Pilot Operating Handbook
Virus SW 121

Registration: ______________________________

Serial No.: ______________________________

Signature: ______________________________

Authority: EASA

EASA
European Aviation Safety Agency

Stamp: ______________________________

An agency of the European Union

Date of Approval: 30th September 2016

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

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0.2 Notes

Special statements in the 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.

0.3 Index of Revisions

Rev.	Description	Reason for revision	Affected pages	Authority
A00	First Issue	/	ALL	EASA
A01	1st Revision	Pre-TC Updates	ALL	EASA
A02	2nd Revision	Pre-TC Updates	ALL	EASA

0.4 List of Effective Pages

Any revision of the present manual, except actual weighing data, must be recorded in the table and in case of approved sections endorsed by the Agency.

A black vertical line in the left hand margin and the revision no. will indicate the new or amended text in the revision.

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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 Virus SW 121 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 has a tricycle landing gear. It is equipped with a 73,5 kW Rotax 912 S3.

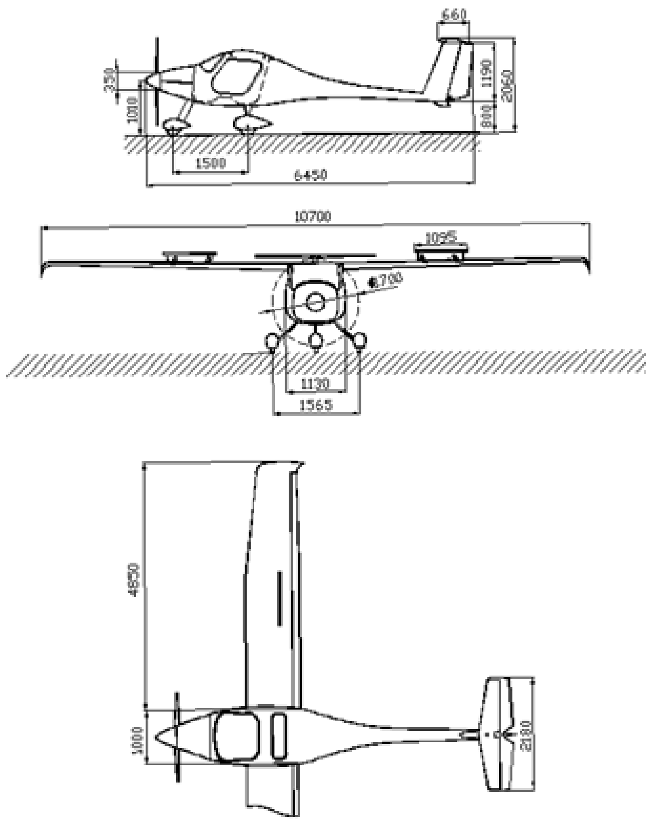
The seats are side-by side with full dual flight controls and joint levers for throttle, choke, propeller, flaps and airbrake control. Access to cockpit is via two large gull-wing doors. Baggage area is behind the seats and accessible via a dedicated baggage door on the left-hand side of the fuselage. The VIRUS SW 121 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

Type certification is based on EASA CS-LSA Light Sport Aircraft Certicication Specifications. Operation of the basic version is restricted to VFR-day and a maximum takeoff weight of 600 kg.

1.4 Three View Drawing



1.5 Dimensions and Weights

Basic Dimensions		
Length	6.45 m	21.15 ft
Span	10.70 m	35.6 ft
Height	2.06 m	6.75 ft

Wing		
Area	9.51 m²	102.4 ft²
Span	10.71 m	35.10 ft
Mean wing chord	0.898 m	2.95 ft

Horizontal Tail		
Area	1.02 m²	10.9 ft²
Span	2.18 m	7.15 ft

Vertical Tail		
Area	1.24 m²	13.3 ft²
Height	1.19 m	3.90 ft

Weights		
Maximum takeoff	600 kg	1323 lb
Design emty weight	349 kg	768 lb
Design useful load	251 kg	552 lb
Maximum baggage weight	25 kg	55 lb
Max. wing loading	63.07 kg/m²	12.92 lb/ft²

1.6 Systems

1.6.1 Powerplant

The engine installed is Rotax 912 S3 providing 73.5 kW takeoff power. All limits as defined by the engine manufacturer apply. The engine can be operated with AVGAS, MOGAS or car fuel (min RON 95; EN228 Premium or Premium plus with max. 10% Ethanol) as by Rotax specification. The propeller is driven by a gearbox. The gearbox is equipped with the Rotax slipper clutch.

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 MTV-33-1-A/170-200 made by MT-propeller. It is a 2-blade hydraulically operated constant-speed propeller with 1.70 m diameter. Construction is fiber reinforced wooden laminated core.

1.6.3 Fuel System

The airplane uses two integral tanks located in the left and right wing, with header tanks present downstream from the main tanks before the fuel selector with three different positions: LEFT, RIGHT, OFF. Maximum usable fuel quantity is 2 x 37.5 kg (2 x 50 L capacity).
The fuel system is designed as a pump system and provided with a mechanical pump. A gascolator that removes water from the fuel system is present and equipped with a 60 micron filter. An electrical pump is not present.

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 via toe-pedals. A parking brake lever is also present.

1.6.5 Ballistic Parachute Rescue System (BPRS)

The airplane is equipped with a ballistic deployed parachute rescue system GRS 6/600 SD 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

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.

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

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

V_{FE} **Maximum Flap Extended Speed** is the highest speed permissible with wing flaps in a prescribed extended position.

V_{NO} **Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air, and then only with caution.

V_{NE} **Never Exceed Speed** is the speed that may not be exceeded at any time.

V_{AE} **Maximum Airbrakes Extended Speed** is the maximum speed at which the airbrakes may be extended.

V_S **Stalling Speed** is minimum steady flight speed at which the aircraft is controllable.

V_{SO} **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.

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 in.Hg) 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.

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 in. Hg.

RPM **Revolutions Per Minute** is engine rotational speed.

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.

Weight and Balance Terminology

C.G. **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

1.8 Conversion Table

SI	US	US	SI
1 bar	14.5037 psi	1 psi	0.0689 bar
1 mm^2	0.0016 in^2	1 in^2	625 mm^2
1 cm^2	0.1550 in^2	1 in^2	6.4510 cm^2
1 daN	2.2481 lbf	1 lbf	0.4448 daN
1 g	0.0353 oz	1 oz	28.328 g
1 hPa	0.0295 in.Hg	1 in.Hg	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 cm^3	0.06102 in^3	1 in^3	16.393 cm3
1 hPa	0.0145 psi	1 psi	68.965 psi

Section 2
Limitations

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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

The indicated airspeeds are based upon the airspeed calibration using the normal static source. When using the alternate static source, allow for the airspeed calibration variation between normal and alternate static sources.

Speed	KTAS	KIAS	Remarks
V_{NE}	**163**	See table below	**Never Exceed Speed** is the speed limit that may not be exceeded at any time.

DA (ft)	0	2000	4000	6000	8000	10000	12000	14000	16000	18000
V_{NE} (KIAS)	**163**	**158**	**154**	**149**	**145**	**140**	**136**	**132**	**128**	**123**

Speed	KIAS	KCAS	Remarks
V_{NO} below FL100	120	120	**Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air.
V_{NO} above FL100	Reduced 0.5 kts for every 1000 ft	Reduced 0.5 kts for every 1000 ft	**Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air.
V_A	100	100	**Operating Maneuvering Speed** is the maximum speed at which full control travel may be used.

V_{FE}	81	81	**Maximum Flap Extended Speed** is the highest speed permissible with wing flaps extended at (+1) stage, 65 KIAS for (+2) stage, 135 for (0) stage.
V_{AE}	100	100	**Maximum Airbrakes Extended Speed** is the highest speed permissible with the airbrakes extended.

2.3 Airspeed Indicator Markings

The airspeed indicator markings are based upon the airspeed calibration using the normal static source. Speeds are KIAS

Marking	Value	Remarks
White Arc	48 - 81	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.
White triangle	65, 81, 135	Flap speed limitations for (+2) stage, (+1) stage and (0) respectively.
Green Arc	53 - 120	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. ***Note:*** Clean configuration is regarded as Flaps in position (0). Expect stalling at 56 KIAS with Flaps in position (-).
Yellow Arc	120 - 163	Caution Range. Operations must be conducted with caution and only in smooth air.
Red Line	163	Never exceed speed. Maximum speed for all operations.

2.4 Engine Limitations

Engine (Rotax 912 S3)

Maximum Power Rating..............................73.5 kW / 5800 RPM max 5 min
Maximum Continuous Power... 69 kW / 5500 RPM

Normal RPM .... 1750 - 5500 RPM
Maximum RPM ....5800 RPM

Minimum Oil Pressure .... 0.8 bar
Normal Oil Pressure .... 2.0 – 5.0 bar
Maximum Oil Pressure ....7.0* bar
*permissible for a short period after cold start

Minimum Oil Temperature.. 50°C
Normal Oil Temperature.. 80°C - 110°C
Maximum Oil Temperature..130°C

Minimum Coolant Temperature... not limited
Maximum Coolant Temperature...120°C

Normal Exhaust Gas Temperature .... 550 - 885°C
Maximum Exhaust Gas Temperature ....900°C

2.5 Engine Instrument Markings

Instrument (Range)	Red Line	Green Arc	Yellow Arc	Red Line
	Minimum	Normal	Caution	Maximum
Tachometer (0 - 6000 RPM)	—	1750-5500	5500-5800	5800
Coolant Temp. (50 - 130°C)	—	—	—	120° C
Exhaust Gas Temp. (400 - 930°C)	—	550-885° C	885-900° C	900 ° C
Manifold Pressure (0 – 35 "Hg)	—	15-29.5 InHg	—	—
Fuel Flow (0 – 30 l/h)	—	5-25 l/h	—	—
Fuel Pressure (0 – 0.5 bar)	—	0.15-0.4 bar	—	—
Oil Temperature (0 - 140°C)	—	50-110° C	110-130° C	130° C
Oil Pressure (0 - 7.8 bar)	0.8 bar (Idle)	2.0-5.0 bar	—	7.0 bar (Cold)
Voltmeter (10 - 16 V)	10 V	11.8–14.4 V	14.4–14.7 V	14.7 V
Ammeter (-40 – 40 A)	—	Green line at 20 A	—	—

2.6 Weight and Center of Gravity Limits

Maximum takeoff weight .... 600 kg / 1323 lbs
Maximum landing weight .... 600 kg / 1323 lbs
Maximum zero fuel weight .... 555 kg / 1221 lbs
Design empty weight (typical) .... 349 kg / 768 lbs
Design useful load .... 251 kg / 552 lbs

Most forward CG .... 25 % MAC / 267 mm
Most rearward CG .... 35 % MAC / 357 mm

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 lb
Minimum weight solo pilot .... 54 kg / 119 lbs
Maximum baggage weight .... 25 kg / 55 lb

2.8 Fuel

Approved fuels: .... AVGAS, MOGAS or car fuel (min RON 95; EN228 Premium or Premium plus with max. 10% Ethanol), as by Rotax specificat-ion.

Total fuel capacity .... 100 liters / 72 kg
Total fuel each tank .... 50 liters / 36 kg
Total usable fuel (all flight conditions) .... 99 liters / 71 kg
Maximum allowable fuel imbalance .... 50 liters / 36 kg

Note: Operation with leaded fuels (including AVGAS) results in shorter oil/filter replacement intervals of 50 hours.
Note: Unusable fuel is 0.5 liters per tank.

2.9 Oil/Coolant

Approved oil ....AeroShell Oil Sport PLUS 4
(and equivalents 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

2.10 Flight Load Factor Limits

Up to V_A .... + 4.0 g / - 2.0 g
Up to V_{NE} .... + 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 CS-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°.

2.12 Altitude Limits

Maximum takeoff altitude .... 10,000 ft MSL
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

The structure has been tested to + 55°C. Refer to AMM chapter 4 for approved colors and makings.

2.14 Minimum Flight Crew

The minimum flight crew is one pilot.

2.15 Kinds of Operation

The airplane is approved for VFR day operations.

Note:
The airplane must be equipped according to the Minimum Equipment List applicable for the planed kind of operation (see Section 6).

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.
Fly when outside air temperature (OAT) is below -20°C.
Fly when outside air temperature (OAT) exceeds 49°C.
Take-off with airbrakes extended.
Avoid applying more than 75% rudder deflection during cruise/climb as this may cause a pitch-down moment.
The 12 V power outlets are not approved to supply power to flight-critical communication or navigation devices.
No intentional spins.
AHRS and GPS is for information only and should not be used for primary navigation as well as attitude and heading references.

2.16.1 Restrictions for Aerotowing Operations

Take-off weight to be kept below 500 kg.
Maximum weight of towed glider 600 kg. Maximum weak-link rating 300 kg.

2.17 PFD / Autopilot Restrictions

1. No autopilot operations with the PFD inoperative.
2. Flight under Instrument Flight Rules (IFR) is not permitted.

In addition, the following limitations apply:

1. Autopilot operation is prohibited above 135 KIAS.
2. The autopilot must not be engaged for takeoff or landing.
3. The autopilot must be disengaged for missed approach, go-around, and balked landing.
4. Autopilot operation is prohibited below 81 KIAS.
5. Flap deflection is limited to (0) and (-) during autopilot operations.
6. The autopilot must be disconnected in moderate or severe turbulence.
7. Minimum engage height for the autopilot is 2000 ft AGL.
8. Minimum speed with the autopilot engaged is 1.3 Vs for the given configuration.
9. Autopilot maneuverability is limited to 30 degrees bank and +-1000 fpm.

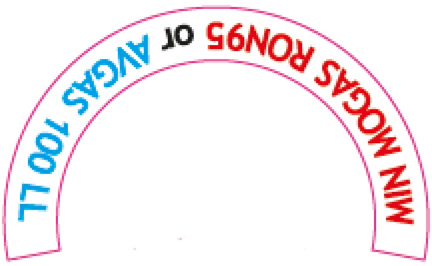
WARNING! Autopilot may not be able to maintain all selectable vertical speeds. Selecting a vertical speed that exceeds the aircraft's available performance may cause the aircraft to stall.

2.18 Placards

2.18.1 Placards (External)

Next to each wing fuel tank filler neck:

Next to each wing fuel tank filler neck:

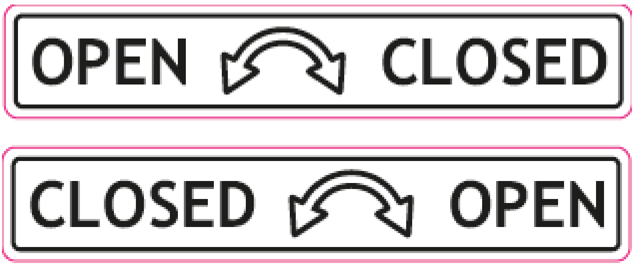


Next to each door, top aft corner:

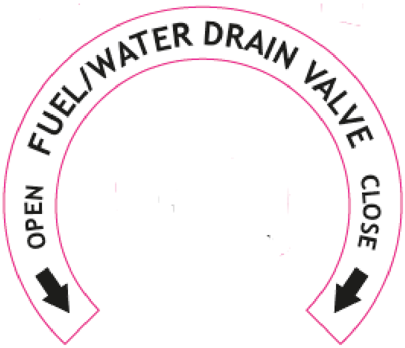
Next to wheels:

On each main landing gear wheel fairing:

Next to door opening latches:



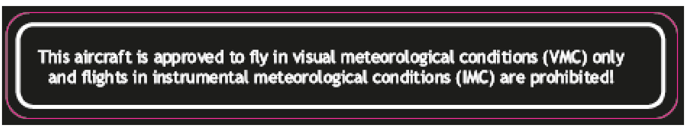
Next to fuel drain:

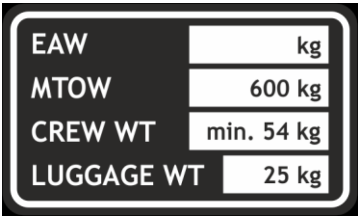


2.18.2 Placards (Engine Compartment)

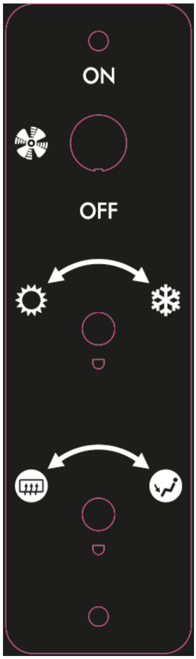
On coolant bottle, oil bottle:

2.18.3 Placards (Instrument Panel)

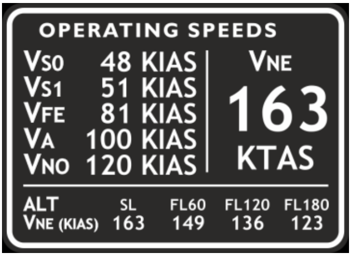



EAW
kg
MTOW
600 kg
CREW WT
min. 54 kg
LUGGAGE WT
25 kg


TANK LIGHTS
ON
OFF
INTERCOM
ON
OFF


ON
OFF

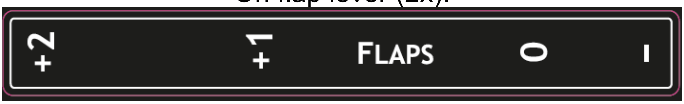
2.18.4 Placards (Center Console)



Next to propeller lever:

Next to choke and throttle levers:

On flap lever (2x):



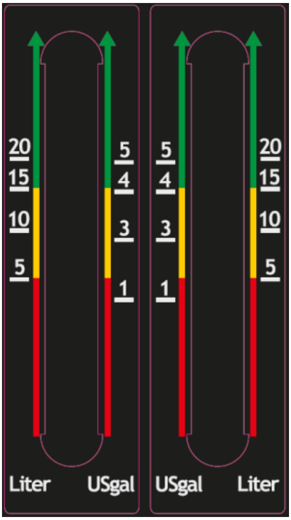
Next to elevator trim switch:

Next to cabin-air control lever:

Next to parking brake lever:

2.18.5 Placards (Cabin)

Next to fuel level indicators:



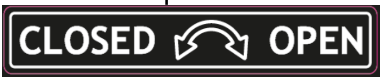
Fuel selector:

Next to microphone jacks:

Next to headphone jacks:

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

Below each door to depict door handle operation:



On upper tube in front or pilot:

On inside of luggage compartment door:

On inside and outside luggage compartment lock:

2.18.6 Placards (Ballistic Parachute Rescue System)

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

Next to doors:

Next to rocket exhaust (bottom of fuselage):

ROCKET GAS EXHAUST

Next to activation handle (cockpit):

PULL FOR PARACHUTE DEPLOYMENT

Section 3
Emergency Procedures

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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
Once you have handled the emergency, assess your next move. Handle any non-critical “clean-up” items in the checklist and put the aircraft on the ground.

3.2 Airspeeds for Emergency Operations

Maneuvering Speed: .... 100 KIAS

Best Glide (flaps +1): .... 70 KIAS

Emergency Landing (Engine-out):
Flaps 0 .... 63 KIAS
Flaps +1 .... 60 KIAS
Flaps +2 .... 58 KIAS

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 Selector .... OFF
2. Throttle lever .... FULL FORWARD
3. Starter .... CRANK

If flames 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. Fuel Selector .... OFF
3. Ignition Switch .... OFF
4. Master Switch .... OFF

3.3.3 Emergency Ground Egress

1. Engine .... SHUTDOWN
2. Parking brake .... SET
3. Seat belts .... RELEASE
4. Airplane .... EXIT

WARNING!

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 becoming airborne, abort with landing on the the runway if possible. If altitude attained precludes a runway stop but is not sufficient 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 Selector... OFF
3. Ignition Switch... OFF
4. Flaps ....AS REQUIRED

If time permits:

5. Throttle Lever..IDLE
6. Master Switch .... OFF
7. Seat Belts ....ENSURE SECURED

3.4.2 Engine Failure in Flight

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

WARNING!

It engine failure is accompanied by fuel fumes in the cockpit or internal engine damage is suspected, set fuel selector to OFF and do not attempt a restart.

1. Best Glide Speed..ESTABLISH
2. Fuel Selector..CHECK / SWITCH TANKS
3. Ignition Switch...CHECK, BOTH

If engine does not start, proceed to Engine Start in Flight or Forced Landing checklist, as required.

Best Glide Speed and Glide Ratio:

Power:	Off
Propeller:	Stopped
Flaps:	+1
Weight:	600 kg
Best Glide Speed:	70 KIAS
Max. Glide Ratio:	15 : 1

3.4.3 Engine Start in Flight

The following procedures address the most common causes for engine loss. Switching tanks and cranking will enhance starting if fuel contamination was the cause of the failure.

Note:

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

1. Master Switch .... ON
2. Throttle Lever .... 10 mm OPEN
3. Fuel Selector .... SWITCH TANKS
4. Ignition Switch .... BOTH
5. Starter (Propeller not windmilling) .... ENGAGE
6. Throttle Lever .... slowly INCREASE

If engine will not start, perform Forced Landing checklist.

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 Forced Landing checklist.

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 forced 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 a forced 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. **Fuel Selector** .... SWITCH TANKS
   Selecting the opposite fuel tank may resolve the problem if fuel starvation or contamination in one tank was the problem.
2. **Throttle Lever**..SWEEP
   Move the Throttle Lever through the complete range to obtain the best operation possible.
3. **Ignition Switch** ....BOTH, L, then R
   Cycling the ignition switch momentarily from BOTH to L and then to R may help identify the problem. An obvious power loss in single ignition operation indicates ignition system or spark plug trouble. Return ignition switch to the BOTH position unless extreme roughness dictates the use of a single ignition circuit.
4. **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 forced landing field.

WARNING!

Prolonged use of high power settings after loss of oil pressure will lead to engine mechanical damage and total engine failure, which could be catastrophic.

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.

1. Throttle Lever.. MINIMUM REQUIRED
2. Land.. AS SOON AS POSSIBLE.

3.4.6 Propeller Governor Failure

If the RPM does not respond to propeller lever movement or overspeeds, the most likely cause is a faulty governor or an oil system malfunction. If moving the power lever is difficult or rough, suspect a propeller lever linkage failure and perform the Propeller Lever Linkage Failure checklist.

Propeller RPM will not increase:

1. Oil Pressure .... CHECK
2. Land .... AS SOON AS POSSIBLE

Propeller overspeeds or will not decrease:

1. Throttle Lever .... ADJUST (to keep RPM in limits)
2. Airspeed .... REDUCE to MAX 90 KIAS
3. Land .... AS SOON AS POSSIBLE

3.5 Smoke in 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 a Forced Landing and shut down the fuel supply to the engine once a safe landing is assured.

1. Temperature Selector ....COLD
2. Vent Selector ....FEET POSITION
3. Fan ....ON
4. Airflow Selector .... OPEN
5. Door Windows .... OPEN

If source of smoke and fume is firewall forward:
1. Airflow Selector ....CLOSED
2. Fan .... OFF
3. Door Windows ....AS REQUIRED
4. Prepare to land as soon as possible.

If airflow is not sufficient to clear smoke or fumes from cabin:
1. Door Windows .... OPEN
2. Cabin Doors...................OPEN if ventilation from windows insufficient

3.5.1 Engine Fire in Flight

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

1. Fuel Selector... OFF
2. Airflow Selector ....CLOSED
3. Throttle Lever ....IDLE
4. Ignition Switch... OFF
5. Land .... AS SOON AS POSSIBLE

3.5.2 Wing Fire in Flight

1. NAV/STROBE Light Switch .... OFF
2. Fuel level light... OFF
3. If possible, side slip to keep flames away from fuel tank and cabin.
4. Land .... AS SOON AS POSSIBLE

Note:
Putting the airplane into a dive may blow out the tire. Do not exceed V_{NE} during the dive.

3.5.3 Cockpit Fire in Flight

It the cause of the fire is apparent and accessible, use a fire extinguisher 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 fire extinguishing.

1. Master Switch .... OFF
2. Battery disconnect switch ....PULL
3. Heater .... OFF
4. Airflow selector ....CLOSED
5. 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.

WARNING!
After pulling the battery disconnect switch an engine restart will no longer be possible!

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 analogue instruments for the continuation of flight.

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).

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

6. Cabin Doors..PARTIALLY OPEN
   Airspeed may need to be reduced to partially open door in flight.
7. When fire extinguished, VENTILATION .... OPEN, FULL COLD
8. Avionics Switch.. OFF
9. Green Electrical Switches... OFF
10. Land .... AS SOON AS POSSIBLE

3.6 Spins

The airplane is not approved for spins, however it was tested for spin recovery characteristics.
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 at the stall or abused accelerated inputs are made to the elevator, rudder and/or ailerons, an abrupt 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 beginning of a spin.

In any case, spin recovery technique is classic:

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

3.7 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
2. The maximum demonstrated deployment speed is 170 KIAS. Reducing airspeed allows minimum parachute loads and prevents structural overload and possible parachute failure.
3. Ignition switch (If time and altitude permit).................................. OFF
4. Generally, a distressed airplane will be safer for its occupants if the engine is not running.
5. 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:

6. Fuel Selector .... OFF
   Shutting off fuel supply to engine will reduce the chances of fire resulting from impact at touchdown.
7. Master Switch .... OFF
8. Ignition Switch .... OFF
9. ELT ....ACTIVATE
10. Seat Belts and Harnesses ....TIGHTEN
    All occupants must have seat belts securely fastened.
11. Loose Items ....SECURE
    If time permits, all loose items should be secured to prevent injury from flying objects in the cabin at touchdown.
12. 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.
13. After the airplane comes to a complete stop, evacuate quickly and move upwind.
14. 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.

3.8 Landing Emergencies

If all attempts to restart the engine failure and a forced 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 forced landing. For forced 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.

3.8.1 Emergency Landing without Engine Power

1. Best Glide Speed..ESTABLISH
2. Radio .... Transmit (121.5 MHz) MAYDAY giving location and intentions
3. Transponder .... SQUAWK 7700
4. ELT ....ACTIVATE
5. Throttle Lever...IDLE
6. Fuel Selector.. OFF
7. Ignition Switch.. OFF
8. Flaps (when landing is assured)..+2
9. Master Switch .... OFF
10. Seat Belt(s) ....SECURED

3.8.2 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.

3.8.3 Landing without Elevator Control

The pitch trim spring cartridge is attached directly to the elevator and provides a backup should you lose the primary elevator control system. Set elevator trim for a 60 KIAS approach to landing. Thereafter, do not change the trim setting until in the landing flare. During the flare, the nose-down moment resulting from a power reduction may cause the airplane to hit on the nosewheel. At touchdown, bring the power lever to idle.

1. Flaps ....SET +2°
2. Trim... SET 60 KIAS
3. Power..AS REQUIRED FOR GLIDE ANGLE

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.

3.8.4 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.

3.8.5 Landing with Defective Brakes

1. Safety harness..................................... Check fastened and tightened

After a safe touch-down:

2. Ignition .... OFF
3. Fuel Selector.. OFF
4. Master Switch .... OFF

3.9 PFD-Malfunction

In the unlikely event of a PFD failure, the pilot may lose the ability to control the autopilot through the PFD controls. If this malfunction occurs, the PFD circuit breakers may be pulled and the airplane flown using the reversionary mode, where the MFD screen displays also airspeed, altitude, attitude and compass information and/or the mechanical instruments.

Note:
The avionics system is equipped with dual ADAHRS units, which provide pressure and attitude data to the screens. In event of PFD screen failure, there is the reversionary mode, which will automatically display main PFD data (airspeed, altitude, attitude, compass) on the MFD screen.

In case of ADAHRS failures:

PFD - Loss of Air Data
In the event the PFD detects a loss of air data (dual ADAHRS failure), or data is unreliable, the affected indicator is removed from the display and replaced with a red “X”. If loss of air data occurs, refer to the mechanical instruments (altitude, airspeed).

PFD - Loss of Attitude Data
In the event the PFD detects a loss of attitude data (dual ADAHRS failure), or data is unreliable, the affected indicator is removed from the display and replaced with a red “X”.

For a more complete description of the PFD and MFD functions, refer to Section 7.

WARNING!

When subjected to a power loss of less than 20 seconds, the PFD is capable of performing a warm start. In this event, a “PLEASE STANDBY” message will be displayed for 2 seconds followed by a “ATTEMPTING QUICK RESTART” message. In the event of a power loss greater than 20 seconds, a warm start is unlikely, and the power interruption will result in loss of attitude information until the PFD can be restarted on the ground.

3.10 Generator Failure

Steady illumination of the “GENERATOR FAIL” caution light 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.

If generator failure persists:

1. Switch off unnecessary equipment to reduce loads. Monitor voltage.
2. 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 disconnect switch should not be pulled 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 Engine Indicating System Failure

In the event of a Data Acquisition Unit failure, the engine indications displayed on the MFD and PFD will be disabled.
In the event of Data Acquisition Unit failure, pull and reset the EIS circuit breaker. If the engine indicating system fails to reset, land as soon as practical.

1. EIS Circuit Breaker ....CYCLE
2. Land as soon as practical

3.12 Communication Failure

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

3.13 Pitot Static Malfunction

3.13.1 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.

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.

3.13.2 Pitot Tube Blocked

If only the airspeed indicator is providing erroneous information, and in icing conditions, the most probable cause is pitot ice. If setting pitot heat ON does not correct the problem, 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. Pitot Heat (Optional) .... ON
2. Groundspeed indicator ....+10 KTS for procedures, observe winds

3.14 Electric Trim / Autopilot Failure

Any failure or malfunction of the electric trim or autopilot can be overridden by use of the control stick. If runaway trim and/or autopilot servo is the problem, cut the circuit by pulling the circuit breaker (AP SERVO or AP PNL or EL. TRIM) and land as soon as conditions permit.

1. Airplane Control................... GRASP STICK, MAINTAIN MANUALLY
2. Autopilot (if engaged) .... DISENGAGE

If problem is not corrected:

3. Circuit Breakers ....PULL AS REQUIRED
   AP SERVO / AP PNL / EL. TRIM
4. Power Lever ....AS REQUIRED
5. Control Stick .... MANUALLY HOLD PRESSURE
6. Land as soon as practical.

3.15 Battery over-voltage

With the battery in an overvoltage situation (over 14.8 V) the battery must be disconnected from the system to prevent adverse effects.

1. Battery disconnect switch ....PULL

WARNING!

After pulling the battery disconnect switch an engine restart will no longer be possible!

3.16 Exceeding V_{NE}

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

3.17 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 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.

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).

3.18 Aerotowing

All emergencies related to the engine and systems performance to be handled as per prior paragraphs, with pilot's consideration when to disconnect glider and/or drop the rope.

Guidelines for aerotowing eventualities:

1. *Glider out of sight (not visible in mirror)*

When unsure of glider's position/behaviour, notify glider pilot, if situation continues, disconnect rope. Land normally.

2. *Engine failure*

Notify glider pilot, disconnect rope. Land according to usual emergency procedure for engine failure.

3. *Rope breakes*

Verify operation of all systems, land normally.

4. *Rope refuses to be dropped (mechanism lock*)

Plan your landing long and approach high not to cause the hanging rope to become tangled into obstacles before the runway. After touchdown, brake gently. Respect all normal operating speeds and procedures.

5. *Glider cannot disconnect*

Continue flight to be over a landable terrain and disconnect the rope by pulling the yellow cockpit rope disconnect lever. Glider will need to land with rope hanging from its nose. Conduct a normal landing procedure.

6. *Rope refuses to disconnect with glider and towing aeroplane*

Continue flight to be over a landable terrain and attempt to disconnect the rope again, both with glider and towing aeroplane. If unsuccessful, conduct a landing in aerotow. Respect normal landing airspeeds and conduct a shallow approach. Allow glider to touch down first, then touch down and brake gently.

Section 4
Normal Procedures

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4.1 Introduction

This section provides amplified procedures for normal operation.

4.2 Airspeeds for Normal Operation

Unless otherwise noted, the following speeds are based on a maximum mass of 600 kg 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	45 KIAS
Obstacle Clearance, flaps (0)	60 KIAS
En-route climb, flaps:	(0) or (-)
Normal	90 - 110 KIAS
Best rate of climb, SL	78 KIAS (V_Y)
Best angle of climb, SL	60 KIAS (V_X)
Landing approach:	
Normal approach, flaps 0	65 - 75 KIAS
Normal approach, flaps +1	63 - 70 KIAS
Normal approach, flaps +2	60 - 65 KIAS
Go-around, Flaps as practical:	
Full Power	60 KIAS
Maximum demonstrated crosswind velocity:	
Takeoff or landing	18 Knots

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

1. Cabin

1. Doors ....Unlock/Open/Close/Secure
2. Airplane rescue system handle ....Check pin inserted
3. Ignition switch ....check OFF
4. Green electrical switches .... All OFF

5. Required documents...ON board
6. Battery disconnect switch ....CONNECT
7. Controls .... Full, Free and Correct

8. Master switch .... ON
9. Avionics switch .... ON
10. Circuit breakers... IN
11. PFD / MFD ....Verify ON
12. Avionics cooling fan ....Audible
13. Voltmeter... 12 - 14 Volts
14. Lights .... Check operation
15. Fuel quantity .... Check
16. Fuel selector .... Select fullest tank
17. Flaps ....Check handle movement
18. Avionics switch, Master Switch... OFF
19. Circuit breakers... IN

2. Left Fuselage

1. COM antenna (top) .... Condition and attachment
2. Wing / fuselage seal.. Check
3. XPDR antenna (underside)....................... Condition and attachment
4. Baggage compartment..Baggage is secure

5. Baggage door...Closed and secure (locked)
6. Static pressure port..Check tor blockage
7. Fuel drain ....Perform

3. Empennage

1. Tiedown rope ....Remove
2. Horizontal and vertical stabilizers .... Condition
3. Elevator and elevator U-piece.................... Condition and movement
4. Rudder .... Freedom of movement
5. Rudder trim tab ....Condition and security
6. Attachment hinges, bolts, springs and pins .... Secure

4. Right Fuselage

1. Static pressure port..Check tor blockage
2. Fuel drain ....Perform
3. Wing / fuselage seal.. Check
4. Door lock ....Unlock
5. Parachute cover, strap covers .... Sealed and secure

5. Right Wing Trailing Edge

1. Flaperon.....................................Condition, security and movement
2. Aileron gap seal .... Security, no wrinkles
3. Hinges, bolts and safety nuts... Secure

6. Right Wing Tip

1. Tip .... Attachment
2. Strobe, NAV light and lens............................Condition and security

7. Right Wing Forward and Main Gear

1. Leading edge .... Condition
2. Fuel cap ....Check quantity and secure
3. Water drain holes... Clean
4. Pitot tube...Cover removed, tube clear

5. Landing gear .... General condition
6. Tire .... Condition, inflation, and wear
7. Wheel and brakes .... Fluid leaks, evidence of overheating,
   .... general condition and security
8. Chocks and tiedown rings/ropes .... Remove

8. Nose, Right Side

1. Cowling .... Attachments secure
2. Exhaust pipe .... Condition, security and clearance
3. Gascolator .... Drain 1 cup, sample
4. Landing light .... Attachment, security, lens
5. Engine oil .... Check quantity, leaks, cap and door secure

9. Nose Gear, Propeller, and Spinner

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

1. Strut .... Condition
2. Landing gear .... General condition
3. Wheel and tire .... Condition, inflation and wear
4. Propeller .... Condition (indentations, nicks, etc.)
5. Spinner .... Condition, security and oil leaks
6. Air inlets, outlets .... Unobstructed

10. Nose, Left Side

1. Landing light .... Condition
2. Cowling .... Attachments secure

11. Left Main Gear and Forward Wing

1. Landing gear .... General condition
2. Tire .... Condition, inflation and wear
3. Wheel and brakes .... Fluid leaks, evidence of overheating,
   .... General condition and security
4. Chocks and tiedown rings/ropes .... Remove
5. Fuel cap .... Check quantity and secure
6. Leading edge .... Condition

12. Left Wing Tip

1. Tip .... Attachment
2. Strobe, NAV light and lens............................Condition and security

13. Left Wing Trailing Edge

1. Flaperon......................................Condition, security and movement
2. Aileron gap seal .... Security, no wrinkles
3. Hinges, bolts and safety nuts.. Secure

4.4 Starting Engine

4.4.1 Before Starting Engine

1. Preflight Inspection .... Completed
2. Mass and Balance .... Verity within limits
3. Fuel quantity...Sufficient
4. Emergency Equipment.. ON board
5. Passengers .... Briefed
6. BPRS Safety Pin .... Removed
7. Seats, Pedals, Seat Belts and Baggage net .... Adjust and Secure
8. Parking brake .... OFF
9. Brakes .... Hold
10. Master switch .... ON
11. Avionics switch.. ON
12. NAV/Strobe Lights .... ON
13. Doors..Closed and latched

CAUTION!
Pedals must be locked in position and control handles fully down before flight. 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.

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

1. External Power (If applicable) .... Connect
2. Brakes .... Hold
3. Fuel Selector .... Fullest Tank
4. Master Switch.. ON (Check Volts)
5. Choke .... As required

6. Propeller Area .... Clear
7. Power Lever .... Open 10 mm
8. Oil Pressure Indication .... Available
9. Ignition Switch .... Start (Release after engine starts)

CAUTION!

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

10. Power Lever .... maintain 2500 RPM or below
11. Oil Pressure .... Check
12. Choke .... Slowly close
13. Engine Parameters .... Monitor
14. External Power (It applicable) .... Disconnect
15. Amp Meter/Indication .... Check

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 .... (-) or (0)
2. Airbrakes .... Check travel
3. Radios / Avionics .... As required
4. Cabin Heat / Defrost .... As required
5. Fuel Selector .... SWITCH TANK (to check flow from both tanks)

4.4.4 Taxiing

When taxiing, directional control is accomplished with rudder deflection and with the use of toe activated brakes when necessary. 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 50C oil temperature is achieved.

1. Parking Brake.. Disengage
2. Brakes.. Check
3. Instruments ....Check, Set

4.4.5 Before Takeoff

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.

1. Brakes.. Hold
2. Doors...Latched
3. Seat Belts and Shoulder Harness..................................... Secure

4. BPRS activation handle ....Verify Pin Removed
5. Airbrakes ....Closed and locked

6. Seat Belts and Shoulder Harness.. Secure
7. Flaps .... (+1)
8. Trim .... Set neutral

9. Fuel Selector .... Fullest tank
10. Fuel Quantity.. Confirm
11. Choke .... Verify closed
12. Throttle Lever ....4000 RPM
13. Alternator... Check value and warning light
14. Voltage ....Check value
15. Ignition Switch .... RIGHT, note RPM, then BOTH
16. Ignition Switch ....LEFT, note RPM, then BOTH
17. Propeller lever ....Cycle lever 3 times, observe RPM drop
18. Propeller lever ....Full forward
19. Throttle lever .... Set to just above idle
20. NAV/Strobe Lights .... As required
21. Landing Light.. As required

22. Navigation Radios/GPS .... Set for takeoff

23. Autopilot .... Check disconnect
24. Annunciator (PFD) .... Check

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..

25. Altimeter .... Set
26. Engine Parameters .... Check
27. Flight Controls... Free and correct
28. Autopilot .... Disengaged

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 5700 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 and short field takeoffs are accomplished with flaps set at (+1). Takeoffs using flaps (0) are permissible, however, no performance data is available for takeoffs in the flaps up configuration. Takeoffs with (-5) flaps are not approved.

Soft or rough field takeoffs are performed with (+1) 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.

4.5.3 Normal Takeoff

1. Brakes .... Release (Steer with rudder only)
2. Propeller lever .... Full forward
3. Throttle lever .... Full forward

4. Engine Parameters .... Check
5. Airspeed indication .... Check
6. Elevator Control .... Rotate smoothly at 45-48 KIAS
7. At 70 KIAS, Flaps .... Retract to 0

4.5.4 Short Field Takeoff

1. Flaps .... (+1)
2. Airbrakes .... Closed and locked
3. Brakes .... Hold
4. Propeller lever .... Full forward
5. Throttle Lever .... Full forward
6. Engine Parameters .... Check
7. Brakes .... Release (Steer with rudder only)
8. Airspeed indication .... Check

9. Elevator Control .... Rotate Smoothly at 45 KIAS
10. Airspeed at Obstacle .... 60 KIAS
11. At 70 KIAS, Flaps .... Retract to (0)

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 the rate-of-climb chart 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: 60 KIAS [flaps (0)], V_Y: 78 KIAS [flaps (0)]

1. Climb Power/RPM .... Set
2. Flaps .... Verify UP (0)
3. Engine Parameters .... Check
4. Switch to other Wing Fuel Tank .... Every 30 min

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. The engine power setting and corresponding fuel consumption for various altitudes and temperatures can be determined by using the cruise data in Section 5.

1. Flaps .... Negative (-5)
2. Cruise Power .... SET
3. Engine Parameters .... Check

WARNING!

The fuel tanks must be changed every 30 min. Otherwise the airplane may roll into the direction of the fuller fuel tank.

WARNING!

Always grasp stick firmly before disengaging the autopilot to prevent advert effects of improperly set elevator trim.

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.

Note:

It is recommended to use Flaps (-5) above 100 KIAS and Flaps (0) below 100 KIAS.

4.8 Descent/Approach

1. Altimeter.. Set
2. Autopilot.. Disengage
3. Cabin Heat/Defrost .... As required
4. Landing Light .... ON
5. Fuel System.. Check
6. Parking brake.. Disengaged
7. Brake pressure .... Check (pump pedals)

4.9 Before Landing

1. Seat Belt and Shoulder Harness .... Secure
2. Flaps .... As required
3. Airbrakes.. As required
4. Autopilot.. Disengage

4.10 Landing

CAUTION!

Landings should be made with full flaps and airbrakes fixed in ½ extended position. 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.

Normal Landing

Normal landings are made with full flaps and airbrakes fixed in ½ extended position with power on or off. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds.

Actual touchdown should be made with power off 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-off 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 and brakes as required. The maximum allowable crosswind velocity is dependent upon pilot capability as well as aircraft limitations. Operation in direct crosswinds of 18 knots has been demonstrated.

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 ....Full forward
2. Airbrakes.. Close
3. Flaps ....(+1)
4. Airspeed...57 - 60 KIAS

After clear of obstacles:

5. Flaps .... UP (0)
6. Airspeed...Best climb speed

4.12 After Landing

1. Throttle Lever ....IDLE
2. Flaps .... (-5) or (0)
3. Transponder .... STBY
4. Lights .... As required
5. Airbrakes..Close at taxi speed

4.13 Shut Down

1. Green electrical switches.. All OFF
2. Throttle lever...IDLE
3. Ignition Switch .... OFF
4. BPRS safety pin ....Insert
5. All Switches .... OFF
6. 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...Inserted, secured
2. Parking brake..................................... Engaged only if necessary
3. Fuel selector .... OFF
4. Chocks, Tie-downs, Pitot Covers .... As required

Note:
Park on level terrain, excessive bank (one wing lower than the other) will result in fuel spilling from fuel vents.

4.15 Soft field operations

As described in 4.5.2. and 4.10.

4.16 Aerotowing

This paragraph contains recommendations and establishes guidelines for operational consideration.

Note:
Total take-off distance is limited by certification basis to be less than 500 m**.** This is achieved by limiting the take-off mass to 500 kg and mass of towed glider to 600 kg.

Attachment and removal of mirror

The mirror for glider-towing operations is attached to the bottom side of the left wing through the dedicated mounting. Remove the plastic cap which covers the tie-down point, insert the mirror mounting and screw it in until it is properly fixed. Clamp the mirror to the mounting. Adjust the mirror position in order to have a clear and unobstructed view of the towed glider.

To remove the mirror, apply the above procedure in reverse.

Recommendations

Before take-off:

1. Rope disconnect ....Check for successful disconnect
2. Mirror ....Adjust before each tow to have clear view of the glider

Take-off:

3. Take-off flap setting ....(+1) for grass and hard runway
4. Trim..set ½ nose-up
5. Lift-off speed .... 55 KIAS
6. Initial climb speed .... 60 KIAS (depends on glider type)

Reaching safe altitude (min 300 ft):

7. Engine power .... Adjust to 27 InHg, 5500 RPM
8. Turn crosswind .... Maximum bank angle 20°
9. Flaps .... (0)
10. Engine temperatures .... Monitor

CAUTION!
In case of engine overheating consider reducing power, increasing speed or disconnecting glider.

Before descent:

11. Glider disconnected .... Check mirror!
12. Power .... Idle
13. Flaps .... (-)
14. Airbrakes .... As desired
15. Rope .... Drop before landing

CAUTION!
Should the rope not be dropped before landing, use caution to maneuver aircraft so that the rope does not catch obstacles on approach path.

Note:
In case the rope cannot be disconnected at both sides (tow-plane and glider), landing in formation was demonstrated to be safe.

Note:
All emergencies to be handled as per chapter Emergency Procedures with pilot’s consideration when to disconnect glider.

Section 5
Performance Data

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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.

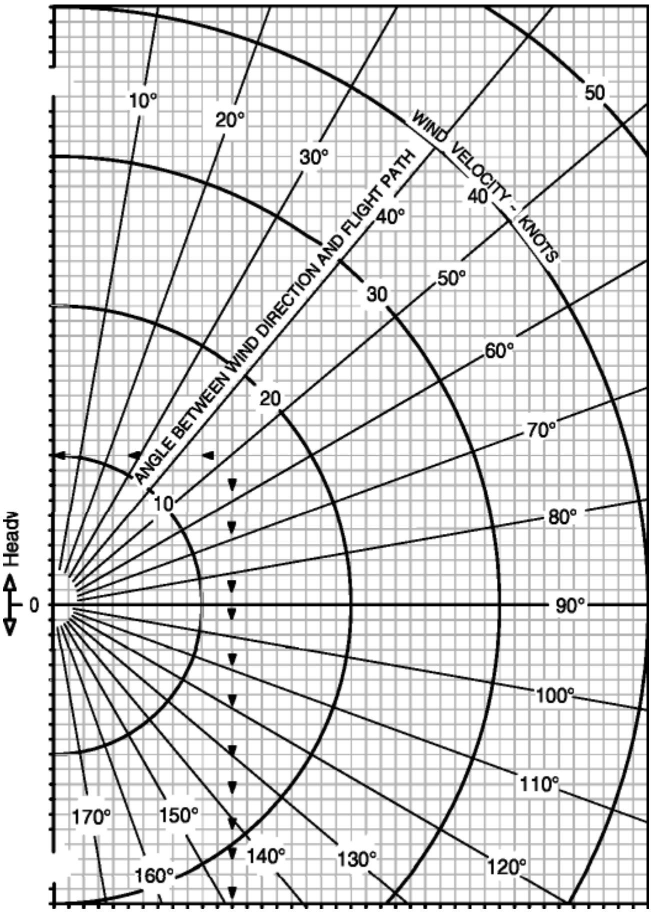
The performance tables do not take into account the expertise of the pilot or the maintenance condition of the airplane. The performance illustrated in the tables can be achieved if the indicated procedures are followed and the airplane is in good maintenance condition.

Note that the flight duration data does not include a fuel reserve. The fuel consumption during cruise is based on propeller RPM and manifold pressure settings. 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

5.3 *Wind Component*



Example:
Runway Heading 10°
Wind Direction 60°
Wind Velocity 15 Knots

5.4 Airspeed Calibration

Airspeed Calibration

Conditions:
Power: Power for level flight or max. continuous power, whichever is less.

Note:
Indicated airspeed values assume zero instrument error.

KIAS	KCAS			
	Flaps (-)	Flaps (0)	Flaps (+1)	Flaps (+2)
40	---	---	37	37
50	49	46	47	48
60	59	57	59	59
70	69	68	69	---
80	79	79	80	---
90	89	90	---	---
100	99	99	---	---
110	109	109	---	---
120	119	119	---	---
130	129	129	---	---
140	139	139	---	---
150	149	149	---	---
160	159	159	---	---
163	162	162	---	---

Note:
Aibrake extension does not influence airspeed calibration values.

5.5 Stall Speed

Conditions:
Power: Idle
Propeller: Full forward (fine pitch)

Note:
The recovery altitude necessary is very dependent on the tempo of recovery. Typical loss of altitude for recovery:
150-250 ft for slow recovery without power
100 ft for normal recovery with power
less than 100 ft for aggressive recovery
150 ft for normal recovery with extended airbrakes

Depending on pilot skill the altitude loss during wings level stall may be 250 feet or more. KIAS values may not be accurate at stall.

Weight	Bank Angle	Stall Speed									
		Flaps (-)		Flaps (+0)		Flaps (+1)		Flaps (+2)		Flaps (+2) & full abks	
kg	Degrees	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
600 Most FWD C.G.	**0**	56	55	53	50	51	48	47	45	50	48
600 Most AFT C.G.	**0**	54	52	51	49	49	46	45	43	48	46
	45	65	64	63	60	59	58	55	54	58	57

5.6 Take-Off

Conditions:
Power: Throttle Full Open, Propeller pitch Full Forward (Fine)
Flaps: (+1)

Runway: Dry, paved and level
Wind: Calm

Correction Factors:
Headwind: Subtract 10% for each 12 knots headwind.
Tailwind: Add 10% for each 2 knots tailwind up to 10 knots.

Runway Surface
Dry Grass: Add 10% to Ground Roll.
Wet Grass: Add 30% to Ground Roll.

Runway Slope:
Increase table distances by 22% of the ground roll distance at Sea Level for each 1% of upslope.

Decrease table distances by 7% of the ground roll distance at Sea Level, for each 1% of slope.

Weight: **600 kg**

Pressure	Distance	Temperature					
Altitude [ft]	[m]	0°C	10°C	20°C	30°C	40°C	ISA
SL	Ground roll	148	157	167	176	186	160
	50 ft	302	316	329	343	356	320

Pressure Altitude [ft]	Distance [m]	Temperature					
		0°C	10°C	20°C	30°C	40°C	11°C
2000	Ground roll	178	189	201	213	225	192
	50 ft	357	373	389	405	421	379

Pressure Altitude [ft]	Distance [m]	Temperature					
		0°C	10°C	20°C	30°C	40°C	7°C
4000	Ground roll	220	234	248	262	277	229
	50 ft	391	408	426	443	460	402

Pressure Altitude [ft]	Distance [m]	Temperature					
		0°C	10°C	20°C	30°C	40°C	3°C
6000	Ground roll	264	280	297	315	333	268
	50 ft	428	447	466	485	504	435

Speed at Liftoff: 47 KIAS
Speed over 50 ft: 60 KIAS (V_X)

5.7 Rate of Climb (V_Y)

Conditions:

Power: Throttle Wide Open (Full forward), Propeller pitch Full Forward (Fine)
Flaps: (0)
Airspeed: Best rate of climb: 78 KIAS (V_Y)

Weight	Pressure Altitude	Climb Speed	Rate of Climb [ft/min]				
	ft	KIAS	0°C	10°C	20°C	30°C	ISA
600 kg	**0**	78	1108	1069	1032	998	1050
	2000	78	1037	1001	967	935	997
	4000	78	969	935	903	873	944
	6000	78	902	870	840	812	892
	8000	78	836	807	779	753	839
	10000	78	772	745	719	696	786
	12000	78	709	684	661	639	733

5.8 Climb Gradient (V_X)

Note:
Angle of climb data shown is for information only, appropriate pilot procedures should be followed for non-ISA conditions.

Weight	Pressure Altitude	Climb Speed	Climb Angle / Gradient
	ft	KIAS	ISA
600 kg	**0**	60	10.93 degrees
	2000	60	9.42 degrees
	4000	60	8.36 degrees
	6000	60	7.08 degrees
	8000	60	5.79 degrees

CAUTION! Expect the climb performance to degrade with increased outside air temperature.

5.9 Cruising - Power Setting, Fuel Consumption

Conditions:
Weight: **600 kg**
Temperature: **ISA**
Wind: **Zero**
Total Fuel: **99 Liter**

Note:
Fuel remaining for cruise is equal to 99 liters usable:
- less climb fuel
- less 6 l for 30 min VFR reserve fuel at 47% power (ISA @ 10,000 ft PA)
- less descent fuel
- less fuel used prior to takeoff.

CAUTION! **Actual flight endurance must be calculated from the following tables.**

Note:
Maximum continuous power is defined by 5500 RPM, not by MAP. MCP is 69 kW. Operation with MAP above 24 InHg with RPM below 4800 is not recommended.

Pressure Altitude	Parameters		ISA		
	RPM	MAP	PWR (%MCP)	KTAS	FF (liter/h)
2000 ft	**5500**	**27.7**	100%	129	**28.8**
	5500	**26.7**	85%	126	22.4
	5300	**25.7**	75%	119	18.4
	4900	**24.7**	65%	105	16.0
	4600	**24.0**	55%	102	14.4

Pressure Altitude	**Parameters**		**ISA**		
	RPM	**MAP**	**PWR (%MCP)**	**KTAS**	**FF (liter/h)**
4000 ft	*Not achievable*		MCP	*Not achievable*	
	5500	**25.3**	85%	130	25.2
	5500	**24.3**	75%	126	19.6
	5100	**23.3**	65%	116	16.8
	4600	**23.3**	55%	113	15.6

Pressure Altitude	**Parameters**		**ISA**		
	RPM	**MAP**	**PWR (%MCP)**	**KTAS**	**FF (liter/h)**
6000 ft	*Not achievable*		MCP	*Not achievable*	
			85%		
	5500	**23.3**	75%	132	23.2
	5300	**22.7**	65%	125	19.6
	4900	**22.0**	55%	115	16.8

Pressure Altitude	**Parameters**		**ISA**		
	RPM	**MAP**	**PWR (%MCP)**	**KTAS**	**FF (liter/h)**
8000 ft	*Not achievable*		MCP	*Not achievable*	
			85%		
	5500	**22.0**	75%	132	23.6
	5300	**21.7**	65%	125	21.2
	5100	**21.0**	55%	118	18.0

Pressure Altitude	Parameters		ISA		
	RPM	MAP	PWR (%MCP)	KTAS	FF (liter/h)
10,000 ft	*Not achievable*		MCP	*Not achievable*	
			85%		
			75%		
	5300	**19.7**	65%	133	22.4
	5500	**20.3**	55%	125	19.2

Pressure Altitude	Parameters		ISA		
	RPM	MAP	PWR (%MCP)	KTAS	FF (liter/h)
12,000 ft	*Not achievable*		MCP	*Not achievable*	
			85%		
			75%		
			65%		
	5500	**18**	55%	120	20.4

5.10 Landing

Conditions:

Wind:	Zero
Runway:	Dry, level and paved
Flaps:	(+2)
Power:	3° power approach to 50 ft height, then reduce power smoothly continue to reach idle just at touch.
Airspeed:	60 KIAS at 50 ft height

Correction Factors:

Headwind: Subtract 10% from table distances for each 13 knots headwind.

Tailwind: Add 10% to table distances for each 2 knots tailwind up to 10 knots.

Dry grass runway: Add 20% to ground roll distance.

Wet grass runway: Add 60% to ground roll distance.

Sloped Runway: Increase table distances by 27% of the ground roll distance for each 1% of slope.
Decrease table distances by 9% of the ground roll distance for each 1% of upslope.

CAUTION!

The corrections should be used with caution since published runway slope data is usually the net slope from one end of the runway to the other. Many runways will have portions of their length at greater or lesser slopes than the published slope, lengthening the estimated landing ground roll.

For operation in outside air temperatures colder than this table provides, use coldest data shown.

For operation in outside air temperatures warmer than this table provides, use extreme caution.

Weight: **600 kg**

Pressure Altitude [ft]	Distance [m]	Temperature					
		0°C	10°C	20°C	30°C	40°C	ISA
SL	Ground roll	248	257	266	275	284	260
	Total over 50 ft	433	442	451	460	469	445

Pressure Altitude [ft]	Distance [m]	Temperature					
		0°C	10°C	20°C	30°C	40°C	11°C
2000	**Ground roll**	267	276	286	296	306	279
	Total over 50 ft	452	461	471	481	491	463

Pressure Altitude [ft]	Distance [m]	Temperature					
		0°C	10°C	20°C	30°C	40°C	7°C
4000	**Ground roll**	287	298	309	319	287	294
	Total over 50 ft	472	483	494	504	472	280

Pressure Altitude [ft]	Distance [m]	Temperature					
		0°C	10°C	20°C	30°C	40°C	3°C
6000	**Ground roll**	310	321	333	344	310	314
	Total over 50 ft	495	506	518	529	495	500

5.11 Noise Characteristics

Noise level according to ICAO Annex 16, Chapter 10:
Measured: 70 dB(A) Max. allow. noise level: 70.8 dB(A)

5.12 Aerotowing Performance

5.12.1 Take-off

Data is valid for a hard-surface runway.

Towed Glider Mass	Ground roll (ISA – Sea level)	Take-off distance 15m obstacle (ISA – Sea level)
Kg	**m**	**m**
300	180	350
400	200	370
500	250	410
600	280	500

5.12.2 Climb

Towed Glider Mass	Climb rate stabilized (ISA Sea level)
Kg	**m/s**
300	3.5
400	2.6
500	2.3
600	2

Note:

Appropriate pilot procedures must be applied when towing outside of ISA sea-level conditions and/or from non-hard surface runways.

Section 6
Weight and Balance

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6.1 Introduction

This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all equipment available for this airplane is included at the back of this section.

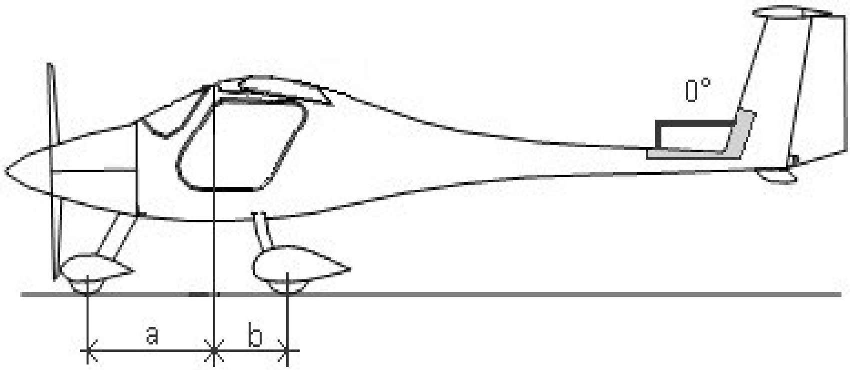
6.2 Airplane Weighing Procedure

1. Preparation:
1. Inflate tires to recommended operating pressures.
2. Service brake reservoir.
3. Drain fuel system.
4. Service engine oil.
5. Move crew seats to the most forward position.
6. Raise flaps to the fully retracted position.
7. Place all control surfaces in neutral position.
8. Verify equipment installation by comparison to equipment list.

2. Leveling:
1. Level longitudinally with a spirit level placed on the pilot door sill by using an angle of 4° and laterally with of a spirit level placed across the door sills.
2. Place scales under each wheel
   (minimum scale capacity 250 kg nose, 500 kg each main wheel).
3. Deflate the nose tire and/or shim underneath scales as required to properly center the bubble in the level.

3. Weighing:
1. With the airplane level and doors closed, record the weight shown on each scale. Deduct the tare, if any, from each reading.

4. Measuring:



1. Drop a plumb bob from datum (each wing root leading edge at root) and stretch a line between the plumb bombs and mark the position of the line at the airplane center line.

2. Stretch a line between the main wheel centers and mark the position of the line at the airplane center line.

3. Measure the distance between the position of the wing root leading edge and the position of the main wheel centers horizontally along the airplane center line. Obtain value ‘b’. Typical value of ‘b’ is 495 mm.

4. Measure the distance between the position of the wing root leading edge and the position of the nose wheel center horizontally along the airplane center line. Obtain value ‘a’. Typical value of a = 1043 mm

5. Calculation:

Summary (Weights)

$G1 = G_{MainWheelLeft} + G_{MainWheelRight}$	=	kg
$G2 = G_{NoseWheel}$	=	kg
Max Takeoff Mass (MTOM)	=	600 kg
Aircraft Empty Weight G_{TOT}	=	kg
Full fuel weight G_F	=	72 kg
Max payload with full fuel **$G_{PL} = MTOM - G_{TOT} - G_F$**	=	kg

MAC=	898 mm	Mean Aerodynamic Chord
R=	43 mm	Wing Root Leading Edge to MAC Leading Edge distance

$$CG_{mm} = \frac{G1 * b - G2 * a}{G_{TOT}} = \frac{(..........) * (..........) - (..........) * (..........)}{(..........)} = ... mm$$

$$CG_{\%MAC} = \frac{CG_{mm} - R_{mm}}{MAC_{mm}} = \frac{........... - 43}{898} * 100 = ... \% MAC$$

Note:
The above procedure determines the airplane basic empty weight, moment and center of gravity aft of datum (wings leading edge at root).

6.3 C.G. - Calculation

	Weight [kg]	**Arm [mm]**	**Moment [kgmm]**
Typical empty weight	349	250	
Pilot		370	
Co-pilot		370	
Fuel (Left wing tank)		215	
Fuel (Right wing tank)		215	
Baggage compartment		1160	
Instrument panel		-320	
Other			
Total weight / Moment		-	
Center of Gravity	-	-	

Max. takeoff weight: 600 kg
Max. empty fuel weight: 555 kg

Most forward CG 25 % MAC / 268 mm
Most rearward CG 35 % MAC / 357 mm

6.4 Equipment List

System, Instrument, Equipment	Required for Kind of Operation			Weight and Bal.	
	VFR Day	VFR Night	IFR	Weight [kg]	Arm [mm]
VHF COM / (NAV)	—	—	—		
Battery	1	—	—		
Ammeter / Indication	1	—	—		
GEN FAIL Annunciator	1	—	—		
Emergency Locator Trans.	—	—	—		
Flap System	1	—	—		
Pitch Trim Indicator	—	—	—		
Pitch Trim System	—	—	—		
Stall Warning System	1	—	—		
Fuel Quantity Indicator	2	—	—		
Fuel Selector Valve	1	—	—		
Anti-Collision Lights	—	—	—		
Oil Quantity Indicator	1	—	—		
Oil Temperature Indication	1	—	—		
Parachute Rescue System	—	—	—		
Autopilot System	—	—	—		
Autopilot Pitch Servo	—	—	—		
Autopilot Roll Servo	—	—	—		
Airplane Flight Manual	1	—	—		

System, Instrument, Equipment	Kind of Operation			Weight and Bal.	
	VFR Day	VFR Night	IFR	Weight [kg]	Arm [mm]
Instrument Lights	—	—	—		
Navigation Lights	—	—	—		
Landing Light	—	—	—		
Airspeed Indicator	1	—	—		
Altimeter	1	—	—		
Magnetic Compass	1	—	—		
Pitot System	1	—	—		
Static System	1	—	—		
PFD Attitude Indication	—	—	—		
PFD Airspeed Indication	—	—	—		
PFD Altitude Indication	—	—	—		
PFD Heading Indication	—	—	—		
PFD Slip/Skid Indication	—	—	—		
Magnetometer	—	—	—		
Vertical Speed Indicator	—	—	—		
Multi-Function Display	1	—	—		
Coolant Temperature Ind.	1	—	—		
EGT Indication	1	—	—		
Fuel Flow Indication	—	—	—		
Manifold Pressure Indication	—	—	—		
Oil Pressure Indication	1	—	—		

6.5 Airplane Weight and Balance Record

Date	Description of Article or Modification	Weight Change added (+) or removed (-)			Running Basic Empty Weight	
		Weight [kg]	Arm [m]	Moment [kgm]	Weight [kg]	Moment [kgcm]

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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.

Note:
Some optional equipment, primarily avionics, may not be described in this section. For description and operation of optional equipment not described in this section, refer to Section 9, Supplements.

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 has glider type airbrakes.
Fuel tanks: Each wing includes one (1) 50 litres semi-integrated fuel tank made of GFRP. The fuel tank is coated with alcohol resistant coating.

7.2.3 Empennage

The empennage consists of a horizontal stabilizer, a single piece elevator elevator, a vertical fin and a rudder. All of the empennage components are conventional spar (shear web), rib, 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 are available through an electric button located on the central console.

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. To this bell-crank the flap handle is connected, allowing for symmetric displacement of flaperons.

7.3.3 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.

7.3.4 Wing Flaps Control System

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

Flaps are hand activated through a lever common to both pilots, located between the seats. The handle is spring locked in 4 positions, corresponding to flap deflections of -5°, 0°, +9°, +20°. 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.

7.3.5 Airbrakes Control System

Schempp-Hirth Style airbrakes are activated by a ceiling mounted pull-lever requiring the thumb-trigger to be released for opening. The lever is connected to the wing-side of the push-rod mechanism via self-fitting coupling. A bell-crank fitted into the wing just aft of the main spar near the root-rib converts rotary motion introduced by the cockpit lever into translational motion required to open and close the airbrakes.

7.3.6 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 adjacent to the trim switch as well as a gauge in the G3X PFD.

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 basalt fibre.

The strut is composed by two parallel elements producing a semi-redundant structure and allowing for predictable locations of stress points. The tube-type nosewheel tire is 4.00 x 6. Wheel track is 1.60 m, wheel base 1.58 m. Inflate to maximum 3.0 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 pedals and incorporates an oil-spring damper element. All wheels are 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 maximum 2.5 bar.

7.4.3 Brake System

The main wheels are equipped with hydraulic disc brakes. Right and left brake are independent and activated by tip brakes on each set of rudder pedals. A parking brake in form of a center console lever accessible to both pilots is installed.

The brake system consists of a master cylinder for each rudder pedal, two hydraulic fluid reservoirs, a parking brake valve, a single disc brake assembly on each main landing gear wheel, and associated hydraulic plumbing. Braking pressure is initiated by depressing the lever on top of a rudder pedal (toe brake). The brakes are plumbed so that depressing either the pilot’s or copilot’s left or right toe brake will apply the respective (left or right) main wheel brake. 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 pedals, 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, let up on the toe brakes and then reapply the brakes with heavy pressure. If the brakes are spongy or pedal travel increases, pumping the pedals may build braking pressure.

CAUTION!
Do not pull the PARK BRAKE knob in flight. If a landing is made with the parking brake valve set, the brakes will maintain any pressure applied after touchdown.

The main wheel brakes are set for parking by using the PARK BRAKE knob on the left side of the console near the pilot’s right ankle. Brake lines from the toe brakes to the main wheel brake calipers are plumbed through a parking brake valve. For normal operation, the knob is pushed forward. With the knob pushed forward, poppets in the valve are mechanically held open allowing normal brake operation. When the handle is pulled back, the parking brake valve holds applied brake pressure, locking the brakes. To apply the parking brake, set the brakes with the rudder-pedal toe brakes, and then pull the PARK BRAKE knob back.

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 and one independent luggage compartment door on the left side.

Doors are locked in the closed position via 3 locking pins operated simultaneously by rotating a common central handle. Baggage compartment door is locked with a key secured closure.

7.5.2 Ventilation

The system's primary source of fresh air, however, is a set of sliding windows and adjustable vents that direct fresh ram air into the cabin. There is a sliding window door on the starboard side, an adjustable circular vent in the door on the port side and another adjustable circular cabin air exhaust in the sun roof.

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. The back panel features a manual pneumatic pump to adjust the size of the lumbar bladder and thus lumbar support.

7.5.4 Baggage Compartment

The baggage compartment door, located on the left side of the fuselage aft of the door, allows entry to the baggage compartment. The baggage door is hinged on the forward edge and latched on the rear edge. The door is locked from the outside with a key lock. The baggage compartment key will also open and close the cabin doors.

The baggage compartment extends from behind the seats to the aft cabin bulkhead and is L50 x W50 x H60 cm in size and limited to 25 kg of load. The seats can be folded forward to provide additional baggage area for long or bulky items.

All items in the baggage compartment must be secured in place by means of a cargo net. The net is attached to 4 rings located at the baggage compartment corners.

7.5.5 Cabin Safety Equipment

Passenger Restraints
The harness is a 3 point restaint system with automobile style quick release buckle.The lap belt strands are attached to the comoposite 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 Rotax 912 S3 engine both providing 73.5 kW takeoff power. All limits as defined by the engine manufacturer apply. The engine can be operated with AVGAS, MOGAS or car fuel (min RON 95; EN228 Premium or Premium plus with max. 10% Ethanol) as by Rotax specification. The propeller is driven by a gearbox. The gearbox is equipped with the Rotax slipper clutch.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, gearbox and propeller governor. TBO is 2000 hours.

7.6.2 Engine Components

Oil System
The dry-sump lubrication system consists of a 3.5 liter-tank, two coolers, a mechanically-driven pump and 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 by carbon composite plenum. 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.

Carburettors

Dual needle-type Bing carburettors 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 upper 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 dual tailpipes. All of it's components are made of titanium, making it very light weight. The two tailpipes are 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 power (throttle) control, a propeller control lever and the choke lever

Power (Throttle) Lever
A throttle control lever is located at the central console 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.

The constant-speed propeller is controlled by a wire controlling a hydraulic governor.

Start/Ignition Switch
A rotary-type key switch, located on the main switch panel, controls ignition and starter operation. The switch is labeled OFF-R-L- BOTH-START. In the OFF position, the starter is electrically isolated, the ignition systems ("magnetos") are grounded and will not operate. Normally, the engine is operated on both magnetos (switch in BOTH position) except for magneto checks and emergency operations. The R and L positions are used for individual magneto checks and for single magneto operation when required. When the master switch ON, rotating the switch to the spring loaded START position energizes the starter and activates both magnetos. The switch automatically returns to the BOTH position when released.

7.6.4 Engine Monitoring Instruments

The aircraft is equipped with electronic engine instrumentation, which is part of the MFD.

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

A Data Acquisition Unit (Garmin GEA24 EIM), mounted inside the instrument panel, converts analog signals from the COOLANT, EGT, MAP, oil pressure, oil temperature, fuel pressure, fuel flo, voltage, amperage and tachometer sensors to digital format, which are then transmitted to the MFD and/or PFD for display.
12 VDC for Data Acquisition Unit operation is supplied through the EIS circuit breaker.

The PFD presents manifold pressure and RPM the upper left area of the display in horizontal tape format and as text immediately nearby. Other parameters are continuously displayed in the engine data block located in the to the right of the MFD. A dedicated full page indication is also available upon pilot's selection.

System health, caution, and warning messages are displayed in colorcoded advisory boxes on the MFD. In addition, the text of the engine parameters displayed on the PFD change to the corresponding color of advisory box during an annunciation event.

Note:

EGT probes are installed to each exhaust pipe. Refer to Garmin G3X Pilot's guide for a more complete description of the MFD, its operating modes, and additional detailed operating procedures for the Engine Monitoring functionality.

7.6.5 Propeller

The airplane is equipped with a constant-speed, two-blade composite propeller (MT Propeller type MTV-33, diameter 1700 mm) and governor.
The propeller governor automatically adjusts propeller pitch to regulate propeller and engine RPM. The propeller governor senses engine speed by means of flyweights and the desired RPM setting through a cable connected to the propeller control lever in the cockpit. The propeller governor boosts oil pressure in order to regulate propeller pitch position.
Moving the throttle lever forward causes the governor to meter less high-pressure oil to the propeller hub allowing centrifugal force acting on the blades to lower the propeller pitch for higher RPM operation.
During stabilized flight, the governor automatically adjusts propeller pitch in order to maintain an RPM setting (propeller and throttle position). Any change in airspeed or load on the propeller results in a change in propeller pitch.

7.7 *Fuel System*

The airplane has two integral fuel tanks, one in each wing. The maximum usable fuel quantity is 75 kg or 100 L (Avgas or Mogas, see chapter Limitations for applicable fuel grades). Two (left and right) transparent vertical tubes, which are visible from the pilot position and connected to the highest and lowers points of each respective tank, serve as a visual indicator of the fuel quantity available. Each tank has a strainer at the fuel outlet that prevents any debris and/or foreign material from making its way towards the engine. Venting of the fuel tanks is through the fuel caps.

There is a 1.5 L stainless steel collector tank (left and right) located just downstream from each fuel tank. It serves as a reserve fuel supply and prevents engine starvation from occuring due to prolonged flight in side slip. After leaving the collector tank the fuel goes through a drain valve (one per tank), located on the bottom-side of the fuselage behind the baggage compartment. Thereafter fuel enters the centrally-located fuel selector switch, which has three different positions: LEFT, RIGHT, and OFF. When the LEFT position is selected the engine is fed fuel from the left fuel tank and excess fuel is returned to the LEFT fuel tank. When the RIGHT fuel position is selected the engine is fed fuel from the right tank and the excess fuel is returned to the RIGHT fuel tank. When the OFF position is selected the fuel selector switch shuts off both the feed and return line. Once the fuel leaves the fuel selector it is fed through a gascolator, which has a drain valve. The gascolator removes water that may be in the fuel and filters out any debris/foreign material larger than 60 microns. Two fuel flow sensors are used to measure flow in feed and return lines and calculate fuel flow whch is displayed on the MFD.

Note:

Indicated fuel flow on MFD is for information only and should not be used for navigation and flight planning purposes. Refer to visual fuel quantity indicators for actual fuel quantity on board and tracking of fuel situation.

Because of aircraft's high wing configuration the fuel system is completely gravity-fed, always ensuring adequate fuel pressure. 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 tanks should be filled after each flight to prevent condensation.

Fuel Selector Valve
A fuel selector valve, located in the middle the center console, provides the following functions:

LEFT	Allows fuel to flow/return from/to the left tank
RIGHT	Allows fuel to flow/return from/to the right tank
OFF	Cuts off fuel flow and return from/to both tanks

The valve is arranged so that to feed off a particular tank the valve should be pointed to the fuel indicator for that tank. To select RIGHT or LEFT, rotate the selector to the desired position. To select Off, first raise the fuel selector knob release and then rotate the knob to OFF.

Draining
Three drains are present. The primary sampling location is the gascolator in the engine compartment, accessible from the bottom engine cowl. In addition, a drain betwen each fuel collector tank and the fuel selector is provided. These two drains are used for draining water from the fuel system and are accesible from the outside, located on the bottom-side of the fuselage behind the baggage compartment area. Industry standard fuel sampling cups or sticks should be used to perform draining.

Fuel Quantity Indicator
A visual fuel quantity indicator is provided for each fuel tank. The tube is

placarded for quantity in Liters and USGal, as well as colorcoded. Do not attempt to takeoff in the area of fuel quantity designated with RED.

Note:
When the fuel level is in the RED area, prolonged uncoordinated flight such as slips or skids can uncover the fuel tank outlets. Therefore, if operating with one fuel tank dry or if operating on LEFT or RIGHT tank when in RED areas, do not allow the airplane to remain in uncoordinated flight for periods in excess of 1 minute seconds.

Fuel Flow Indication
Indicated fuel flow on MFD is for information only and should not be used for navigation and flight planning purposes. Refer to visual fuel quantity indicators for actual fuel quantity on board and tracking of fuel situation.

7.8 *Electrical System*

7.8.1 Electrical System

The airplane is equipped with a single-alternator, 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 250W AC output at 5800 RPM and rectified with electronic full-wave rectifier regulator (RU 912). The generator system is capable of delivering max. 18A at 14V which feeds the onboard battery (12V, 11Ah). 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. An ammeter and a voltmeter are integrated in the MFD system and they are displayed on EMS mode display to monitor electrical system operating. Generator failure is indicated by a warning red LED light on the Switch panel (top, left, 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. Both 12V sockets are 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. For more detailed information see attached drawing. 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 :

Garmin G3X avionics system which includes dual display GDU37x (PFD,MFD), GEA24 (EIS), GMC305 (AP PNL), 2x GSA28 (Servo motors), 2x GSU25 (ADAHRS), GMU22 (Magnetometer), GTP59 (OAT sensor), and GAP26 (Pitot tube). Total consumption of all these items is max 8.63A at 14V.

Garmin GTR225 transceiver consumption is typical 0,5A and max 4.2A at 14V, optionally can be installed GNC255 transceiver.

Garmin GTX328ES transponder consumption is typical 1.1A and max 3.1A at 14V.

Landing light consumption is 5A at 14V.

Nav lights consumption is 0.27A at 14V.

Strobe lights consumption is 0.44A at 14V.

Cockpit illumination and dimming is 0.4A at 14V.

Electrical trim consumption is 0.3A at 14V.

7.8.4 Switches

Master Switch
The MASTER 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. To check or use avionics equipment or radios while on the ground, the AVIONICS power switch must also be turned on.

Both 12V sockets are connected via switch/fuse directly to the main battery.

Avionics Power Switch
A toggle switch, labeled AVIONICS, controls electrical power from the main bus to the Avionics Bus. The switch is located next to the MASTER switch.

Typically, the switch is used to energize or de-energize all avionics on the Avionics Bus simultaneously. With the switch in the OFF position, no electrical power will be applied to the avionics equipment, regardless of the position of the master switch or the individual equipment switches.

For normal operations, the AVIONICS switch should be placed in the OFF position prior to activating the MASTER switches, starting the engine, or applying an external power source.

Battery Disconect Switch
The battery can be disconnected from the circuit. There are two handles in the cockpit used to operate the battery connection: the battery dissconnection lever and the battery disconnection ring. The battery disconnection lever, which is a red flagtype lever is found on the firewall above the main battery on the left-hand side of the cabin. This lever has an attached wire which leads to the battery disconnection ring on the instrument panel's switch column.

To disconnect the battery from the circuit, pull the battery disconnection ring on the instrument panel's switch column.

To reconnect the battery back to the circuit, use the flag-type lever on the firewall. Deflect the lever so that its flag end points towards the firewall. Having done this correctly, you will feel the flag-lever jam into position.

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.

Note:
The LOW VOLTS warnings come from the Garmin G3X displays and are displayed on both displays. See Garmin G3X Pilot's Guide for details.

7.8.6 Circuit Breakers and Fuses

Individual electrical circuits connected to the Main and AvionicsI 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

Two 12-volt convenience outlets is installed on the instrument 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.

7.9 *Lightning*

7.9.1 Exterior Lightning

Navigation Lights

The airplane is equipped with LED standard wing tip navigation lights. The lights are controlled through the NAV/STROBE 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 are installed integral with the standard navigation light and controlled by the same switch

Landing Light

A High Intensity LED landing light is 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

Mechanical instruments, Airspeed Indicator and Altimeter are TSO'd and internally illuminated. Other instrumentation has backlit dimmable LCD displays and illuminated buttons.

Panel Flood Lights

A cabin flood-light is present and provides illumination to master electrical panel and circuit breakers. Fuel level indicator tubes are lighted individually with dedicated LED elements and are controlled on demand with a labeled switch on the instrument panel.

Dimming

Intensity of all displays' illumination is synchronized and controlled by the SmartDim controller, either reacting to ambient light conditions automatically or as manually set by the pilot. Rotating the knob to the right will result in brigher illumination, rotating the knob to the left will result in dimming. Pressing the knob for 2 seconds will engage automatic illumination which reacts to ambient light conditions using a built-in light sensor. Corresponding SmartDim display indications are provided.

7.10 *Environmental System*

Cabin ventilation and heating is realised with two principles, the cabin passive inlets/outlets for fresh air routing and the cabin heat system.

Cabin passive ventilation
The system's primary source of fresh air is a set of sliding windows and adjustable vents that direct fresh ram air into the cabin. There is a sliding window door on the starboard side, an adjustable circular vent in the door on the port side and another adjustable circular outlet in the sun roof.

Cabin Air Selector
This is the shut-off valve from the firewall forward compartment into the cabin. The stainless steal 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. Make sure the Cabin Air Selector is open before using the Cabin Heat System.

Cabin Heat System
A stainless steel heat muff fastened to the exhaust system muffler serves as the system's source of hot air. Fresh enters the engine bay from the oil cooler and is directed into the heat muff. Hot air leaving the heat muff is then directed through scat tobing to a mixer and onwards through the Cabin Air Selector, which are fastened to the aircraft's firewall.

A Cabin heat panel is located on the right side of the instrument panel with a fan toggle switch (ON/OFF), the temperature control knob (left: cold, right: hot) and airflow direction knob (left: windshield, right: feet).

Airflow direction
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 in between can also be assumed and is indicated by the knob position itself.

Heating
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 ambient air to be delivered in the cabin. Maximum hot position will only let the hot air from the exhaust muff into the cabin.

Windshield defrost
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 heated pitot tube mounted on the starboard wing, approximately 3 meters from fuselage and dual static ports mounted in the fuselage just below the baggage compartment. The pitot heat is optional and pilot controlled through a panel-mounted switch.

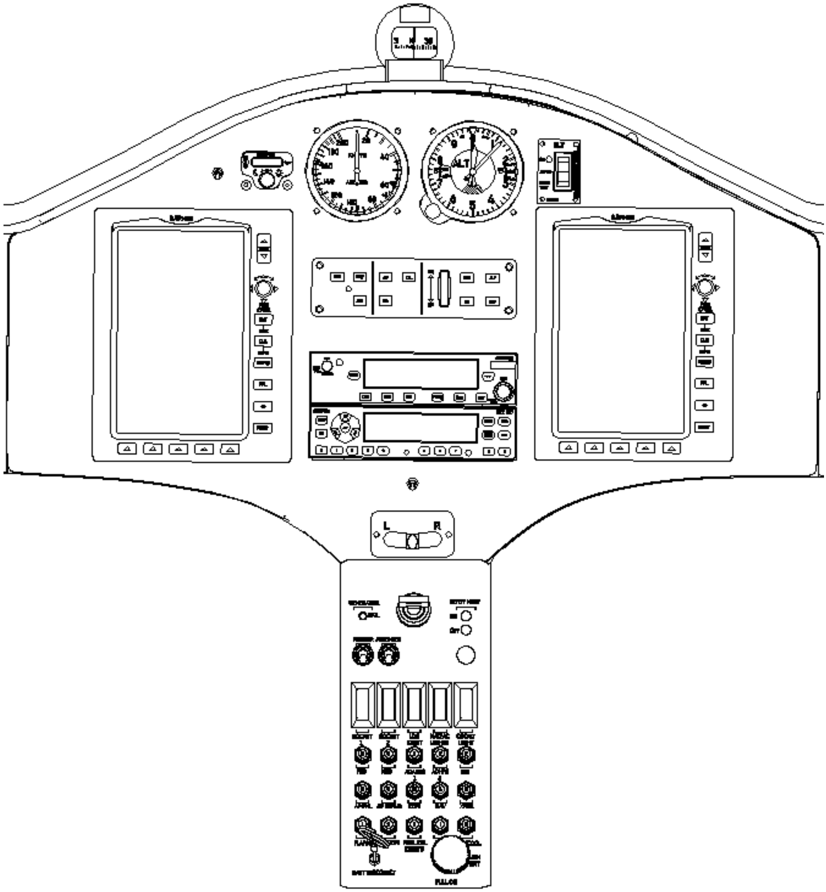
The pitot tube drives the total pressure to both to the Garmin ADAHRS units as well as the mechanical airspeed indicator. The pitot tube also has a AOA sensing port.

The lines from the static ports join together and then trive the static pressure to both Garmin ADAHRS units as well as the mechanical airspeed indicator and altimeter.

7.12 *Stall Warning System*

The stall warning system is integrated with the PFD, by using real AOA sensing via the AOA-measuring pitot tube and the associated AOA display on the PFD. The system is calibrated to produce an aural buzzer-warning of increased frequency and intensity as the RED stall margin is approached. The alarm begins at the top portion of the yellow region and continues into the red region as described above. The RED AOA region is corresponding to 1.1 x Vs at 1 g condition. YELLOW AOA region begins at a condition corresponding to 1.3 x Vs at 1 g. The GREEN AOA region serves as an orientation of stall margin.

7.13 *Flight Deck Arrangement*



Instrument Panel
The airplane is equipped with an two Garmin G3X (GDU 370) displays. The PFD (left) is a 7'' portrait-oriented display intended to be the primary display of primary flight parameter information (attitude, airspeed, heading, and altitude). The PFD accepts data from a variety of sources, including the GPS sensors, GNC255 (VOR, optional), the G3X autopilot, and serves as the heading source for the Multifunction Display.

A mechanical altimeter and airspeed indicator are in the top segment of the instrument panel in case of total or partial PFD failure. Attitude information to the autopilot are provided straight from the dual ADAHRS units, the PFD's function does not influence the functionality of the autopilot. The autopilot panel indicates modes that are active or armed.

Below the autopilot panel are the COM Garmin GTR225 (or optional NAV/COM Garmin GNC255) and Transponder Garmin GTX328 units.

There is a switch panel with MASTER, AVIONICS and Ignition switch, as well as rocker switches and circuit breakers located below the instrument panel. Cockpit heat panel is located on the right side of the instrument panel.

A switch panel located in the “dash board” bolster below the flight instruments contains the master switch, avionics power switch, pitot heat switch, and lighting switches.

Center Console
A center console contains (front-to-back) the parking brake lever, power lever, choke lever, propeller lever, fuel selector, elevator trim knob and indicator and the flap lever. On the ceiling there is the airbrakes activation handle. On the back wall, above the flaps handle, there is the flood cabin light and jacks for microphones and headphones.

7.14 *Flight Instruments*

Note: This chapter provides general information for use of the equipment. For a detailed description of the G3X suite, refer to GARMIN G3X Pilots Guide, revision M, Part Number 190/01115/00.

The Primary Flight Display (PFD) provides the functions of the attitude indicator, magnetic heading indicator, airspeed indicator, groundspeed indicator, AOA tape, altimeter, vertical speed indicator, directional gyro, course deviation indicator, wind data, FMS and avionics-related annunciator. In addition, the PFD communicates with GPS1, GPS2, NAV (optional), the Multifunction Display (MFD), and Autopilot System. It also triggers aural and acustic warnings.

An integral air data/attitude and heading reference system (ADAHRS) uses a 3-axis solid state gyro and accelerometer system and a remote magnetometer to replace the vertical and directional gyros. ADAHRS also provides roll, pitch, heading data and outside air temperature (OAT) data and continually updates the winds aloft and true airspeed (TAS) indications on the PFD. The magnetometer assembly is mounted in the back fuselage.

Mechanical instruments for airspeed and attitude and altitude are mounted in the top segment of the instrument panel and do not require electrical power to function.

Circuit breakers that apply to the PFD are labeled PFD, ADAHRS 1 and ADAHRS 2. The display presents the Initialization Display immediately after power is applied. Power-on default is 75% brightness. The dimming is via the dedicated SmartDim controller installed to the left of the mechanical airspeed indicator.

7.14.1 Attitude Direction Indicator (ADI)

Air Data

The airspeed tape to the left of the main ADI begins indicating at 20 Knots Indicated Airspeed (KIAS) and is color-coded to correspond with airspeeds for V_{SO}, V_{FE}, V_S, V_{NO}, and V_{NE}. An altitude tape is provided to the right of the main ADI and also displays a symbol for the Altitude preselect (Altitude bug). The Vertical Speed Indicator (VSI) is displayed to the right of the altitude tape. The displayed scale of the VSI is +/- 2000 ft/min. An additional data blocks are provided for display of outside air temperature (OAT), true airspeed (TAS), and groundspeed (GS). Controls for selecting bug and barometric correction values are along the right side of the PFD.

Attitude Data

Attitude is depicted on the main ADI using an aircraft reference symbol against a background of labeled pitch ladders and an arced scale along the top of the ADI to indicate bank angle. A skid/slip indicator is attached to the bottom edge of the bank angle pointer. The Flight director function integrates into the ADI.

7.14.2 Horizontal Situation Indicator (HSI)

Heading Data

Magnetic heading in the PFD is represented in boxed numeric form at the left of the compass rose and the top magnetic heading strip. Heading rate (Rate of Turn Indicator) takes the form of a purple trend vector, begins behind the magnetic heading indicator and moves left or right accordingly. Graduations are provided on the rate-of-turn indicator scale to indicate half and full standard-rate turns. A heading bug is also provided on the compass rose and the heading strip above the attitude indicator.

Navigation Data
Navigation data on the PFD takes several forms. A course deviation indicator (CDI) is always provided on the HSI and a bearing pointer can be optionally selected for display on the HSI by the pilot. Controls for selecting the source of navigation data, selecting the display format of the navigation data, and for selecting the type of compass rose and moving map to be displayed are along the right and bottom side of the PFD. The active flight plan contained in the GPS Nav/Com unit selected as the primary navigation source (Nav) can be optionally selected for display on the HSI as well as the desired range of the optionally selectable moving map display. If a localizer or ILS frequency is tuned and captured in the GPS Nav/Com selected as the Nav source, a vertical deviation indicator (VDI) and horizontal deviation indicator (HDI) are automatically displayed on the ADI.

7.14.3 Attitude Indicator

The attitude indicator gives a visual indication of flight attitude and is part of the PFD. Bank attitude is indicated by a pointer at the top of the indicator relative to the bank scale with index marks at 10°, 20°, 30°, 45° and 60° on either side of the center mark. A yellow fixed miniature airplane superimposed over a movable mask containing a white symbolic horizon bar, which divides the mask into two sections, indicates pitch and roll attitudes. The upper “blue sky” section and the lower “earth” sections have pitch reference lines useful for pitch attitude control. The indicator can follow maneuvers through 360° in roll and 360° in pitch. When Synthetic-vision function is active the sky-up, earth-down background of the attitude indicator is replaced by a 3D terrain representation. The horizon line remains white. The Flight director function integrates onto the attitude indicator.

7.14.4 Mechanical Airspeed Indicator

Indicated airspeed is indicated on an internally lit precision airspeed indicator installed in the pilot's instrument panel. The instrument senses difference in static and Pitot pressures and displays the result in knots on an airspeed scale.

7.14.5 Mechanical Altimeter

Airplane altitude is depicted on a conventional, three-pointer, internally lit barometric altimeter. The instrument senses the local barometric pressure adjusted for altimeter setting and displays the result on the instrument in feet. The altimeter is calibrated for operation between -1000 and 20,000 feet altitude. The scale is marked from 0 to 10 in increments of 2. The long pointer indicates hundreds of feet and sweeps the scale every 1000 feet (each increment equals 20 feet). The short, wide pointer indicates thousands of feet and sweeps the scale every 10,000 feet (each increment equals 200 feet). The short narrow pointer indicates tens of thousands feet and sweeps from 0 (zero) to 2 (20,000 feet with each increment equal to 2000 feet). Barometric windows on the instrument's face allow barometric calibrations in either inches of mercury (in.Hg) or millibars (mb). The barometric altimeter settings are input through the barometric adjustment knob at the lower left of the instrument.

7.14.6 Turn Coordinator

Turn Coordinator function and roll data display is integrated into the PFD.

7.14.7 Course Deviation Indicator

The Course Deviation Indicator is integrated into the PFD.

7.14.8 Magnetic Compass

A conventional liquid filled, magnetic compass is installed on top of the instrument panel. A compass correction card is installed with the compass.

7.15 *Avionics System*

The following paragraphs and equipment descriptions describe all standard avionic installations offered for the aircraft. The avionics navigation and communication equipment are mounted in the instrument panel and are easily accessible from either pilot seat.

For detailed descriptions of specific avionic equipment, operating procedures, or data for optional avionic equipment, refer to the the Airplane Flight Manual Supplement, Section 9.

The standard avionics configuration consists of:

Display Garmin GDU 370 (PFD)

Display Garmin GDU 370 (MFD)

ADHARS Garmin GSU25 (2x)

AOA Pitot probe Garmin GAP26

EIS Garmin GEA 24 (Engine Data Acquisition unit)

Magnetometer Garmin GMU 22

Altimeter Mikrotechna LUN1128 (Mechanical Altimeter)

Airspeed Indicator Mikrotechna LUN1116 (Mechanical Airspeed Indicator)

Radio COM Garmin GTR 225 or COM/NAV Garmin GNC 255 (option)

Transponder Garmin GTX 328 (S-Mode transponder)

Autopilot panel Garmin GMC 305

Pipistrel SmartDim controller

ELT Kannad 406 AF compact + remote panel Kannad RC200

Mechanical Compass

Slipball Winter

Cabin heat control panel

Switches and breakers

7.15.1 Communication (COM) Transceivers

A VHF communication (COM) transceiver is installed to provide VHF communication. The transceivers and integrated controls are mounted in the Garmin GTR 225 or GNC 255 (option) units. The transceivers receive all narrow- and wide-band VHF communication transmissions transmitted within range of the selected frequency. The antennas pick up the signals and route the communication signals to the transceivers, which digitize the audible communication signal. The digitized audio is then routed to the audio control unit for distribution to the speakers or headphones.

The Garmin GTR 225 or GNC 255 (optiona) is designated as COM. COM provides transceiver active and standby frequency indication, frequency memory storage, and knob operated frequency selection. The COM transceiver provides either 720-channel (25 kHz spacing) or 2140-channel (8.33 kHz spacing) operation in a frequency range from 118.000 to 136.975 MHz. The COM antenna is located on top of fuselage behind the cabin. 12

VDC for COM transceiver operation is controlled through the Avionics Switch and supplied through the COM circuit breaker on the Avionics Bus.

7.15.2 Navigation (NAV) Transceivers (Option)

Refer to Supplement 9-S2.

7.15.3 Transponder

The airplane is equipped with a single Garmin GTX 328 ATC Mode S (identification and altitude) transponder with squawk capability. The transponder system consists of the integrated receiver/transmitter control unit, an antenna, and an altitude encoder. The receiver/ transmitter receives interrogations from a ground-based secondary radar transmitter and then transmits to the interrogating Air Traffic Control Center. Digitized altitude information, provided by the altitude encoder, is plumbed into the airplane static system. The transponder and integrated controls are mounted in the center console. The transponder control provides active code display, code selection, IDENT button, and test functions. A FUNC (function) key allows for selection of pressure altitude, flight time, count-up timer and countdown timer modes. The display is daylight readable and dimming is operator controlled through the INST lights control on the instrument panel bolster. The transponder antenna is mounted on the underside of the fuselage just aft of the firewall. 12 VDC for transponder operation is controlled through the Avionics Switchl. 12 VDC for receiver, transmitter, and altitude encoder operation is supplied through the XPDR circuit breaker on the Avionics Bus.

7.15.4 Audio System

The airplane is equipped with a VOX intercom system as part of the COM unit. A separate designated intercom ON/OFF switch is provided below the Transponder on the central part of the instrument panel.

Headset/Microphone Installation
The airplane is equipped with provisions for two headsets with integrated microphones. The microphone-headsets use remote Push-To-Talk (PTT) switches located on the top of the associated control stick grip. The microphone (MIC) and headset jacks for the pilots are located on the upper part of the back cockpit wall. The volume is controlled via the COM unit and intercom function via the dedicated intercom switch.

7.15.5 Hour Meter

Hour meterr function is integrated into the MFD.

7.16 *Autopilot*

The airplane is equipped with a 2-axis G3X Automatic Flight Control System (Autopilot), controlling pitch and roll via separate servo motors (GSA 28 type). It is fully integrated with the PFD. A dedicated autopilot panel (GMC 305) is installed on the central part of the instrument panel for easier mode selection/recognition/activation/arming. When in an active autopilot mode, full guidance is provided, including smooth transitions to altitude and heading captures. If not in an active autopilot mode (i.e., “hand-flying”), there is no guidance other than the position of the appropriate bugs and/or the flight director, as set by the pilot. A button on pilot's control stick handle may be used to disengage the autopilot.

The reference bugs' status, autopilot annunciations, and flight director steering command bars (if installed) will indicate when PFD is coupled with the autopilot. A solid magenta Heading, Altitude, or VSI bug indicates that the function is currently coupled to an active mode of the autopilot.

In flight director equipped aircraft, when a vertical mode of the autopilot is being used, a set of flight director command bars will indicate the required steering of the aircraft to achieve the commanded tracking from the autopilot. In autopilot mode, “AP” will be in the autopilot annunciation field, the command bars will be visible and magenta and the aircraft should track the bars.

In flight director only mode, “FD” will be displayed in the autopilot annunciation field, the command bars will be visible and green, and the pilot is expected to actuate the flight controls as required to track the bars.

Note:
One of the horizontal modes (HDG, NAV, GPSS) must be engaged on the autopilot control interface before a vertical mode can be used.

When HDG mode is engaged, rotation of the heading bug greater than 180 degrees may result in a reversal of turn direction.

The following modes of the G3X Autopilot system are supported:

1. HDG (Heading Hold) Mode
2. ALT (Altitude Capture/Hold) Mode
3. VS (Vertical Speed Hold) Mode
4. GPS Track (Direct-To) Mode
5. NAV (Capture NAV track or radial) Mode

6. VNV (Vertical Navigation from GPS source) Mode

7.APR (simultaneous Vertical Navigation and NAV guidance from GPS or NAV source) Mode

8. IAS (Indicated Airspeed Hold) Mode

9. LVL (Level-button) Mode

12 VDC for autopilot and is supplied through the two circuit breakers. The autopilot panel is controlled with the AP PNL and the servos with the AP SERVO circuit breaker circuit breaker.

7.17 *Emergency Locator Transmitter*

The airplane is 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 top-right side of the instrument panel. The transmitter unit is mounted longitudinally in the airplane in order to detect deceleration greater than 3.5 ft/sec. If rapid deceleration is detected, the transmitter will repeatedly transmit VHF band audio sweeps at 121.5 MHz, 243.0 MHz and 406 MHz.

The transmitter and portable antenna are accessible by folding the right seat. The ELT can be removed from the airplane and used as a personal locating device if it is necessary to leave the airplane after an accident. The battery, which powers the ELT, must be replaced at specified intervals based upon the date appearing on the battery (refer to Airplane Maintenance Manual).

The ELT remote switch and indicator panel is installed on top-right side of the instrument panel provides test and monitoring functions for the ELT. The panel contains a button labeled ON, a button labeled RESET, and a red LED (light). The red light flashes when the ELT is transmitting. The ON button is used to test the unit in accordance with the maintenance manual procedures. The RESET button can be used to cancel an inadvertent transmission

In the event of an accident:

1. Verify ELT operation by noting that the ELT indicator light on the remote panel is flashing.

2. If possible, access the unit as described below and set the ELT main transmitter control switch ON.

Portable use of ELT:

1. Fold right seat to gain access to the unit.
2. Disconnect fixed antenna lead from front of unit.
3. Disconnect lead from remote switch and indicator unit.
4. Loosen attach straps and remove transmitter unit and portable antenna.
5. Attach portable antenna to antenna jack on front of unit.
6. Set main control switch to ON.
7. Hold antenna upright as much as possible.

7.18 *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.

7.18.1 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 structire.

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 6/600 SD SPEEDY. 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 KIAS.

7.18.2 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.

7.18.3 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.

7.19 *Towing equipment (optional)*

The aircraft is optionally equipped with towing equipment, consisting of the composite tail attachment, containing the hook/relelase assembly, the actuation cable from the tail into the cabin and the yellow cockpit rope-disconnect lever, positioned in front of the pilot on the middle console.

The mirror is attached via a triple-redundant suction cup device. Location for installation is marked on the bottom surface of the left-wing.

The towing equipment is limited to use with a weak link (max rating 300 kg) and for towing of gliders with a take-off weight of less than 600 kg. Associated Normal procedures and Performance is listed under relevant chapters of this AFM.

Section 8
Handling, Servicing and Maintenance

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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

As required by national operating rules all airplanes must pass a complete annual inspection every twelve calendar months. In addition to the annual inspection airplanes must pass a complete inspection after every 100 flights hours.

The airworthiness authority may require other inspections by the issuance of airworthiness directives applicable to the aircraft, engine, propeller and components. The owner is responsible for compliance with all applicable airworthiness directives and periodical inspections.

As required by national operating rules all airplanes must pass a complete annual inspection every twelve calendar months.

8.3 Pilot conducted Maintenance

Pilots operating the airplane should refer to the regulations of the country of certification for information of preventive maintenance that may be performed by pilots. This maintenance may be performed only on an aircraft that the pilot owns or operates and which is not used in air carrier service. All other maintenance required on the airplane is to be accomplished by appropriately licensed personnel. A licensed maintenance company should be contacted for further information. Preventive maintenance should be accomplished with the appropriate service manual.

The following is a list of the maintenance that the pilot may perform:

1. Remove, install, and repair tires.
2. Clean, grease, or replace wheel bearings
3. Replace defective safety wire or cotter pins.
4. Lubrication not requiring disassembly other than removal of non-structural items such as access covers, cowlings or fairings.
5. Replenish hydraulic fluid in the hydraulic and brake reservoirs.
6. Repair interior upholstery and furnishings.
7. Clean or replace fuel and oil strainers, as well as replace or clean filter elements.
8. Replace the battery and check fluid level and specific gravity.

8.4 Changes and Repairs

Only licensed personnel is permitted to accomplish changes or repairs. Changes to the aircraft must be performed in coordination with the manufacturer and the authority. Intention is to protect the aircraft's airworthiness state. Information regarding repairs are contained in the maintenance manual.

8.5 Servicing

8.5.1 Tire Servicing

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

Nose wheel tire:	1.8 – 2.2 bar
Main wheel tires:	2.2 – 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 on rudder pedals around cap before opening reservoir cap itself
3. Remove cap and add MIL-H-5606 hydraulic fluid.
4. Install cap, check brakes, inspect area for leaks

8.5.3 Propeller Servicing

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 switch OFF, Ignition 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 bottle 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 fillers are located on top of the wing. Each wing holds a maximum of 50 l. The fuel tank caps are equipped with vent tubes.

WARNING!
Have a fire extinguisher available. Do not till 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 tilled.
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 wing around fuel tiller.
4. Remove fuel filler cap and fuel airplane to desired level.

Note:

Do not open (turn) the fuel cap by means of handling the vent tube. Use the provided tool or a coin.

Note:

Do not permit fuel nozzle to come in contact with bottom of fuel tanks. Keep fuel tanks at least half full at all times to minimize condensation and moisture accumulation in tanks. In extremely humid areas, the fuel supply should be checked frequently and drained of condensation to prevent possible distribution problems.

If fuel is going to be added to only one tank, the tank being serviced should be filled to the same level as the opposite tank. This will aid in keeping fuel loads balanced.

5. Remove nozzle, install filler cap, and remove protective cover.
6. Repeat refuel procedure tor opposite wing.
7. Remove ground wires.
8. 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.

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

The gascolator drain is accessible through the lower engine cown (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.

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.

WARNING!

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 switch OFF, Avionics switch OFF
3. Connect (+) lead of external power source to (+) terminal of the battery. Connect (-) lead of external power source to the exhaust.
4. Master 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.
5. If avionics are required, set AVIONICS power switch ON.

CAUTION!

If maintenance on avionics systems is to be performed, it is recommended that external power be used. It is not recommended to start or crank the engine with the AVIONICS power switch ‘on.’

To remove external power from airplane:

1. Carefully remove cables from battery terminal and exhaust.

8.6.2 Towing / Ground movements

Towing is not approved. For ground movements the following applies.

CAUTION!

While pushing the aircraft backward, the nose-wheel must be off the ground to keep the nose wheel from turning abruptly. Do not use the tail vertical or horizontal control surfaces or stabilizers to move the airplane. Grab the tailcone in front of the vertical fin to push and maneouver. Wing roots can be used as push points. Do not push or pull on wing control surfaces or propeller to maneuver the airplane. Do not move the airplane when the main gear is obstructed with mud or snow.

Observe:

1. Be especially cognizant of hangar door clearances.
2. Release parking brake and remove chocks
3. Move airplane to desired location by grabbing on the tail cone.
4. When moving backward, lower the tail to keep nose wheel off the ground.
5. Install chocks when repositioning complete.

To obtain a minimum radius turn during ground handling, the airplane may be rotated around either main landing gear by pressing down on a fuselage just forward of the horizontal stabilizer to raise the nosewheel off the ground.

8.6.3 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, gravel, 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.

8.6.4 Parking

1. For parking, head airplane into the wind if possible.
2. Choose even terrain so that fuel does spill because of sloped wings.
3. Retract flaps to (-), retract and lock airbakes.
4. Set parking brake by first applying brake pressure using the toe brakes and then pulling the PARKING BRAKE knob aft.
5. Chock both main gear wheels.
6. Tie down airplane.
7. Install a pitot head cover.
8. Cabin and baggage 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.

8.6.5 Tie-down

1. Head the airplane into the wind if possible.
2. Retract flaps to (-), retract and lock airbakes.
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 alternator, 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, antistatic acrylic 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. 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 OFF.

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.

Section 9
Supplements
List of effective Supplements

Any revision or addition of effective supplements must be recorded in the table.
A black vertical line in the left hand margin and the revision no. will indicate the new or amended text in the revision.

Suppl.-No.	Supplement	Revision
9-S1	ELT KANNAD AF406 COMPACT	A01
9-S2	GARMIN GNC 255 NAV/COM	A01

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Section 9
Supplement 9-S1
KANNAD AF406 COMPACT
406 MHz ELT System

When the KANNAD AF406 COMPACT 406 MHz ELT System is installed on the aircraft, this AFM Supplement is applicable and must be inserted in the Supplements Section of the Aircraft Flight Manual. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic Aircraft Flight Manual.

Signature: ______________________________

Authority: ______________________________

Stamp: ______________________________

Date of Approval: ______________________________

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9.1 Section 1: General

The 406 MHz emergency locator transmitter (ELT) is a radio-frequency transmitter that generates a signal to assist in search and rescue for missing aircraft. The ELT automatically transmits the standard sweep tone on 121.5 MHz if rapid deceleration is detected. In addition, for the first 24 hours of operation, a 406 MHz signal containing aircraft specific information is transmitted at 50 seconds for 440 milliseconds.

9.2 Section 2: Limitations

No change.

9.3 Section 3: Emergency Procedures

9.3.1 Forced Landing

Before performing a forced landing activate the ELT transmitter manually by turning the ELT remote switch to the 'ON'-position. Immediately after a forced landing, perform the following procedure:

Note:
The ELT Remote Switch and Control Panel Indicator could be inoperative in the event of a forced landing. If inoperative, the inertia “G” switch will activate automatically. However, to turn the ELT OFF and ON will require manual switching of the main control switch located on the ELT unit.

1. ELT Remote Switch .... Verify ON
   Switch the ELT Remote Switch ON even if the red LED annunciator is flashing. If airplane radio operable and can be safety used (no threat of fire or explosion), turn radio ON and select 121.5 MHz.
   If the ELT can be heard transmitting, it is working properly.
2. Battery Power .... Conserve
   Do not use radio transceiver until rescue aircraft is sighted.

After sighting rescue aircraft:

3. ELT Remote Switch .... "ARM" position to prevent radio interference.
   Attempt contact with rescue aircraft with the radio transceiver set to a frequency of 121.5 MHz. If no contact is established, switch the panel mounted switch to the 'ON'-position immediately.

9.3.2 Portable Use of ELT

The ELT transmitter can be removed from the airplane and used as a personal locating device if it is necessary to leave the airplane after an accident. Access the unit as described below and set the ELT transmitter control switch to the 'ON'-position.

1. Remove avionics bay access panel along the lower aft center access panel of baggage compartment.
2. Disconnect fixed antenna lead from front of unit.
3. Disconnect lead from remote switch and indicator unit.
4. Disconnect antenna from mounting tray.
5. Loosen attach straps and remove transmitter unit.
6. Attach antenna to antenna jack on front of unit.
7. Set main control switch to ON.
8. Hold antenna upright as much as possible.

9.4 Section 4: Normal Procedures

No change.

9.5 Section 5: Performance

No change.

9.6 Section 6: Weight and Balance

No change.

9.7 Section 7: System Description

This airplane is equipped with a self-contained KANNAD AF 406 COMPACT 406 MHz ELT System. The transmitter unit is automatically activated upon sensing a change of velocity along its longitudinal axis exceeding 4 to 5 feet per second. Once activated, the transmitter transmits VHF band audio sweeps at 121.5 Mhz until battery power is gone. In addition, for the first 24 hours of operation, a 406 MHz signal is transmitted at 50- second intervals. This transmission lasts 440 ms and contains identification data received by Cospas-Sarsat satellites. The transmitted data is referenced in a database maintained by the national authority responsible for ELT registration to identify the beacon and owner. The ELT transmitter is installed immediately behind the aft cabin bulkhead, slightly to the right of the airplane centerline. The transmitter and antenna are accessible through the avionics bay access panel along the aft portion of the RH fuselage or the lower aft center access panel of baggage compartment. The main transmitter control switch is labeled “ON” - “ARM”. The transmitter is in the armed position for normal operations. A red LED annunciator flashes when the ELT is transmitting. A battery pack consisting of two “D” cell lithium batteries mounts to a cover assembly within the transmitter to provide power to the transmitter. The expiration date of the batteries are indicated on the outside of the ELT battery case and recorded in the aircraft logs. A warning buzzer is mounted to the transmitter mounting tray. When the ELT is activated, the buzzer “beeps” periodically. This buzzer operates in tandem with the ELT panel indicator and serves as a redundant annunciation. Power to the buzzer is supplied by the ELT batteries.

9.8 Section 8: Handling, Servicing and Maintenance

ELT and RCPI batteries must be inspected in accordance with the Aircraft Maintenances Manual. The ELT and RCPI batteries must be replaced upon reaching the date stamped on the batteries, after an inadvertent activation of unknown duration, or whenever the batteries have been in use for one cumulative hour.

Inspection / Test
After setting transmitter switch to ARM position, the ELT automatically enters a self-test mode. The self-test transmits a 406 MHz test coded pulse that monitors certain system functions before shutting off. The test pulse is ignored by any satellite that receives the signal, but the ELT uses this pulse to check output power and frequency. Other parameters of the ELT are checked and a set of error codes is generated if a problem is found. The error codes are indicated by a series of pulses on the transmitter LED, remote control panel indicator LED, and alert buzzer.

Note:
Regulations require that transmitter tests only be done during the first 5 minutes of each hour and must not last for more than 3 audio sweeps (1.5 seconds). If you are at a location where there is an control tower or other monitoring facility, notify the facility before beginning the tests. Never activate the ELT while airborne for any reason.

Operators may wish to use a low quality AM broadcast receiver to determine if energy is being transmitted from the antenna. When the antenna of the radio (tuning dial on any setting) is held about 6 inches from the activated ELT antenna, the ELT aural tone will be heard on the AM broadcast receiver. This is not a measured check, but it does provide confidence that the antenna is radiating sufficient power to aid search and rescue. The aircraft’s VHF receiver, tuned to 121.5 MHz, may also be used. This receiver, however, is more sensitive and could pick up a weak signal even if the radiating ELT’s antenna is disconnected. Thus it does not check the integrity of the ELT system or provide the same level of confidence as does an AM radio.

1. Tune aircraft receiver to 121.5 MHz.
2. Turn the ELT aircraft panel switch "ON" for about 1 second, then back to the "ARM" position. The receiver should transmit 3 audio sweeps.
3. At turn-off (back to 'ARM' state) the panel LED and buzzer should present 1 pulse. If more are displayed, determine the problem from the list below.

4. Codes displayed with the associated conditions are as follows:
   a. 1-Flash: Indicates that the system is operational and that no error conditions were found.
   b. 2-Flashes: Not used.
      If displayed, correct condition before further flight.
   c. 3-Flashes: Open or short circuit condition on the antenna output or cable. If displayed, correct condition before further flight.
   d. 4-Flashes: Low power detected.
      If displayed, correct condition before further flight.
   e. 5-Flashes: Indicates that the ELT has not been programmed. Does not indicate erroneous or corrupted programmed data.
      If displayed, correct condition before further flight.
   f. 6-Flashes: Indicates that G-switch loop is not installed.
   g. If displayed, correct condition before further flight.
   h. 7-Flashes: Indicates that the ELT battery has too much accumulated operation time (> 1hr).
      If displayed, correct condition before further flight.

Section 9
Supplement 9-S2
Garmin GNC 255 NAV/COM

When a Garmin GNC 255 NAV/COM is installed on the aircraft, this AFM Supplement is applicable and must be inserted in the Supplements Section of the Aircraft Flight Manual. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic Aircraft Flight Manual.

Signature: ______________________________

Authority: ______________________________

Stamp: ______________________________

Date of Approval: ______________________________

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9.1 Section 1: General

No change.

9.2 Section 2: Limitations

No change.

9.3 Section 3: Emergency Procedures

No change.

9.4 Section 4: Normal Procedures

No change.

9.5 Section 5: Performance

No change.

9.6 Section 6: Weight and Balance

No change.

9.7 Section 7: System Description

Note: This supplement provides specific procedures for use of the GNC 255 NAVCOM and a general description of GNC 255 unit. For a detailed description of the GNC 255, refer to GARMIN GNC 255 Pilots Guide, latest revision.

7.15.2 Navigation (NAV) Transceivers (Option)

If the optional GNC 255 COM/NAV unit is installed, the airplane is equipped with an NAV receiver. The receiver is designated as NAV. The NAV receiver controls are integrated into the Garmin GNC 255. The unit has VHF Omnirange/Localizer (VOR/LOC) capability. The VOR/LOC receiver receives VOR/LOC on a frequency range from 108.000 MHz to 117.950 MHz with 50 kHz spacing. The NAV has glideslope capability and glideslope is received from 329.150 to 335.000 MHz in 150 kHz steps. The receiver control provides active and standby frequency indication, frequency memory storage, and knob-operated frequency selection. IDENT audio output for VOR and LOC is provided to the audio system. The NAV antenna, mounted on top of the vertical tail, provides VOR/LOC input for the NAV receiver. 12 VDC for navigation receiver operation is controlled through the Avionics Switch and supplied through the NAV circuit breaker on the Avionics Bus.

9.8 Section 8: Handling, Servicing and Maintenance

No change.