PIPISTREL

PILOT OPERATING HANDBOOK

ALPHA Trainer LSA

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***applicable to all ALPHA Trainer aircraft, from serial number 996 AT 912 LSA onwards, that are registered as an S-LSA or E-LSA (experimental) airplane and have a MTOM of 550 kg.**

Aircraft Serial Number: 1001 AT 912 LSA

Aircraft Registration Number: N221PF

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Pilot Operating Handbook

ALPHA Trainer LSA - 550 kg

Authority:
Verified and approved under the authority of DOA No.: SLO.DOA.002

The airplane must be operated in compliance with information and limitations contained herein.

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Online updates, service notice tracking & airworthinress reporting

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USING THIS HANDBOOK

Special statements in the Pilot Operating Handbook/Airplane Flight Manual concerning the safety or operation of the airplane are highlighted by being prefixed by one of the following terms:

WARNING: Means that the non-observance of the corresponding procedures lead to an immediate or significant degradation in flight safety.

CAUTION: Means that the non-observance of the corresponding procedures leads to a minor or to a long term degradation of the flight safety.

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

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A00	First	/	ALL	SLO.DOA.002

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SECTION

1

SECTION 1 – GENERAL

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1.1. INTRODUCTION

This section contains information of general interest to pilots and owners. You will find the information useful in acquainting yourself with the airplane, as well as in loading, fueling, sheltering, and handling the airplane during ground operations. Additionally, this section contains definitions or explanations of symbols, abbreviations, and terminology used throughout this handbook.

1.2. DESCRIPTION

The ALPHA Trainer is a two-seat aircraft of composite construction. The aircraft is arranged as a high wing mono-plane with cantilevered wings and a conventional empennage with a T-tail. The aircraft incorporates a tricycle landing gear and is equipped with a 59.6 kW Rotax 912 UL (or A2, avalable as option).

The seats are side-by side with full dual flight controls and joint levers for throttle, choke and flaps control. Access to cockpit is via two large gull-wing doors. Baggage area is behind the seats. The ALPHA Trainer is equipped with a ballistic parachute system.

The load-bearing structure of the airplane is made of carbon, glass and aramid fiber composite material, the components of which, epoxy resin as well as fiber materials, are in compliance with worldwide accepted aviation specifications. The proven low-pressure wet lay-up method from the sailplane industry is used to build the airplane structure.

1.3. CERTIFICATION BASIS

ALPHA Trainer LSA complies with the following ASTM standard specifications for Light Sport Aircraft:

F2245 / F2746 / F2295

1.4. THREE VIEW DRAWING

Figure 01-001
ALPHA Trainer

1.5. AIRCRAFT OVERVIEW

Basic Dimensions	**Metric**	**Imperial**
Length	6.5 m	21’ 4”
Span	10.50 m	34’ 6”
Height	2.05 m	6’ 9”
Wing		
Area	9.51 m^2	102.4 ft^2
Mean aerodynamic chord	0.90 m	2’ 11.4”
Aspect ratio	11.8	
Horizontal Tail	Metric	Imperial
Area	1.08 m^2	11.6 ft^2
Vertical Tail		
Area	1.1 m^2	11.8 ft^2
Weights		
Maximum takeoff weight	550 kg	1212 lb
Design empty weight	279 kg	615 lb
Design useful load	271 kg	597 lb
Maximum baggage weight	10 kg*	22 lb*
Performance		
Top speed	120 KIAS (SL)	
Cruise speed (5300 RPM)	100 KIAS (SL)	
Endurance at cruise speed	3h + 30’ reserve	
Best climb	76 KIAS (V_Y)	1220 ft/min
Best angle climb	58 KIAS (V_x)	
Stall speed full flap (+2)	37 KIAS	
Stall speed clean (0)	43 KIAS	
Fuel **	Metric	Imperial
Total capacity	50 L	13.2 US gal
Unusable fuel	2 L	0.5 US gal
Engine		
Max power rating (5 min.)	59.6 kW at 5800 RPM	
Max continuous power	58 kW at 5500 RPM	

*only when solid baggage compartment (p/n 6023077) is installed and CG limitations are respected.

** Please see chapter 2 - Limitations - for information about approved fuel types.

1.6. SYSTEMS

1.6.1. POWERPLANT

The engine installed is Rotax 912 UL providing 59.6 kW takeoff power. All limits as defined by the engine manufacturer apply. The engine can be operated with AVGAS 100LL or MOGAS (min. RON 90 antiknock properties and max. 10% ethanol content) as by Rotax specification. The propeller is driven by a gearbox.

The engine is provided with a liquid cooling system for the cylinder heads and a ram-air cooling system for the cylinders. There is also an oil cooling system.

1.6.2. PROPELLER

The airplane is equipped with a Pipistrel FP02-80 propeller. It is a 2-blade, fixed pitch, wooden propeller with 1.65 m (65”) diameter.

1.6.3. FUEL SYSTEM

The airplane uses single tank located in the fuselage, behind the cabin. Maximum usable fuel quantity is 34.5 kg / 48 L (36 kg / 50 L max tank capacity). The fuel system is provided with a mechanical pump mounted on the engine. A gascolator that removes water from the fuel system is mounted on the firewall and equipped with filter. A second fuel filter and an auxiliary electrical fuel pump (booster pump) are positioned downstream from the tank.

1.6.4. LANDING GEAR

The airplane has as a tricycle type fixed landing gear. The nose wheel is steerable via rudder pedals. The main wheels are equipped with hydraulic brakes, which are operated with an handle located between the seats.

1.6.5. BALLISTIC PARACHUTE RESCUE SYSTEM (BPRS)

The airplane is equipped with a ballistic deployed parachute rescue system GRS 6/473 SPEEDY. The system is not accounted for in the sense of “alternative level of safety”. It is purely considered as a true “second chance” beyond what is required by the certification standard. The period for repacking of the parachute is 6 years. The date of exchange is indicated on the parachute canister.

1.7. SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

1.7.1. GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

KCAS Knots Calibrated Airspeed is the indicated airspeed corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.

KIAS Knots Indicated Airspeed is the speed shown on the airspeed indicator. The IAS values published in this handbook assume no instrument error.

KTAS Knots True Airspeed is the airspeed expressed in knots relative to undisturbed air which is KCAS corrected for altitude and temperature.

VG Best Glide Speed is the speed at which the greatest flight distance is attained per unit of altitude lost with power idle.

VA Operating Maneuvering Speed is the maximum speed at which application of full control movement will not overstress the airplane.

VFE Maximum Flap Extended Speed is the highest speed permissible with wing flaps in a prescribed extended position.

VNO Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air, and then only with caution.

VNE Never Exceed Speed is the speed that may not be exceeded at any time.

VAE Maximum Airbrakes Extended Speed is the maximum speed at which the airbrakes may be extended.

VSO Stalling Speed is the minimum steady flight speed at which the aircraft is controllable in the landing configuration (100% flaps) at the most unfavorable weight and balance.

V_X Best Angle of Climb Speed is the speed at which the airplane will obtain the highest altitude in a given horizontal distance. The best angle-of-climb speed normally increases slightly with altitude.

V_Y Best Rate of Climb Speed is the speed at which the airplane will obtain the maximum increase in altitude per unit of time. The best rate-of-climb speed decreases slightly with altitude.

SL Sea Level.

1.7.2. METEOROLOGICAL TERMINOLOGY

IMC Instrument Meteorological Conditions are meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima for visual flight defined in FAR 91.155.

ISA International Standard Atmosphere (standard day) is an atmosphere where
(1) the air is a dry perfect gas,
(2) the temperature at sea level is 15 °C,
(3) the pressure at sea level is 1013.2 millibars (29.92 InHg), and
(4) the temperature gradient from sea level to the altitude at which the temperature is -56.5 °C is -0.00198 °C per foot and zero above that altitude.

MSL Mean Sea Level is the average height of the surface of the sea for all stages of tide. In this Handbook, altitude given as MSL is the altitude above the mean sea level. It is the altitude read from the altimeter when the altimeter's barometric adjustment has been set to the altimeter setting obtained from ground meteorological sources.

OAT Outside Air Temperature is the free air static temperature obtained from inflight temperature indications or from ground meteorological sources. It is expressed in either degrees Celsius or degrees Fahrenheit.

- Pressure Altitude is the altitude read from the altimeter when the altimeter's barometric adjustment has been set to 1013 mb (29.92 inHg) corrected for position and instrument error. In this Handbook, altimeter instrument errors are assumed to be zero.

- Standard Temperature is the temperature that would be found at a given pressure altitude in the standard atmosphere. It is 15 °C at sea level pressure altitude and decreases approx. 2 °C for each 1000 feet of altitude increase.

DA Density Altitude (ft) is pressure altitude corrected for non-standard temperature. As temperature and altitude increase, air density decreases.

1.7.3. ENGINE POWER TERMINOLOGY

HP Horsepower is the power developed by the engine.

MCP Maximum Continuous Power is the maximum power that can be used continuously.

MAP Manifold Pressure is the pressure measured in the engine's induction system expressed as inHg.

RPM Revolutions Per Minute is engine rotational speed.

1.7.4. PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

g One "g" is a quantity of acceleration equal to that of earth's gravity.

- Demonstrated Crosswind Velocity is the velocity of the crosswind component for which adequate control of the airplane during taxi, takeoff, and landing was actually demonstrated during certification testing.
- Service Ceiling is the maximum altitude at which the aircraft at maximum weight has the capability of climbing at a 100 ft/min.
- Unusable Fuel is the quantity of fuel that cannot be used in flight.
- Usable Fuel is the fuel available for flight planning.

1.7.5. WEIGHT AND BALANCE TERMINOLOGY

C.G. or CG **Center of Gravity** is the point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.

- **Arm** is the horizontal distance from the reference datum to the center of an item's gravity. The airplane's arm is obtained by adding the airplane's individual moments and dividing the sum by the total weight.
- **Basic Empty Weight** is the actual weight of the airplane including all operating fix installed equipment of the airplane. The basic empty weight includes the weight of unusable fuel and full oil.

MAC **Mean Aerodynamic Chord** is the chord drawn through the centroid of the wing plan area.

LEMAC **Leading Edge of Mean Aerodynamic Chord** is the forward edge of MAC aft of the reference datum.

- **Maximum Gross Weight** is the maximum permissible weight of the airplane and its contents as listed in the aircraft specifications.
- **Moment** is the product of the items weight multiplied by its arm.
- **Useful Load** is the basic empty weight subtracted from the maximum weight of the aircraft. It is the maximum allowable combined weight of pilot, passengers, fuel and baggage.
- **Reference Datum** is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
- **Tare** is the weight of all items used to hold the airplane on the scales for weighing. Tare includes blocks, shims, and chocks. Tare weight must be subtracted from the associated scale reading.

MLE **Minimum List of Equipment** is a list of equipment that must be installed and operable for the aircraft to be considered airworthy for a certain kind of operation.

1.8. CONVERSION TABLE

SI	US	US	SI
1 bar	14.5037 psi	1 psi	0.0689 bar
1 mm2	0.0016 in2	1 in2	625 mm2
1 cm2	0.1550 in2	1 in2	6.4510 cm2
1 daN	2.2481 lbf	1 lbf	0.4448 daN
1 g	0.0353 oz	1 oz	28.328 g
1 hPa	0.0295 inHg	1 inHg	33.898 hPa
1 kg	2.2046 lb	1 lb	0.4536 kg/min
1 kg/min	2.2046 lb/min	1 lb.min	0.4536 kg/min
1 l	0.2641 US gal	1 US gal	3.7864 l/min
1 l	1.057 US quart	1 US quart	0.9461 l
1 l/min	0.2641 US gal/min	1 US gal.min	3.7864 l/min
1 daNm	88.4956 lbf.in	1 lbf.in	0.0113 daNm
1 daNm	7.3801 lbf.ft	1 lbf.ft	0.1355 daNm
1 m	3.2809 ft	1 ft	0.3040 m
1 mm	0.0394 in	1 in	16.393 mm
1 cm3	0.06102 in3	1 in3	16.393 cm3
1 hPa	0.0145 psi	1 psi	68.965 hPa

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SECTION

2

SECTION 2 – LIMITATIONS

TABLE OF CONTENTS

2.1 INTRODUCTION

This section provides operating limitations, instrument markings and basic placards necessary for the safe operation of the airplane and its standard systems and equipment. Refer to section 9 for operating limitations for optional equipment.

2.2 AIRSPEED LIMITATIONS

Speeds in the table below are KIAS.

Speed	KIAS	Remarks
V_{NE}	135	**Never Exceed Speed** is the speed limit that may not be exceeded at any time.
V_{s0}	37	**Stall speed - landing configuration** is the stall speed with full flaps (+2) at MTOM.
V_s	43	**Stall speed - clean configuration** is the stall speed with flaps retracted (0) at MTOM.
V_{NO}	108	**Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air.
V_A	96	**Operating Maneuvering Speed** is the maximum speed at which full control travel may be used.
V_{FE}	70	**Maximum Flap Extended Speed** is the highest speed permissible with wing flaps extended at (+1) stage, 60 KIAS for (+2) stage.
V_{AE}	70	**Maximum Airbrakes Extended Speed** is the highest speed permissible with the airbrakes extended (if applicalble).

2.3 AIRSPEED INDICATOR MARKINGS

Speeds in the table below are KIAS.

MARKING	VALUE (KIAS)	REMARKS
White Arc	37 - 70	Flap Operating Range. Lower limit is the most adverse stall speed in the landing configuration. Upper limit is the maximum speed permissible with flaps extended at 1st stage (+1).
Green Arc	43 - 108	Normal Operating Range. Lower limit is the maximum weight stall at most forward C.G. in clean configuration. Upper limit is the maximum structural cruising speed.
Yellow Arc	108 - 135	Caution Range. Operations must be conducted with caution and only in smooth air.
Red Line	135	Never exceed speed. Maximum speed for all operations.
Blue line	76	Best climb rate speed (V_Y)

2.4 ENGINE LIMITATIONS

Engine (Rotax 912 UL): please refer to Rotax 912 Series Operators Manuals for additional information.

Maximum Power rating	59.6 kW / 5800 RPM Max 5 min
Maximum RPM	5800 RPM
Normal RPM	1400 - 5500 RPM
Maximum continuous RPM	5500 RPM (58 kW)
Minimum Oil Pressure	0.8 bar (12 psi)
Normal Oil Pressure	2.0 – 5.0 bar (27 - 73 psi)
Maximum Oil Pressure	7.0* bar (102 psi) *permissible for a short period after cold start

Minimum Oil Temperature	50 °C (120 °F)
Normal Oil Temperature	90 °C - 110 °C (190 - 230 °F)
Maximum Oil Temperature	140°C (285 °F)
Minimum Coolant Temperature	not limited
Maximum Coolant Temperature	120 °C (248 °F)
Maximum Exhaust Gas Tempera-ture	880 °C (1616 °F)

2.5 ENGINE INSTRUMENT MARKINGS

INSTRUMENT (RANGE)	RED LINE	GREEN ARC	YELLOW ARC	RED LINE
	MINIMUM	NORMAL	CAUTION	MAXIMUM
Tachometer (0 - 7000 RPM)	1400	1400 - 5500	5500 - 5800	5800
Coolant Temp. (/ - 120 °C) (/ - 248 °F)	––	––	––	120 °C (248 °F)
Exhaust Gas Temp. (650 - 925 °C) (1202 - 1697 °F)	650 °C (1202 °F)	750 - 850 °C (1382-1562 °F)	850 - 925 °C (1562-1697 °F)	925 °C (1697 °F)
Manifold Pressure (0 - 35 inHg)	––	15 - 29.5 inHg	––	––
Fuel Pressure (0 - 0.4 bar) (0 - 0.4 psi)	0.01 bar (0.21 psi)	0.01 - 0.4 bar (0.21 - 5.8 psi)	––	0.4 bar (5.8 psi)
Oil Temperature (0 - 140 °C) (0 - 285 °F)	50 °C (120 °F)	90 - 110 °C (190 - 230 °F)	110 - 125 °C (230 - 257 °F)	140 °C (285 °F)
Oil Pressure (0 - 7 bar) (0 - 101 psi)	1 bar (14.5 psi)	1.5 - 5 bar (21.7 - 72.5 psi)	5 - 6.5 bar (72.5 - 94.2 psi)	6.5 bar (94.2 psi)
Voltmeter (10 - 16 V)	11.4 V	11.4–14.4 V	––	14.4 V

2.6 WEIGHT AND CENTER OF GRAVITY LIMITS

Maximum takeoff weight	550 kg / 1212 lbs
Maximum landing weight	550 kg / 1212 lbs
Design empty weight (typical)	279 kg / 615 lbs
Design useful load	271 kg / 597 lbs
Most forward CG	25 % MAC 267 mm or 10 7/16”
Most rearward CG	35 % MAC 355 mm or 13 31/32”

NOTE: The reference datum is wing’s leading edge at root.

2.7 OCCUPANCY

Max. Occupancy	Pilot and 1 Passenger
Maximum weight / per seat	110 kg / 242 lbs, 200 kg/ 440 lbs total
Minimum weight solo pilot	55 kg / 121 lbs
Maximum baggage weight *	10 kg / 22 lbs

* only when solid baggage compartment (p/n 6023077) is installed and CG limitations are respected

2.8 FUEL

Approved fuels include MOGAS or AVGAS 100LL, as per Rotax specification, with max. 10% ethanol and the following antiknock properties: min. RON 90 (min. AKI 87)

Total fuel capacity	50 liters / 13.2 US gal 36 kg / 79 lbs
Total usable fuel (all flight conditions)	48 liters / 12.7 US gal 34.5 kg / 76 lbs

NOTE: Operation with leaded fuels (including AVGAS) results in shorter oil filter replacement intervals of 50 hours.

NOTE: Unusable fuel is 2 liters (0.5 US gal)

2.9 OIL/COOLANT

Recommended oil: SAE 10W-40 (Aero Shell Oil Sport Plus 4, as per Rotax specification).

Maximum oil capacity	3.5 liter
Minimum oil required	marked on dipstick
Approved coolant*	50/50 water/antifreeze mixture
Min/max coolant quantity	marked on overflow bottle

* as by Rotax specification - see SI-912-016 "Selection of suitable operat-ingfluids" latest issue.

2.10 FLIGHT LOAD FACTOR LIMITS

+ 4.0 g / - 2.0 g

NOTE: Engine will not operate below 0.0 g due to design of engine's fuel and oil system. Limitations from Rotax Specification apply.

2.11 MANEUVER LIMITS

This airplane is certified in the LSA category and is not designed for aerobatic operations. Only those operations incidental to normal flight are approved. These operations include normal stalls, chandelles, lazy eights, and turns in which the angle of bank is limited to a maximum of 60°.

Intentional spinning is NOT approved!

2.12 ALTITUDE LIMITS

Maximum operating altitude	18,000 ft MSL

NOTE: In most countries operating rules require the use of supplemental oxygen at specified altitudes below the maximum operating altitude.

2.13 TEMPERATURE LIMITS

Flight when the temperature of the aircraft's surface is at risk of exceeding 55° C is prohibited.

2.14 MINIMUM FLIGHT CREW

The minimum flight crew is one pilot.

2.15 KINDS OF OPERATION

The airplane is approved for the following operations:

- VFR-day

NOTE: The airplane must be equipped according to the MLE for the planned kind of operation, see 2.15.1.

- VFR-night

NOTE: The minimum equipment list for Night VFR is identical that for DAY-VFR, but shall include any additional equipment deemed necessary by local regulations in the given area of operation.

- IFR (VMC conditions only)

The minimum equipment list for IFR-VMC is identical that for DAY-VFR, but shall include any additional equipment deemed necessary by local regulations in the given area of operation.

NOTE: IFR flight only allowed in VMC conditions and with approved IFR instruments and appropriate pilot rating/certification.

2.15.1 MINIMUM LIST OF EQUIPMENT

SYSTEM, INSTRUMENT, EQUIPMENT	MLE - REQUIRED FOR KIND OF OPERATION		
	VFR Day	VFR Night	IFR
VHF COM / (NAV)	—	—	—
Battery	1	—	—
Ammeter / Indication	1*	—	—
GEN FAIL Annunciator	1	—	—
Generator	1	—	—
Emergency Locator Trans.	—	—	—
Safety belts	2	—	
Flap System	1	—	—
Pitch Trim Indicator	—	—	—
Pitch Trim System	—	—	—
Fuel Quantity Indicator	1*	—	—
Fuel Valve	1	—	—
Electric Fuel Pump (booster pump)	1	—	—
Anti-Collision Lights	—	—	—
Oil Quantity Indicator	1	—	—
Oil Temperature Indication	1*	—	—
Parachute Rescue System	—	—	—
Pilot’s Operating Handbook	1	—	—
Placards	1	—	—
Checklist	1	—	—
Instrument Lights	—	—	—
Navigation Lights	—	—	—
Landing Light	—	—	—
Airspeed Indicator	1	—	—
Altimeter	1	—	—
Magnetic Compass	1	—	—
Pitot/static System	1	—	—
Vertical Speed Indicator	—	—	—
Coolant Temperature Ind.	1*	—	—
EGT Indication	1*	—	—
Fuel Flow Indication	—	—	—
Manifold Pressure Indication	—	—	—
Oil Pressure Indication	1*	—	—

* The indication is integrated into the system/display

2.16 OPERATIONAL RESTRICTIONS

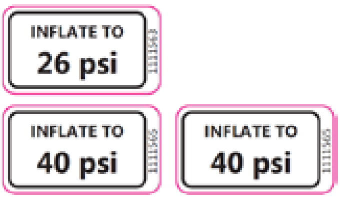
Flight into known icing conditions is prohibited.
No flights in heavy rainfall or blizzard conditions.
Areas with risk of thunderstorms should be avoided.
Smoking is prohibited.
Engine: -25°C (oil temperature) to 50°C (ambient temperature) as per Rotax OM.
Do not take-off with airbrakes extended.
The 12 V power outlets are not approved to supply power to flight-critical communication or navigation devices.
GPS is for information only and should not be used for primary navigation heading references.
Do not take-off or land when crosswind component exceeds 18 kts (9 m/s).
Do not take-off with flaps retracted (0).

2.17 PLACARDS

2.17.1. PLACARDS (EXTERNAL)

Next fuel tank filler neck:

Next to wheel tire pressure hatches:



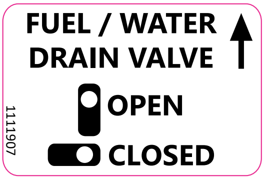
or

On each main landing gear wheel fairing (if applicable) (2x):

On vent/drain holes:

Next to door opening latches:

Next to fuel drain outlet on bottom engine cowling:



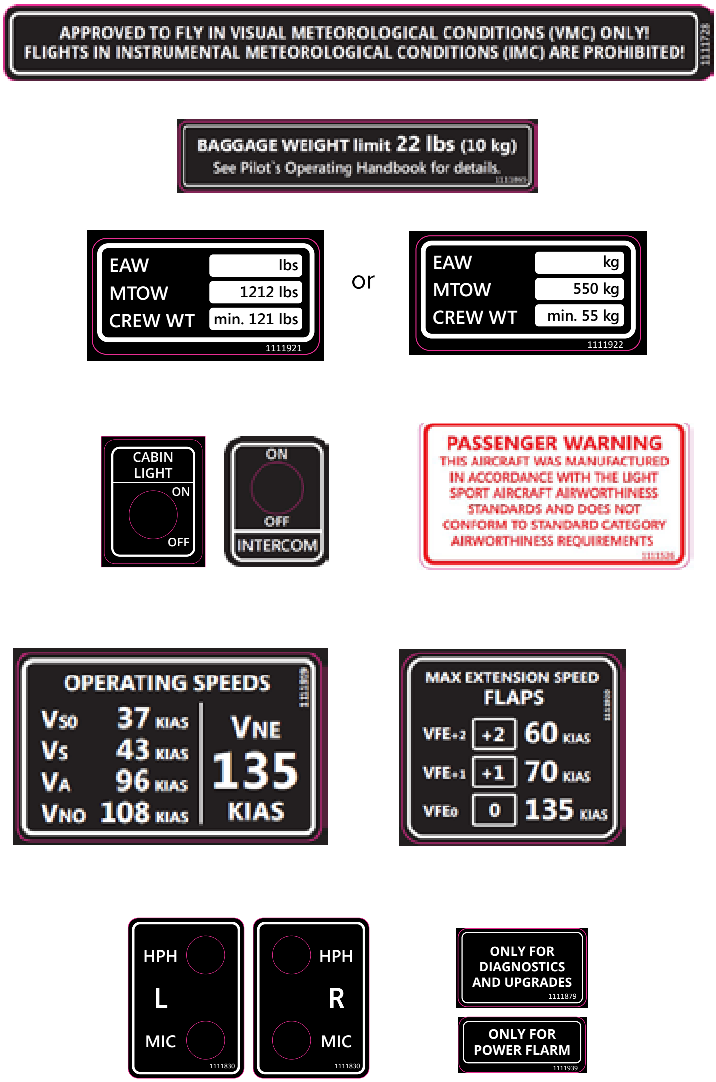
Near the oil system breather:

On the fuel system breather:

2.17.2 PLACARDS (ENGINE COMPARTMENT)

On coolant bottle, oil bottle:

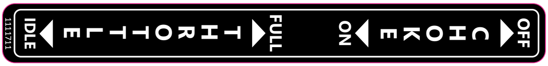
2.17.3 PLACARDS (INSTRUMENT PANEL)



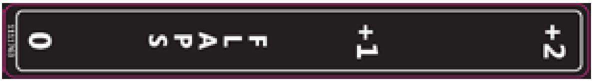
2.17.4 PLACARDS (CENTER CONSOLE)

Next to fuel shut off valve:

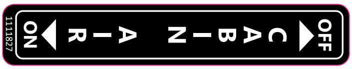
Next to choke and throttle levers (2x):



On flap lever (2x):



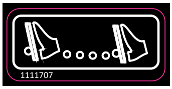
Next to cabin-air control lever:



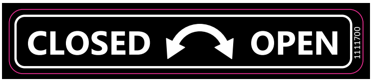
Next to brake lever (2x):

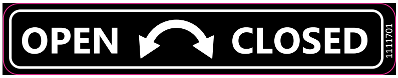
2.17.5 PLACARDS (CABIN)

In front of control sticks - rudder pedal adjustment (2x):



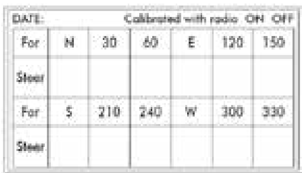
Below each door to depict door handle operation:





On upper tube in front of pilot:

On the dashboard:



DATE: Calibrated with radio ON OFF

For	N	30	60	E	120	150
Steer						
For	S	210	240	W	300	330
Steer						

2.17.6 PLACARDS (BALLISTIC PARACHUTE RESCUE SYSTEM)

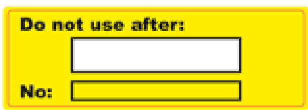
On/adjecent to parachute rescue system hatch and over rocket position:

Next to doors (2x):

Next to rocket exhaust (bottom of fuselage):

Next to activation handle (cockpit):

On the parachute container:



SECTION

3

SECTION 3 – EMERGENCY PROCEDURES

TABLE OF CONTENTS

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3.1 INTRODUCTION

This section provides procedures for handling emergencies and critical flight situations. Although emergencies caused by airplane, systems, or engine malfunctions are extremely rare, the guidelines described in this section should be considered and applied as necessary should an emergency arise.

En-route emergencies caused by weather can be minimized or eliminated by careful flight planning and good judgment when unexpected weather is encountered.

In-flight mechanical problems will be extremely rare if proper preflight inspections and maintenance are practiced. Always perform a thorough walk-around preflight inspection before any flight to ensure that no damage occurred during the previous flight or while the airplane was on the ground. Pay special attention to any oil/fluid leaks or fuel stains that could indicate engine problems.

Aircraft emergencies are very dynamic events. Because of this, it is impossible to address every action a pilot might take to handle a situation. However, four basic actions can be applied to any emergency:

Maintain Aircraft Control

Many minor aircraft emergencies turn into major ones when the pilot fails to maintain aircraft control. Remember, do not panic and do not fixate on a particular problem. To avoid this, even in an emergency: aviate, navigate, and communicate, in this order. Never let anything interfere with your control of the airplane. Never stop flying.

Analyze the Situation

Once you are able to maintain control of the aircraft, assess the situation. Look at the engine parameters. Listen to the engine. Determine what the airplane is telling you.

Take Appropriate Action

In most situations, the procedures listed in this section will either correct the aircraft problem or allow safe recovery of the aircraft. Follow them and use good pilot judgment.

The Ballistic Parachute Rescue System (BPRS) should be activated in the event of a life-threatening emergency where BPRS deployment is determined to be safer than continued flight and landing.

Land as soon as possible

Find the nearest suitable area, such as an open field, at which a safe approach and landing is assured, and land without delay.

Land as soon as practical

The continuation of the flight and the landing site is at discretion of the pilot. It is not recommented to continue the flight beyond the nearest suitable landing area.

CAUTION: The following procedures apply to an aircraft configured with all the optional equipment and systems. Skip steps that do not apply to the specific aircraft if the equipment is not installed. See Chapter 7 for additional information.

3.2 AIRSPEEDS FOR EMERGENCY OPERATIONS

Maneuvering speed:	**96 KIAS**
Best Glide speed (flaps 0):	**64 KIAS**
Minimum sink speed (flaps 0):	**58 KIAS**
Minimum sink rate (flaps 0):	**460 ft/min**
Best L/D ratio (flaps 0):	**15:1**

3.3 GROUND EMERGENCIES

3.3.1 ENGINE FIRE DURING ENGINE START

A fire during engine start may be caused by fuel igniting in the fuel induction system. If this occurs, attempt to draw the fire back into the engine by continuing to crank the engine.

1	Fuel Valve	CLOSED
2	Booster pump	OFF

3	Brakes	ENGAGE

Once the aircraft has stopped:

4	Starter	KEEP CRANKING
5	Throttle Lever	FULL POWER

If fire is estinguished:

6	MAG L / MAG R Switches	OFF
7	Master BAT & Master GEN	OFF

If fire persist, perform Emergency Engine Shutdown on Ground and Emergency Ground Egress checklists.

3.3.2 EMERGENCY ENGINE SHUTDOWN ON GROUND

1	Throttle Lever	IDLE
2	MAG L / MAG R Switches	OFF
3	Fuel Valve	CLOSED
4	Master BAT & Master GEN	OFF
5	Booster pump	CHECK OFF

3.3.3 EMERGENCY GROUND EGRESS

1	Engine	SHUTDOWN
2	Brakes / Parking Brake	ENGAGED
3	Seat Belts	RELEASE
4	Airplane	EXIT

While exiting the airplane, make sure evacuation path is clear of other aircraft, spinning propellers, and other hazards. If the engine is left running, set the parking brake prior to evacuating the airplane.

3.4 IN-FLIGHT EMERGENCIES

3.4.1 ENGINE FAILURE AT TAKEOFF (LOW ALTITUDE)

If the engine fails immediately after take-off, abort by landing on the runway. If this is not possible and altitude is not sufficient enough to restart the engine, lower the nose to maintain airspeed and establish a glide attitude. In most cases, the landing should be made straight ahead, turning only to avoid obstructions. After establishing a glide for landing, perform as many of the checklist items as time permits.

WARNING: If a turn back to the runway is elected, be very careful not to stall the airplane.

1	Best Glide or Landing Speed (as appropriate)	**ESTABLISH**
2	Fuel Valve	**CLOSED**
3	MAG L / MAG R Switches	**OFF**
4	Flaps	**AS REQUIRED**
5	Booster pump	**OFF**

If time permits:

1	Throttle Lever	**IDLE**
2	Master BAT & Master GEN (just before touch down)	**OFF**
3	Seat Belts	**ENSURE SECURED**

3.4.2 ENGINE FAILURE IN FLIGHT

If the engine fails at altitude, pitch as necessary to establish best glide speed (64 KIAS). While gliding toward a suitable landing area, attempt to identify the cause of the failure and correct it. If altitude or terrain does not permit a safe landing, BPRS deployment may be required.

Best Glide Speed and Best Glide Ratio conditions:

Propeller	**STOPPED**
Flaps	**0**

Max. Glide (L/D) Ratio (flaps 0):	**15 : 1**
Best Glide speed (flaps 0):	**64 KIAS**
Minimum sink speed (flaps 0):	**58 KIAS**
Minimum sink rate (flaps 0):	**460 ft/min**

WARNING: If engine failure is accompanied by fuel fumes in the cockpit or internal engine damage is suspected, set fuel valve and Booster pump to OFF and do not attempt a restart.

1	Best Glide Speed (64 KIAS)	**ESTABLISH**
2	Fuel Valve	**CHECK OPEN**
3	MAG L / MAG R Switches	**CHECK ON**

3.4.3 ENGINE START IN FLIGHT

NOTE: Engine Start in flight may be performed during 1g flight anywhere within the normal operating envelope of the airplane.

1	Master BAT	**ON**
2	Throttle Lever	**10 mm OPEN**
3	Starter (Propeller not windmilling)	**ENGAGE**
4	Throttle Lever	**slowly INCREASE**
5	Master GEN (After the engine has started)	**ON**

NOTE: If engine does not start, perform Landing Emergencies procedure.

3.4.4 ENGINE PARTIAL POWER LOSS

Indications of a partial power loss include fluctuating RPM, reduced or fluctuating manifold pressure, low oil pressure, high oil temperature and a rough-running engine. Mild engine roughness in flight may be caused by one or more spark plugs becoming fouled. A sudden engine roughness or misfiring is usually evidence of an ignition system malfunction.

NOTE: Low or no oil pressure may be indicative of an imminent engine failure.

NOTE: A damaged propeller may cause extremely rough operation. If an out-of-balance propeller is suspected, immediately shut down engine and perform Emergency Landing procedure.

If a partial engine failure permits level flight, land at a suitable airfield as soon as possible. If conditions do not permit safe level flight, use partial power as necessary to set up a emergency landing pattern over a suitable landing field. Always be prepared for a complete engine failure and consider BPRS deployment if a suitable landing site is not available.

WARNING: If there is a strong smell of fuel in the cockpit, divert to the nearest suitable landing field. Fly an emergency landing pattern and shut down the engine fuel supply once a safe landing is assured.

The following procedure provides guidance to determine and correct some of the conditions contributing to a rough running engine or a partial power loss:

1	Throttle Lever	**SWEEP**
	Move the Throttle Lever through the complete range to obtain the best operation possible.	
2	MAG L / MAG R Switches	**Check single MAG switch operation**
	Cycling the ignition switch momentarily from both ON to only MAG L ON and then to only MAG R ON may help identify the problem. An obvious power loss in single ignition operation indicates ignition system or spark plug trouble. Return switches to both ON position unless extreme roughness dictates the use of a single ignition circuit.	
3	Land	**AS SOON AS POSSIBLE**

3.4.5 LOW OIL PRESSURE

If low oil pressure is accompanied by a rise in oil temperature, the engine has probably lost a significant amount of its oil and engine failure may be imminent. Immediately reduce engine power to idle and select a suitable field for emergency landing.

WARNING: Prolonged use of high power settings after loss of oil pressure will lead to engine mechanical damage and total engine failure.

1	Throttle Lever	MINIMUM REQUIRED
2	Land	AS SOON AS POSSIBLE

NOTE: Full power should only be used following a loss of oil pressure when operating close to the ground and only for the time necessary to climb to an altitude permitting a safe landing or analysis of the low oil pressure indication to confirm oil pressure has actually been lost.

If low oil pressure is accompanied by normal oil temperature, it is possible that the oil pressure sensor, gauge, or relief valve is malfunctioning. In any case, land as soon as practical and determine cause.

3.5 STALL RECOVERY

1	Reduce angle of attack	Control Stick Forward
2	Throttle Lever	Full Power
3	Horizontal Flight	Resume

3.6 SPINS

The airplane is NOT approved for intentional spins.

While the stall characteristics of the airplane make accidental entry into a spin extremely unlikely, spinning is possible. Spin entry can be avoided by using good airmanship: coordinated use of controls in turns, proper airspeed control and never abusing the flight controls with accelerated inputs when close to the stall.

If the controls are misapplied or abrupt inputs are made to the control surfaces at or around stall, a sudden wing drop may be felt and a spiral or spin may be entered. In some cases it may be difficult to determine if the aircraft has entered a spiral or the started spinnig.

In any case, spin recovery technique is classic:

1	Throttle IDLE
2	Apply full rudder deflection in direction opposite the spin
3	Lower the nose towards the ground to build speed (Stick forward)
4	As rotation stops, neutralize rudder
5	Establish horizontal flight without exceeding g-load or airspeed limitations

3.7 FIRE IN FLIGHT

3.7.1 SMOKE IN THE COCKPIT

If smoke and/or fumes are detected in the cabin, check the engine parameters for any sign of malfunction. If a fuel leak has occurred, actuation of electrical components may cause a fire. If there is a strong smell of fuel in the cockpit, divert to the nearest suitable landing field. Perform an Emergency Landing and shut down the fuel supply to the engine once a safe landing is assured.

1	Cabin Air Selector	ON
2	Door Vents	OPEN
3	Fan Toggle Switch	ON
4	Airflow Direction Knob	Feet position
5	Temperature Control Knob	Cold

If source of smoke and fume is firewall forward:

1	Cabin Air Selector	OFF
2	Fan Toggle Switch	OFF
3	Door Vents	AS REQUIRED
4	Land	AS SOON AS POSSIBLE

If airflow is not sufficient to clear smoke or fumes from cabin:

1	Door Vents	OPEN

NOTE: Door structure/hinge is not designed for intentional open-door operations. Be advised that the chances of door failure occuring is higher, as the airspeed at which the door's opened at increases.

3.7.2 ENGINE FIRE IN FLIGHT

If an engine fire occurs during flight, do not attempt to restart the engine.

1	Fuel Valve	CLOSED
2	Booster pump	OFF
3	Cabin Air Selector	OFF
4	Fan Toggle Switch	OFF
5	Throttle Lever	Full Forward
6	MAG L / MAG R Switches	OFF
7	Land (emergency landing)	AS SOON AS POSSIBLE
8	Master BAT & Master GEN (just before touchdown)	OFF

NOTE: As an alternative, putting the airplane into a dive may put the fire out.

3.7.3 COCKPIT FIRE IN FLIGHT

If the cause of the fire is apparent and accessible, use a fire extinguisher (if available), or any other means, to extinguish flames and land as soon as possible. Opening the vents may feed the fire, but to avoid incapacitating the crew from smoke inhalation, it may be necessary to rid cabin of smoke or fumes.

1	Cabin Air Selector	OFF
2	Fan Toggle Switch	OFF
3	Door Vents	AS REQUIRED
4	MASTER BAT Switch	OFF
5	MASTER GEN Switch	OFF
6	Booster pump	OFF
7	Fire Extinguisher (if available)	ACTIVATE

WARNING: If turning off the master switches eliminated the fire situation, leave the master switches OFF. Do not attempt to isolate the source of the fire by checking each individual electrical component.

CAUTION: When Master Switch is turned OFF, the engine will continue to run but the power to the Electronic Flight Displays will be cut. Refer to back-up instruments for the continuation of flight (if available).

WARNING: Should the fire extinguisher contain Halon gas, its operation can be toxic, especially in a closed area. After extinguishing fire, ventilate cabin by opening air vents and unlatching door (if required).

NOTE: Door structure/hinge is not designed for intentional open-door operations. Be advised that the chances of door failure occuring is higher, as the airspeed at which the door's opened at increases.

If airflow is not sufficient to clear smoke or fumes from cabin after the fire has been extinguished:

1	Cabin Air Selector	ON
2	Fan Toggle Switch	ON
3	Temperature Control Knob	Cold
4	Green Electrical Switches	OFF
5	Land	AS SOON AS POSSIBLE

3.8 BPRS DEPLOYMENT

The Ballistic Parachute Rescue System (BPRS) should be activated in the event of a life-threatening emergency where BPRS deployment is determined to be safer than continued flight and landing.

WARNING: BPRS deployment is expected to result in loss of the airframe and, depending upon adverse external factors such as high deployment speed, low altitude, or rough terrain may result in severe injury or death to the occupants. Because of this, BPRS should only be activated when any other means of handling the emergency would not protect the occupants from serious injury.

CAUTION: Expected impact in a fully stabilized deployment is equivalent to a drop from approximately 3 meters.

Once it is decided to deploy BPRS, the following actions should be taken:

1	Airspeed	**MINIMUM POSSIBLE**

NOTE: The maximum demonstrated deployment speed is 170 TAS.

Reducing airspeed allows minimum parachute loads and prevents structural overload and possible parachute failure.

2	MAG L / MAG R Switches (If time and altitude permit)	**OFF**

Generally, a distressed airplane will be safer for its occupants if the engine is not running.

3	Activation Handle	**PULL**

Pull the activation T-handle from its holder. Pull down/forward on handle with both hands in a strong, steady, and continuous motion. Maintain maximum pull force until the rocket activates.

NOTE: Pull handle strongly at least 30 centimeters to make sure activation is successful.

WARNING: Rapidly pulling the activation T-handle will greatly increase the pull forces required to activate the rocket. Use a firm and steady pulling motion.

After Deployment:

4	Fuel Valve	**CLOSED**
5	Booster pump	**OFF**

Shutting off fuel supply to engine will reduce the chances of fire resulting from impact at touchdown.

6	Master BAT & Master GEN	**OFF**
7	ELT	**ACTIVATE**
8	Seat Belts and Harnesses	**TIGHTEN**

All occupants must have seat belts securely fastened.

9	Loose Items	**SECURE**

If time permits, all loose items should be secured to prevent injury from flying objects in the cabin at touchdown.

10	Assume emergency landing body position

The emergency landing body position is assumed by placing both hands on the lap, clasping one wrist with the opposite hand, and holding the upper torso erect and against the seat backs.

After the airplane comes to a complete stop, evacuate quickly and move upwind.

As occupants exit the airplane, the reduced weight may allow winds to drag the airplane further. As a result of landing impact, the doors may jam. If the doors cannot be opened, break out the windows. Crawl through the opening.

3.9 LANDING EMERGENCIES

If all attempts to restart the engine failure and an emergency landing is imminent, select a suitable field and prepare for the landing. If flight conditions or terrain does not permit a safe landing, BPRS deployment may be required.

A suitable field should be chosen as early as possible so that maximum time will be available to plan and execute the emergency landing. For emergency landings on unprepared surfaces, use full flaps if possible. Land on the main gear and hold the nose wheel off the ground as long as possible. If engine power is available, before attempting an "off airport" landing, fly over the landing area at a low but safe altitude to inspect the terrain for obstructions and surface conditions.

NOTE: Use of full (+2) flaps will reduce glide distance. Full flaps should not be selected until landing is assured.

3.9.1 EMERGENCY LANDING WITHOUT ENGINE POWER

1	Best Glide Speed	ESTABLISH - 64 KIAS
2	Throttle Lever	IDLE
3	Fuel Valve	CLOSED
4	Booster pump	OFF
5	MAG L / MAG R Switches	OFF
6	Master BAT & Master GEN (just before touch down)	OFF

7	Seat Belts	SECURED
8	Transponder	SQUAWK 7700
9	ELT	ACTIVATE
10	Radio	Transmit (121.5 MHz) MAYDAY, giving locations and intentions
11	Flaps (when landing is assured)	+2

3.9.2 DITCHING

1	Radio	Transmit (121.5 MHz) MAYDAY, giving location and intentions
2	Transponder	SQUAWK 7700
3	BPRS	PULL
4	Doors	UNLATCH before impact with water
5	Airplane	EVACUATE
6	Flotation Devices	INFLATE WHEN CLEAR OF AIRPLANE

NOTE: If available, life preservers should be donned and life raft should be prepared for immediate evacuation upon touchdown. Consider OPENING a door prior to assuming the emergency landing body position in order to provide a ready escape path.

It may be necessary to allow some cabin flooding to equalize pressure on the doors. If the doors cannot be opened, break out the windows and crawl through the opening.

3.9.3 LANDING WITH A DEFECTIVE MAIN LANDING GEAR TIRE

1	Land the airplane at the edge of the runway that is located on the side of the intact tire, so that changes in direction during roll-out due to the braking action of the defective tire can be corrected on the runway.
2	Land with the wing low on the side of the intact tire.

3	Direction should be maintained using the rudder. This should be supported by use of the brake. It is possible that the brake must be applied strongly - if necessary to the point where the wheel locks.

CAUTION: A defective tire is not easy to detect. The damage normally occurs during take-off or landing and is hardly noticeable during fast taxiing. It is only during the lower taxiing speeds that a tendency to swerve occurs.

3.9.4 LANDING WITH DEFECTIVE BRAKES

1	Seat belts	**CHECK FASTENED AND TIGHTENED**
	After a safe touch-down:	
2	MAG L / MAG R Switches	**OFF**
3	Fuel Valve	**CLOSED**
4	Booster pump	**OFF**
5	Master BAT & Master GEN (just before touch down)	**OFF**

3.10 GENERATOR FAILURE

Steady illumination of the "GENERATOR FAIL" caution light on the switch panel indicates a failure of the generator. The most likely the cause of the generator failure is a wiring fault, a malfunctioning generator, or a malfunctioning voltage regulator. Usually, electrical power malfunctions are accompanied by an excessive rate of charge or a discharge rate shown on the ammeter. In this condition on board battery should provide power for at least 30 minutes.

If generator failure persists

1	Unnecessary equipment	**OFF (to reduce loads)**
2	Voltage	**Monitor**
3	Land	**AS SOON AS PRACTICAL**

CAUTION: The generator in this airplane is self-exciting. This generator requires battery power for generator starting; however, once started, the generator will provide self-generated field power to continue operation in case of a battery failure. To assure generator restart power is available if the generator fails, the battery should not be disconnected during flight.

NOTE: If it is necessary to reduce electrical loads due to an generator malfunction, switch off electrical components and/or systems that are not essential for the current flight conditions rather than pulling circuit breakers. Load shedding in this manner will prevent accidental circuit breaker disconnection and loss of power to flight-critical systems.

3.11 COMMUNICATION SYSTEM FAILURE

1	Switches, Controls, Volume	CHECK
2	Frequency	CHANGE
3	Circuit Breakers	CHECK
4	Headset	CHANGE
5	Transmission	ATTEMPT
6	If unsuccessful	TRANSPONDER 7600

3.12 PITOT STATIC MALFUNCTION

Static Source Blocked

If erroneous readings of the static source instruments (airspeed, altimeter and vertical speed) are suspected, the information from the GPS system should be used for situational awareness. Set cabin air ON.

NOTE: Referring to the GPS for flying, adjust indicated airspeed during climb or approach. Use +10 KTS on top of standard procedure as guidance and observe the wind situation.

Pitot Tube Blocked

If only the airspeed indicator is providing erroneous information, and in icing conditions, the most probable cause is pitot ice. Descend into warmer air. If an approach must be made with a blocked pitot tube, use known pitch and power settings and the GPS groundspeed indicator, taking surface winds into account.

1	Groundspeed indicator	+10 KTS for procedures, observe winds

3.13 ELECTRIC TRIM FAILURE

Any failure or malfunction of the electric trim can be overridden by use of the control stick. If runaway trim is the problem, cut the circuit by pulling the circuit breaker and land as soon as conditions permit.

1	Airplane Control	GRASP STICK, MAINTAIN MANUALLY
	If problem is not corrected:	
3	Elevator Trim Circuit Breaker	PULL
4	Throttle Lever	AS REQUIRED
5	Control Stick	MANUALLY HOLD PRESSURE
6	Land	AS SOON AS PRACTICAL

3.14 BATTERY OVERVOLTAGE / MALFUNCTION

If the standard lead-acid battery is installed and overvoltage occurs (over 14.4 V), the battery must be disconnected from the system to prevent adverse effects.

1	MASTER BAT switch	OFF

WARNING: Engine restart is not possible with MASTER BAT switch in OFF position!

The EarthX battery disconnects itself in case of over- or undervoltage.

NOTE: When EarthX battery type is installed, battery over-voltage, low voltage or other battery system malfunctions, are additionally indicated by the Batt Caution light on the switch panel. The rate at which the light flashes, indicates what type of malfunction or error is in question. Please refer to EarthX ETX lithium battery user's manual for additional information about how to troubleshoot any battery errors/malfunctions.

3.15 EXCEEDING V_{NE}

Should the VNE be exceeded, pull the stick gently in order to reduce airspeed and continue flying using gentle control deflections. Land safely as soon as possible and have the aircraft verified for airworthiness by authorized service personnel.

3.16 ICE BUILD-UP

Turn back or change altitude to exit icing conditions. Consider lateral or vertical path reversal to return to last “known good” flight conditions. Maintain VFR flight! Set cabin air/heating ON. Watch for signs of icing on the pitot tube. In case of pneumatic instrument failures, use the GPS information to reference to approximate ground speed. Plan the landing at the nearest airport, or a suitable off airport landing site in case of an extremely rapid ice build-up. Increase the speed to avoid stall.

CAUTION: Maneuver the airplane gently and leave the flaps retracted. When ice is built-up at the horizontal stabilizer, the change of pitching moment due to flaps extension may result of loss of elevator control. Approach at elevated speeds (+15 KTS, also if using the GPS as a reference).

WARNING: Failure to act quickly may result in an unrecoverable icing encounter.

WARNING: If control is lost, it may be necessary to deploy the Ballistic Parachute Rescue System (BPRS).

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3.17

CHECKLISTS

EMERGENCY PROCEDURES

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GROUND EMERGENCIES

ENGINE FIRE DURING ENGINE START	
Fuel Valve	CLOSED
Booster pump	OFF
Brakes	ENGAGE
Once aircraft has stopped:	
Starter	KEEP CRANKING
Throttle Lever	Full Power
If flames are estinguished:	
MAG L / MAG R Switches	OFF
Master BAT & Master GEN	OFF
If flames persist: perform Emergency engine shutdown on Ground and Emergency egress checklist.	

EMERGENCY ENGINE SHUTDOWN	
Throttle Lever	IDLE
MAG L / MAG R Switches	OFF
Fuel Valve	CLOSED
Master BAT & Master GEN	OFF
Booster pump	CHECK OFF

EMERGENCY GROUND EGRESS	
Engine	SHUTDOWN
Brakes / Parking Brake	ENGAGED
Seat Belts	RELEASE
Airplane	EXIT

IN FLIGHT EMERGENCIES

ENGINE FAILURE AT TAKE OFF (LOW ALT)	
Best Glide or Landing Speed (as appropriate)	ESTABILISH (see POH)
Fuel Valve	CLOSED
MAG L / MAG R Switches	OFF
Flaps	as required
Booster pump	OFF
If time permits:	
Throttle Lever	IDLE
Master BAT & Master GEN (just before touch down)	OFF
Seat belts	ensure secured

ENGINE FAILURE IN FLIGHT	
Best Glide Speed	ESTABILISH (64 KIAS)
Fuel Valve	CHECK OPEN
MAG L / MAG R Switches	CHECK ON
Restart the engine in flight:	

ENGINE START IN FLIGHT	
Master BAT	ON
Thottle Lever	10 mm OPEN
Starter (Propeller not windmilling)	ENGAGE
Thottle Lever	Slowly INCREASE
Master GEN (after engine has started)	ON

ENGINE PARTIAL POWER LOSS	
Throttle Lever	Sweep
MAG L / MAG R Switches	Check single MAG switch operation
Land	AS SOON AS POSSIBLE
If engine stops: perform engine failure in flight check-list	

LOW OIL PRESSURE	
Throttle Lever	Minimum Required
Land	AS SOON AS POSSIBLE

SMOKE IN THE COCKPIT	
Cabin Air Selector	ON
Door Vents	OPEN
Fan Toggle Switch	ON
Airflow Direction Knob	Feet position
Temperature Control Knob	Cold
If source of smoke is firewall forward:	
Cabin Air Selector/ Fan Toggle Switch	OFF
Door Vents	As required
Land	AS SOON AS POSSIBLE
If airflow is not sufficient to clear smoke or fumes from cabin:	
Door Vents	OPEN

ENGINE FIRE FLIGHT	
Fuel Valve	CLOSED
Booster pump	OFF
Cabin Air Selector	OFF
Throttle Lever	Full Forward
MAG L / MAG R Switches	OFF
Master BAT & Master GEN (just before touchdown)	OFF
Land (emergency landing)	AS SOON AS POSSIBLE

COCKPIT FIRE IN FLIGHT	
Cabin Air Selector	OFF
Fan Toggle Switch	OFF
Door Vents	As required
MASTER BAT Switch	OFF
MASTER GEN Switch	OFF
Booster pump	OFF
Fire Extinguisher (if available)	ACTIVATE
If airflow is not sufficient to clear smoke or fumes from cabin - When fire extinguished:	
Cabin Air Selector	ON
Green Electrical Switches	OFF
Land	AS SOON AS POSSIBLE

STALL RECOVERY	
Reduce AoA	Control Stick Forward
Throttle Lever	Full Power
Horizontal Flight	Resume

SPIN RECOVERING TECHNIQUE	
Throttle Lever	IDLE
Rudder	Full deflection - direction opposite to the spin
Stick	Forward - lower the nose to build us speed
As rotation stops:	
Rudder	Neutralize
Establish horizontal flight without exceeding g-load or airspeed limitations	

BPRS DEPLOYMENT	
Airspeed	MINIMUM POSSIBLE
MAG L / MAG R Switches (if time/altitude permits)	OFF
Activation Handle	PULL
After Deployment:	
Fuel Valve	CLOSED
Booster pump	OFF
Master BAT & Master GEN	OFF
ELT	ACTIVATE
Seat Belts	TIGHTEN
Loose Items	SECURE
Assume emergency landing body position. After the impact break out the windows to exit if doors are jammed.	

LANDING EMERGENCIES

ENMERGENCY LANDING WITHOUT ENGINE POWER	
Best Glide Speed	ESTABLISH - 64 KIAS
Transponder	SQUAWK 7700
ELT	ACTIVATE
Throttle Lever	IDLE
Fuel Valve	CLOSED
Booster pump	OFF
MAG L / MAG R Switches	OFF
Radio	Transmit (121.5 MHz) MAYDAY giving location and intentions
Flaps (when landing is assured)	+2
Master BAT & Master GEN (just before touchdown)	OFF
Seat Belts	SECURED

DITCHING	
Radio	Transmit (121.5 MHz) MAYDAY
Transponder	SQUAWK 7700
BPRS	ACTIVATE
Doors	UNLATCH before impact with water
Airplane	EVACUATE
Floatation Devices	INFLATE when clear of the airplane

LANDING WITHOUT ELEVATOR CONTROL	
Flaps	+2
Trim	SET 60 KIAS
Throttle Lever	as required for glide angle

LANDING WITH DEFECTIVE BRAKES	
Seat Belts	SECURED
After safe touch-down	
MAG L / MAG R Switches	OFF
Fuel Valve	CLOSED
Booster pump	OFF
Master BAT & Master GEN (just before touchdown)	OFF

GENERATOR FAILURE	
Unnecessary equipment	Switch OFF (to redurce loads)
Voltage	monitor
Land	AS SOON AS PRACTICAL

PITOT STATIC MALFUNCTION	
Refer to GPS for flying:	
Ground speed indicator	+10 KTS for procedures, observe winds

COMMUNICATION FAILURE	
Switches, Controls, Volume	CHECK
Frequency	CHANGE
Circuit Breakers	CHECK
Headset	CHANGE
Transmission	ATTEMPT
If unsuccessful:	
TRANSPONDER	SQUAWK 7600

TRIM / AUTOPILOT FAILURE	
Airplane Control	Graps stick - maintain manually
If problem is not corrected:	
Trim Circuit Breaker	PULL
Throttle Lever	As required
Control Stick	Manually hold pressure
Land	AS SOON AS PRACTICAL

BATT OVERVOLTAGE / MALFUNCTION	
Master BAT Switch	OFF

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SECTION

4

SECTION 4 – NORMAL PROCEDURES

TABLE OF CONTENTS

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4.1 INTRODUCTION

This section provides amplified procedures for normal operation.

CAUTION: The following procedures apply to an aircraft configured with all the optional equipment and systems. Skip steps that do not apply to the specific aircraft if the equipment is not installed. See Chapter 7 for additional information.

4.2 AIRSPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum mass of 550 kg (1212 lbs) and may be used for any lower actual mass. However, to achieve the performance specified in Section 5 for takeoff and landing distance, the speed correction appropriate to the particular mass must be used.

TAKEOFF ROTATION		
Normal	Flaps +1	40-43 KIAS
CLIMB		
Normal	Flaps 0	76 KIAS
Best rate of climb (SL)	Flaps 0	76 KIAS (V_Y)
Best angle of climb (SL)	Flaps 0	58 KIAS (V_X)
LANDING APPROACH		
Normal approach	Flaps +1	60 KIAS
Normal approach	Flaps +2	55 KIAS
GO AROUND		
Full power	Flaps 0 or +1	65 KIAS

Maximum crosswind velocity

Takeoff or landing	18 Knots (9 m/s)

4.3 PREFLIGHT INSPECTION

Before carrying out preflight inspections, ensure that all required maintenance has been performed. Review your flight plan and compute weight and balance.

NOTE: Throughout the walk-around: check all visible hinges, hinge pins, and bolts for security; check skin for damage, condition, and evidence of cracks or delaminations, check all control surfaces for proper movement and excessive free play; check area around liquid reservoirs and lines for evidence of leaking.

In cold weather, remove all frost, ice, or snow from fuselage, wing, stabilizers and control surfaces. Ensure that control surfaces are free of ice or debris. Check that wheels and wheel fairings are free of snow and ice accumulation.

4.3.1 PREFLIGHT WALK-AROUND

CABIN		
1	Doors	UNLOCK/OPEN/ CLOSE/SECURE
2	BPRS handle, pin inserted	CHECK
3	MAG L / MAG R Switches	CHECK OFF
4	Green electrical switches	ALL OFF
5	Required documents	On board
6	Flight Controls, Flap handle	Free and Correct
7	Circuit breakers	IN
8	Master BAT switch	ON
9	Master GEN switch	ON
10	Generator FAIL light	Verify ON
11	Displays	Verify ON
12	Voltmeter	12 - 14 Volts
13	Lights	Check operation
14	Fuel quantity	CHECK
15	Fuel Valve	OPEN

16	Master BAT switch	OFF
17	Master GEN switch	OFF
18	Circuit breakers	CHECK IN

LEFT FUSELAGE		
1	COM/XPDR antennas	Condition and attachment
2	Wing / fuselage seal	CHECK
3	Fuel cap	Check fuel quantity and secure

EMPENNAGE		
1	Tiedown rope	REMOVE
2	Horizontal and vertical stabilizers	CHECK CONDITION
3	Elevator and elevator U-piece	Condition and movement
4	Rudder	Freedom of movement
5	Attachment hinges, bolts, springs and pins	SECURE

RIGHT FUSELAGE		
1	Wing / fuselage seal	CHECK
2	Door lock	Unlock
3	Parachute cover, strap covers	Sealed and secure
4	Fuel system breather	Check for bloackage

RIGHT WING		
1	Flaperon	Condition and movement
2	Flaperon gap seal	Condition, no wrinkles
3	Hinges, bolts and safety nuts	Secured
4	NAV/AC lights	Condition and security
5	Leading edge	CHECK condition
6	Water drain holes	Clean
7	Pitot tube	Cover removed, tube clear

8	Airbrake	CHECK condition

RIGHT MAIN LANDING GEAR		
1	Landing gear	General condition
2	Tire	Condition, inflation, and wear
3	Wheel and brakes	Fluid leaks, evidence of overheating, general condition and wear
4	Wheel Fairing	CHECK attachment
5	Chocks and tiedown rings/ropes	Remove

PROPELLER AND COWLINGS AREA		
1	Cowlings	Attachment secured
2	Propeller	Condition
3	Spinner	Condition, security
4	Air inlets, outlets	Unobstructed
5	Oil system breather	Check for bloackage

WARNING: Keep clear of propeller rotation plane. Do not allow others to approach propeller.

ENGINE AND NOSE LANDING GEAR AREA		
1	Engine oil	Check quantity, leaks, cap and door secure
2	Exhaust pipe	Condition, security and clearance
3	Gascolator	Drain 1 cup, sample
4	Landing light	Attachment, security, lens
5	Strut	CHECK condition
6	Nose landing gear	General condition
7	Wheel and tire	Condition, inflation and wear

8	Wheel Fairing	CHECK attachment
9	Shock absorber	CHECK functionality

LEFT MAIN LANDING GEAR		
1	Landing gear	General condition
2	Tire	Condition, inflation and wear
3	Wheel and brakes	Fluid leaks, evidence of overheating, general condition and wear
4	Wheel Fairing	CHECK attachment
5	Chocks and tiedown rings/ropes	Remove

LEFT WING		
1	Leading edge	Condition
2	NAV/AC lights	Condition and attachment
3	Flaperon	Condition, attachment, movement
4	Flaperon gap seal	Condition, no wrinkles
5	Hinges, bolts and safety nuts	Secure
6	Airbrake	CHECK condition

4.4 STARTING ENGINE

4.4.1 BEFORE STARTING ENGINE

1	Preflight Inspection / Logbook	Completed
2	Fuel quantity	Sufficient
3	Emergency Equipment	On board
4	Passenger	Briefed
5	BPRS Safety Pin	Removed

6	Seats, Pedals, Seat Belts and Baggage net	**Adjust and Secure**
7	Doors	**Closed and latched**

CAUTION: Ensure seat belt harnesses are not twisted.

4.4.2 STARTING ENGINE

If the engine is warm, no choke is required. For the first start of the day and in cold conditions, applying choke will be necessary.

If the airplane will be started using external power, keep all personnel and power unit cables well clear of the propeller rotation plane.

1	Parking brake	**ENGAGE**
2	Fuel Valve	**OPEN**
3	Master BAT switch	**ON**
4	Master GEN switch	**ON**
5	Generator Fail Light	**CHECK ON**
6	Choke	**As required**
7	Propeller Area	**Clear**
8	Throttle Lever	**Open 10 mm**
9	Oil Pressure Indication	**Available**
10	MAG L / MAG R Switches	**ON**
11	Starter	**ENGAGE**

CAUTION: Limit cranking to intervals of 20 seconds with a 20 second cooling period between cranks. This will improve battery and contactor life.

12	Thottle Lever	**Slowly increase, maintain 2000 RPM for two mins, then set 2500 RPM for warm up**
13	Oil Pressure	**Check**
14	Choke	**Slowly close**

15	Engine Parameters	**Monitor**
16	Ammeter/Indication	**Check**
17	Generator Fail Light	**CHECK OFF**
19	NAV/AC Lights	**ON**
19	Booster pump	**ON**

CAUTION: After starting, if the oil gauge does not begin to show pressure within 30 seconds in warm weather and about 60 seconds in very cold weather, shut down engine and investigate cause. Lack of oil pressure indicates loss of lubrication, which can cause severe engine damage. In this time also consider the time the avionics suite needs to start displaying engine information.

4.4.3 BEFORE TAXIING

1	Flaps	**(0)**
2	NAV/COM, GPS, XPDR	**SET as required**
3	Cabin Heating	**As required**
4	ELT	**Armed and CHECK (refer to OEM for periodical testing)**
5	Parking brake	**DISENGAGE**

4.4.4. TAXIING

When taxiing, directional control is accomplished with rudder/steering deflection. Use only as much power as is necessary to achieve forward movement. Deceleration or taxi speed control using brakes but without a reduction in power will result in increased brake temperature and may in extreme cases cause fire. Taxi over loose gravel at low engine speed to avoid damage to the propeller tips.

WARNING: Maximum continuous engine speed for taxiing is 1800 RPM on flat, smooth, hard surfaces. Power settings slightly above 1800 RPM are permissible to start motion, for turf, soft surfaces, and on inclines. Use minimum power to maintain taxi speed.

If the 1800 RPM taxi power limit and proper braking procedures are not observed, the brake system may overheat and result in brake damage or brake fire.

If due to soft terrain a higher RPM setting is required, please consider not to exceed 2500 RPM before a 50° C oil temperature is achieved.

Check the brakes functionality during taxi.

4.4.5 BEFORE TAKEOFF / HOLDING POINT

During cold weather operations, the engine should be properly warmed up before takeoff. In most cases this is accomplished when the oil temperature has reached at least 50° C. In warm or hot weather, precautions should be taken to avoid overheating during prolonged ground engine operation. Additionally, long periods of idling may cause fouled spark plugs.

WARNING: Do not takeoff with frost, ice, snow, or other contamination on the fuselage, wing, stabilizers, and control surfaces.

ENGINE TEST		
1	Brakes	Hold
2	Doors	Latched
3	Choke	Verify closed
4	Throttle Lever	4000 RPM
5	Generator Fail Light	CHECK OFF
6	Voltage	Check value
7	MAG L switch	OFF, note RPM, then ON
8	MAG R switch	OFF, note RPM, then ON

WARNING: RPM drop must not exceed 300 RPM for either ‘’magneto’’ and the difference in drop should not exceed 150 RPM.

9	Engine Parameters	CHECK

10	Throttle lever	Set to just above idle

NOTE: RPM drop must not exceed 300 RPM for either ''magneto'' and the difference in drop should not exceed 150 RPM If there is doubt concerning operation of the ignition system, RPM checks at higher engine speeds will usually confirm whether a deficiency exists. An absence of RPM drop may indicate faulty grounding of one side of the ignition system or magneto timing set in advance of the specified setting.

BEFORE TAKEOFF		
1	Seat Belts	Secure
2	BPRS activation handle	Verify Pin Removed
3	Airbrakes	Check closed *
4	Flaps	Set (+1)
5	Trim	Set neutral
6	Fuel Valve	CHECK OPEN
7	Fuel Quantity	CHECK
8	NAV/AC Lights	As required
9	Landing Light	As required
10	Circuit breakers	CHECK
11	NAV/COM, GPS, XPDR	SET
12	Altimeter	SET
13	Engine Parameters	CHECK
14	Flight Controls	CHECK free and correct

* **WARNING:** Ensure the airbrakes are closed for takeoff! See SPOH-161-00-41-050 Electric airbrakes POH supplement for additional information about use, setting and testing.

4.5 TAKEOFF

4.5.1 POWER CHECK

Check full-throttle engine operation early in takeoff run. The engine should run smoothly and turn approximately 5300-5500 RPM. All engine parameters should read in the green. If power is not developed, abort take-off.

NOTE: For takeoff over a gravel or grass surface, advance power lever slowly. This allows the airplane to start rolling before high RPM is developed, and gravel will be blown behind the propeller rather than pulled into it.

4.5.2 FLAP SETTING

Normal takeoffs are accomplished with flaps set at (+1). For short field Takeoffs (+2) flap setting is possible. Using flaps (0) are permissible, however, no performance data is available for takeoffs in the flaps up configuration. is not approved.

Soft or rough field takeoffs are performed with (+2) flaps by lifting the airplane off the ground as soon as practical in a tail-low attitude. If no obstacles are ahead, the airplane can be accelerated immediately to a higher climb speed, while considering the flap limit airspeed.

Takeoffs into strong crosswinds are normally performed with the flaps set at (+1) to minimize the drift angle immediately after takeoff. With the control column deflected into the wind, accelerate the airplane to a speed slightly higher than normal while decreasing the aileron deflection as speed increases then rotate to prevent possibly settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

NORMAL TAKEOFF		
1	Brakes	**Release**
3	Throttle lever	**Full forward**
4	Engine Parameters	**Check**
5	Airspeed indication	**Check**
6	Elevator Control	**Rotate smoothly at about 40-43 KIAS**
7	At 70 KIAS, Flaps	**(0)**

SHORT FIELD TAKEOFF		
1	Flaps	(+2)
2	Airbrakes	Verify Closed! *
3	Brakes	Hold
5	Throttle Lever	Full forward
6	Engine Parameters	Check
7	Brakes	Release
8	Airspeed indication	Check
9	Elevator Control	Rotate Smoothly at about 40 KIAS
10	Airspeed at Obstacle	58 KIAS
11	At 60 KIAS, Flaps	(+1)
12	At 70 KIAS, Flaps	(0)

* **WARNING:** Ensure the airbrakes are closed for takeoff! See SPOH-161-00-41-050 Electric airbrakes POH supplement for additional information about use, setting and testing.

4.6 CLIMBING

Normal climbs are performed flaps UP (0) and full power at speeds 5 to 10 knots higher than best rate-of-climb speeds. These higher speeds give the best combination of performance, visibility and engine cooling.

CAUTION: RPM above 5500 is limited to 5 minutes!

For maximum rate of climb, use the best rate-of-climb speeds shown in Section 5. If an obstruction dictates the use of a steep climb angle, the best angle-of-climb speed should be used. Climbs at speeds lower than the best rate-of-climb speed should be of short duration to avoid engine-cooling problems.

NOTE: V_X: 58 KIAS [flaps (0)], V_Y: 76 KIAS [flaps (0)]

1	Climb Power/RPM	Set

2	Best Climb Speed	V_Y = 76 KIAS
3	Engine Parameters	CHECK

CAUTION: Avoid prolonged use of more than 75% rudder deflection as this may result in a pitch-down moment. Should this occur, first neutralize rudder to recover.

4.7 CRUISE

Normal cruising is performed between 55% and 75% power.

Recommended cruise is at 5300 rpm, with an expected fuel burn of around 13.6 l/h (3.6 US gal /h).

1	Flaps	(0)
2	Booster pump	OFF
3	Cruise Power	SET
4	Engine Parameters	CHECK

CAUTION: Should you experience turbolence, reduce airspeed below V_{NO}.

4.8 DESCENT/APPROACH

1	Altimeter	Set
2	Cabin Heating	As required
3	Landing Light	ON
4	Fuel System	CHECK
5	Engine Parameters	CHECK
6	Parking brake	CHECK Disengaged
7	Seat Belts	Secure

4.9 BEFORE LANDING

1	Approach Speed	Reduce below 70 KIAS

2	Flaps	As required (+1)
3	Booster pump	ON
4	Flaps (on final)	(+2) below 60 KIAS
5	Airbrakes (on final)	As required *
6	Trim	As required
7	Final Speed	55 KIAS

* **WARNING:** Ensure the airbrakes are closed in event of go around maneuver! See SPOH-161-00-41-050 Electric airbrakes POH supplement for additional information about use, setting and testing.

4.10 LANDING

CAUTION: Landings should be made with full flaps. Glideslope should be controlled with throttle. Landings with less than full flaps are recommended in crosswinds or if the flaps fail to deploy, or to extend the aircraft's glide distance due to engine malfunction.

NOTE: For flapless approach and landing increase speeds by 5 kts.

NOTE: Flapless landings are permitted only during day-time operations.

NOTE: Airbrakes can be used for landing. See SPOH-161-00-41-050 Electric airbrakes POH supplement - for additional information about use, setting and testing.

Normal Landing

Normal landings are made with full flaps and airbrakes with power on or idle. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds (60 - 65 KIAS).

Actual touchdown should be made with power idle and on the main wheels first to reduce the landing speed and subsequent need for braking. Gently lower the nose wheel to the runway after airplane speed has diminished. This is especially important for rough or soft field landings.

Short Field Landing

For a short field landing in smooth air conditions, make an approach at 60 KIAS with full flaps and fully extended airbrakes using enough power to control the glide path (slightly higher approach speeds should be used under turbulent air conditions). After all approach obstacles are cleared, progressively reduce power to reach idle just before touchdown and maintain the approach speed by lowering the nose of the airplane. Touchdown should be made power idle and on the main wheels first. Immediately after touchdown, lower the nose wheel and apply braking as required. For maximum brake effectiveness, retract the flaps, hold the control stick full back, and apply maximum brake pressure without skidding. Keep airbrakes open until reaching taxi speeds.

Crosswind Landing

Normal crosswind landings are made with (+1) flaps. Avoid prolonged slips. After touchdown, hold a straight course with rudder. The maximum allowable crosswind velocity is dependent upon pilot capability as well as aircraft limitations. Crosswind landings require higher final approach speed to ensure maneuverability. Increase the approach speed by 1 kts for every 1 kts of crosswind component.

Max Crosswind Component:	**18 Kts (9 m/s)**

4.11 BALKED LANDING

In a balked landing (go around), apply full power and pitch up (climb), then close airbrakes*, then reduce the flap setting to (+1). If obstacles must be cleared during the go around, climb at 57-60 KIAS with (+1) flaps. After clearing any obstacles, retract the flaps and accelerate to the normal climb speed.

1	Throttle Lever	**Check Full Forward**
2	Airbrakes	**Close ***
3	Flaps	**(+1)**
4	Airspeed	**57 - 60 KIAS**

After clear of obstacles:

5	Flaps	**(0)**
6	Airspeed	**Best climb speed V_Y (76 KIAS)**

* **WARNING:** Ensure the airbrakes are closed immediately after the go around is initiated! See SPOH-161-00-41-050 Electric airbrakes POH supplement for additional information about use, setting and testing.

4.12 AFTER LANDING

1	Throttle Lever	**IDLE**
2	Flaps	**(0)**
3	Booster pump	**OFF**
4	Transponder	**STBY**
5	Lights	**As required**
6	Airbrakes	**Close at taxi speed**

4.13 SHUT DOWN

Leave the engine running at idle RPM for a minute in order to cool it down.

1	Green electrical switches	**All OFF**
2	Throttle lever	**IDLE**
3	MAG L / MAG R Switches	**OFF**
4	Master GEN switch	**OFF**
5	Master BAT switch	**OFF**
6	BPRS safety pin	**Insert**
7	ELT	**Transmit Light OUT**

NOTE: After a hard landing, the ELT may activate. If this is suspected, press the RESET button.

4.14 PARKING

1	BPRS safety pin	CHECK Inserted, secured
2	Parking brake	Engaged only if necessary
3	Fuel Valve	CLOSED
4	Chocks, Tie-downs, Pitot Covers	As required

4.15 SOFT FIELD OPERATIONS

As described in 4.5.2. and 4.10.

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4.16

CHECKLISTS

NORMAL PROCEDURES

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PREFLIGHT WALK-AROUND

CABIN	
Doors	UNLOCK/OPEN/ CLOSE/SECURE
BPRS Handle / Pin	CHECK, Pin inserted
MAG L / MAG R Switches	CHECK OFF
Green Electrical Switches	ALL OFF
Required Documents	On Board
Flight Controls, Flaps	Free and Correct
Circuit Breakers	IN
Master BAT	ON
Master GEN	ON
Generator Fail light	Verify ON
Displays	Verify ON
Voltmeter	12 - 14 V
Lights	CHECK operation
Fuel Quantity	CHECK
Fuel Valve	OPEN
Master BAT	OFF
Master GEN	OFF
Circuit Breakers	CHECK IN

LEFT FUSELAGE	
COM/XPDR antennas	Condition and attachment
Wing / Fuselage Seal	CHECK condition
Fuel cap	CHECK fuel quantity and secure
EMPENNAGE	
Tiedown Rope	Remove
Horizontal and Vertical Stabilizers	CHECK condition
Elevator and Elevator U-Piece	Condition and movement
Rudder	Condition and movement
Hinges, Bolts, Springs and Pins	Secure
RIGHT FUSELAGE	
Wing / Fuselage Seal	CHECK
Door Lock	Unlock
Parachute cover, strap covers	Sealed and secure
Fuel system breather	CHECK for blockage
RIGHT MAIN LANDING GEAR	
Landing Gear	CHECK condition
Tire	Condition, inflation and wear
Wheel and brake	Fluid Leaks, evidence of overheating, general condition and wear
Wheel Fairing	CHECK attachment
Checks and Tiedown rings / ropes	REMOVE

RIGHT WING	
Flaperon	Condition and movement
Flaperon Gap Seal	CHECK condition, no wrinkles
Hinges, Bolts, Safety Nuts	CHECK condition and secured
NAV/AC lights	CHECK condition
Leading Edge	CHECK condition
Water Drain Holes	Clean
Fuel Cap	CHECK quantity and secure
Pitot Tube	Cover REMOVED Tube clear
Airbrake	CHECK condition

PROPELLER AND COWLINGS AREA	
Engine Cowlings	Attachment secured
Propeller	CHECK condition
Spinner	Condition, attachment
Air inlets and Outlets	Unobstructed
Oil system breather	CHECK for blockage

ENGINE AND NOSE LANDING GEAR AREA	
Engine Oil	CHECK quantity, leaks, cap and door secured
Exhaust Pipe	CHECK and condition
Gascolator	Drain 1 cup, sample
Landing Light	Attachment and condition
Nose Landing Gear	CHECK condition
Strut	CHECK condition
Wheel and Tire	Condition, inflation and wear
Wheel Fairing	CHECK attachment
Shock Absorber	CHECK functionality
LEFT MAIN LANDING GEAR	
Landing Gear	CHECK condition
Tire	Condition, inflation and wear
Wheel and brake	Fluid Leaks, evidence of overheating, general condition and wear
Wheel Fairing	CHECK attachment
Checks and Tiedown rings / ropes	REMOVE

LEFT WING	
Leading edge	Condition
NAV/AC lights	Condition and attachment
Flaperon	Condition, attachment, movement
Flaperon gap seal	Condition, no wrinkles
Hinges, bolts and safety nuts	Secure
Airbrake	CHECK condition

STARTING ENGINE

BEFORE STARTING ENGINE	
Preflight Inspection / Logbook	Completed
Fuel Quantity	Sufficient
Emergency Equipment	On board
Passenger	Briefed
BPRS Safety Pin	Removed
Seats, Pedals, Seat belts and Baggage	Adjust and Secure
Doors	Closed and latched
STARTING ENGINE	
Parking Brake	ENGAGE
Fuel Valve	OPEN
Master BAT switch	ON
Master GEN switch	ON
Generator Fail Light	CHECK ON
Chocke	As required
Propeller Area	Clear
Throttle Lever	Open 10 mm
Oil Pressure Indication	Available
MAG L / MAG R Switches	ON
Starter	ENGAGE

STARTING ENGINE (continue)	
Throttle Lever	2000 RPM for 2 mins then 2500 RPM for warm up
Oil Pressure	CHECK
Choke	Slowly close
Engine Parameters	Monitor
Ammeter / Indication	CHECK
Generator Fail Light	CHECK OFF
NAV/AC Lights	ON
Booster pump	ON

BEFORE TAXIING	
Flaps	(0)
NAV/COM, GPS, XPDR	SET as required
Cabin Heating	As required
ELT	CHECK (refer to OEM)
Parking Brake	DISENGAGE

BEFORE TAKEOFF

ENGINE TEST	
Brakes	HOLD
Doors	Latched
Choke	Verify CLOSED
Throttle Lever	4000 RPM
Generator Fail Light	CHECK OFF
Voltage	CHECK Value
MAG L switch	OFF, note RPM, then ON
MAG R switch	OFF, note RPM, then ON
Engine Parameters	CHECK
Throttle Lever	Set to just above idle
BEFORE TAKEOFF	
Seat Belts	Secured
BPRS Activation Handle	Verify Pin Removed
Airbrakes	CHECK Cloesed
Flaps	(+1)
Trim	Set Neutral
Fuel Valve	CHECK OPEN
Fuel Quantity	CHECK

BEFORE TAKEOFF (continue)	
NAV / Strobe / Landing Lights	As required
Circuit Breakers	CHECK
NAV/COM, GPS, XPDR	SET
Altimeter	SET
Engine Parameters	CHECK
Flight Controls	Unobstructed and Correct

TAKEOFF

NORMAL TAKEOFF	
Brakes	Release
Throttle Lever	Full Forward
Engine Parameters	CHECK
Airspeed Indication	CHECK
Elevator Control	Rotate smoothly at 40-43 KIAS
at 70 KIAS, FLAPS	(0)

SHORT FIELD TAKEOFF	
Flaps	(+2)
Brakes	HOLD
Throttle Lever	Full Forward
Engine Parameters	CHECK
Brakes	Release
Airspeed Indication	CHECK
Elevator Control	Rotate smoothly at about 40 KIAS
Airspeed at Obstacle	58 KIAS
at 60 KIAS, FLAPS	(+1)
at 70 KIAS, FLAPS	(0)

CLIMB	
Climb Power / RPM	SET
Flaps	Verify (0)
Engine Parameters	CHECK
Best Climb Speed (V_Y)	76 KIAS

CRUISE (continue)	
Flaps	Verify (0)
Booster pump	OFF
Cruise Power	SET
Engine Parameters	CHECK
DESCENT / APPROACH	
Altimeter	SET
Cabin heating	As required
Landing Light	ON
Fuel System	CHECK
Engine Parameters	CHECK
Parking Brake	CHECK Disengaged
Seat Belts	Secure
BEFORE LANDING/LANDING	
Approach Speed	Reduce below 70 KIAS
Flaps	As required (+1)
Booster pump	ON
Flaps (on final)	(+2) below 60 KIAS
Airbrakes (on final)	As required
Trim	As required
Final Speed	55 KIAS

BALKED LANDING	
Throttle Lever	Full Forward
Airbrakes	CLOSE
Flaps	(+1)
Airspeed	57 - 60 KIAS
After Clear of Obstacles:	
Flaps	(0)
Airspeed V_y	76 KIAS

AFTER LANDING	
Throttle Lever	IDLE
Flaps	(0)
Booster pump	OFF
Transponder	STBY
Lights	As required
Airbrakes	Close at taxi speed

SHUT DOWN	
Green electrical switches	All OFF
Throttle lever	IDLE
MAG L / MAG R Switches	OFF
Master GEN switch	OFF
Master BAT switch	OFF
BPRS safety pin	Insert
ELT	Transmit Light OUT

PARKING	
BPRS Safety Pin	CHECK Inserted / Secured
Parking Brake	ENGAGED Only if necessary
Fuel Valve	CLOSED
Pitot Covers	Installed
Chocks, Tie-downs	As required

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SECTION

5

SECTION 5 – PERFORMANCE DATA

TABLE OF CONTENTS

5.1. INTRODUCTION

The performance tables and diagrams on the following pages show the performance of the airplane. The data presented in these tables and diagrams has been derived from test–flights using an airplane and engine in good operating condition, and was corrected to standard atmospheric conditions 15° C and 1013.25 mbar at sea level.

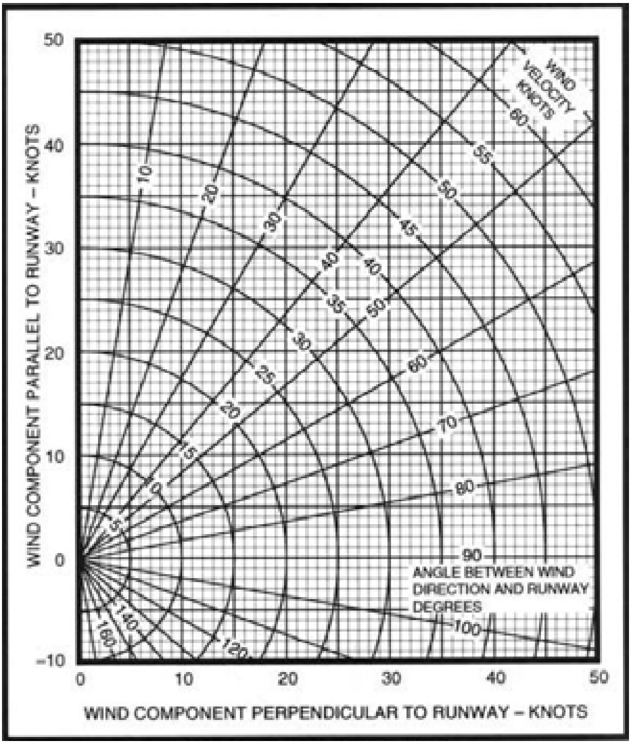
The performance tables do not take into account the expertise of the pilot or the maintenance condition of the airplane. The performance illustrated in the tables can be achieved if the indicated procedures are followed and the airplane is in good maintenance condition.

Some undefined variables such as the operating condition of the engine, contamination of the aircrafts surface, or turbulence could have influences on flights distance and flights duration. For this reason, it is of utmost importance that all available data is used when calculating the required amount of fuel for a flight.

5.2. OUTSIDE AIR TEMPERATURE FOR ISA-CONDITION

Pressure Altitude [ft]	ISA-40° C	ISA-20° C	ISA	ISA+10° C	ISA+20° C
SL	-25	-5	15	25	35
1000	-27	-7	13	23	33
2000	-29	-9	11	21	31
3000	-31	-11	9	19	29
4000	-33	-13	7	17	27
5000	-35	-15	5	15	25
6000	-37	-17	3	13	23
7000	-39	-19	1	11	21
8000	-41	-21	-1	10	20
9000	-43	-23	-3	7	17
10000	-45	-25	-5	5	15
11000	-47	-27	-7	3	13
12000	-49	-29	-9	1	11
13000	-51	-31	-11	-1	9
14000	-53	-33	-13	-3	7
15000	-55	-35	-15	-5	5
16000	-57	-37	-17	-7	3
17000	-59	-39	-19	-9	1
17500	-60	-40	-20	-10	0
18000	-61	-41	-21	-11	-1

5.3. WIND COMPONENT



EXAMPLE:

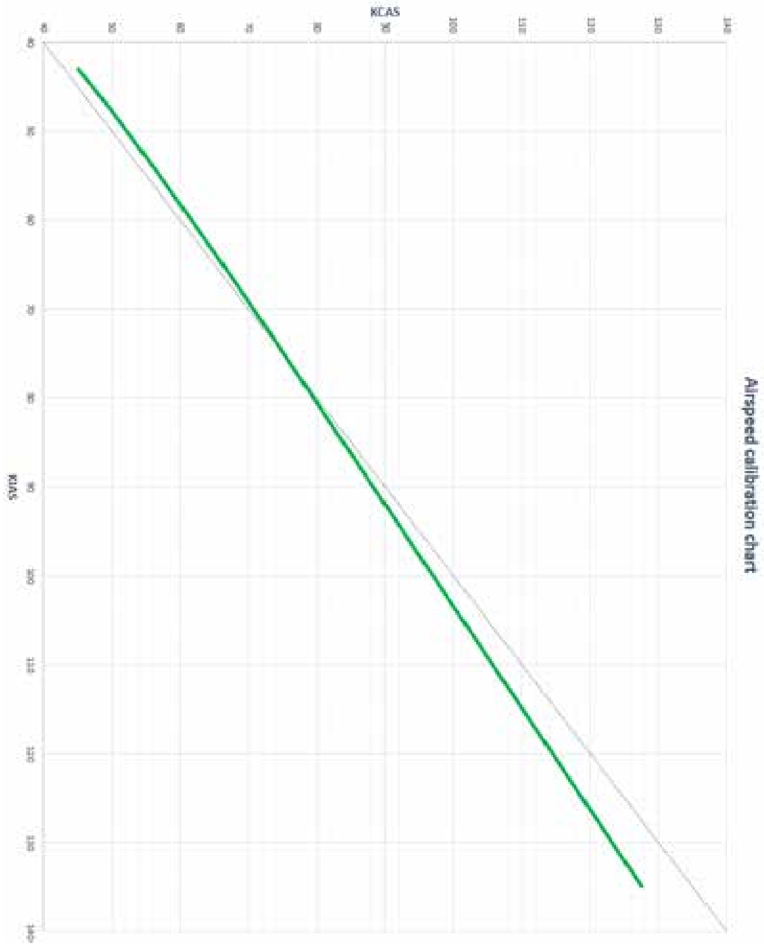
Runway Heading:	10°
Wind Direction:	60°
Angle between wind and runway:	50°
Wind Velocity:	15 Knots
Component parallel:	~9,6 Knots
Component perpendicular:	~11,5 Knots

5.4. AIRSPEED CALIBRATION

KIAS/KCAS Diagram

<u>Conditions</u>
Power: power level for level flight, or max. continuous power whichever is less

The IAS-CAS relation is shown in the graph below:



5.5. STALL SPEED

Conditions

Power: idle
Attitude: level flight
Weight: MTOM (1212 lbs / 550 kg)

NOTE: The recovery altitude necessary is very dependent on the tempo of recovery.

Typical loss of altitude for recovery:	
Slow recovery without power:	150-250 ft
Normal recovery with power:	100 ft
Aggressive recovery	less than 100 ft
Normal recovery with extended airbrakes	150 ft

Depending on pilot skill the altitude loss during wings level stall may be 250 feet or more.

NOTE: KIAS values may not be accurate at stall.

STALL SPEED		
Flaps (+0)	Flaps (+1)	Flaps (+2)
KIAS	KIAS	KIAS
43	40	37

5.6. TAKE-OFF

5.6.1. TAKE-OFF PERFORMANCE

Conditions		
	Weight:	MTOM (1212 lbs / 550 kg)
	Power:	throttle full open
	Flaps:	(+1)
	Runway:	dry, paved and level
	Wind:	calm

Conditions		**DISTANCE** [ft] / *[m]*
SL 15° C/ISA	**Ground roll (MTOM)**	555 / *170*
	50 ft / 15 m obstacle	870 / *265*

NOTE: In order to meet the data for takeoff runway lenght over 50 ft / 15m obstacle maintain Vx (58 KIAS) after takeoff.

CAUTION: Soft (grass) runways increase the published takeoff performance data by 20%.

Takeoff performance may vary depending on the wind, temperature, elevation and wing/propeller surface condition.

CAUTION: Calculating take-off performance in hot atmosphere, it is mandatory to consider the takeoff runway length prolongs as follows:
L = 1,10 • (Lh + Lt - L0).
Abbreviations are as follows:
Lh = takeoff runway length at present elevation, ISA standard conditions.
Lt = takeoff runway length at sea level at same temperature/wind as on the given location.
L0 = zero wind takeoff runway length at 15°C at sea level.
e.g. if outside temperature is 25°C and you are on 500 m elevation, your takeoff runway length will be: L = 1,10 • (Lh + Lt - L0) = 1,10 • (205 m + 215 m - 180 m) = 264 meters.

5.6.2. EFFECTS OF ELEVATION

The table below provides data about the effect of elevation on takeoff runway lenght.

DISTANCE [ft] / *[m]*	RUNWAY ELEVATION			
	0 ft / m	1650 ft/ 500 m	3280 ft/ 1000 m	4920 ft/ 1500 m
Atm. pressure	29.92 inHg 1013 hPa	28.17 inHg 954 hPa	26.52 inHg 898 hPa	24.95 inHg 845 hPa
Outside temperature	59 °F / 15 ° C	53 °F / 11.7 ° C	47 °F / 8.5 ° C	41 °F / 5.2 ° C
Ground roll	555 / *170*	700 / *213*	870 / *265*	1090 / *332*
50 ft / 15 m obstacle	870 / *265*	1035 / *316*	1295 / *395*	1420 / *433*

5.6.3. EFFECTS OF OUTSIDE AIR TEMPERATURE

The table below provides data about the effect of outside air temperature on takeoff runway lenght. Data is referenced for sea level (SL) performance at MTOM.

DISTANCE [ft] / *[m]*	OUTSIDE AIR TEMPERATURE				
	32 °F / 0 °C	50 °F / 10 °C	59 °F / 15 °C	68 °F / 20 °C	77 °F / 25 °C
Ground roll	455 / *140*	490 / *150*	555 / *170*	670 / *205*	820 / *250*
50 ft / 15 m obstacle	785 / *240*	835 / *255*	870 / *265*	965 / *295*	1045 / *320*

DISTANCE [ft] / *[m]*	OUTSIDE AIR TEMPERATURE			
	86 °F / 30 °C	95 °F / 35 °C	104 °F / 40 °C	113 °F / 45 °C
Ground roll	935 / *285*	1020 / *310*	1040 / *317*	1110 / *338*
50 ft / 15 m obstacle	1280 / *390*	1410 / *430*	1490 / *455*	1640 / *500*

5.6.4. EFFECTS OF THE WIND

Wind (head, cross or tailwind) affects aircraft's ground speed (GS).

Headwind on takeoff or landing causes the takeoff and landing distance length to shorten as the GS is slower during these two flight stages. The opposite holds true for tailwind on takeoff and landing as tailwind increases takeoff and landing distances significantly.

The table below provides data about the effect of the wind (headwind "+", tailwind "-") on takeoff runway lenght. Data is referenced for sea level (SL) performance at MTOM.

DISTANCE [ft] / *[m]*	**WIND SPEED**						
	-6 kts	**-4 kts**	**-2 kts**	**0 kts**	**+4 kts**	**+8 kts**	**+12 kts**
Ground roll	680 / *270*	645 / *197*	605 / *184*	555 / *170*	525 / *160*	495 / *151*	480 / *146*
50 ft / 15 m obstacle	1130 / *345*	1065 / *325*	965 / *294*	870 / *265*	810 / *247*	760 / *232*	720 / *220*

WARNING: Tailwind affects takeoff and landing performance by more than twice as much as headwind does.

Headwind shortens takeoff and landing distances by 25 feet with every 3 kts of wind increase (e.g. provided there is a 6 kts headwind on takeoff and landing, distances will be approximately 50 ft (16 meters) shorter than ones published in the manual).

Tailwind increases takeoff and landing distances by 60-65 feet with every 3 kts wind increase (e.g. provided there is a 6 kts tailwind on takeoff or landing, distances will be approximately 120-130 feet longer then ones published in the manual).

CAUTION: The maximum allowed crosswind component speed on takeoff and landing is 18 kts (33 km/h). In these conditions it is recommended not to takeoff with flaps positioned at +2.

CAUTION: The runway length required increases by 10 % for every 5 kts of crosswind component.

5.7. CLIMB

5.7.1. CLIMB PERFORMANCE

Climb performance may vary depending on, temperature, altitude, humidity and wing propeller surface condition.

Conditions	Power:	throttle full open
	Weight:	MTOM (1212 lbs / 550 kg)
	Flaps:	(0)

Best Climb Speed (V_Y)	**76 KIAS**
Best Climb rate	**1220 ft/min**
Climb rate at 100 KIAS	**800 ft/min**
Best Angle Climb Speed (V_x)	**58 KIAS**

5.7.2. EFFECTS OF OUTSIDE AIR TEMPERATURE

For every 5°C of OAT increase versus ISA, the climb rate decreases by 60 ft/min.

5.7.3. EFFECTS OF ELEVATION

The table below provides data about the effect of elevation on climb rate at best climb speed (V_Y) at MTOM.

ALTITUDE:	**CLIMB RATE:**
0 ft /m	**1220 ft/min**
1600 ft / *500 m*	**1180 ft/min**
3300 ft / *1000 m*	**1100 ft/min**
5000 ft / *1500 m*	**1020 ft/min**

NOTE: Climb rate is measured at max continuous power (5500 RPM), flaps (0) at V_Y and MTOM.

5.8. CRUISE

5.8.1. CRUISE PERFORMANCE

Conditions	Weight:	MTOM (1212 lbs / 550 kg)
	Temperature:	ISA
	Wind:	zero
	Altitude:	sea level
	Flaps:	(0)

Reference cruise parameters:

RPM	KIAS	FF [US gal] / *[liter/h]*	ENDURANCE
5300	100	3.6 / *13.6*	3 hrs + 30 min reserve

NOTE: Best economy cruising level for the ALPHA Trainer is 6000 ft. There, cruise performance is equivalent or better than above due to IAS-TAS relation, but fuel consumption is lower. At these parameters the fuel burn is around 13.6 litres per hour. For detailed fuel consumption determination for various cruising regimes consult the Rotax 912 Operators manual.

5.8.2. EFFECTS OF OUTSIDE AIR TEMPERATURE

For every 10°C of OAT increase versus ISA, the cruising speed at 5300 RPM decreases by 3 kts.

5.9. DESCENT

Reference values:

Sink rate - 58 KIAS - flaps (0)	**460 ft/min**
Best L/D ratio speed - flaps (0)	**64 KIAS**
Best L/D ratio - flaps (0)	**15:1**

5.10. LANDING

5.10.1. LANDING PERFORMANCE

Conditions		
	Weight:	MTOM (1212 lbs / 550 kg)
	Wind:	zero
	Runway:	dry, level and paved
	Flaps:	(+2)
	Airspeed:	55 KIAS

CAUTION: Minimum recommended runway length for approaches is 1640 feet (500 m) with no obstacles inside the 3 deg glide slope area and runway heading in order ensure safe flying activity. Use of shorter strips should be considered a major exception and requires a lot of skill, heavy use of slipping until the last moment before touchdown and is performed at own risk.

PRESSURE Altitude [ft]	DISTANCE [ft] / *[m]*	
SL	**Ground roll**	410 / *125*
	50 ft / 15 m obstacle	1510 / *460*

CAUTION: Landing roll increases by 10 % for every 2000 ft increase in density altitude.
CAUTION: Total landing distance increases by 2% for every 2000 ft increase in density altitude.

5.10.2. CROSSWIND LANDINGS

The maximum allowed crosswind component speed on landing is 18 kts (33 km/h). Normal crosswind landings are made with flaps extended to +1. Avoid prolonged slips. After touchdown, hold a straight course with rudder. Only in case of high crosswind component it is permitted to land with flaps retracted (0°).

CAUTION: The runway length required increases by 10 % for every 5 kts of crosswind component.

5.11. NOISE CHARACTERISTICS

According to independent testing performed by German LBA-LTF noise regulations the airplanes, the equivalent exhibited noise measures 55.8 dBa. Noise is measured on the ground when the airplane overflies at 500 ft at full power, at speed of best climb. Measures have been taken to make the cockpit exceptionally quiet on the inside as well.

SECTION

6

SECTION 6 – WEIGHT AND BALANCE

TABLE OF CONTENTS

6.1 INTRODUCTION

This section provides information about how to calculate the takeoff weight and C.G. of the aircraft. Once calculated, these two values can be used to find a point on the weight and balance chart (see section 6.3) and thus determine whether aircraft is within the flight limits (see section 2.6). A sample calculation is provided for reference.

WARNING: It is the owner and/or operator's responsibility to ensure the aircraft's takeoff weight and C.G. are within the envelope presented in the weight and balance chart (see section 6.3).

NOTE: The aircraft's empty weight and empty weight C.G. are the starting point for all takeoff calculations. Please refer to the aircraft's weight and balance report for the current empty weight data.

6.2 C.G. SAMPLE CALCULATION

The calculation below is an example of how to calculate the aircraft's takeoff weight and C.G.. Except for the arm values in *italic* font, the values do not apply to any particular aircraft and are for illustration purposes only. The arm values in *italic* font are accurate and shall be used for any preflight calculations. The calculation results (i.e. Total weight and C.G.) shall be entered into the weight and balance chart in section 6.3, to determine whether the aircraft is within the flight limits prescribed in section 2.6.

NOTE: Calculate the moment for each item by multiplying its weight by its arm. Add up the moments to get the total moment and then divide by the total weight to get the C.G..

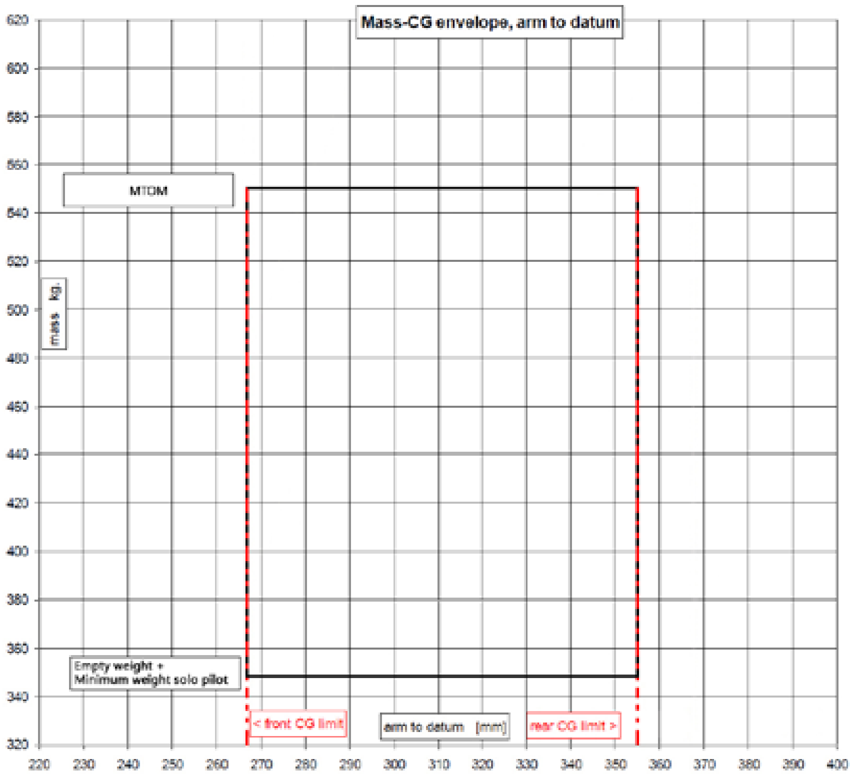
	WEIGHT	**ARM**	**MOMENT**
	[lbs] (*[kg]*)	**[inches]([mm])**	**[lbs*inches] ([kgmm])**
Aircraft empty weight	647.6 (293.6)*	10 (254)*	6476 (74574.4)
Pilot	154 (70)	*14.5 (370)*	2233 (25900)
Co-pilot	176 (80)	*14.5 (370)*	2552 (29600)
Fuel	79 (36)	*44.5 (1130)*	3515.5 (40680)
Baggage compartment	22 (10)	*36.6 (930)*	805.2 (9300)
Total weight / moment	1078.6 (489.6)	-	15581.7 (180054.4)
C.G.	-	14.4 (367.8)	-

* These values are to be obtained from the applicable aircraft's weight and balance report.

NOTE: $CG_{\%MAC} = 100 \times (CG_{mm} - 40) / 900$.

6.3 WEIGHT AND BALANCE CHART

The chart below shows the ALPHA Trainer's mass-CG envelope. Once the aircraft's takeoff weight and C.G. have been calculated, they can be used to find a point in the chart and determine whether or not the aircraft is within the flight limits.



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SECTION

7

SECTION 7 – AIRPLANE DESCRIPTION

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7.1 INTRODUCTION

This section provides a basic description and operation of the standard airplane and its systems. Optional equipment described within this section is identified as optional.

7.2 AIRCRAFT STRUCTURE

7.2.1 FUSELAGE

The fuselage is designed as a carbon fiber honeycomb-sandwich construction using aramide as inner laminate in the cockpit area. The main bulkhead is designed as a carbon / honeycomb sandwich. The undercarriage is attached directly to the engine mount, which is attached to the main bulkhead. The firewall is made out of CFRP prepreg honeycomb sandwich. It has a ceramic insulation with stainless steel sheet on top. In the baggage compartment there is a CFRP container for the ballistic rescue system. Primary and secondary control rods are covered by CFRP fairings to protect them from luggage. The baggage compartment floor is made out of CFRP. It is bolted to the bulkheads and to the CFRP tunnel, that covers the elevator control rod. The back rest is made out of GFRP and fixed to the bulkhead by velcro for easy access to the baggage compartment. The cabin floor is also the lower seat structure and made out of CFRP with aramide. The external structure is covered by a protective acrylic paint coating, which has already been applied in the mold.

7.2.2 WINGS

The detachable wing is a single spar cantilever wing. The left and right wing are connected by two bolts through the spar ends. The wing structure is made mostly from carbon fibre. The main spar shear web and the root ribs are made from glass fibre. This is for visual inspection and easier damage detection reasons. The spar caps are produced using carbon roving. The wing spar is designed as double-T-type spar. Lateral loads and twisting moments are conventionally transferred to the fuselage through root ribs and lateral-force bolts. The wing shell is designed as a 2-cell CFRP sandwich shell which is closed by a rear shear web to which the flaperons are attached. The wings are connected as it is classic with gliders by two spar ends being connected with two main bolts. There is also the third middle bolt to provide torsion stiffness mating the wings to the fuselage.

The wings attach with shear pins to bushes at the fuselage root ribs. Each wing half can be optionally equipped with glider type electric airbrakes.

7.2.3 EMPENNAGE

The empennage consists of a horizontal stabilizer, a single piece elevator, a vertical fin and a rudder. All of the empennage components are conventional spar (shear web) and skin construction.

The horizontal stabilizer is attached to an aluminum bracket that is pivoted to the vertical stabilizer and can be removed. The shell of the horizontal tail is designed as CFRP sandwich. The horizontal tail is attached to an aluminum bracket at the back C-spar and a self locking bolt at the location of the front C-spar.

The elevator is designed as a bottom surface supported hinged flap. The elevator is actuated through a pushrod connected to the elevator control bracket. The elevator shell is designed as a 1-cell CFRP sandwich shell. The elevator is hinged in maintenance-free bushings mounted on stainless steel brackets at the stabilizer rear spar and bottom shell. Counterbalance weights are integrated into the elevator tips.

The vertical fin is designed to be one part with the tail fuselage, made of carbon honeycomb sandwich with carbon spars. The bending moment is carried by one C-type spar which is reinforced by CFRP tapes at the flanges.

The rudder is designed as a centrally supported hinged flap. The rudder shell is designed as single-cell GFRP sandwich shell. The rudder is hinged in two maintenance-free spherical plain bearings. Balancing weights are mounted at the front end of the rudder.

7.3 FLIGHT CONTROL SYSTEM

The aircraft uses conventional flight controls for ailerons, elevator and rudder. The control surfaces are pilot controlled through either of two control sticks positioned centrally in front of each pilot. The location and design of the control sticks allow easy, natural use by the pilots. The control system uses a combination of push rods, cables and bell cranks for control of the surfaces.

Pitch trim is available through an electric button located on the instrument panel.

7.3.1 ELEVATOR CONTROL SYSTEM

The sticks are mounted on a common lateral rod which actuates the elevator longitudinal pushrod, running the length of the fuselage behind the cockpit control levers. A bell-crank is located on the bottom side of the vertical fin and can be inspected through a provision in the vertical stabilizer end-rib. The hook-up to the elevator is via a U-member which conforms to the shape of the elevator. In case the horizontal tail plane is removed the U-member remains attached to the fuselage whereas the elevator remains attached to the horizontal stabilizer. There are no cables in the pitch control system.

7.3.2 AILERON CONTROL SYSTEM

Roll control is achieved by torsional activation of flaperon control surfaces via an all-pushrod mechanisms. A conventional center control stick is available to each pilot. The sticks are mounted on a common lateral rod which actuates the elevator longitudinal pushrod. There is a bell-crank located on the bottom of the fuselage behind the seats which provides differential motion. The flap handle is connected to this bell-crank, allowing for symmetric displacement of flaperons.

7.3.4 RUDDER CONTROL SYSTEM

Rudder pedals are available to each pilot and are adjustable in-flight in a fore-aft sense. Metal cables in teflon-coated bowdens run from the individual pedal to bellcranks located behind the seats and below the cargo compartment floor. Single cables run from the cable junction backwards and are attached directly to the rudder. The tension of the cables is adjusted with cable tensioners and rudder neutralisation is achieved by means of two retaining springs attached to the bellcranks junctions.

The nose wheel is part of the yaw control system and is moved whenever the pedal is pressed. Cables for nosewheel steering run from the bellcranks behind the seats forward to the nosewheel hinge element, where a anti-shimmy damper is also connected to.

7.3.5 WING FLAPS CONTROL SYSTEM

There are no separate flap control surfaces in place. Function of flaps is achieved through symmetric deflections of the flaperons.

The flaps are hand activated through a lever common to both pilots, located between the seats. The handle is spring locked in 3 positions, corresponding to flap deflections of 0°, +9°, +19°. The positions are denominated (0), (+1), (+2) respectively. The thumb-lock button prevents inadverted handle movement. The backside of the flap handle connects to the main flaperon bell-crank.

7.3.6 AIRBRAKES CONTROL SYSTEM (optional)

Schempp-Hirth Style electric (servo-operated) airbrakes are activated by a control switch on the instrument panel.

CAUTION: The system must be operated according the procedures and limitations explained in the following document *SPOH-161-00-41-050_Electric airbrakes POH supplement.*

7.3.7 ELEVATOR TRIM SYSTEM

Spring type elevator trim is activated by a linear servo motor assembly located behind the luggage compartment. The motion of the linear servo is controlled through a cockpit switch and an integral position sensor. Trim position is indicated with discrete steps on a dedicated LED display on the instrument panel.

7.4 LANDING GEAR

7.4.1 MAIN GEAR

The landing gear is a conventional, fixed tricycle type. The main landing gear consists of a single composite landing gear strut made of glass fibre. The strut is composed by two parallel elements producing a semi-redundant structure and allowing for predictable locations of stress points. The tube-less type wheel tire is 4.00 x 6. Wheel track is 1.60 m, wheel base 1.58 m. Inflate to 40 psi (2.8 bar).

7.4.2 NOSE GEAR

The nose landing gear is supported from the main engine frame. The nose landing gear is steerable, connected to the rudder pedal control system and incorporates an oil-spring damper element. All wheels can be equipped with aerodynamic fairings made of CFRP. The tube-type nosewheel tire is 4.00 x 4. The nose gear is steerable. It is always connected to the rudder pedal control system. The suspension is a spring-type oleo-strut. The main tube of the strut and the fork are made out of aluminum. The inner tube is made out of crome plated steel. Inflate to 26 psi (1.8 bar).

7.4.3 BRAKE SYSTEM

The main wheels are equipped with hydraulic disc brakes. Brakes are activated by a lever positioned in the central console between the seats. A metal pin on the brake handle is used to keep the handle pulled and thus mantaining pressure in the circuit and acting as parking brake function.

The brake system consists of a master cylinder activated by the brake handle, an hydraulic fluid reservoirs, a single drum (disc for Beringer wheels option) brake assembly on each main landing gear wheel, and associated hydraulic plumbing. Braking pressure is initiated by pulling the lever. The reservoir is serviced with DOT-4 hydraulic fluid.

Brake system malfunction or impending brake failure may be indicated by a gradual decrease in braking action after brake application, noisy or dragging brakes, soft or spongy handle, excessive travel, and/or weak braking action. Should any of these symptoms occur, immediate maintenance is required. If, during taxi or landing roll, braking action decreases, release the handle and then reapply the brakes with heavy pressure. If the brakes are spongy or handle travel increases, pumping the handle may build braking pressure.

CAUTION: Do not set the parking brake in flight. If a landing is made with the parking brake set, the brakes will maintain any pressure applied after touchdown.

The main wheel brakes are set for parking by using the parking brake pin on the brake activation handle. To apply the parking brake, set the brakes pulling the handle, and set the pin to keep the handle pulled.

7.5 AIRPLANE CABIN

7.5.1 CABIN DOORS

Windshield, upper window and doors'- windows are made from Lexan shatter-resistant polycarbonate. The fuselage has two cabin doors made out of CFRP frames.

Doors are locked in the closed position via 3 locking pins operated simultaneously by rotating a common central handle.

7.5.2 VENTILATION

The system's primary source of fresh air is a set of adjustable vents that direct fresh ram air into the cabin.

7.5.3 SEATS

The seating arrangement consists of two seats, comprising a bottom cushion and hard padded back panel. The back panel rests on the cockpit aft bulkhead.

The seats are not adjustable in position or recline, however the back panel can be removed/reclined to access the baggage compartment.

7.5.4 BAGGAGE COMPARTMENT

The baggage compartment extends from behind the seats to the aft cabin bulkhead and is limited to 22 lbs (10 kg) of load only when equipped with the solid baggage compartment floor (optional). All items in the baggage compartment must be secured in place.

7.5.5 CABIN SAFETY EQUIPMENT

Passenger Restraints

The harness is a 4 point restraint system with turn-buckle quick release. The lap belt strands are attached to the composite seat shell that is locally reinforced with M8 bolts. The shoulder harness strand is attached at the bottom of the rear baggage compartment bulkhead with M8 bolt. The attachment point is reinforced with a comoposite rib.

7.6 POWERPLANT

7.6.1 ENGINE

The engine installed is a Rotax 912 UL (A2 version offered as option) engine providing 59.6 kW takeoff power. All limits as defined by the engine manufacturer apply. The engine can be operated with MOGAS or AVGAS 100LL, with max. 10% ethanol and the following antiknock properties: min. RON 90 (min. AKI 87) as by Rotax specification. The propeller is driven by a gearbox. The engine is provided with a liquid cooling system for the cylinder heads and a ram-air cooling system for the cylinders. There is also an oil cooling system for oil common to engine and gearbox.

7.6.2 ENGINE COMPONENTS

Oil System

The dry-sump lubrication system contains 3.5 liters of oil and consists of a tank, an oil cooler and a a mechanically-driven pump and optionally with a thermostat. Once the oil temperature reaches 80°C the thermostat opens, allowing the oil to flow through the coolers. A dipstick is present on the oil tank to check oil quantity.

CAUTION: The engine should not be operated with less than minimum indicated quantity of oil (dipstick). For extended flights, oil quantity of at least half-level between min and max deliminators is recommended.

Engine Cooling

The engine is air and water cooled. Cooling air enters the engine bay through an inlet on the starboard side of the spinner and is then distributed over the engine's cylinders. The water cooling system consists of a cooler and mechanically-driven pump to provide cooling to cylinder heads. The heated air exits the engine compartment through a common outlet on the bottom aft portion of the cowling. No movable cowl flaps are used.

Carburetors

Dual needle-type Bing carburetors are used, each serving one cylinder bank. Lifetime fliters are installed directly on the carborettors. There is no additional air induction system or carburettor heat, as the engine receives pre-heated air from the aft side of the cooling radiator.

Engine Fuel Ignition

Dual self-powered electronic ignition drive two spark plugs in each cylinder. The system is denominated as Magnetos, as it mimics the typical functionality of mechanical magnetos. Normal operation is conducted with both magnetos, as more complete burning of the fuel-air mixture occurs with dual ignition.

Engine Exhaust

The exhaust system consists of four exhaust headers, a muffler and a tailpipe. All of it's components are made of titanium, making it very light weight. The tailpipe is directed downwards at a 45 degrees angle relative to the aircraft's roll axis, thus decreasing the possibility of any CO finding to enter into the cabin.

7.6.3 ENGINE OPERATING CONTROLS

Engine controls are easily accessible to both pilots on the center console. They consist of a single-lever throttle control and the choke lever.

Throttle Lever

A throttle control lever is located in the central console and controls engine power. The lever acts upon two cables which control the throttle valves of the two carburetors. A wire, which is operated by the choke handle, actuates the choke shaft of the respective carburetor, to provide assistance with cold starts. The engine is not equipped with a carburetor heat device because the carburetor air inlet position inside the engine cowling grants a sufficiently warm air temperature in any condition.

Start button

A push-type button, located on the main switch panel, activates starter operation. The button is labeled START.

Magnetos/ignition switches

The two ignition circuits are indipendently activated by two switches positioned on the switch panel and designated MAG L and MAG R. Normally, the engine is operated on both magnetos (both switch OP) except for magneto checks and emergency operations.

7.6.4 ENGINE MONITORING INSTRUMENTS

The aircraft is equipped with electronic engine instrumentation, which is part of the Engine Management System display.

NOTE: For additional information on instrument limit markings, refer to Section 2, Limitations.

A Data Acquisition Unit, mounted inside the instrument panel, converts analog signals from the COOLANT, EGT, MAP, oil pressure, oil temperature, fuel quantity, fuel pressure and voltage sensors to digital format, which are then transmitted to the display.

The display presents engine and system data in horizontal tape, vertical tape and numerical format.

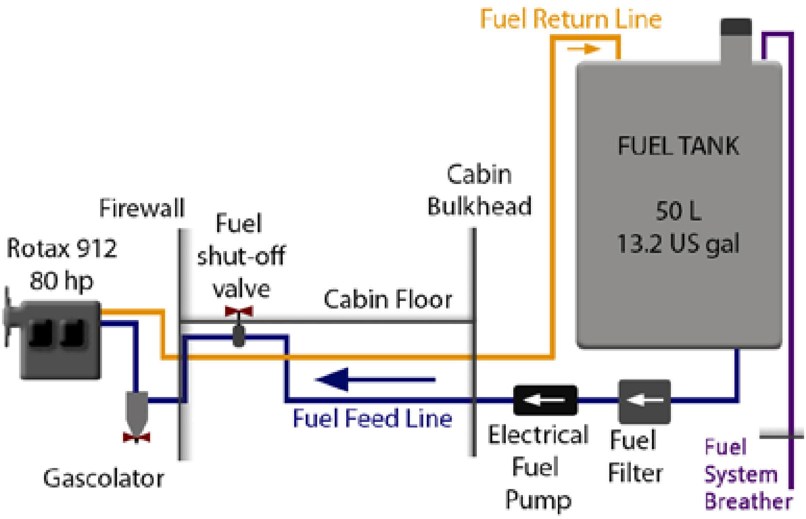
ALPHA Trainer
Engine Management System display
- example of data presentation

7.6.5 PROPELLER

The airplane is equipped with a Pipistrel FP02-80 propeller. It is a 2-blade, fixed pitch, wooden propeller with 1.65 m (65") diameter.

7.7 FUEL SYSTEM

The airplane has single 13.2 US gal (50 L) polyamide fuel tank in the fuselage, positioned behind the cabin. The maximum usable fuel quantity is 12.7 US gal or 76 lbs (34.5 kg or 48 L) (AVGAS or MOGAS, see chapter 2 - Limitations - for applicable fuel grades). Fuel quantity is measured by a level sensor in the tank and indicated on the Engine Management System display. Venting of the fuel tank is through a venting line connected to the bottom of the fuselage. After leaving the tank the fuel goes through a line fuel filter and throught the auxiliary electric pump (denominated BOOSTER PUMP on the switch), located on the bottom-side of the fuselage behind the cabin.



ALPHA Trainer
Fuel system schematic

Thereafter fuel enters the fuel shut-off valve, activated from the cabin, which has two positions: OPEN and CLOSED. When CLOSED position is selected the valve shuts off the fuel feed line. Once the fuel leaves the fuel valve it is fed through a gascolator, which has a drain valve. The gascolator removes water that may be in the fuel and filters out debris/foreign material. The fuel system features a fuel return line connected directly to the fuel tank.

NOTE: Indicated fuel flow on Engine Management System display, if available, is for information only and it is calculated indirectly. It should not be used for navigation and flight planning purposes. Refer to fuel quantity indicator for actual fuel quantity on board and for tracking of fuel situation.

WARNING: Fuel system venting is essential to system operation. Blockage of the system will result in decreasing of fuel flow and eventual engine fuel starvation and stoppage.

If takeoff weight limitations for the next flight permit, the fuel tank should be filled after each flight to prevent condensation.

Draining

The sampling location is the gascolator in the engine compartment, accessible from the bottom engine cowl. The drain is used for draining water from the fuel system and is accesible from the outside. Industry standard fuel sampling cups or sticks should be used to perform draining.

7.8 ELECTRICAL SYSTEM

7.8.1 ELECTRICAL SYSTEM

The airplane is equipped with a single-generator, single-battery, 14-volt direct current (VDC) electrical system designed to reduce the risk of electrical system faults. The system provides uninterrupted power for avionics, flight instrumentation, lighting, and other electrically operated and controlled systems during normal operation.

7.8.2 POWER GENERATION

The electrical system is a 12-Volt DC system. Power is supplied by integrated generator with approximately 250 W AC output at 5800 RPM and rectified with electronic full-wave rectifier regulator (RU 912). The generator system is capable of delivering max. 12A at 14V which feeds the onboard battery (12V, 11Ah or 12.4Ah for EarthX). In case of emergency, the battery will supply reduced number of necessary direct-current loads with power for 30 minutes. The electrical system is controlled by means of switch/fuse which are arranged in one row at the upper half of the switch panel under the instrument panel.

The circuit breakers (CB) are located under the switch/fuses of the switch panel. A voltmeter is integrated in the Engine Management System display system to monitor electrical system operating. Generator failure is indicated by a warning red LED light on the Switch panel (labeled GENERATOR FAIL).

7.8.3 POWER DISTRIBUTION

The Master relay connects the battery with main bus. Main bus supplies the avionics relay which delivers the power to the switch panel and circuit breakers. 12V socket is connected via switch/fuse directly to the main battery.

The 22000uF/25V capacitor provides a continuous control voltage for the regulator/rectifier in the event of momentary interruption of battery voltage. This is necessary as generator output voltage is variable with RPM and may increase to as much as 240V AC.

The avionics bus comprises all avionics loads and electrically operated instruments. Harnesses of the electrical system from the engine is leading through the firewall and connected to the electrical board and to other provided systems.

The electrical system is divided on three main subsystems (engine harness, main electrical board and switch panel) which are than interconnect to all equipment and devices.

Electrical supply from generator and battery is distributed to the following :

Equipment	Electrical Consumption [A] @ 14 V
Kanardia ASI, VSI, ALT, RPM, Engine Management System display	2.3 A (Total)

Kanardia Horis	0.23 A
Garmin GTR200 transceiver	0.51 A (Typical) 2.6 A (Max)
Garmin GTX335 transponder	0.72 A (Typical) 1.22 A (Max)
Landing light	5 A
NAV/AC lights	1 A (steady) 2 A (Peak)
Electrical trim	0.3 A

7.8.4 SWITCHES

MASTER BAT switch

The MASTER BAT toggle Switch activates the relay to connect the battery with main bus. Main bus supplies the avionics relay which delivers the power to the switch panel and circuit breakers. 12V socket is connected via switch/fuse directly to the main battery. Starter button has no function when MASTER BAT switch is OFF.

During normal operation the battery is always connected. It only disconnects then the MASTER BAT switch is OFF.

MASTER GEN Switch

A toggle switch, labeled MASTER GEN, connects the generator to the bus.

7.8.5 WARNING LIGHTS

Generator Fail Light

The red GENERATOR FAIL Light on the upper-left side of the switch panel is connected to the voltage regulator. When ON, this means that the generator is not operating. Normal state (generator operating) is when this LED light is OFF.

NOTE: Engine RPM below 1600 will typically result in GENERATOR FAIL warning light to come ON, however this is not a failure but a case of insufficient RPM to generate electrical power. Increase RPM.

Battery Caution Light

The orange Batt Caution light is installed on the switch panel only when EarthX battery is installed. Batt Caution light is ON when the battery management system (BMS) integrated in the battery detects any malfunctions (See Chapter 3 - Emergency procedures for additional details).

7.8.6 CIRCUIT BREAKERS AND FUSES

Individual electrical circuits connected to the Buses in the airplane are protected by re-settable circuit breakers mounted in the circuit breaker panel, part of the main switch panel below the instrument panel.

7.8.7 MISCELLANEOUS COMPONENTS

Convenience Outlets

A 12-volt convenience outlet is installed on the switch panel. The receptacle accepts a standard cigarette-lighter plug. The outlet may be used to power portable equipment non essential to flight. Amperage draw through the outlet must not exceed 2 A. Power for the convenience outlet is supplied through the 2-amp 12VDC OUTLET circuit breaker on the Battery Bus. USB sockets are optionally available.

7.9 LIGHTNING

7.9.1 EXTERIOR LIGHTNING

Navigation Lights

The airplane can be equipped with LED standard wing tip navigation lights. The lights are controlled through the NAV/AC light switch on the switch panel. 12 VDC for navigation light operation is supplied through the NAV/STROBE light switch, which includes a resettable circuit breaker element.

Strobe Light

Anti-collision strobe lights can be installed integral with the standard navigation light and controlled by the same switch.

Landing Light

A High Intensity LED landing light can be mounted in the lower engine cowl. The landing light is controlled through the LDG light switch on the switch panel. 12 VDC for navigation light operation is supplied through the LDG light switch, which includes a resettable circuit breaker element. The landing light has a built-in thermal protection and its operation is not time limited.

7.9.2 INTERIOR LIGHTNING

Instrument Lights

Digital instrumentation (i.e. Horis) has backlit dimmable LCD displays and illuminated buttons.

7.10 ENVIRONMENTAL SYSTEM

There are two separate systems that account for cabin ventilation and heating: the cabin passive inlets/outlets for fresh air routing (passive ventilation) and the cabin heat system.

Cabin passive ventilation

The system's primary source of fresh air is a set of adjustable vents on the doors that direct fresh ram air into the cabin.

Basic heating system (standard equipment)

This is the shut-off valve from the firewall forward compartment into the cabin. This ON/OFF valve is controlled by a push-pull knob on the bottom of the switch panel, next to the battery disconnect ring. Pull to open, twist to lock, push to shut.

Advanced heating and ventilation system (optional equipment)

This system replaces the basic heating system. It is composed of a stainless steel heat muff fastened to the exhaust system muffler that serves as the system's source of hot air. Air from the oil cooler enters the engine bay and is directed into the heat muff. Hot air leaving the heat muff is then directed through scat tubing to a mixer where it meets fresh air coming from a NACA inlet positioned on the upper engine cowling. The mixer regulates the fresh/hot air ratio passing through the cabin air selector, which is fastened to the aircraft's firewall. The system is controlled from the cabin by a cabin heat panel and a stainless steel shut off valve. This ON/OFF valve is controlled by a push-pull knob on the bottom of the switch panel, next to the battery disconnect ring. Pull to open, twist to lock, push to shut.

The cabin heat panel is positioned on the instrument panel and allows the pilot to control, via rotary knobs and toggles switches, the temperature (fresh/hot air ratio), the flow (fan on/off) and where (cabin or windshield) the air entering the cabin should go.

The following are the offered control possibilities:

The bottom knob on the cabin heat system panel controls the direction of airflow, either towards the windshield (rotate left) or towards pilot's feet (rotate right). Any setting inbetween these two results in air flowing in both directions.

The upper knob on the cabin heat system panel controls the temperature of the airflow. Rotate left for cooler and rotate right for warmer. Maximum cold position will result in external ambient being delivered to the cabin. In this case the system serves as an additional source of fresh air. Maximum hot position will only let the hot air from the exhaust muff into the cabin.

To activate windshield defrost turn the temperature knob on the cabin heat panel to HOT (upper knob, full right), select windshied as direction of airflow (bottom knob full left) and engage the fan (ON).

7.11 PITOT SYSTEM

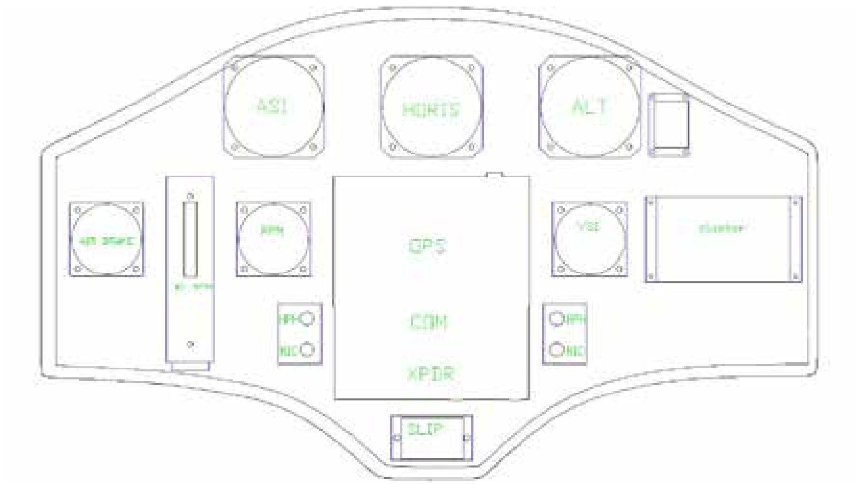
The pitot-static system consists of a single pitot tube mounted on the starboard wing, approximately 3 meters from fuselage. The pitot tube drives the total and static pressure to the instruments.

7.12 FLIGHT DECK ARRANGEMENT

Instrument Panel

A typical instrument panel arrangement consists of a set of analogue gauges for airspeed, altitude, vertical speed and rpm. Each instrument features a LCD display showing the values indicated by the instrument pointers. The upper portion of the panel is occupied by a Kanardia Horis. Engine Management System display is installed on the right side of the panel. Garmin Aera GPS, Transponder and Radio are installed in the central area. Other items installed are the trim indicator, slip ball indicator, ELT remote switch, airbrakes control panel (option) and headset jack sockets.

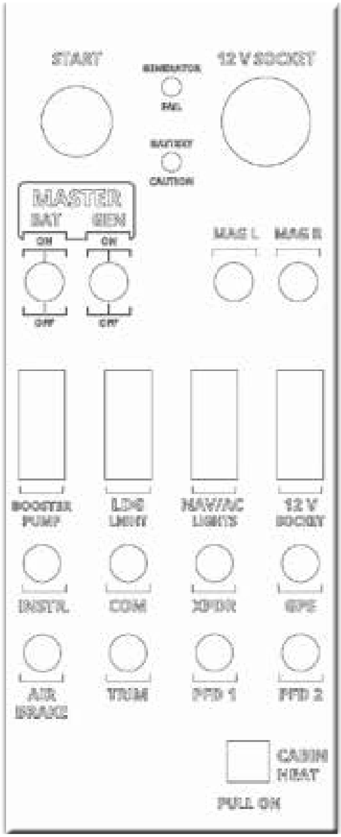
NOTE: Please refer to OEM documentation for additional information about individual instruments.



ALPHA Trainer LSA
Example of instrument panel configuration

Switch Panel

A switch panel located in the "dash board" bolster below the flight instruments contains the BAT and GEN master switches, magneto switches, starter button, Booster pump, lighting switches and circuit breakers.



ALPHA Trainer LSA
Example of switch panel

Center Console

The center console contains (front-to-back) throttle and choke lever, elevator trim switch, brake lever and the flap lever.

7.13 FLIGHT INSTRUMENTS

The following paragraph lists a typical avionic configuration offered for the aircraft. The avionics, navigation and communication equipment are mounted in the instrument panel and are easily accessible from either pilot seat.

NOTE: Please refer to OEM documentation for additional information about individual equipment, or for optional equipment not mentioned in the configuration described below.

The typical avionics configuration consists of:

1	Airspeed Indicator Kanardia
2	Altimeter Kanardia
3	Variometer Kanardia
4	Tachometer (RPM) Kanardia
5	Engine Management System Kanardia (Engine Data Acquisition unit Daqu and display DiGi)
6	Radio COM Garmin GTR 200
7	Transponder Garmin GTX 335
8	GPS Garmin Aera 660
9	Airbrakes control panel
10	Mechanical Compass
11	Slipball Winter
12	ELT Artex 345 (option)
13	Kanardia Horis display
14	Electric Trim
15	Switches and breakers

7.14 EMERGENCY LOCATOR TRANSMITTER

The airplane is optionally equipped with a self-contained emergency locator transmitter (ELT). The transmitter and antenna are installed immediately behind the aft cabin wall to the right of the airplane centerline. The main transmitter control switch, labeled ON-OFF-ARMED, on the transmitter is in the armed position for normal operations. A remote switch and indicator panel is installed on the instrument panel. If rapid deceleration is detected, the transmitter will repeatedly transmit VHF band audio sweeps.

NOTE: Please refer to OEM documentation for additional information about ELT pre-flight testing procedures.

7.15 BALLISTIC PARACHUTE RESCUE SYSTEM (BPRS)

The aircraft is equipped with the Ballistic Parachute Rescue System (BPRS) designed to bring the aircraft and its occupants to the ground in the event of a life-threatening emergency. The system is intended to save the lives of the occupants but will most likely destroy the aircraft and may, in adverse circumstances, cause serious injury or death to the occupants. Because of this it is important carefully to consider when and how you would use the system.

WARNING: The parachute system does not require electrical power for activation and can be activated at any time. The solid propellant rocket flight path is upward from the parachute cover. Stay clear of parachute canister area when aircraft is occupied. Do not allow children in the aircraft unattended.

7.15.1 SYSTEM DESCRIPTION

The BPRS consists of a parachute, a solid-propellant rocket to deploy the parachute, a rocket activation handle, a composite container and a harness connecting the canopy to the wingbox structure.

A composite box containing the parachute and solid-propellant rocket is mounted to the airplane structure behind the right seat and is divided from the baggage compartment. There is an exhaust tube leading the activation gasses from the rocket to the outside (bottom) of the fuselage, the exhaust is placarded.

The type of BPRS is Galaxy Rescue System GRS 6/473. The parachute system attaches with 2 belts to the aft fuselage/wings pins and belonging bulkhead. When deployed, the aircraft is suspended under the parachute with approx. 20° nose down attitude. The parachute system is activated by an activation handle, located between the occupant seats on the tubular structure overhead. The handle is pulled forward and/or downward for activation. A rocket is ignited that leaves the fuselage through a special egress panel directly behind the main bulkhead. The rocket pulls the complete parachute package out of its container at once. Maximum demonstrated parachute activation speed is 170 KTAS.

7.15.2 ACTIVATION

The BPRS is activated by an activation handle, located between the occupant seats on the tubular structure overhead. Pulling the activation T-handle will activate the rocket and initiate the BPRS deployment sequence.

To activate the rocket, two separate events must occur:

1	Pull the activation T-handle from its receptacle. Pulling the T-handle removes it from the o-ring seal that holds it in place and takes out the slack in the cable (approximately 5 cm of cable will be exposed). Once the slack is removed, the T-handle motion will stop and greater force will be required to activate the rocket.
2	Clasp both hands around activation T-handle and pull straight forward/downward with a strong, steady, and continuous force until the rocket activates. A chin-up type pull works best. Up to 200 N force, or greater, may be required to activate the rocket. The greater force required occurs as the cable arms and then releases the rocket igniter firing pin, which ignites the rocket fuel.

NOTE: Rapidly pulling on the activation T-handle greatly increases the pull forces required to activate the rocket.

A safety pin is provided to ensure that the activation handle is not pulled during inadvertantly; for example, the presence of unattended children in the airplane, the presence of people who are not familiar with the BPRS activation system in the airplane, or during display of the airplane. A “Remove

Before Flight” streamer is attached to the pin.

WARNING: Always remove the safety pin of the BPRS before engine start-up and re-insert before leaving the aircraft.

WARNING: After maintenance has been performed or any other time the system has been safe tied, operators must verify that the pin has been removed before further flight.

7.15.3 DEPLOYMENT CHARACTERISTICS

When the rocket launches, the parachute assembly is extracted outward due to rocket thrust and rearward due to relative airflow. In approximately two seconds the parachute will begin to inflate.

When air begins to fill the canopy, forward motion of the airplane will dramatically be slowed. This deceleration increases with airspeed but in all cases within the parachute envelope should be less than 4 g’s. During this deceleration a slight nose-up may be experienced, particularly at high speed. Following any nose-up pitching, the nose will gradually drop until the aircraft is hanging nose-low beneath the canopy. Descent rate is expected to be less than 1500 feet per minute with a lateral speed equal to the velocity of the surface wind. In addition, surface winds may continue to drag the aircraft after ground impact.

CAUTION: Ground impact is expected to be equivalent to touchdown from a height of approximately 3 meters. Occupants must prepare for it in accordance with the BPRS Deployment procedure in Section 3 - Emergency Procedures.

NOTE: The BPRS is designed to work in a variety of aircraft attitudes, including spins. However, deployment in an attitude other than level flight may yield deployment characteristics other than those described above.

BPRS installation:
hatch and belt positioning

BPRS installation:
belts attachment points
to fuselage structure

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SECTION

8

SECTION 8 – HANDLING AND SERVICING

TABLE OF CONTENTS

8.1 INTRODUCTION

The airplane owner should establish contact with the dealer or certified service station for service and information. All correspondence regarding the airplane must include its serial number (see tail-mounted type dataplate). A maintenance manual with revision service may be procured by the manufacturer.

8.2 AIRPLANE INSPECTION PERIODS

All applicable periodical inspections can be found in the latest revision of the aircraft's maintenance manual. The airworthiness authority may require other inspections by issuing airworthiness directives applicable to the aircraft, engine, propeller and/or specific components. The owner is responsible for compliance with all applicable airworthiness directives and periodical inspections.

8.3 PILOT CONDUCTED MAINTENANCE

Please refer to applicable Aircraft Maintenance Manual (AMM) and the regulations of the country of registration for information what maintenance may performed by the pilot.

8.4 CHANGES AND REPAIRS

Information regarding changes and repairs can be found in the applicable maintenance manual (AMM).

8.5 SERVICING

8.5.1 TIRE SERVICING

The main landing gear wheel assemblies use 4.00 x 6 tires. The nose wheel assembly uses a 4.00 x 4 tire. For maximum service from the tires, keep them inflated to the proper pressure

Nose wheel tire (recommended):	**26 psi (1.8 bar)**
Main wheel tires (recommended):	**40 psi (2.8 bar)**

When checking tire pressure, examine the tires for wear, cuts, nicks, bruises and excessive wear.

8.5.2 BRAKE SERVICING

Brake Hydraulic Fluid Replenishing

The brake system is filled with DOT-4 hydraulic brake fluid. The fluid level should be checked at every oil change and at the annual / 100 h inspections, replenishing the system when necessary.
To replenish brake fluid:

1	Chock tires and release parking brake.
2	Clean area around the brake handle before opening reservoir cap itself.
3	Remove cap and add DOT-4 hydraulic fluid.
4	Install cap, check brakes, inspect area for leaks.

8.5.3 PROPELLER

The spinner and backing plate should be cleaned and inspected for cracks frequently. Before each flight the propeller should be inspected for dents, scratches, as well as corrosion on visible metal parts. If found, they should be repaired as soon as possible by a rated mechanic, since a nick or scratch causes an area of increased stress which can lead to serious cracks or the loss of a propeller tip. The back face of the blades should be repainted when necessary with flat black paint to retard glare. Refer to Propeller Maintenance Manual for detailed information.

8.5.4 OIL SERVICING

Oil must be changed every 100 hours and sooner under unfavorable (AVGAS) operating conditions.

An oil filler cap and dipstick are located at the right side of the engine, accessible through an access door on the top right side of the engine cowling. To check and add oil:

1	Open access door on upper cowl. Open cap of the oil bottle.
2	Verify Master switches OFF, Ignition (Magneto switches) OFF.
3	Rotate the propeller in normal direction until a blurbing noise is heard. This is an evidence the oil has pumped through the system properly.
4	Pull dipstick, clean dipstick, and verify oil level.
5	Add oil through filler as required to maintain level between indicated min and max ticks. The capacity of oil system is 3.5 liters.
6	Reinstall dipstick and secure cap.
7	Close and secure access door.

8.5.5 FUEL SYSTEM SERVICING

Fuel Filter Screening

Refer to procedures in Maintenance manual

Filling Fuel Tanks

Fuel filler is located on top of the fuselage, behind the cabin. The tank holds a maximum of 50 L.

WARNING:

Have a fire extinguisher available.
Do not fill tank within 30 m of any electrical equipment capable of producing a spark.
Permit no smoking or open flame within 30 m of airplane or refuel vehicle.
Do not operate radios or electrical equipment during refuel operations.
Do not operate any electrical switches.

To refuel airplane:

1	Place fire extinguisher near fuel tank being filled.
2	Connect ground wire from refuel nozzle to airplane exhaust, from airplane exhaust to fuel truck or cart, and from fuel truck or cart to a suitable earth ground.
3	Place rubber protective cover over the fuselage around fuel filler.
4	Remove fuel filler cap and fuel airplane to desired level.

NOTE: Keep fuel tank at least half full at all times to minimize condensation and moisture accumulation in the tank. In extremely humid areas, the fuel supply should be checked frequently and drained of condensation to prevent possible distribution problems.

5	Remove nozzle, install filler cap, and remove protective cover.
6	Remove ground wires.
7	Remove fire extinguisher.

Fuel Draining and Sampling

Typically, fuel contamination results from foreign material such as water, dirt, rust, and fungal or bacterial growth. Additionally, chemicals and additives that are incompatible with fuel or fuel system components are also a source of fuel contamination. To assure that the proper grade of fuel is used and that contamination is not present, the fuel must be sampled prior to each flight.

Fuel drains is provided for the fuel gascolator. Fuel must be sampled by draining a cupful of fuel into a clear sample cup.

The gascolator drain is accessible through the lower engine cowling (left side) just forward of the firewall.

If sampling reveals contamination, the gascolator must be sampled again repeatedly until all contamination is removed. If after repeated samplings, evidence of significant contamination remains, do not fly the airplane until a mechanic is consulted, the fuel system is drained and purged, and the source of contamination is determined and corrected.

The gascolator sampling outlet is open by rotating the knob and closed by rotating in the opposite direction.

CAUTION: Make sure the gascolator sampling outlet has been closed and is not leaking fuel before flight.

Fuel/water drain outlet

8.6 GROUND HANDLING

8.6.1 APPLICATION OF EXTERNAL POWER

No dedicated ground service receptacle is available, however it is possible to connect a battery-booster or external power to battery plus terminal and the exhaust.
If external power will be used to start engine, keep yourself, others, and power unit cables well clear of the propeller rotation plane.

CAUTION: Do not use external power to start the airplane with a 'dead' battery or to charge a dead or weak battery in the airplane. The battery must be removed from the airplane and battery maintenance performed with appropriate procedures.

To apply external power to the airplane:

1	Ensure that external power source is regulated to 14 VDC.
2	MASTER BAT and MASTER GEN - OFF.
3	Connect (+) lead of external power source to (+) terminal of the battery. Connect (-) lead of external power source to the exhaust.

4	MASTER BAT switch to ON. 14 VDC from the external power unit will energize the main distribution and essential distribution buses. The airplane may now be started or electrical equipment operated.

CAUTION: If maintenance on avionics systems is to be performed, it is recommended that external power be used.

To remove external power from airplane:

1	Carefully remove cables from battery terminal and exhaust.

8.6.2 TAXIING / GROUND MOVEMENTS

Before attempting to taxi the airplane, ground personnel should be instructed and authorized by the owner to taxi the airplane. Instruction should include engine starting and shutdown procedures in addition to taxi and steering techniques. All Normal procedures apply.

CAUTION: Verify that taxi and propeller blast areas are clear before beginning taxi.

Do not operate the engine at high RPM when running up or taxiing over ground containing loose stones or any loose material that may cause damage to the propeller blades. Taxi with minimum power needed for forward movement. Excessive braking may result in overheated or damaged brakes and/or fire. Observe wing clearance when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane. Avoid holes when taxiing over uneven ground.

1	Remove chocks.
2	Start engine in accordance with Starting Engine procedure.
3	Release parking brake.
4	Advance throttle to initiate taxi. Immediately after initiating taxi, apply the brakes to determine their effectiveness.
5	Taxi airplane to desired location.

6	Shut down airplane and install chocks and tie-downs.

8.6.3 PARKING

For parking:

1	Head airplane into the wind if possible.
2	Choose even terrain so that fuel does not spill because of sloped wings.
3	Retract flaps to 0, retract airbrakes.
4	Set parking brake by first applying brake pressure pulling the handle and then set the pin on the handle.
5	Chock both main gear wheels.
6	Tie down airplane.
7	Install a pitot head cover.
8	Fold the bottom part of the seat up (vertically) to prevent any moisture from accumulating below the seat.
9	Cabin a doors should be locked. Lock doors at own discretion.

CAUTION: Care should be taken when setting overheated brakes or during cold weather when accumulated moisture may freeze a brake.

8.6.4. TIE-DOWN

1	Head the airplane into the wind if possible
2	Retract flaps to (0), retract airbrakes
3	Chock the wheels
4	Attach tie-down rings
5	Secure tie-down ropes to the wing tie-down rings and to the tail ring at approximately 45° angles to the ground

CAUTION: Anchor points for wing tie-downs should not be more than 5 m apart to prevent tie-down rings damage in heavy winds.

8.7 CLEANING

8.7.1. CLEANING EXTERIOR SURFACES

The airplane should be washed with a mild soap and water. Harsh abrasives or alkaline soaps or detergents could make scratches on painted or plastic surfaces. Cover static ports and other areas where cleaning solution could cause damage. Be sure to remove the static port covers before flight.

NOTE: Prior to cleaning, place the airplane in a shaded area to allow the surfaces to cool.

To wash the airplane, use the following procedure:

1	Flush away loose dirt with water
2	Apply cleaning solution with a soft cloth, a sponge or a soft bristle
3	To remove exhaust stains, allow the solution to remain on the surface
4	To remove stubborn grease, use a cloth dampened with degreaser or naphtha.
5	Rinse all surfaces thoroughly.

Any good silicone free automotive wax may be used to preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coating of wax on the leading surfaces will reduce the abrasion problems in these areas. Pledge spray is recommended to be applied once the surface is clean and can be used instead of waxing.

Windscreen and Windows

Before cleaning lexan surfaces, rinse away all dirt particles before applying cloth or chamois. Never rub dry lexan. Do not attempt to polish lexan.

CAUTION: Clean windshield and windows only with a solvent free, none abrasive, antistatic cleaner. Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or glass window cleaning sprays. Use only a nonabrasive cotton cloth or genuine chamois to clean acrylic windows. Pledge spray is, however, recommended to be applied once the windshield is clean.

NOTE: Wiping with a circular motion can cause glare rings. Use an up and down wiping motion to prevent this. To prevent scratching from dirt that has accumulated on the cloth, fold cloth to expose a clean area after each pass.

1	Remove grease or oil using a soft cloth saturated mild detergent, then rinse with clean, fresh water.
2	Using a moist cloth or chamois, gently wipe the windows clean of all contaminates.
3	Dry the windows using a dry nonabrasive cotton cloth or chamois.

Engine Compartment

NOTE: Only to be cleaned by licensed service personnel.

1	Place a large pan under the engine to catch waste.
2	Remove induction air filter and seal off induction system inlet.
3	With the engine cowling removed, spray or brush the engine with solvent or a mixture of solvent and degreaser. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.

CAUTION: Do not spray solvent into the generator, starter, or induction air intakes.

8.7.2. CLEANING INTERIOR SURFACES

Windshield and Windows

Never rub dry lexan. Do not attempt to polish lexan.

CAUTION: Clean lexan windows with a solvent free, none abrasive, anti-static acrylic cleaner. Do not use gasoline, alcohol, benzene, carbon tetra-chloride, thinner, acetone, or glass window cleaning sprays. Use only a non-abrasive cotton cloth or genuine chamois to clean acrylic windows. Paper towel or newspaper are highly abrasive and will cause hairline scratches.

NOTE: Wiping with a circular motion can cause glare rings. Use an up and down wiping motion to prevent this. To prevent scratching from dirt that has accumulated on the cloth, fold cloth to expose a clean area after each pass.

1	Wipe the windows clean with a moist cloth or chamois.

2	Dry the windows using a dry nonabrasive cotton cloth or chamois.

Instrument Panel and Electronic Display Screens

The instrument panel, control knobs, and plastic trim need only to be wiped clean with a soft damp cloth. The multifunction display, primary flight display, and other electronic display screens should be cleaned with LCD Screen Cleaning Solution.

CAUTION: To avoid solution dripping onto display and possibly migrating into component, apply the cleaning solution to cloth first, not directly to the display screen. Use only a lens cloth or nonabrasive cotton cloth to clean display screens. Paper towels, tissue, or camera lens paper may scratch the display screen. Clean display screen with power idle.

1	Gently wipe the display with a clean, dry, cotton cloth.
2	Moisten clean, cotton cloth with cleaning solution.
3	Wipe the soft cotton cloth across the display in one direction, moving from the top of the display to the bottom. Do not rub harshly.
4	Gently wipe the display with a clean, dry, cotton cloth.

The airplane interior can be cleaned with a mild detergent or soap and water. Harsh abrasives or alkaline soaps or detergents should be avoided. Solvents and alcohols may damage or discolor vinyl or urethane parts. Cover areas where cleaning solution could cause damage. Use the following procedure:

CAUTION: Solvent cleaners and alcohol should not be used on interior parts. If cleaning solvents are used on cloth, cover areas where cleaning solvents could cause damage.

1	Clean headliner, and side panels, with a stiff bristle brush, and vacuum where necessary.
2	Soiled upholstery, may be cleaned with a good upholstery cleaner suitable for the material. Carefully follow the manufacturer's instructions. Avoid soaking or harsh rubbing.

Leather Upholstery and Seats

Wipe leather upholstery with a soft, damp cloth. For deeper cleaning, use a mix of mild detergent and water. Do not use soaps as they contain alkaline which will cause the leather to age prematurely. Cover areas where cleaning solution could cause damage. Solvent cleaners and alcohol should not be used on leather upholstery.

1	Clean leather upholstery with a soft bristle brush and vacuum it.
2	Wipe leather upholstery with a soft, damp cloth.
3	Soiled upholstery, may be cleaned with approved products. Avoid soaking or harsh rubbing.

Carpets

To clean carpets, first remove loose dirt with a whiskbroom or vacuum. For soiled spots and stubborn stains use a non-flammable, dry cleaning fluid. Floor carpets may be cleaned like any household carpet.

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SECTION

9

SECTION 9 – SUPPLEMENTS

LIST OF SUPPLEMENTS

PART	SUBJECT	REVISION
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SUPPLEMENT

9-S1

SECTION 9 – SUPPLEMENT 9-S1

TRAINING SUPPLEMENT

TABLE OF CONTENTS

9.1 INTRODUCTION

This chapter has been written to assist owners/pilots/instructors of ALPHA Trainer on their quest to learn how to safely and efficiently fly this aircraft in addition to the information already assembled in the rest of this POH. This section will cover most operations the aircraft offers in an order established in section Normal procedures and recommended speeds. Please consider what follows as an add-on to that chapter.

9.2 ENGINE START-UP

First and foremost make sure you have sufficient fuel quantity on board for the desired length of flight. If you are not completely confident there is enough, step out of the aircraft and add more fuel into the tanks. There is an old aviators' saying: "The only time you have too much fuel is when you are on fire."

When engaging engine starter, wheel brakes MUST be engaged. To keep your propeller in perfect shape, avoid starting up on areas where there are small stones on the ground. Those little stones can easily be picked up by the propeller causing damage to the blades.

Warming up must be conducted below 2500 RPM. When reaching safe operational engine temperatures, verify maximum engine ground RPM. Hold the stick back completely and slowly(!) add throttle to full power, then verify RPM.

9.3 TAXI

Taxiing with the ALPHA Trainer is rather simple considering the steerable nose wheel. It is recommended you taxi slowly, up to 10 km/s (5 kts), while holding the stick back fully to ease the pressure of the nose wheel.

During taxiing monitor engine temperatures. Due to low airflow around the radiators the CHT and Oil temperature will rise during long taxi periods. If you are holding position, do not leave throttle at idle. It is better you have some 2500 RPM as this will provide some airflow from the propeller to the radiators and the temperatures will not rise so quickly. Should you see engine temperatures exceed safe operational values, shut off the engine, point the aircraft's nose into the wind and wait for the temperatures to reduce.

9.4 TAKE OFF AND INITIAL CLIMB

Having checked and set all engine and aircraft parameters, you should be ready for take off by now. Reverify fuel valve is open. Trim lever should be in the middle.

Start the take-off roll gradually. Keep adding throttle smoothly and slowly to full power. There are two reasons for this. First, you change flight stage from zero movement to acceleration slowly; this provides you with time to react to conditions. Second, especially if taking-off from a gravel runway, this method of adding full throttle will prevent the little stones on the runway to damage the propeller. Extremely short runways are an exception. There you should line up the aircraft, set flaps to 2nd stage, step on the brakes, apply full power and release the brakes. As you start to move, pull the stick 1/3 of elevator's deflection backwards to ease the pressure on the nose wheel and lift it off the runway slightly. Do not use full back deflection as this will cause the aircraft's tail to touch the ground.

When the nose wheel has lifted off the ground, there is nothing else but to hold the same pitch attitude and the aircraft will become airborne. Crosswind take-offs, depending on wind strength, require a little bit of aileron deflection into the wind. Remember, wings must stay level throughout ground-roll, rotation and initial climb!

Having lifted off the ground, gently push the stick forward just a bit to accelerate. At some 110 km/h (60 kts) set flaps to 1st stage, at 130 km/h (70 kts) set them to neutral.

9.5 CLIMB

A comfortable setting for climb is flaps in zero/neutral position, speed of 76 kts (140 km/h) at or slightly below 5500 RPM. In summer time or when outside temperature exceeds 85° F (30°C) you should consider climbing at some 85 kts (160 km/h) to provide more airflow to the engine radiators. Trim the aircraft for comfortable stick forces.

9.6 CRUISE

Make sure flaps are retracted. A comfortable cruise setting is 5300 engine RPM.

Cruising fast, do not kick-in rudder for turns! Above 85 kts (160 km/h) the rudder becomes almost insignificant in comparison to aileron deflections when it comes to making a turn. Cruising fast, it is important to fly coordinated (ball in the middle) as this increases efficiency and decreases side-pressure onto vertical tail surfaces. Also, pay attention to turbulence. If you hit turbulence at speeds greater than VNO, reduce power immediately and pull up the nose to reduce speed.

If flying a traffic pattern, set engine power so that airspeed does not exceed 150 km/h (80 kts).

9.7 DESCENT

Descending with the Alpha Trainer is the stage of flight where the most care should be taken. The aircraft is aerodynamically clean and builds up speed very fast.

Start the descent by reducing throttle and keep your speed below VNO. During initial descent it is recommended you trim for a 10 kts lower speed than the one you decided to descent at. Do this for safety. In case you hit turbulence simply release forward pressure on the stick and the aircraft will slow down.

Also, keep in mind you need to begin your descent quite some time before destination. A comfortable

rate of descent is 500 fpm (2.5 m/s). So it takes you 2 minutes for a 1000 ft (300 m) drop. At 105 kts (200 km/h) this means 3.6 NM for each 1000 ft drop.

Entering the traffic pattern the aircraft must slow down. In order to do this, hold your altitude and reduce throttle to idle. Gradually slow down to below 80 kts (150 km/h), then set proper engine RPM to maintain speed of 70 kts (130 km/h). Trim the aircraft for comfortable stick forces.

Before turning to base-leg, reduce power to idle and set flaps to 1st stage at 70 kts (130 km/h). Once out of the turn, reduce speed towards 60 kts (110 km/h). Power remains idle from the point of turning base all the way to touch-down. If you plan your approach this way, you will always be on the safe side - even if your engine fails, you will still be able to safely reach the runway!

Turn to final at 55 kts (100 km/h). When in runway heading, set flaps to 2nd stage. Use the throttle to obtain the desired descent path (if applicable).

9.8 ROUNDOUT (FLARE) AND TOUCHDOWN

Your speed should be a constant 55 kts (100 km/h) throughout the final with the descent path constant as well. At a height of 10 meters (25 feet) start a gentle flare and approach the aircraft must touch down with the main (back) wheels first, so that you will not bounce on the runway. After touchdown, operate the rudder pedals if necessary to maintain runway heading and try to have the nose wheel off the ground for as long as possible. When the nose wheel is to touch the ground, rudder pedals MUST be exactly in the middle not to cause damage to the steering mechanism. While braking, hold the stick back fully! Once you have come to a standstill, retract flaps all the way to normal 0° position (handle full down).

Should you bounce off the runway after touch-down, do not, under any circumstances, push stick forward. Bouncing tends to reduce by itself anyhow.

Crosswind landings, depending on the wind speed, require some sort of drift correction. Most efficient is the low-wing method, where you are to lower the wing into the wind slightly and maintain course by applying appropriate rudder deflection. You can also try the crab method.

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