat belts are provided as an integral unit for both occupants. The flat metal tip is inserted into the receptacle to lock the belt mechanism. Pressing the red button releases the buckle.

8.13. DOORS

Each BushCat door is latched in three places. The lower latch system has a forward and an aft latch which secure the bottom edge of the door to the fuselage. An additional latch is provided on the forward edge of the door as a failsafe. In flight opening of door/s is prohibited.

8.14. BAGGAGE COMPARTMENTS

The BushCat is equipped with two luggage areas. The upper luggage area is located directly behind the occupants' headrests. This area allows for small items to be stored and is accessible during flight. The lower luggage area is located aft of the fuel tank. This area is not accessible in flight.

CHAPTER 9. HANDLING AND SERVICING

9.1. GROUND HANDLING

The BushCat can be manoeuvred by hand on the ground safely as long as care is taken to avoid injury and/or damage to the aircraft. The aircraft should not be handled if the engine is running or if there is an occupant in the cockpit who is not a qualified pilot current on the type.

Towing behind a motorized vehicle is not recommended.

Persons may push the aircraft by applying pressure to the lift struts as close to the wing attachment point as possible. Applying pressure to the propeller and/or spinner is not advised.

Tail-dragger specific:
To turn the aircraft in any desired direction, the tail of the tail-dragger BushCat may be lifted using the aft lower fuselage longerons (provided the aircraft is not heavily loaded and no persons are in the cockpit) as a pick up point placing hands approximately 12 inches apart so as to spread the load. Do not lift the tail more than 12 inches to avoid the propeller touching the ground or over balancing the aircraft. If the aircraft is heavily loaded this technique is not advised.

Nose-wheel specific:
To turn the aircraft in any desired direction, the tail of the BushCat nose-wheel may be lowered by applying pressure to the upper fuselage longerons at a point close to the tail of the aircraft. Hands should be placed on the longeron at approximately 12 inches apart to spread the load. Only lower the tail enough to raise the nose wheel an inch or two off the ground. One may then 'walk' the aircraft to the left or right to steer it in the intended direction.

The aircraft should always be parked into wind and chocked. If the wind is (or has the potential to be) gusting or increasing in velocity, the aircraft should be tied down and pegged with the use of an aviation grade tie-down kit.

9.2. TIE DOWN INSTRUCTIONS

Tie down points to be used are at the very top of the forward lift strut (left and right). The tail should also be tied down using the tail wheel spring on tail-dragger variants and the strike plate under the ventral fin on nose-wheel variants.

The control stick should be locked back (elevator up) with the use of the occupant seat belts.

The pitot cover should be placed over the pitot tube after each flight.

9.3. SERVICE AND GENERAL CARE

Please refer to the BushCat aircraft maintenance manual for all servicing, maintenance and aircraft cleaning instructions.

CHAPTER 10. REQUIRED PLACARDS AND MARKINGS

10.1. AIRSPEED INDICATOR RANGE MARKINGS

The airspeed indicator shall be marked as follows for a 600kg maximum weight aircraft:

A white arced line from the V_{SO} to V_F speeds (45 - 83 MPH). The lower limit of the white arc indicates the stalling speed of the aircraft with flaps fully extended (V_{SO}). The speed at the upper limit of the white arc indicates speed you can safely fly with flaps fully extended (V_F). Thus the white arc region is the flap operation speed range.

A green arced line shall run from the V_S to V_{NO} (51-89 MPH). The lower limit of the green arc indicates the stalling speed of the aircraft with no flaps (V_S). The upper limit of the green arc indicates the maximum speed for operation in rough air (V_{NO}).

A yellow arced line shall run from the V_{NO} speed to the V_{NE} speed (89-103MPH).

A red line shall be placed at the upper limits of the yellow line to represent the V_{NE} speed (103MPH).

EFIS Systems shall have the following speed ranges programmed to indicate the same speed ranges as indicated on a standard airspeed indicator.

- V_{SO} to V_F speeds: 45 - 83 MPH.
- V_S to V_{NO} speeds: 51 -89 MPH.
- V_{NO} to V_{NE} speeds: 89-103 MPH.
- V_{NE} 103 MPH.

10.2. PLACARDS TO BE PLACED ON THE INSTRUMENT PANEL

10.2.1. PASSENGER WARNING

Figure 10.1

10.2.2. SPINS PROHIBITED

A placard should be located below the passenger warning to indicate that spins and aerobatics are prohibited.

INTENTIONAL SPINS &

AEROBATICS ARE PROHIBITED

Figure 10.2

10.2.3. OPERATING LIMITS

The operating limitation template should be placed in an easily visible location for the pilot.

OPERATING LIMITS

Never Exceed Speed		V_{NE}	103 MPH
Max Structural Cruise		V_{NO}	89 MPH
Operating Manoeuvring Speed		V_O	81 MPH
Max Flaps Extended		V_{FE}	83 MPH
Stall Speeds (560kg)	Flaps 0°	V_S	50 MPH
	Flaps 17°	V_{S1}	46 MPH
	Flaps 26°	V_{S0}	44 MPH
Stall Speeds (600kg)	Flaps 0°	V_S	51 MPH
	Flaps 17°	V_{S1}	47 MPH
	Flaps 26°	V_{S0}	45 MPH

All speeds are IAS at ISA sea Level

Figure 10.3

10.3. MISCELLANEOUS PLACARDS

10.3.1. FUEL LOCATION PLACARD

The fuel placard is to be located at the fuelling location on the outside of the aircraft.

FUEL
HERE

Figure 10.4

10.3.2. FUEL CAP PLACARD

The fuel cap placard is to be placed on left hand side of the aft fuselage next to the “Fuel Here” sticker.

Figure 10.5

10.3.3. FLAP POSITION INDICATORS

The flap positions placards are located on the bracket where the flap stops are, which is located at the base of the flap handle.

Figure 10.6

10.3.4. CHOKE AND ELEVATOR TRIM

The choke and trim placard is located on the centre console between the pilot and passenger.

Figure 10.7

10.3.5. THROTTLE INDICATOR

Located on both the left and right side of the arm rest where the throttle is located.

Figure 10.8

10.3.6. DOOR LATCHES

The door latches should be indicated by the following Labels on the inside of the aircraft door.

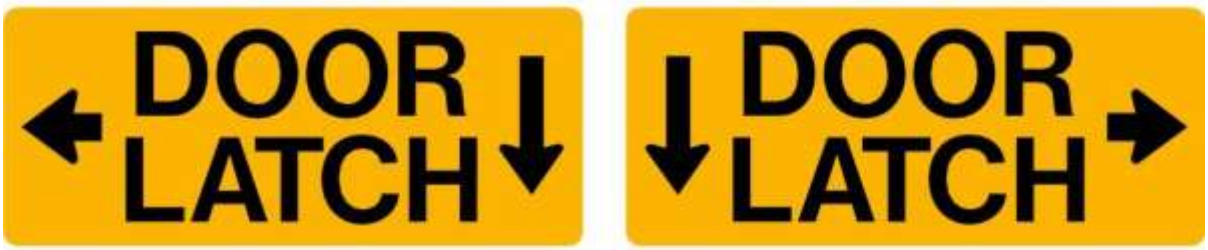


Figure 10.9

10.3.7. BAGGAGE LIMITS

The baggage limits shall be labelled with the following label on the vertical ballistic parachute strut located in the centre behind the seats.

Figure 10.10

10.3.8. LIGHT SPORT / EXPERIMENTAL PLACARD

The aircraft should be labelled with either the lettering "***Light Sport***" or “***Experimental***” depending on its certification category. The former is required for S-LSA, while the latter is required for E-LSA. These markings should be clearly visible at all times on the outside of the aircraft and visible to anyone that is entering the aircraft.

LIGHT-SPORT

Figure 10.11

EXPERIMENTAL

Figure 10.12

10.3.9. Occupant Restraint System

The declaration of ASTM compliance for the occupant restraint system shall be placed on the vertical tube between the pilot and passenger seats.

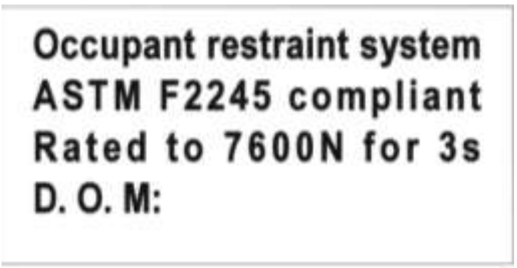


Figure 10.13

10.3.10. Dorsal Fin No Grip

The Dorsal fin shall be labelled on both sides by the following no grip sticker.

Figure 10.14

CHAPTER 11. TRAINING SUPPLEMENT

The objective of this flight training supplement is to cover the unusual operation or characteristics of the BushCat which are not ordinarily covered or applicable in typical flight school training. Note that this chapter is intended to familiarise the pilot with the specific characteristics of the aircraft and is not a substitute for the Normal Procedures section. The supplement is intended for BushCat familiarisation and is not a substitute for flight school training. All the recommendations or described manoeuvres/procedures in this section should initially be accomplished under the supervision of an appropriately rated flight instructor.

The following phases of flight will be covered as they contain some appreciable differences in aircraft operation or handling to other light aircraft.

- Entry, Exit and Starting
- Takeoff
- Stalls/Spins
- Approach and landing

11.1. ENTRY, EXIT AND STARTING

Before start, always ensure that both doors are closed and latched at ALL THREE latch points. When climbing into the cabin from either side with the door support tubes holding the doors up, it is worth remembering to take the door support tube out of the door, rest the door against your back and secure the door support in its holder before entering the aircraft. Once seated and strapped in, it is extremely difficult to release the door support, pull it into the aircraft and close the door. If a BRS is installed, it is recommended that the safety pin be removed for flight and the handle stowed where it is easily reachable. Before disembarking the aircraft, make sure that the safety pin is reinserted to prevent inadvertent deployment of the system (as could happen if the handle gets caught on a belt loop, for example).

For the first flight of the day, the cold start procedure for the Rotax 912 engine is recommended. The cold start procedure requires one hand on the starter and one hand on the choke lever. If the aircraft is not equipped with a park brake and has a hand operated brake system on the control stick, the pilot should be quick to move his/her hand from the starter to the brake lever to prevent the aircraft rolling once the engine starts. This is particularly critical if the aircraft is not equipped with a park brake. Always ensure that the armrest is down and the throttle is closed before starting the engine (as applicable to the start procedure being used). The aircraft may begin to roll if the throttle has not been set correctly before the start and the arm rest is stowed vertically, preventing quick access to the throttle to rectify the situation.

11.2. TAKEOFF

The minimum oil temperature for takeoff for the Rotax 912 is 50°C or 120°F. This ensures that the oil viscosity has reduced enough so that the oil does not bypass the oil filter (refer to the Rotax 912 maintenance material for more information). If this temperature is not achieved before the engine run up, warm the engine at 2000 RPM for 2 minutes, and 2500 RPM thereafter until the minimum temperature is achieved (as per the Rotax 912 operators manual). The run up check at 4000 RPM and the takeoff thereafter should only be done once the oil is warm enough.

Always ensure that both arm rests are down before commencing the takeoff run. If one armrest is up, the throttle on that side may jam against the cabin structure or an item of baggage stowed in the upper baggage compartment as the throttle on the other side is advanced for takeoff. As the throttles are directly linked, this jam may cause the pilot to believe that full power has been set, when this may not be the case. It is recommended that no aft movement of the control stick take place before the airspeed has reached a V_R of 55 MPH (for a normal takeoff).

The installation of vortex generators has afforded a reduction in the takeoff and landing speeds required. However, takeoff below the published V_R speed is not recommended as the aircraft will be in a very low speed, high attitude and low energy state if an engine failure occurs just after takeoff. Thus, it will likely bleed off speed very quickly if an engine failure does occur. Even if such a failure occurs just after takeoff while flying the published speeds, the pilot may have to pitch the nose down promptly to maintain a safe airspeed. If obstacle clearance is not a factor once airborne, allow the aircraft to accelerate in the initial climb to at least 10mph above V_R. This will give a greater speed margin to allow for an engine failure to be recognised and reacted to.

An alternative takeoff technique is in use by some operators of nose wheel aircraft, whereby aft pressure is applied to lift the nose wheel off the ground while the aircraft builds up speed. The aircraft will then fly off the runway once sufficient airspeed is attained. If this technique is adopted, caution should be taken to not strike the ventral strake of the aircraft due to over rotation. Additionally, the pilot has less control over the speed at which the aircraft gets airborne, which may result in getting airborne at speeds closer to the stall.

In order to retract the flaps during the climb out, it is recommended that the pilot remove his/her left hand from the throttle and place it on the control stick to steady it. This is done shortly before reaching straight up with the right hand to retract the flaps. This prevents side loads being imposed on the flap lever by reaching over with the left hand which could cause the lever to misalign with the position detents or damage the mechanism. This method should always be employed when extending or retracting the flaps in flight. Always ensure that the pins on the flap lever have properly engaged with the detents on the desired setting before letting go of the lever.

11.3. STALLS/SPINS

Vortex generators installed on the upper wing surface allow a higher angle of attack and lower flight speeds to be obtained prior to wing stall. The BushCat is not fitted as standard with any stall warning system, and so the only indicators of an impending stall are low airspeed, high pitch attitude and a light aerodynamic buffet. Operators who are accustomed to the BushCat without vortex generators will notice a significant change in the stalling characteristics of the aircraft. With vortex generators fitted, there is little aerodynamic buffet preceding the stall in most configurations. The stall is defined by a sharp breakaway of airflow from the wing and a nose down pitching tendency. Recovery is made by moving the stick forward to un-stall the wings, before applying full power and slowly pulling out of the dive. With vortex generators fitted, the aircraft is less prone to wing drops during stalls, but this could still happen if the stall is entered with control deflection or sideslip. If a wing-drop is encountered, centralising the ailerons, applying opposite rudder and lowering the nose should prevent the aircraft from entering a spin. During stalls with the power set significantly above idle, the nose of the aircraft may not drop and the aircraft may sit in the stall until aft pressure on the control stick is released or positive recovery inputs are applied. During this, significant aerodynamic buffeting could occur and lateral oscillations may develop if the aircraft is not recovered from the stall expeditiously.

If a spin develops, the usual spin recovery techniques as discussed in the procedures section have been shown to quickly recover the aircraft. The aircraft tends to spin in a nose down attitude and thus builds up speed very quickly. A pull-out manoeuvre should be executed quickly after spin recovery to prevent exceeding V_{NE}.

11.4. APPROACH AND LANDING

The normal approach speeds for the aircraft, depending on the type of landing and weight, are between 56 and 60 MPH. However, the aircraft has been shown to bleed off speed very quickly during the flare and high sink rates can occur. In an effort to reduce the risk of hard and bounced landings it is recommended that an approach speed of 1.3 x Vso is used, particularly when new to the aircraft. The aircraft should then be gently flared at 3-6 ft above the landing surface and this altitude held until the speed bleeds off and the aircraft sinks to the ground. The lower approach and landing speeds afforded by the vortex generators can lead to a lack of elevator authority to adequately flare the aircraft prior to touchdown if speeds lower than the published V_{Ref} are used, particularly if steeper approaches are flown in an effort to clear obstacles. It is imperative that this situation is caught *before* the flare is initiated, by diligently flying the recommended approach speeds and going around if the approach becomes destabilised. If it is found that full aft stick is inadequate to achieve the required pitch rate/attitude in the flare, a controlled increase in power can assist the situation.

Also note that during a sideslip manoeuvre the airspeed indicator will tend to over read and could potentially result in a dangerous situation where the aircraft is flying slower than indicated which could lead to a stall close to the ground. Operator are advised to familiarise themselves with the aircraft before attempting a sideslip approach and to ensure enough safety margin above the stall speed.

Operation in gusts and crosswinds require aileron input into the direction of the wind. Approaching at slightly higher speeds will allow for more margin to the stall and greater control. Even once the aircraft is on the ground, positive aileron control inputs may be required to keep the aircraft from tipping over as it slows down. Gusts from the side can easily lift one wing and tip the aircraft while it is rolling.

For aircraft fitted with certain makes of tundra tyres, landing on grass only will prolong the life of the tyre.

CHAPTER 12. AIRCRAFT SUPPLIMENT

The information presented in this chapter pertains specifically to the individual aircraft to which this POH refers. This information has been verified by the flight test personnel and is not valid unless signed at the end of the chapter by an authorised individual. The information is valid for new aircraft on the date of manufacture. Any modifications to the aircraft which alter the information in this section should be documented in the aircraft documentation along with the altered information.

12.1. SERIAL NUMBER

Make: SkyReach

Model: BushCat

Variant (Choose one): ☐ Nose-wheel

☐ Tail-dragger

Serial #:

Registration:

Note: Both serial number and registration should also be filled in on the front cover of this manual.

12.2. FACTORY FITTED SERIAL NUMBER PARTS

The following parts have been fitted during the initial aircraft assembly process. Changes to life limit items must be logged in the aircraft logbook.

ITEM DESCRIPTION	SKYREACH PART No	SERIAL NUMBER
Engine	N/A	
Propeller	N/A	
Grove undercarriage	N/A	
BRS recovery parachute (if fitted)	N/A	
BRS rocket (if fitted)	N/A	
Fuselage sail	BC-00-17000	
Left wing sail	CX-00-21500-01	
Right wing sail	CX-00-21500-02	
Left flap sail	CX-00-22200-01	
Right flap sail	CX-00-22200-02	
Left aileron sail	CX-00-23200-01	
Right aileron sail	CX-00-23200-02	
Left horizontal stabiliser sail	BC-00-33200-01	
Right horizontal stabiliser sail	BC-00-33200-02	

Left elevator sail	BC-00-34200-01	
Right elevator sail	BC-00-34200-02	
Vertical stabiliser sail	BC-00-31200	
Dorsal fin sail	BC-00-35200	
Rudder sail	BC-00-32200	
Elevator control stick hinge bolt	CX-00-61312	

12.3. NUMERICAL PARTICULARS

1	Empty mass as equipped above		kg	=		lbs
2	Maximum allowable fuel mass	69	kg	=	152.12	lbs
3	Maximum upper baggage area mass	23.2	kg	=	51.00	lbs
4	Maximum lower baggage area mass	20	kg	=	15.00	lbs
5	Pilot and passenger seat CG location	580	mm	=	22.83	inch
6	Fuel tank CG location	1085	mm	=	42.71	inch
7	Upper baggage CG location	1075	mm	=	42.32	inch
8	Lower baggage CG location	1600	mm	=	63.00	inch
9	Location of main wheels		mm	=		inch
10	Location of nose wheel (if applicable)		mm	=		inch
11	Location of tail wheel (if applicable)		mm	=		inch
12	Wheel base		mm	=		inch

12.4. EQUIPMENT LIST

The equipment marked with an ‘x’ has been fitted to the aircraft and is included in the 'empty aircraft mass':

Engine (Choose one):	☐	Rotax 912 UL (with accessories and fluids)	**Serial Number If applicable**
	☐	Rotax 912 ULS (with accessories and fluids)	
	☐	Other:________________________________	
Propeller (Choose one):	☐	Kiev model #283	
	☐	Other:________________________________	
Tyres (Choose one):	☐	Air Trac 6.00 – 6 (6 ply)	
	☐	Carlisle 8.00 – 6 (4 ply)	
	☐	Air Trac 8.50 – 6 (6 ply)	
	☐	Aero Classic 27.5 x 10.0 – 8 (4 ply)	
	☐	Other:________________________________	
Optional airframe hardware:	☐	Aerodynamic compensators	
	☐	Sun shield	
	☐	BRS airframe recovery system	
Optional electrical accessories:	☐	Electric cabin heater	
	☐	Super-Mario landing lights	
	☐	AEROLEDs AeroSun landing/wig wag lights	
	☐	CN Lighting wingtip position/strobe lights	
	☐	Kuntzleman Magnum strobe light (tail mounted)	
	☐	Kuntzleman wingtip position/strobe lights	
	☐	Reiff Rotax 912 engine preheat system	
	☐	Siren system	
Primary flight instruments:	☐	Analogue airspeed indicator	
	☐	Analogue altimeter indicator (hPa subscale)	
	☐	Analogue airspeed indicator ("Hg subscale)	

	☐	Analogue airspeed indicator (Combination subscale)	
	☐	Analogue vertical speed indicator	
	☐	Analogue g-meter	
	☐	Slip indicator	
	☐	Belite angle of attack sensor and gauge	
	☐	MGL GF-1 G-force meter	
	☐	MGL ALT-3 digital altimeter	
	☐	Garmin G5 electronic flight instrument	
Engine instruments:	☐	Analogue tachometer	
	☐	Analogue oil pressure gauge	
	☐	Analogue oil temperature gauge	
	☐	Analogue coolant temperature gauge	
	☐	Analogue fuel pressure gauge	
	☐	Analogue CHT gauge/s	
	☐	Analogue EGT gauge/s	
	☐	Analogue Voltage gauge	
	☐	Analogue Amp gauge	
	☐	MGL xTreme-EMS	
	☐	MGL E-1 universal engine monitor	
	☐	MGL TP-2 Dual channel universal temp/pressure gauge	
Multi function systems:	☐	MGL xTreme-EFIS	
	☐	MGL iEFIS Explorer	
	☐	MGL SP-7 AHRS	
	☐	MGL SP-6 Compass	
	☐	MGL RDAC XF	
	☐	MGL iBox	
	☐	Dynon SkyView SV-HDX800	
	☐	Dynon SV-ADAHRS-200 AHRS module	
	☐	Dynon SV-EMS-220 engine monitor module	
	☐	Dynon SV-XPNDR-261 transponder module	
	☐	Dynon SV-COM-425 VHF radio module	
	☐	Dynon SV-GPS-2020 GPS module	

Serial #:		Date:	

	☐	Dynon SV-ADSB-470 ADSB module	
Radios:	☐	MGL V6 VHF radio w/antenna	
	☐	Trig TY-91 VHF radio w/antenna	
	☐	Dynon SV-COM-C25 radio head unit	
	☐	Garmin GTR200 VHF radio w/antenna	
	☐	Sandia STX165 transponder w/antenna	
	☐	Trig TT-22 transponder w/antenna	
	☐	Artex ELT345 emergency locator transmitter w/antenna	
	☐	Trig TN-72 ADS-B GPS position source w/GPS antenna	
	☐	Dynon SV-INTERCOM-2S intercom system	
Other:	☐	Hour meter	
	☐	AirGizmos Garmin aera 500 mount	
	☐	AirGizmos Garmin aera 660 mount	
	☐	Compass	
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12.5. MASS AND BALANCE

MASTER*

*Unless proceeded by updated mass and balance. Consult the aircraft maintenance logs.

The following calculation uses the method set out in chapter 7 to determine the empty mass and CG location of your aircraft. Metric (millimetres/kilograms) or imperial units (inches/pounds) may be used for this calculation. Regardless of the units chosen, consistency should be kept throughout the mass and balance process.

Position	***Scale Reading***	***- Tare***	***= mass 'P'***
Front wheel			
Left main			
Right main			
Tail wheel			
Aircraft Empty Weight			

Position	**Arm**
Front wheel arm	
Left main arm	
Right main arm	
Tail wheel arm	

Position	***Weight 'P'***	***x Arm 'L'***	***= Moment 'M'***
Front wheel			
Left main			
Right main			
Tail wheel			
Total		N/A	

Empty mass ('P')	
Empty CG arm (calculated above)	
Empty moment ('M')	

12.6. INSTRUMENT PANEL

The following list of instrument panels makes reference to the standard panels in section 8.10 and their associated wiring schematics in the BushCat maintenance manual. If a custom instrument panel is fitted to the aircraft, a layout diagram **and** wiring schematic must be attached to this document (as the BushCat maintenance manual does not have an aircraft specific supplement. If a custom panel has been installed, which has the same equipment and panel items as one of the standard panels, using a different panel layout, only a layout diagram needs to be attached to this document.

- ☐ Panel 1a
- ☐ Panel 1b
- ☐ Panel 2a
- ☐ Panel 2b
- ☐ Panel 3a
- ☐ Panel 3b
- ☐ Panel 4
- ☐ Panel 5a
- ☐ Panel 5b
- ☐ Panel 6a
- ☐ Panel 6b
- ☐ Panel 7a
- ☐ Panel 7b
- ☐ Panel 8
- ☐ Panel 9
- ☐ Panel 10
- ☐ Panel 11
- ☐ Custom panel layout only – using equipment from panel #: ☐
- ☐ Custom panel with other equipment

12.7. DECLARATION

The information entered into this aircraft supplement correctly reflects the aircraft listed in section 12.1 at the time of manufacture.

Name	Signature	Date