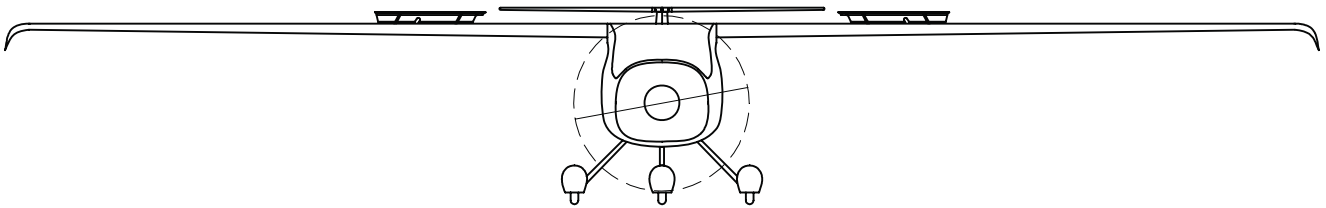




# Pilot's Operating Handbook and Training Supplement

**applies to LSA-GLIDER version of Virus 912 LSA  
equipped with Rotax 912 UL (80 HP) engine**

**Tail-wheel version owners see  
Supplemental sheet at the back of this manual**



**ORIGINAL ISSUE**  
**(25 October, 2010)**

**SERIAL NUMBER** \_\_\_\_\_

**REGISTRATION NUMBER** \_\_\_\_\_

This publication includes the material required to be furnished to the pilot by ASTM F2245.

## **WARNING!**

As this manual applies to both models of Virus 912 LSA (80 HP) it is mandatory to designate those specific parts of this manual that regard the aircraft you fly.



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# Performance - Specifications

<b>Virus 912 LSA</b>	<b>80 hp Rotax 912</b>
stall speed (flaps extended)	36 kts (67 km/h)
stall speed (flaps zero)	42 kts (78 km/h)
cruise speed (5300 RPM)	116 kts (215 km/h)
maximum speed at sea level	119 kts (220 km/h)
VNE	120 kts (222 km/h)
usable fuel capacity standard tanks 14.5 USgal/55 L, endurance	4.1 hours
usable fuel capacity long-range tanks 24.5 USgal/93 L endurance	6.8 hours
fuel flow at cruise speed	3.3 gph (12.5 l/h)
range at cruise speed (excl reserve, standard tanks)	475 NM
range at cruise speed (excl reserve, long range tanks)	795 NM
takeoff - ground roll - at MTOM	500 ft (152 m)
takeoff total distance over 50 ft obst. at MTOM	825 ft (252 m)
landing distance over 50 ft obst. (airbrakes)	885 ft (270 m)
absolute ceiling at MTOM (with engine running)	17,200 ft (5250 m)

**NOTE** Airbrakes are standard equipment and recommended for operations on runways shorter than 2000 ft. The above performance figures are based on airplane weight at 1210 lbs (550 kg), standard atmospheric conditions, level hard-surfaced dry runways and no wind. They are calculated values derived from flight test conducted by Pipistrel LSA s.r.l. under carefully documented conditions and will vary with individual airplanes and numerous factors (surface condition, temperature, water on wing, etc).

<b>Virus 912 LSA</b>	<b>80 hp Rotax 912</b>
maximum weight takeoff	1210 lbs (550 kg)
maximum weight landing	1210 lbs (550 kg)
standard empty weight	958 lbs (292 kg)
maximum useful load	568 lbs (258 kg)
baggage allowance	55 lbs (25 kg)
fuel capacity, usable	14.5/24.5 USgal
fuel capacity, usable	55 L/93 L
oil capacity (oil bottle)	3.1 quarts
engine	Rotax 912 80 hp
propeller	fixed pitch* dia. 63" 1620 mm

\*Propeller is a ground adjustable, two-blade composite propeller with metal hub, see chapter Airplane and Systems Description for more details. Optional is autofeathering propeller.

## Noise levels

According to independent testing performed by German LBA-LTF noise regulations the aeroplanes, the equivalent exhibited noise measures less than 60 dBa.

# Coverage

The Pilot's Operating Handbook (POH) in the airplane at the time of delivery from Pipistrel LSA s.r.l. contains information applicable to the Virus 912 LSA aircraft and to the airframe designated by the serial number and registration number shown on the Title Page. All information is based on data available at the time of publication.

This POH consists of ten sections that cover all operational aspects of a standard equipped airplane. Section 10 contains the supplements which provide amended operating procedures, performance data and other necessary information for airplanes conducting special operations and/or are equipped with both standard and optional equipment installed in the aeroplane. Supplements are individual documents and may be issued or revised without regard to revision dates which apply to the POH itself. The Log of Effective Pages should be used to determine the status of each supplement.

## Revision tracking, filing and identifying

Pages to be removed or replaced in the Pilot's Operating Handbook are determined by the Log of Effective pages located in this section. This log contains the page number and revision level for each page within the POH. As revisions to the POH occur, the revision level on the effected pages is updated. When two pages display the same page number, the page with the latest revision shall be used in the POH. The revision level on the Log Of Effective Pages shall also agree with the revision level of the page in question. Alternative to removing and/or replacing individual pages, the owner can also print out a whole new manual in its current form, which is always available from [www.pipistrel.eu](http://www.pipistrel.eu).

Revised material is marked with a vertical double-bar that will extend the full length of deleted, new, or revised text added to new or previously existing pages. This marker will be located adjacent to the applicable text in the marking on the outer side of the page. The same system is in place when the header, figure, or any other element inside this POH was revised. Next to the double-bar, there is also a number indicative to which revision the change occurred in. A list of revisions is located at the beginning of the Log Of Effective Pages

## Warnings, Cautions and Notes

Safety definitions used in the manual:

**WARNING!** Disregarding the following instructions leads to severe deterioration of flight safety and hazardous situations, including such resulting in injury and loss of life.

**CAUTION!** Disregarding the following instructions leads to serious deterioration of flight safety.

**NOTE** An operating procedure, technique, etc., which is considered essential to emphasize.

## Online updates, service notice tracking

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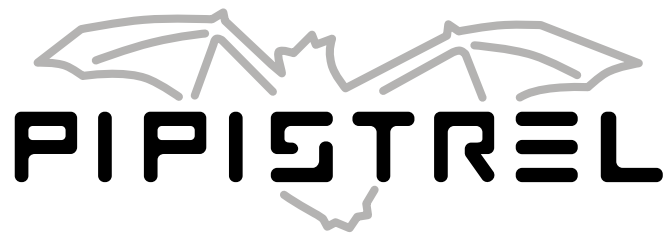


# Log of Effective Pages

Use to determine the currency and applicability of your POH. Pages are affected by the current revision are marked in bold text in the Page Number column.

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4-2	Original	0	9-7	Original	0





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**2 Airplane and system description**

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**3 Operating limitations**

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**5 Performance**

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**7 Normal procedures**

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**10 Supplement for TW version**

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# **1 General**

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**Introduction (1-2)**

**Technical brief (1-2)**

**3-view drawing (1-3)**

**Powerplant, fuel, oil (1-4)**

**Weights (1-6)**

**Centre of gravity range (1-6)**

**G-load factors (1-6)**

# Introduction

This manual contains all information needed for appropriate and safe use of Virus 912 LSA.

## IT IS MANDATORY TO CAREFULLY STUDY THIS MANUAL PRIOR TO USE OF AIRCRAFT

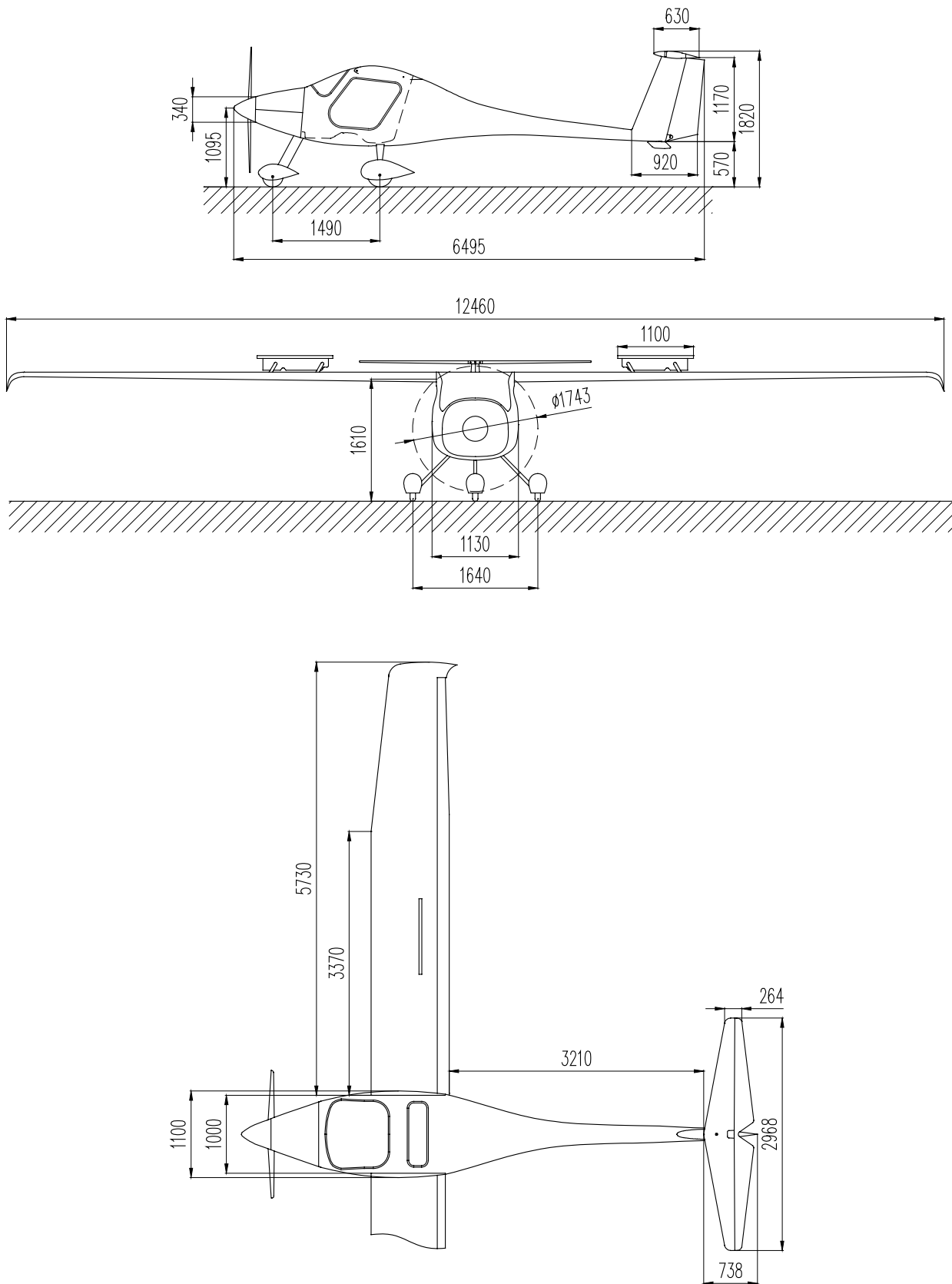
In case of aircraft damage or people injury resulting from disobeying instructions in the manual PIPISTREL LSA s.r.l. denies all responsibility.

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# Technical brief

<b>PROPORTIONS</b>	<b>Virus 912 LSA</b> <small>(all models)</small>
wing span	40 ft 10 inch (12.46 m)
length	21 ft 3 inch (6.50 m)
height	6 ft (1.82 m)
wing surface	118 sqft (11.00 m <sup>2</sup> )
vertical fin surface	12 sqft (1.1 m <sup>2</sup> )
horizontal stabilizer and elevator surface	17.5 sqft (1.63 m <sup>2</sup> )
aspect ratio	13.1
positive flap deflection (down)	9°, 18°
negative flap deflection (up)	5°
centre of gravity (MAC)	20% - 38%

# 3-view drawing



# Powerplant, fuel, oil

**Engine manufacturer: ROTAX**

**Engine type: ROTAX 912 UL (80 HP), ROTAX 912 ULS (100 HP)**

Data below is data relevant for pilot. Consult the original Rotax engine manual for all other details.

## The engine

TEMPERATURE °C / ROTAX ENGINE	912 UL 80 HP
cylinder head temp. (CHT); minimum, working, highest	80; 110; 120
max. CHT difference	/
exhaust gas temperature (EGT); normal, max.	650-885; 900
max. EGT difference	30
cooling fluids temperature (WATER); minimum, highest	50; 120
oil temperature (OIL TEMP); minimum, normal, highest	50; 90-110; 140
RPM, PRESSURE	912 UL 80 HP
oil pressure (OIL PRESS); lowest, highest bar (psi)	1.0; 6.0 (14.5; 87.0)
engine revolutions (RPM); on ground recommended	5500
RPM on ground; max. allowable	5800
magneto check at (RPM)	4000
max. single magneto drop (RPM)	300

## Fuel and oil

ROTAX ENGINE	912 UL 80 HP
recommended fuel	unleaded super, grade 87 and up, no alcohol content
also approved fuels	leaded* or AVGAS 100LL*
recommended oil	API SJ SAE 10W-50
oil capacity typical 3 quarts (3 liters)	check dipstick

**\*Engine life is reduced. Should you be forced to use this kind of fuel, change of engine oil every 50 flight hours is crucial. Please consult the manufacturer on which type of oil to use.**

### IMPORTANT!

Four-stroke engines should only be powered by unleaded fuel, for lead sedimentation inside the engine shortens its life. Provided you are unable to use unleaded fuel, make sure engine oil and the oil filter are replaced every 50 flight hours.

**WARNING!** Use of fuel with alcohol content and/or other additives is not permitted.

## NOTES

To ensure maximum fuel capacity and minimise crossfeeding when refuelling, always park the airplane in a wings level, normal ground attitude.

The visual fuel indicator is equipped with marking for fuel status in USgal and litres. Due to the wing dihedral the fuel indicator tops before the fuel tank is full. Pilot caution is advised.

Maximum full capacity is indicated only through the fuel filler on the wing, by visual check. At the same time, verify that the vent tubes remain unobstructed from contamination.

## Propeller

Virus 912 LSA	Propeler
Virus 912 LSA with Rotax 912 UL (80 HP)	Pipistrel F2-80

## Engine instrument markings

Instrument	Red line (minimum)	Green arc (normal)	Yellow arc (caution)	Red line (maximum)
Tachometer (RPM)	1600	1600-5500	5500-5800	5800
Oil temperature	50°C (122°F)	90-110°C (194-230°F)	110-140°C (230-284°F)	140 (284°F)
Cylinder head temp.	/		110-120°C (230-248°F)	120°C (248°F)
Oil pressure	1.0 bar (14.5 psi)			6.0 bar (87.0 psi)

# Weights

## Virus 912 LSA weights

WEIGHT	912 LSA 80 HP
standard empty weight	643 lbs (292 kg)
max. takeoff weight (MTOM)	1210 lbs (550 kg)
fuel capacity (full)	2 x 7.25/13 USgal
fuel capacity (usable)	14.5/24.5 USgal (55/93 L)
max. fuel weight allowable	101/167 lbs (46/76 kg)
maximum useful load	568 lbs (258 kg)
minimum combined cockpit crew weight	119 lbs (54kg)
maximum combined cockpit crew weight	519 lbs (236 kg)
luggage weight	typically 55 lbs (25 kg), see page p.51 for exact values. Allowance depends on configuration, see weight and balance.

**WARNING!** Should one of the above-listed values be exceeded, the other **MUST** be reduced in order to keep MTOM below 1210 lbs (550 kg). Pay special attention to luggage weight as this is the only applicable mass on the airframe that has an influence on centre of gravity. Exceeding baggage weight limits can shift aircraft's balance to the point when the flight becomes uncontrollable! More information on baggage allowance can be found in chapter "Weight and Balance".

Luggage access is via the optional side access door, for larger items the seat folds and the luggage compartment becomes reachable.

## Centre of gravity range

- Aircraft's safe centre of gravity position ranges between 20% and 38% of mean aerodynamic chord.
- Centre of gravity point ranges between 210 mm (8.3") and 374 mm (14.72") backwards of datum. Datum is wing's leading edge at the fuselage root.

## G-load factors

- max. positive wing load: + 4 G
- max. negative wing load: - 2 G

These values correspond to ASTM standards for LSAs. All parts have been tested to a safety factor of a minimum 1.875, meaning they were subjected to at least a load of 7.5 G

## ***2 Aircraft and System description***



**Introduction (2-2)**

**Cockpit controls (2-4)**

**Instrument panel (2-4)**

**Undercarriage (2-6)**

**Seats and safety  
harnesses (2-6)**

**Pitot-static system (2-6)**

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**Engine lubrication system (2-14)**

**Wheel brake system (2-14)**

# Introduction

Virus 912 LSA is a 40 ft (12.46 m) wingspan, two-seat T-tail motorglider made almost entirely of composite materials. Its low-drag, high-wing-monoplane, engine-at-the-front construction makes it efficient even when flying unpowered. In fact, the propeller can be feathered to reduce drag even more.

The undercarriage is a tricycle type with two main, brake equipped, wheels mounted on struts and a steerable nose wheel.

Virus 912 LSA features flaperons, interconnected flaps and ailerons presented in the same deflecting surface. Flaps offer 4 settings: neutral, 1<sup>st</sup>, 2<sup>nd</sup> and the negative (reflex) position. Full dual main flight control levers make Virus 912 LSA ideal for initial as well as for advanced flight training. All aileron, elevator and flap controls are connected to the cabin controls using self-fitting push-pull tubes. Rudder is controlled via cables. The elevator trim is mechanical, spring type.

Airbrakes are available as standard, they reduce the requirements for runways size for landing and provide for steeper approaches and expedite descents.

All aircraft ship with H type safety safety belt attached to the fuselage at three mounting points. Rudder and brake pedals can be adjusted also during flight to suit your size and needs.

Fuel tanks are located inside the wings. Fuel selector is in the form of two separate valves, located on the left and right upper wall of the cabin. The gascolator is located beneath the lower engine cover.

Refuelling can be done by pouring fuel through the fuel tank openings on top of the wings or by using an electrical fuel pump.

All glass surfaces are made of 2 mm anti UV GE tinted Lexan, which was specially developed not to shatter or split on impact.

Main wheel brakes are hydraulically driven disc type. The hydraulic brake fluid used is DOT 3 or DOT 4.

Cabin ventilation is achieved through special vents fitted onto glass doors, cabin heating, however, is provided utilizing hot air from the engine.

To enhance aerodynamics even more, every Virus 912 LSA comes equipped with special wheel fairings and the propeller spinner. The propeller is a ground adjustable composite two blade design.

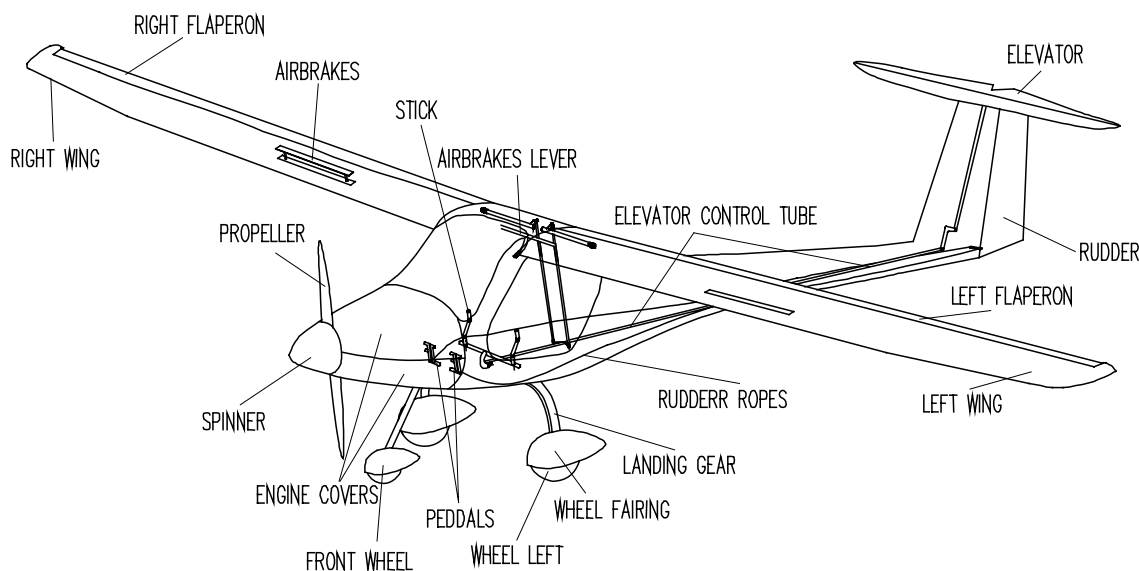
The electric circuit enables the pilot to test individual circuit items and to disconnect the entire wiring but leave the engine running, should there come to a distress situation.

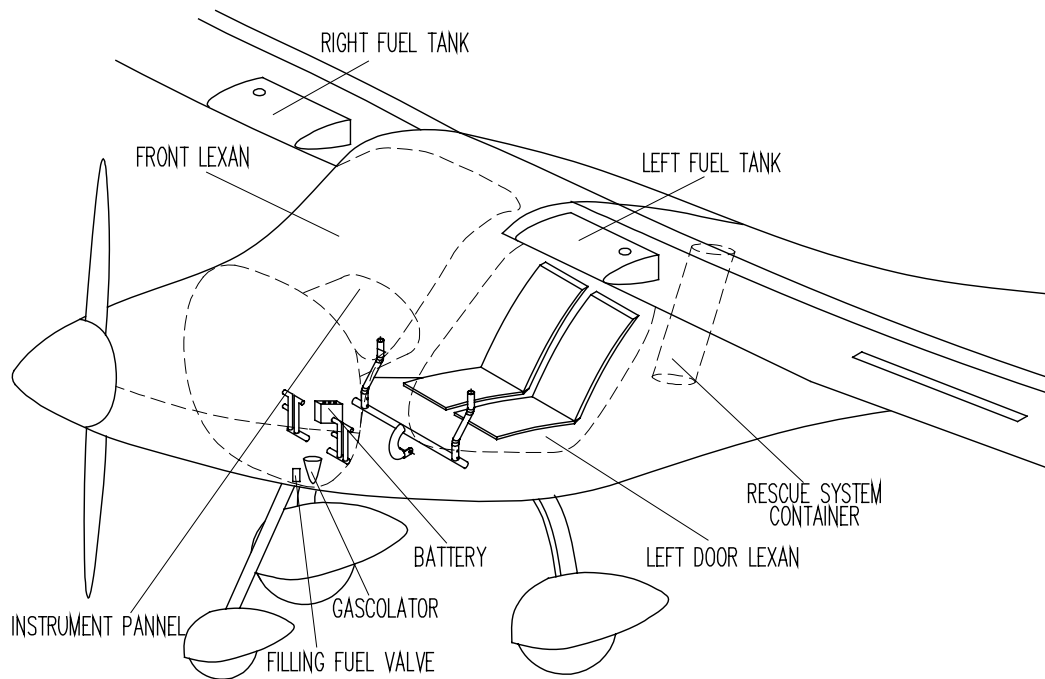
Navigational (NAV), anti collision (AC) and landing (LDG) lights are an option.

The firewall is reinforced by heat and noise insulation.

Basic instruments come installed with operational limits pre-designated, advanced avionics in form of EFIS glass cockpits etc. are an option. Parachute rescue system is an option.

Optional is also the side access door to the cargo compartment behind the seats.





### Composite parts are made of:

<b>fabric:</b>	GG160, GG200, 90070, 92110, 92120, 91125, 92140, 92145, KHW200
<b>roving:</b>	NF24
<b>foam:</b>	75 kg/m <sup>3</sup> PVC 3mm, PVC 5 mm, PVC 8mm
<b>GFK:</b>	3 mm, 5 mm, 7 mm of thickness
<b>paint:</b>	acrylic paint
<b>firewall</b>	glass-aluminium sandwich

### Medal parts used are:

<b>tubes:</b>	materials: Fe0146, Fe 0147, Fe0545, Fe1430, AC 100, CR41 in LN9369
<b>sheet metal:</b>	materials: Fe0147 in Al 3571
<b>rods:</b>	materials: Fe 1221, Fe 4732, Č4130, Al 6082, CR41 in Al 6362
<b>cable:</b>	AISI 316
<b>bolts and nuts:</b>	8/8 steel

All composite parts are made of glass, carbon and kevlar fiber manufactured by Interglas GmbH.

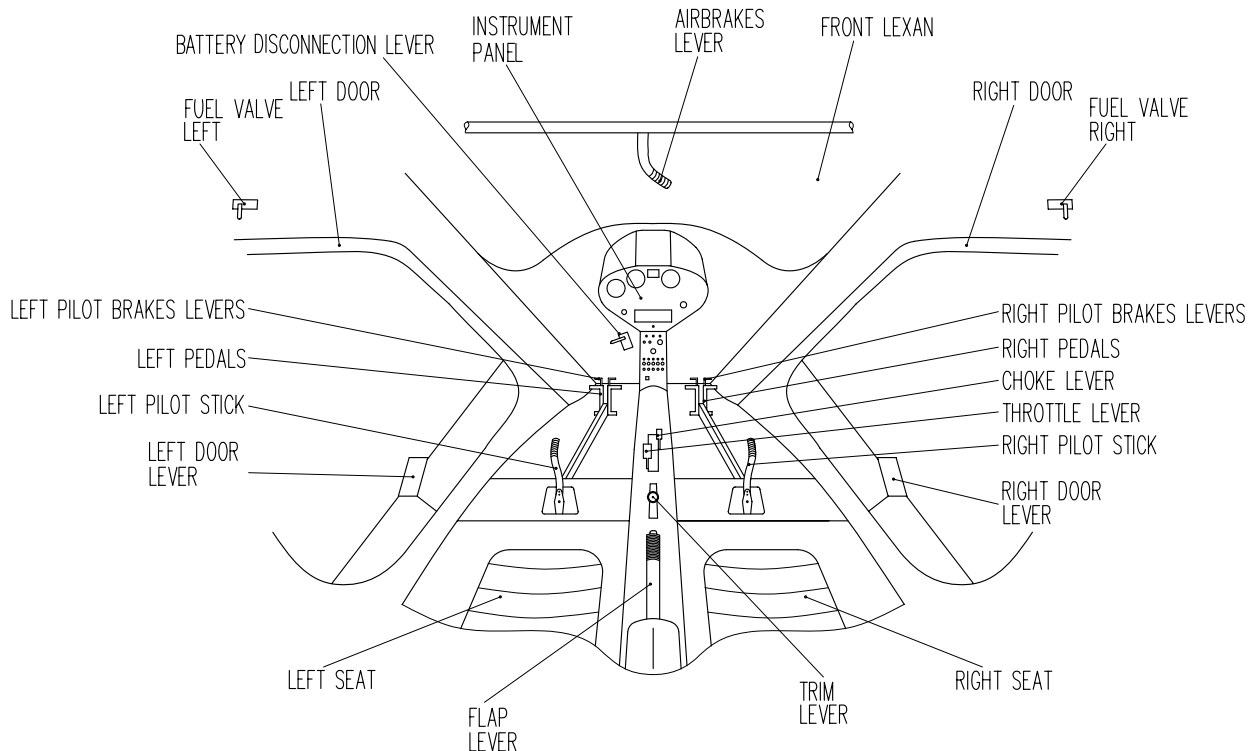
**All parts have been tested at safety factor of a minimum 1.875.**

**All composite parts are made in moulds, therefore no shape or structural differences can occur.**

**All parts and materials used in Virus 912 LSA are also being used in the glider and general aviation industry and all comply with aviation standards.**

# Cockpit levers

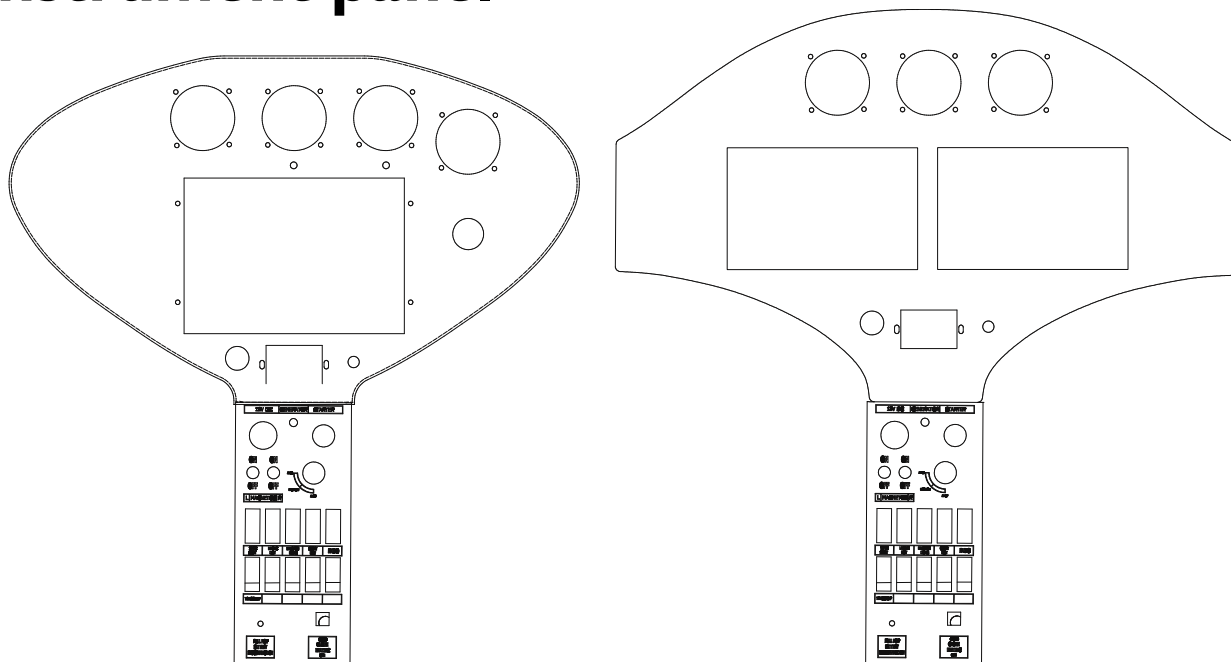
Virus 912 LSA's cockpit levers are divided into two groups:



**Individual control levers:** pilot stick and rudder with differential brake levers

**Joint control levers:** throttle lever, chock lever, flap lever, trim lever, airbrakes lever (if applicable), fuel valves, door handles, battery disconnection lever/ring and emergency parachute release handle.

# Instrument panel



Small instrument panel (left) with Brauniger as the middle screen - Large instrument panel with two screen setup (Dynon D100 and EMS 120). Both are for illustration purpose only!

There are two types of instrument panels, the big and small version, both equipped with the Brauniger Alpha MFD as the standard multifunction instrument. Factory approved options are a single Dynon D180 EFIS/EMS as the main instrument or dual screen efis setup with Dynon D100 and EMS120. All instruments have flight data recording capabilities and display all necessary flight and engine data to the pilot. Since 2010 Dynon Skyview SV-700 (single and dual screen) and SV-1000 (single screen) are an option. When a GPS unit is factory fitted the GPS data is transmitted to the glass cockpit instrument via a cable and a NMEA protocol. For additional information consult individual operators manuals for the instruments installed.

### **Notes on Brauniger Alpha MFD multifunction instrument**

- The new version of Brauniger AlphaMFD multifunction instrument (V315) also features an acoustic vario-meter and an acoustic VNE alarm.
- Certain Brauniger AlphaMFD instalations require the multifunction instrument to be switched ON seperately from the aircraft's master switch.
- Always make sure the instrument is switched OFF when you leave the aircraft so as not to discharge its internal battery.

The cockpit electrical switch panel has separate magneto- master switch and starter switch. The toggle switches used in the main sector have integrated automatic thermal circuit breakers.

# Undercarriage

The undercarriage is a tricycle type with two main, brake equipped, wheels mounted on struts and a steerable nose wheel. The nose wheel steers through rudder pedals

<b>distance between main wheels:</b>	63 inch (1.6 m)
<b>distance between main and nose wheel:</b>	60 inch (1.52 m)
<b>tire:</b>	4,00" x 6" (main wh.), 4,00" x 4" (nose wh.)
<b>tire pressure</b>	24 psi - 28 psi (main wh.), 18 psi (nose wh.)
<b>brakes:</b>	disk type, driven by brake pedals located on both rudder pedals
<b>brake fluid:</b>	DOT 3 or DOT 4

Beringer high performance brakes with the parking brake is optional equipment. To apply the parking brake, depress the pedal brake levers, hold them engaged and pull the parking brake lever (on the side of the instrument column in front of the control stick). Then release the pedal brake levers. To disengage, push the parking brake levers to full forward position.

## Seats and safety harnesses

Seats have no stiff internal structure and can therefore be folded easily for luggage access. The seat has one position, whereas the pedals are adjustable. Custom made seats are available for ordering. All Virus 912 LSA ship with H type safety harness attached to the fuselage at three mounting points.

## Pitot-Static tubes

The pitot tube is attached to the bottom side of the right-hand wing. Pitot lines made of plastic materials lead through the inside of the wing all the way to the instrument panel. Pitot heat and an AOA-indication pitot are optional

## Air brakes

Air brakes are most commonly used to increase drag and steepen the final approach. They are standard equipment on the Virus 912 LSA. Airbrakes make the total landing distance equivalent to the total take-off distance, enabling you to use STOL runways for your operations.

During takeoff, climb and cruise air brakes **MUST** be retracted and locked (handle in cockpit in full up position). To unlock and extend air brakes, press on the release lever and pull the handle downwards

# Power plant

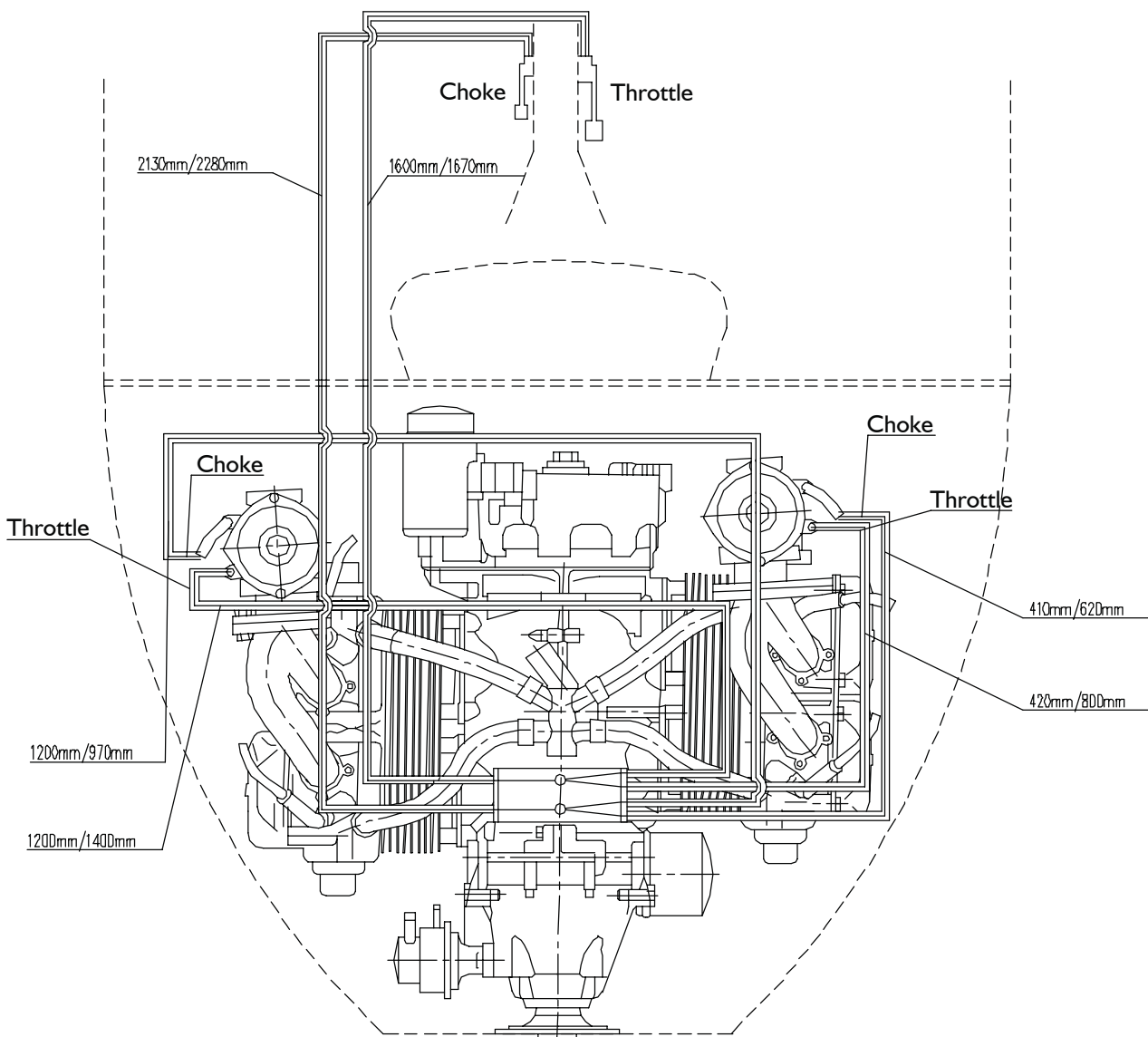
Virus 912 LSA is equipped with Rotax 912 UL 80 HP engine

## Engine description:

<b>Engine:</b>	<b>ROTAX 912UL 80 HP (4-stroke boxer, four cylinders, 1211 cm<sup>3</sup>)</b> twin carburated - dual electronic ignition
<b>cooling:</b>	crank case aircooled, cylinder heads watercooled - own radiator and pump, other moving parts oilcooled - own radiator and pump
<b>lubrication:</b>	centrally oiled - own oil pump and radiator
<b>reduction gearbox:</b>	integrated
<b>reduction ratio:</b>	1 : 2.27
<b>el. generator output power:</b>	250 W at 5500 RPM
<b>starter:</b>	electric
<b>engine power:</b>	80 HP at 5800 RPM
<b>battery:</b>	12 V, 10 Ah

All metal cables used are fire resistant, kept inside metal, self-lubricating flexible tubes.

## Schematic of throttle and choke control



## Propeller types:

propeller Pipistrel F2-80 (for Rotax 912 UL 80 HP):	twin blade, ground adjustable composite propeller - diameter 63" / 1620 mm
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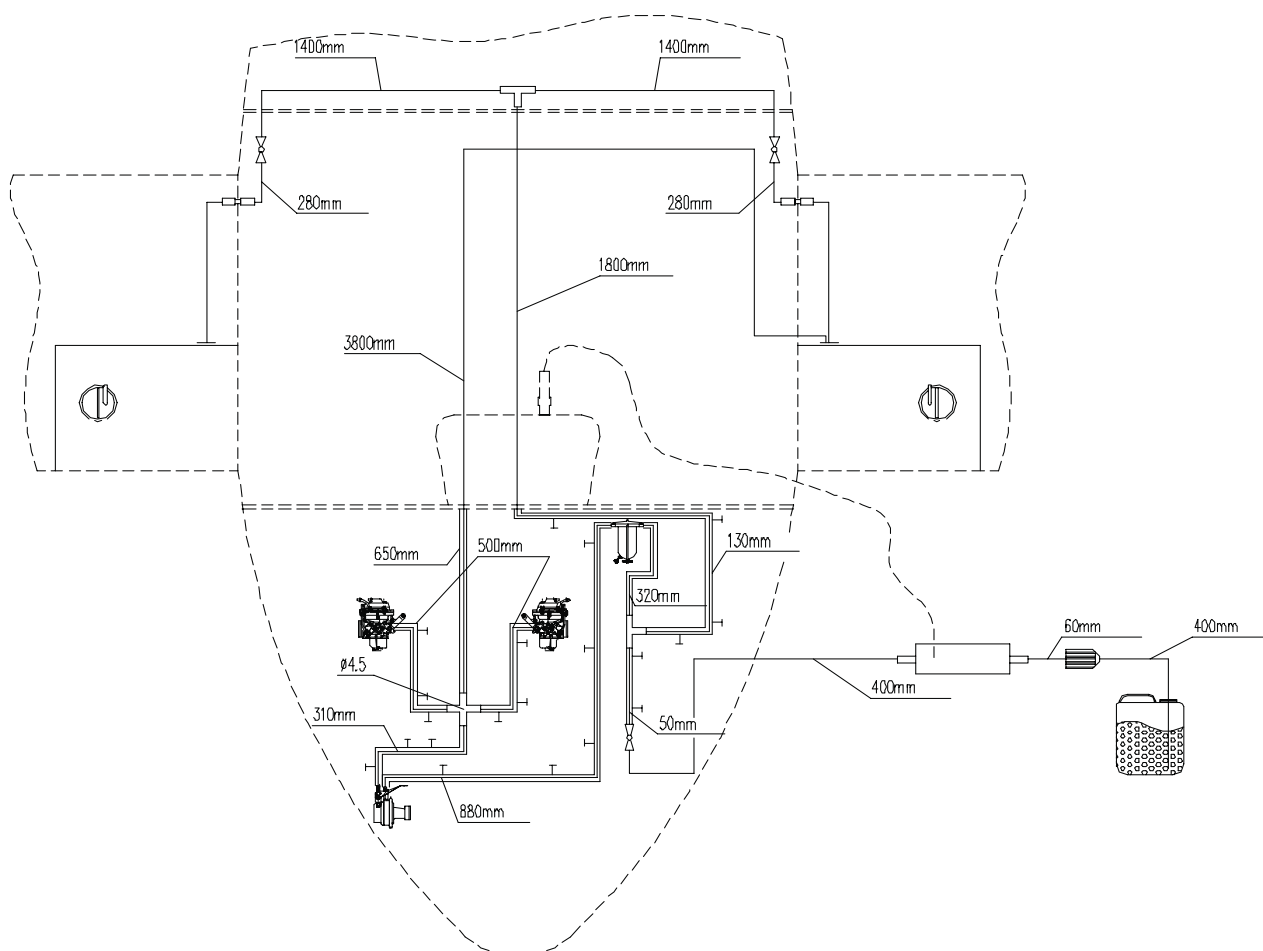
Depending on the configuration, the propeller may be ground adjustable or automatically featherable. In the latter case the propeller feathers automatically by a means of spring when the engine is not running. No specific limitations apply, apart from checking the propeller pitch travel during the preflight inspection. Do not attempt to restart the engine in flight above 50 kts.

## Fuel system

description:	vented wing fuel tanks with refueling cap on top of the wings
fuel selector valves:	separated, one for each fuel tank
gascolator:	filter equipped with drain valve
fuel capacity std. tanks:	7.25 + 7.25 USgal (30+30 L)
fuel capacity lng. range:	13 + 13 USgal (50 + 50 L)
unusable fuel (per reservoir):	0.75 USgal (3 L)
fuel filter:	inside the gascolator

All fuel hoses are protected with certified glass-teflon covers. Virus 912 LSAS's fuel system features fuel return circuit. The fuel connectors from fuselage to the wing tanks can be either fixed or click-on fast type.

### Schematic of fuel system (fuel return circuit)



**WARNING!** Visual fuel quantity indicator (tubes) in cockpit do not always provide relevant information about the actual fuel quantity on board. Because of wing dihedral, angle of attack, sideslip and reservoir supply point the readout may be incorrect. Flying with less than 1.5 Inch (30 mm) (see red marking!) of indicated fuel (measured from the bottom of the tube upwards in any of the reservoirs) is therefore regarded as hazardous any may result in engine fuel starvation and/or engine failure.

**CAUTION!** Due to the position of the fuel reservoir supply point, flying in considerable sideslip for a long time may result in fuel starvation to the engine if the fuel tank in the opposite direction of the sideslip is closed. Should this occur, righten the flight and re-open the fuel tank in question immediately to prevent engine failure.

Draining of water and/or particles is carried out by draining the contents of the gascolator, installed below the bottom engine cover and reachable through a dedicated placarded opening. Unscrew the discharge valve and drain at least 1 cup of fuel in a transparent canister, verify for water/particle contamination. Always fasten the draining valve before flight!

When using the single point fuel valve, found below the cowl opening (placarded), make sure you have closed it before flight. The single point fuel valve can either be used for fuelling the aircraft by using a pump and container, or for discharging all of the fuel on board before disassembling the aeroplane.

## Electrical system

<b>description:</b>	Dual electronic ignition. Standard, 12 V circuit charges the battery and provides power to all appliances and instruments.
<b>master switch:</b>	key type
<b>avionics switch:</b>	avionics active with key position II
<b>ignition switches:</b>	separated for each system
<b>other switches:</b>	fused and equipped with control lights
<b>battery:</b>	12 V, 10 Ah
<b>measured power consumption of some circuit breakers:</b>	Landing light: 4.5 A, Nav/Strobe lights: 1 (steady) - 2 (peak) A , Cockpit light: 0.5 A, Radio & Transponder, EFIS, autopilots: Please consult item's operating manual

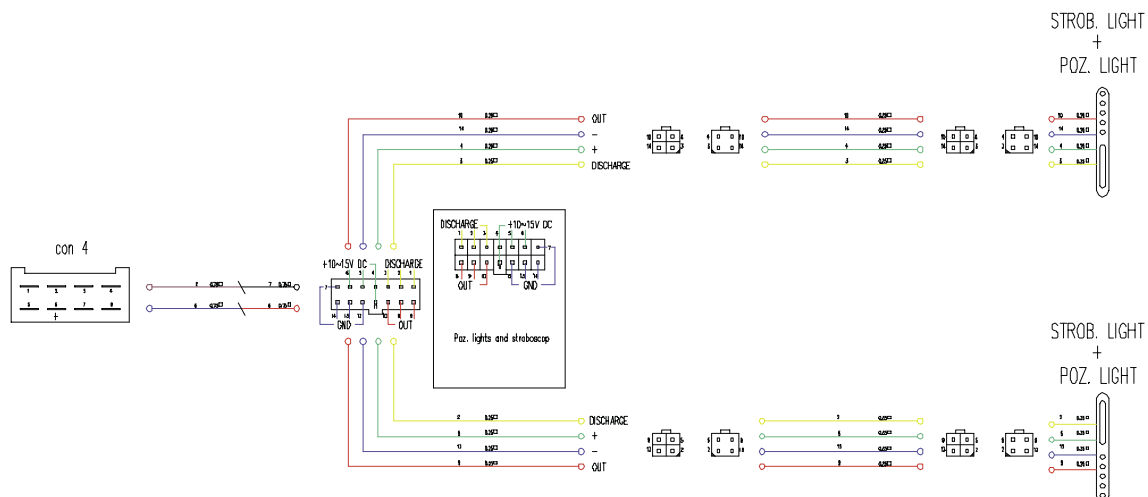
Characteristic are separate magneto switches in form two toggle switches and a key-type three stage master switch, which also operated as the avionics switch. Therewith are individual fused rocker switches used to control individual electrical loads (radio, transponder, lights, efis, ems, autopilot, etc.).

The only electrical load which can be used without the master switch in either ALL ON or ENGINE only position is the 12 V plug, all other loads function only when the master (key) is in the ALL ON position.

The position I (ENGINE ONLY) is there to provide continuous operation of the engine in case of emergency, where all other electrical load (12 V plug is the exception) are disengaged.



## Schematic of electrical system (continued)



## Pitot heat

Pitot heat is available in combination with the AOA sensing pitot tube. It is the single most powerful electrical load in the system, consuming more than 100 Watts of power. When activating the pitot heat (toggle switch on the main electrical panel), monitor system voltage (and or current) to make sure the battery is not being discharged due to prolonged use of large electrical loads in combination with the pitot heat, both on ground and in flight.

## Battery disconnection system

On the Virus 912 LSA, the main battery can be disconnected from the circuit.

There are two handles in the cockpit used to operate the battery disconnection, the battery disconnection lever and the battery disconnection ring. The battery disconnection lever, which is a red flag-type lever is found on the firewall above the main battery on the left-hand side of the cockpit. 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, simply 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 lock into position.

Battery reconnection can be done in-flight as well (e.g. following a successfully rectified emergency situation) but only from the left-hand seat, since you cannot reach the flag-lever from the right-hand side of the cockpit.

# Engine cooling system

## Rotax 912 UL cooling system

The Rotax 912 engine's cylinders are aircooled, the cylinder heads watercooled. The cooling-air intake is located on the right-hand bottom part of the engine cover.

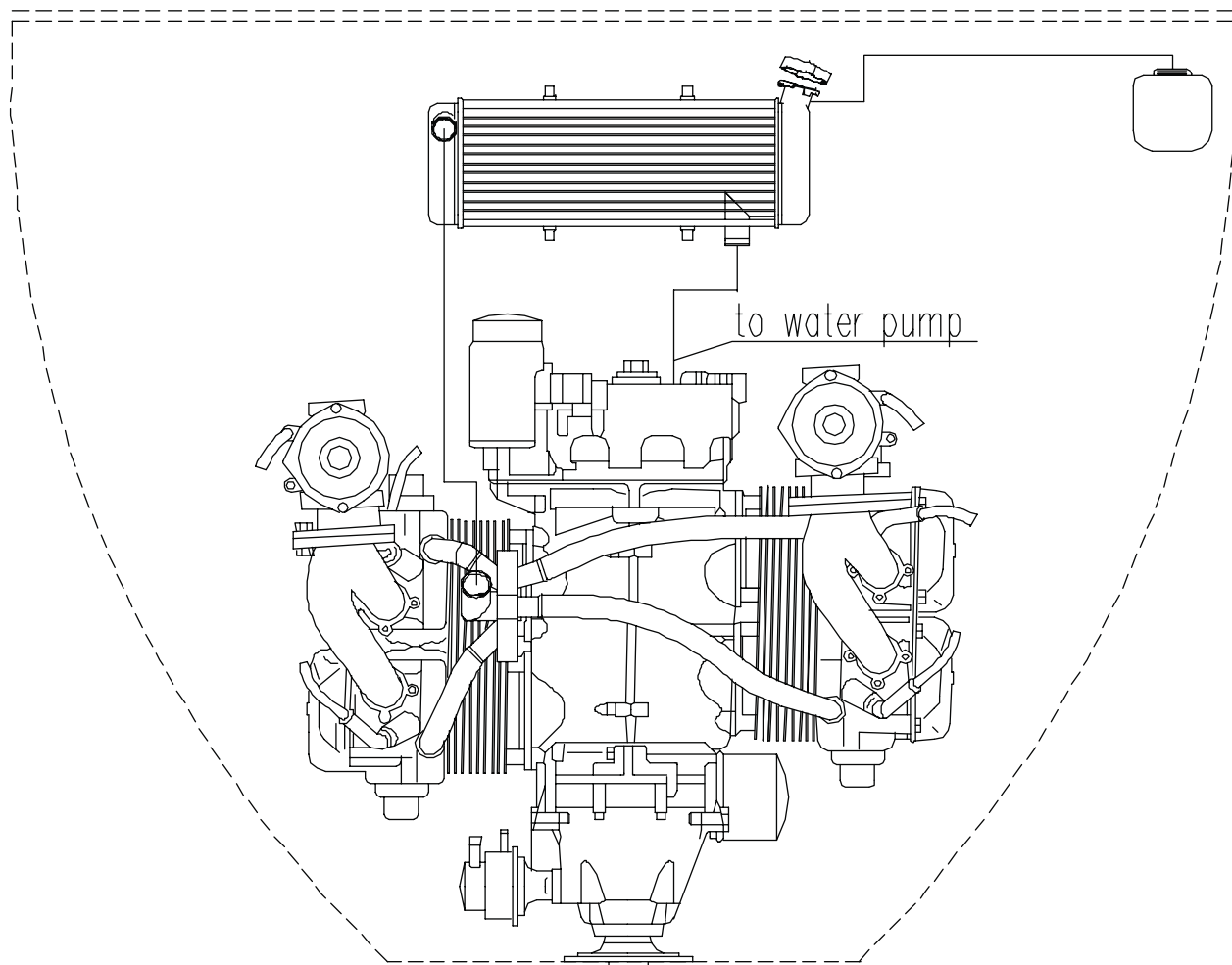
Cylinder heads are watercooled. The water pump forces water through the radiator, placed behind the air intake opening on the top engine cover. The engine does not feature a thermostat valve. The system is pressurised with a pressurised valve placed on one of the hoses. The overflow tank fluid level must always be inside the designated limits!

The engine does not feature a cooling fan, therefore cooling is entirely dependant on moving air currents and airspeed.

**CAUTION!** You are strongly discouraged from leaving the engine running at idle power when on ground.

The manufacturer recommends use of cooling fluids used in car industry diluted in such a manner that it withstands temperatures as low as - 20°C/-4°F.

## Schematic of engine cooling system

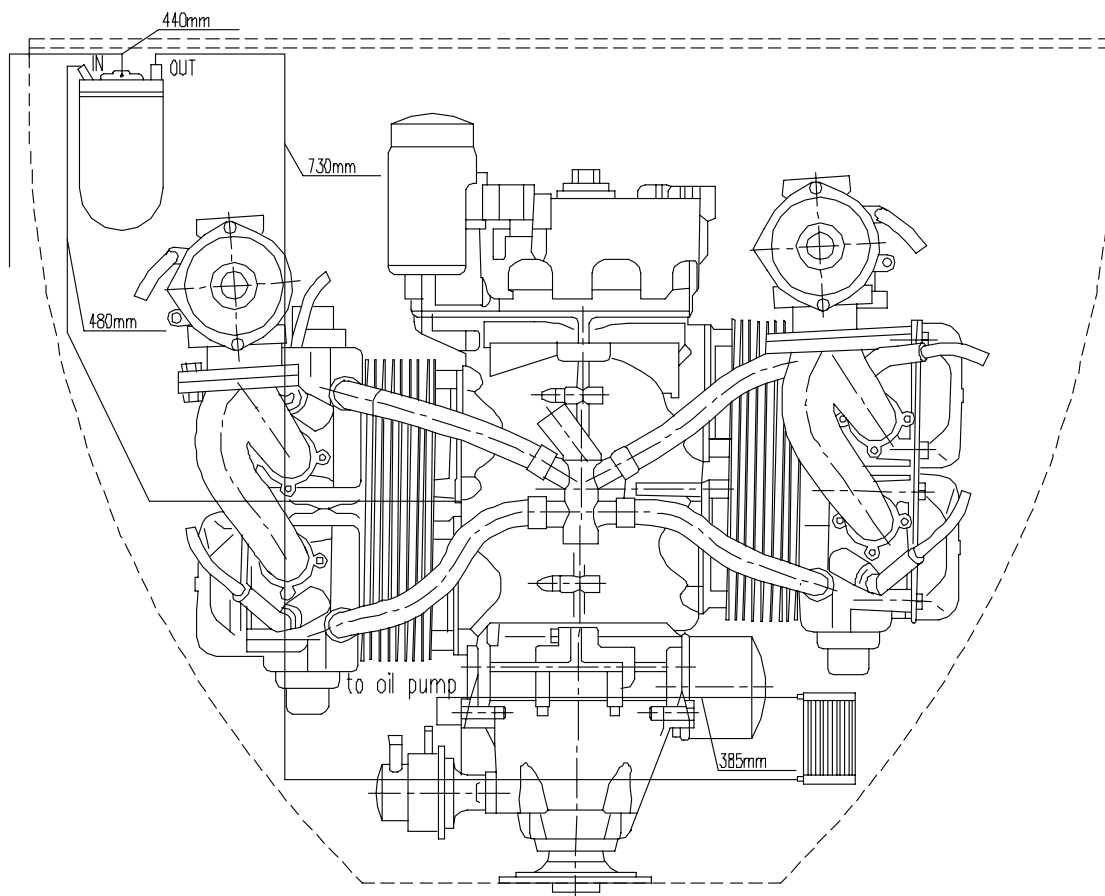


# Engine lubrication system

**Rotax 912** is a four-stroke engine, equipped with a dry sump and lubricated centrally with use of its own oil pump. All the oil needed is located inside an outer canister. When the engine is running, the oil cools itself passing through a radiator, located on the left-hand side of the bottom engine cover. Oil quantity can be checked visually with a oil level bar. Make sure the oil quantity is sufficient limits at all times.

**CAUTION!** Oil temperature, pressure and quality is strictly defined and must not, under any circumstances, vary from its safe values.

## Schematic of engine lubrication system



# Wheel brake system

Wheel brake system features separate braking action for each of the main landing gear. Wheel brakes are drum or disc, wire driven (old type) or hydraulic type (new type).

Wheel brake levers are operated by pressing the levers mounted on top of the rudder pedals.

Hydraulic brake fluid used for hydraulic type brakes is DOT 3 or DOT 4.

Aircraft equipped with the Beringer high-performance brakes feature also a parking brake.



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# **3 Limitations**

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**Introduction (3-2)**

**Airsped limitations (3-2)**

**Powerplant limitations (3-3)**

**Weight limits (3-4)**

**Cockpit crew (3-4)**

**Centre of gravity limits (3-4)**

**Load factors (3-5)**

**Service ceiling and airspeed reductions (3-5)**

**Manoeuvre limits (3-5)**

**Kinds of operations (3-6)**

**Minimum equipment list (3-6)**

**Other restrictions (3-7)**

**Placards (3-8)**

# Introduction

This section includes operating limitations, instrument markings and basic placards necessary for the safe operation of the airplane, it's engine, standard system and standard equipment. The limitations included in this section have been approved. Observance of these operating limitations is required by Federal Aviation Regulations. Virus 912 LSA is approved under ASTM standard F2245.

## Airspeed limitations

	Velocity	IAS [kts (km/h)]	Remarks
<b>VS</b>	Stall speed Clean	<b>42 (78)</b>	Stall speed flap up.
<b>VS0</b>	Stall speed Landing configuration	<b>36 (67)</b>	Stall speed flaps full.
<b>VFE</b>	Max. velocity flaps extended	<b>70 (130)</b>	Do not exceed this speed with flaps extended (+9, +18 degrees).
<b>VA</b>	Design manoeuvring speed	<b>76 (141)</b>	Do not make full or abrupt control movements above this speed.
<b>VNE</b>	Velocity never to be exceeded	<b>120 (222)</b>	Never exceed this speed in any operation. VNE is defined as TAS above 3000 ft MSL, see »Service ceiling and airspeed reductions«.
<b>VRA</b>	Maximum safe velocity in rough air	<b>76 (141)</b>	Maximum speed in turbulent air.
<b>VAE</b>	Maximum velocity of airbrake extention	<b>86 (160)</b>	Do not extend spoilers above this speed.
<b>VES</b>	Maximum velocity for engine restart in flight	<b>50 (90)</b>	Applicable only for the autofeathering propeller version! Do not restart the engine in flight beyond this speed.

## Airspeed indicator markings

MARKING	IAS [kts (km/h)]	Definition
<b>White band</b>	<b>36 -70 (67 - 130)</b>	Full Flap Operating Range. Lower limit is the maximum weight VS0 in landing configuration. Upper limit is maximum speed permissable with flaps extended.
<b>Green band</b>	<b>42 -76 (83 - 141)</b>	Normal Operating Range Lower end is maximum weight VS1 at most forward C.G. with flaps retracted. Upper limit is maximum structural cruising speed.
<b>Yellow band</b>	<b>76 - 120 (141 - 222)</b>	Manoeuvre the aircraft with caution in calm air only.
<b>Red line</b>	<b>120 (222)</b>	Maximum speed for all operations
<b>Blue line</b>	<b>70 (130)</b>	Best climb rate speed ( $V_Y$ )

# Powerplant limitations

**Engine manufacturer: ROTAX**

**Engine type: ROTAX 912 UL (80 HP), ROTAX 912 ULS (100 HP)**

Data below is data relevant for the pilot. Consult the original Rotax engine manual for all other details.

## The engine

TEMPERATURE °C / ROTAX ENGINE	912 UL 80 HP
cylinder head temp. (CHT); minimum, working, highest	80; 110; 120
max. CHT difference	/
exhaust gas temperature (EGT); normal, max.	650-885; 900
max. EGT difference	30
cooling fluids temperature (WATER); minimum, highest	50; 120
oil temperature (OIL TEMP); minimum, normal, highest	50; 90-110; 140
RPM, PRESSURE	912 UL 80 HP
oil pressure (OIL PRESS); lowest, highest	1.0; 6.0
engine revolutions (RPM); on ground recommended	5500
RPM on ground; max. allowable	5800
ignition check at (RPM)	4000
max. single ignition drop (RPM)	300

## Fuel and oil

ROTAX ENGINE	912 UL 80 HP
<b>recommended fuel</b>	unleaded super, grade 87 and up, no alcohol content
<b>also approved fuels</b>	leaded* or AVGAS 100LL*
<b>recommended oil</b>	API SJ SAE 10W-50

**\*Shorter maintenance intervals are imposed. Should you be forced to use this kind of fuel, change of engine oil every 50 flight hours is crucial. Please consult the manufacturer on which type of oil to use.**

### IMPORTANT!

Four-stroke engines should only be powered by unleaded fuel, for lead sedimentation inside the engine shortens its life. Provided you are unable to use unleaded fuel, make sure engine oil and the oil filter are replaced every 50 flight hours.

**WARNING!** Use of fuel with alcohol content and/or other additives is not permitted.

## Propeller

Virus SW	Propeler
Virus 912 LSA with Rotax 912 UL (80 HP)	Pipistrel F2-80 - diameter 63 inch (1620 mm)

## Engine instrument markings

Instrument	Red line (minimum)	Green arc (normal)	Yellow arc (caution)	Red line (maximum)
Tachometer (RPM)	1600	1600-5500	5500-5800	5800
Oil temperature	50°C (122°F)	90-110°C (194-230°F)	110-130°C (230-266°F)	130 (266°F)
Cylinder head temp.	/		110-120°C (230-248°F)	120°C (248°F)
Oil pressure	1.0 bar (14.5 psi)			6.0 bar (87.0 psi)

## Weights

### Virus 912 LSA weights

WEIGHT	912 LSA 80 LSA
max. takeoff weight (MTOM)	1210 lbs (550 kg)
minimum combined cockpit crew weight	119 lbs (54kg)
maximum combined cockpit crew weight	519 lbs (236 kg)
baggage area	85 lbs absolute limit, where the load is to be distributed and loading not exceed 8 pounds per square foot. Always verify baggage allowance with a Centre of Gravity calculation!

**WARNING!** Should one of the above-listed values be exceeded, other **MUST** be reduced in order to keep MTOM below 1210 lbs (550 kg). Pay special attention to luggage weight as this is the only applicable mass on the airframe that has an influence on centre of gravity. Exceeding baggage weight limits can shift aircraft's balance to the point when the flight becomes uncontrollable! More information on baggage allowance can be found in chapter "Weight and Balance".

## Centre of gravity range

- Centre of gravity point ranges between 210 mm and 374 mm (8.3 inch and 14.7 inch) aft of datum. Datum is is wing's leading edge at fuselage root.

## G-load factors

max. positive wing load: + 4 G

max. negative wing load: - 2 G

These values correspond to ASTM standards for LSAs. All parts have been tested to a safety factor of a minimum of 1.875, meaning they were subjected to at least a load of 7.5 G

## Service ceiling and airspeed reductions

Service ceiling is not limited, however due to the glider-type construction and aerodynamics, the VNE must be regarded as TAS when flying higher than 9000 ft. VNE limits are also provided on the cockpit placard.

**WARNING!** Above pressure altitude of 9000 ft, the VNE MUST be treated as True AirSpeed (TAS). Indicated AirSpeed (IAS) MUST be reduced accordingly! Table with IAS, TAS relation for the VNE of 120 kts is provided below:

Altitude	0 ft	6000 ft	12000 ft	18000 ft
TAS	120 kts	120 kts	120 kts	120 kts
VNE (IAS)	120 kts	120 kts	111 kts	101 kts

## Maneuver limits

Virus 912 LSA is approved under ASTM standard F2245 and is intended for recreational and instructional flight operations. In the acquisition of various pilot certificates certain maneuvers are required and these maneuvers are permitted in this airplane.

**Following NON-aerobatic manoeuvres are permitted as defined:**

- Power-on and -off stalls not below 1500 feet (450 feet) above ground level.
- Power on and off lazy eights not below 1500 feet (450 feet) above ground level, entry speed 90 kts
- Steep turns with initial speed of 80 kts.
- Chandelle maneuvers not below 500 feet (150 meters) above ground level, entry speed 105 kts.
- Spin initiation and recovery (at most 180° in actual spinning manoeuvre).

**WARNING!** Aerobatic maneuvers, including full developed spins, are prohibited.

**CAUTION!** Intentional flying with both cabin doors open is prohibited. Flying with one door

# Kinds of operations

**Virus 912 LSA is approved for DAY - NIGHT - VFR operations only. Flight into known icing conditions is prohibited.**

**WARNING!** Should you find water drops on the airframe during preflight check-up at temperatures close to freezing, you may expect icing to appear in flight. Optional airbrakes are especially prone to icing under such circumstances. As water may accumulate underneath the top plate(s), spoilers may freeze to the wing surface. Should this occur, you will most definitely be unable to extend spoilers before the ice melts. Therefore, flying under circumstances mentioned above, it is recommended to extend and retract the spoilers in flight frequently to prevent its surface freezing to the airframe.

## Minimum equipment list (DAY - VFR)

- Placards, checklist
- Airspeed indicator (functional), Altimeter (functional), Compass (functional)
- Tachometer (RPM), EGT indication (functional), CHT indication (functional), OIL temp. indication (functional), OIL press. indication (functional)
- 12 V Main battery (functional), Alternator (functional) Safety belts (2x), Visual fuel indication (L/R functional), Fuel shut-off valves (L/R, functional)

## Minimum equipment list (NIGHT - VFR)

In addition to the MEL for DAY - VFR:

- Artificial horizon (functional)
- NAV/STROBE/LDG lights (functional), Cockpit light (functional)
- Stand-by battery (12 V), VHF COM/TRANSPONDER/ALTITUDE ENCODER/GPS - as required for the operation

## Fuel limitations

FUEL	Virus 912 LSA
fuel capacity (full standard tanks)	2 x 8 USgal (2x30 L)
fuel capacity (full long range tanks)	2 x 13 USgal (2x50)
fuel capacity (usable - all flight conditions, standard/long range)	14.5 / 24.5 USgal 55 / 93 L
unusable fuel	1.5 USgal (0.75 USgal per tank)
max. fuel weight allowable	167 lbs (76 kg)

**WARNING!** Takeoff is prohibited if either visual fuel indicator indicates in the red area (less than 1.3 USgal) or when unsure about the fuel quantity on board.

## NOTES

To ensure maximum fuel capacity and minimise crossfeeding when refuelling, always park the airplane in a wings level, normal ground attitude.

The visual fuel indicator is equipped with marking for fuel status in USgal and litres. Due to the wing dihedral the fuel indicator tops before the fuel tank is full. Pilot caution is advised.

Maximum full capacity is indicated only through the fuel filler on the wing, by visual check. At the same time, verify that the vent tubes remain unobstructed from contamination.

## Other restrictions

**Due to flight safety reasons it is forbidden to:**

- fly in heavy rainfalls;
- fly during thunderstorm activity;
- fly in a blizzard;
- fly according to instrumental flight rules (IFR) or attempt to fly in zero visibility conditions (IMC);
- fly when outside air temperature (OAT) reaches 55°C (131°F) or higher;
- perform aerobatic flying;
- take off and land with flaps retracted or set to negative (-5°) position (landing with -5° is permissible only in case of very strong winds, but is not to be performed as a normal procedure)
- take off with airbrakes extended.
- the 12 Volt power outlet is not approved to supply power to flight-critical communication or navigation devices.

# Placards

### OPERATING SPEEDS

V <sub>SO</sub>	36 kts	<h1 style="font-size: 2em;">VNE</h1> <h2 style="font-size: 1.5em;">120 kts</h2>
V <sub>SI</sub>	42 kts	
V <sub>FE</sub>	70 kts	
V <sub>A</sub>	76 kts	
V <sub>B</sub>	76 kts	
V <sub>AE</sub>	86 kts	

ALT (m)	0	2000	4000	6000
FL	FL 0	FL 66	FL 131	FL 181
VNE	120 kts	120 kts	109 kts	101 kts

### FLAPS

+18°	36 kts - 60 kts
+9°	39 kts - 70 kts
0°	42 kts - 80 kts
-5°	47 kts - 120 kts

80 % ANTIFREEZE  
+20 % WATER

ROCKET GAS  
EXHAUST

ATTENTION!  
ROCKET INSIDE

MAX 1.2 bar  
MAX 18 psi

MAX 0.8 bar  
MAX 12 psi

MAX 1.8 bar  
MAX 26 psi

MAX 1.8 bar  
MAX 26 psi

NO STEP

NO STEP

MOGAS RON95 or AVGAS 100 LL

MOGAS RON95 or AVGAS 100 LL

FUEL/WATER DRAIN VALVE

OPEN       CLOSE

MOGAS RON95 or AVGAS 100 LL



**WARNING**  
**EMERGENCY PARACHUTE**  
 equipment, see Flight Manual



# ***4 Weight and balance***

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**Introduction (4-2)**

**Weighing procedure (4-2)**

**Equipment list (4-3)**

**Determination of CG (4-3)**

**Sample CG calculation (4-4)**

# Introduction

This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample calculations are provided for reference. For additional information regarding Weight and Balance procedures, refer to the Aircraft Weight and Balance Handbook (FAA-H-8083-1). Specific information regarding the weight and arm for this airplane as delivered from the factory can be found in the aircraft documentation folder, look for Weight and Balance Report.

**WARNING!** It is the responsibility of the pilot to make sure the airplane is loaded properly. Operation outside of prescribed weight and balance limitations could result in an accident and serious or fatal injury.

## Weighing procedure

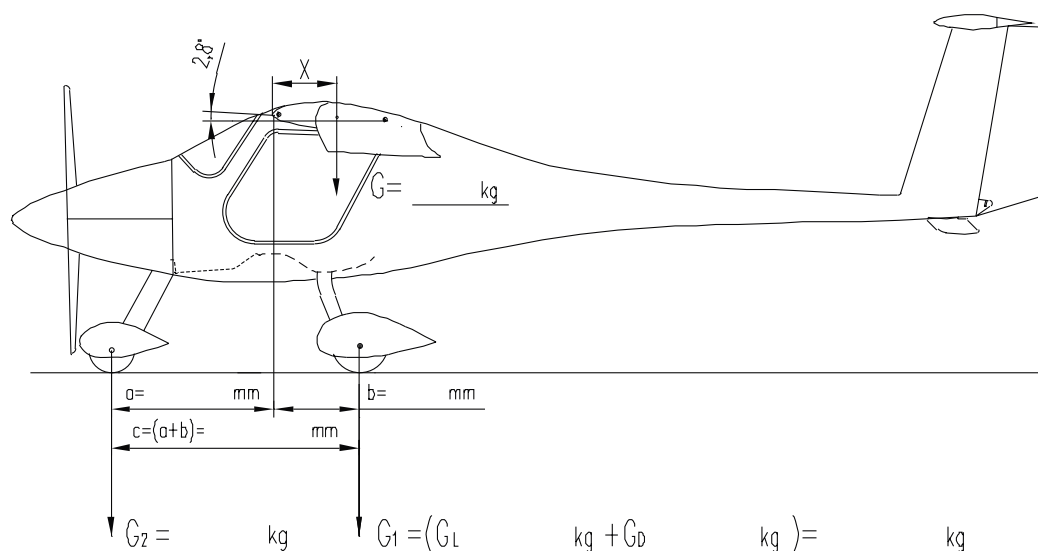
- Make sure all listed aircraft parts and appliances are installed and in position.
- Remove all other objects (e.g. tools, mops, tie downs and other things ...).
- Empty fuel tanks except for the unusable fuel, inflate tires to recommended operating pressures.
- Fill up engine oil to the top marking.
- Retract flaps and airbrakes (optional), leave control surfaces centred.
- Level the aircraft inside a closed space - use the provided airfoil template at lower side of the wing close to the wing root and make sure its straight edge is level (horizontal).
- Once leveled, read the scale readings and subtract eventual tare weight.
- Now record all readings and fill out the bottom table.

Datum is wing's leading edge at wing root. Calculate the lever arm of CG using this formula:

$$\text{Lever arm of CG (X)} = ((G_1 / G) \times c) - a$$

## Weighing form

Weighing point and symbol	Scale reading	Tare	Nett
right main wheel (G <sub>D</sub> )			
left main wheel (G <sub>L</sub> )			
nose wheel (G <sub>2</sub> )			
total (G = G <sub>D</sub> + G <sub>L</sub> + G <sub>2</sub> )			



# Equipment list

Aircraft's empty weight data is unique for each and every Virus 912 LSA delivered. The owner is responsible for keeping the equipment list up to date

**Virus 912 LSA model:**

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**Serial number:**

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**Registration number:**

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**Installed equipment:**

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## Determination of CG

	Weight (lbs)	Weight's lever arm (inch)	Moment (in x lb)	Remarks
<b>Basic cfg. empty weight</b>				
<b>Baggage</b>		46		
<b>Instruments</b>		- 12.5		minus!!!
<b>Pilots</b>		0 (zero)		
<b>Fuel</b>		4		

**CAUTION!** Each newly installed part or appliance must be registered in the upper table. Also, new total weight and lever arm of CG values must be entered and position of CG re-determined. Furthermore, the moment must be recalculated. This is rather unchanging to do. First multiply the new part's weight by it's lever arm measured from the reference point (wing's leading edge). Then sum up all momentums and divide the sum by the new total weight.

**WARNING!** Aircraft's safe center of gravity position ranges between 8.3" and 14.7 aft of datum and is not critically affected by cockpit crew weight or weight of fuel on board in any way.

**WARNING!** Absolute safe measure for the amount of luggage is 55 lbs. The actual amount of luggage you can safely transport depends on the centre of gravity of empty aircraft. See next pages.

# Sample c.g. calculation

## Guidelines

$G_{total}$  is the total mass of empty aircraft. All calculations can be performed with aircraft empty weight and empty weight centre of gravity (c.g.), as the pilots sits directly below the centre of gravity and do not cause the c.g. to shift. The amount of fuel quantity also has no impact on the c.g..

**WARNING! Both pilots' weight and weight of fuel do not influence c.g. or their influence is insignificant. However, baggage can influence the c.g. severely and may cause the aircraft to become uncontrollable!**

## Basic CG formulas and calculation

The below instructions are valid for Virus 912 LSA Tail Wheel and Nose Wheel editions. Read thoroughly. Note also that the basic c.g. at 287 mm will be used purely as an example.

First, weigh the aircraft according to the procedure described in this chapter and write down values of  $G_1$  (sum of scale readings at main wheels) and  $G_2$  (scale reading at tail/front wheel). Then calculate the position of c.g. in millimeters (mm) from the datum (wing's leading edge at wing root).

For Tail wheel edition of Virus use the following formula:

$$CG_{mm} = \frac{G_{2tail} \cdot b}{G_{total}} + a = \frac{G_{2tail} \cdot 4300mm}{G_{total}} + 110mm = 287mm$$

where:

**$G_{2tail}$**  is the scale reading at the tail wheel,

**$G_{total}$**  is the sum of  $G_1$  and  $G_{2tail}$  ( $G_1 + G_{2tail}$ ), a.k.a. aircraft empty weight

**$a$**  is the distance from main wheel axis to wing's leading edge,

**$b$**  is the distance between main and tail wheel axis.

For Nose wheel edition of Virus use the following formula:

$$CG_{mm} = \frac{G_{1back} \cdot c}{G_{total}} - a = \frac{G_{1back} \cdot 1525mm}{G_{total}} - 1020mm = 287mm$$

where:

**$G_{2back}$**  is the sum of scale readings at both main (back) wheels,

**$G_{total}$**  is the sum of  $G_1$  and  $G_{2back}$  ( $G_1 + G_{2back}$ ), a.k.a. aircraft empty weight

**$a$**  is the distance from nose wheel axis to wing's leading edge,

**$b$**  is the distance from main wheel axis to wing's leading edge,

**$c = (a+b)$**  is the sum of both distances above.

Second, determine the c.g. position in percentage (%) of Mean Aerodynamic Chord (MAC) with following the formula:

$$CG_{\%MAC} = \frac{CG_{mm} - R}{MAC} \cdot 100 = \frac{287mm - 29mm}{908mm} \cdot 100 = 28.4\%$$

where:

**$CG_{mm}$**  is the position of CG in millimeters (mm),

**$R$**  is the difference between wing's leading edge and MAC's leading edge (29 mm),

**$MAC$**  is the Mean Aerodynamic Chord (908 mm).

## Baggage and CG

The amount of baggage you can carry in the solid baggage compartment or in the baggage pouch behind the seats is limited by the centre of gravity of the empty aircraft (pilots' and fuel weight do not influence c.g.) and the MTOM.

To calculate how much the c.g. shifts because of added baggage into the solid baggage compartment or the baggage pouch behind the seats use the following formula:

$$CG_{with.bags} = \frac{(G_{total} \cdot CG_{mm}) + (G_{bags} \cdot L_{mm})}{G_{total} + G_{bags}} = \frac{(292kg \cdot 287mm) + (10kg \cdot 1160mm)}{292kg + 10kg} = 316mm$$

where:

**Gtotal** is the aircraft empty weight,

**CGmm** is the position of CG of empty aircraft in millimeters (mm),

**Gbags** is the weight of the baggage,

**Lbags** is the lever arm from the datum to baggage area (1160 mm).

Again, express the new c.g. in percentage of MAC:

$$CG_{(+bags)\%MAC} = \frac{CG_{with.bags} - R}{MAC} \cdot 100 = \frac{316mm - 29mm}{908mm} \cdot 100 = 31.6\%$$

where:

**CGwith.bags** is the position of CG now with bags in millimeters (mm),

**R** is the difference between wing's leading edge and MAC's leading edge (29 mm),

**MAC** is the Mean Aerodynamic Chord (908 mm).

We now have the data of c.g. of the sample aircraft with 22 lbs (10 kgs) of baggage. You can recalculate the formulas using the weights and c.g. of your empty aircraft and the planned amount of baggage for your flight.

**CAUTION:** The baggage weight limitations in this manual represent fool-proof limits for safe operation, even without special c.g. calculation. However, the actual baggage weight limitation is different of each individual aircraft and can be determined using the above formulas. The decision of how much baggage to carry on a flight is at pure responsibility of the pilot in command!

**WARNING!** Always make sure that the baggage is placed fixed inside the baggage area. Movements of baggage in-flight will cause shifts of centre of gravity!

**WARNING!** Do not, under any circumstances attempt to fly the aircraft outside the allowable c.g. limits! Allowable c.g. range is between 8.3" and 14.7", measured from the wing's leading edge backwards which corresponds to 20% - 38% MAC)

**WARNING!** Maximum takeoff weight (MTOM) MUST NOT, under any circumstances, exceed 1210 lbs (550 kg).



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# **5 Performance**

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**Introduction (5-2)**

**Airspeed indicator  
calibration (5-2)**

**Take-off performance (5-2)**

**Climb performance (5-4)**

**Cruise (5-5)**

**Descent (5-5)**

**Landing performance (5-  
6)**

**Crosswind takeoffs/  
landings (5-6)**

# Introduction

This section provides information on aircraft's airspeed calibration, stall speeds and general performance. All data published was obtained from test flight analysis using average flying skills.

Virus 912 LSA 80/100 has demonstrated adequate engine cooling performance at ambient temperatures of 38 Celsius / 100°F. This is not to be regarded as the limit temperature, however temperatures higher than the mentioned may have adverse effects on engine cooling and overall performance.

## Airspeed indicator calibration (IAS to CAS)

Pitot tube's mounting point and construction makes IAS to CAS correction values insignificant. Therefore pilots should regard IAS to be same as CAS. **IAS = CAS.**

## Stall speeds

Stall speeds at MTOM (1210 lbs, 550 kg) for all models of Virus 912 LSA are as follows:

flaps in negative position; -5° (up):	45 kts (83 km/h)
flaps in neutral position; 0° (neutral):	42 kts (78 km/h)
flaps in 1 <sup>st</sup> position; +9° (down):	40 kts (74 km/h)
flaps in 2 <sup>nd</sup> position; +19° (down):	36 kts (67 km/h)

## Take-off performance

All data published in this section was obtained under following conditions:

aircraft at MTOM  
 elevation: sea level  
 wind: calm  
 runway: hard runway  
 Data extrapolated for ICAO standard atmosphere

<b>Virus 912 LSA</b>	<b>912 LSA</b>
takeoff ground roll at MTOM	500 ft (152 m)
takeoff runway length (over 50 ft/15m obstacle)	825 ft (252 m)

### Notes

In order to meet the data for takeoff runway length over 50 m obstacle maintain Vx after take-off.

Soft (grass) runways increase the published take-off performance data by 20%.

Takeoff runway length may vary depending on the wind, temperature, elevation and wing & propeller surface condition.

## Effect of elevation

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

elevation (ft)	0	1500	3000	4500
atmosph. pressure (inHg)	29.92	28.17	26.52	24.95
atmosph. pressure (hPa)	1012	954	898	845
outside temperature (°F)	59	53	47	41
outside temperature (°C)	15,0	11,7	8,5	5,2
<b>Takeoff ground roll [ft (m)]</b>				
<b>912 LSA</b>	500 (152)	625 (190)	775 (235)	895 (272)

**WARNING:** If the outside temperature is higher than 15°C / 59°F it is mandatory to consider the takeoff runway length prolongs as follows:  $L = 1.10 \cdot (L_h + L_t - L_0)$ .

Abbreviations are as follows:

$L_h$  = takeoff runway length at present elevation,

$L_t$  = takeoff runway length at sea level at same atmospheric conditions,

$L_0$  = takeoff runway length at 59°F.

## Effect of the wind

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

Headwind on takeoff and landing causes the Takeoff and Landing runway length to shorten as the GS is smaller during these two flight stages. The opposite stands for tailwind on takeoff and landing as tailwind prolongs Takeoff and Landing runway length significantly.

The data on the next page was obtained through testing and therefore serve as informative values only.

**Headwind** shortens takeoff and landing runway length by 25 feet (8 meters) with every 3 kts (5 km/h) of wind increase (e.g. provided there is a 6 kts (10 km/h) headwind on takeoff and landing, distances will be approximately 50 ft meters (16 meters) shorter than ones published in the manual).

**Tailwind** prolongs takeoff and landing runway length by 60-65 feet (18-20 meters) with every 3 kts (5 km/h) wind increase (e.g. provided there is a 6 kts (10 km/h) tailwind on takeoff or landing, distances will be approximately 120-130 feet (36-40 meters) longer than ones published in the manual).

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

The table below provides data about the effect of headwind (+) and tailwind (-) on takeoff runway length (referenced for sea level conditions, airplane at MTOM).

windspeed (kts)	-6	-4	-2	0	4	8	12
<b>Takeoff runway length [ft (m)]</b>							
<b>912 LSA</b>	630 (192)	585 (178)	540 (165)	500 (152)	470 (143)	430 (131)	400 (122)

## Effect of outside temperature

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

OAT temp (°F)	59	68	77	86	95
	Takeoff runway length [m (ft)]				
<b>912 LSA</b>	500 (152)	620 (189)	700 (213)	765 (233)	825 (251)

## Climb performance

<b>Virus 912 LSA</b>	<b>912 LSA</b>
best climb speed	70 kts (130 km/h)
best climb rate at MTOM	1080 fpm (5.4 m/s)
climb rate at 100 kts (185 km/h)	680 fpm (3.4 m/s)

## Effect of altitude

The table below provides data about the effect of elevation on climb rate at best climb speed  $V_y$  at MTOM

<b>Virus 912 LSA</b>	<b>912 LSA</b>
0 m (0 ft)	1080 fpm (5.4 m/s)
500 m (1600 ft)	1000 fpm (5.0 m/s)
1000 m (3300 ft)	940 fpm (4.7 m/s)
1500 m (5000 ft)	900 fpm (4.5 m/s)

**Note:** climb rate is measured at max continuous power (5500 RPM) of the engine with flap in neutral position (0 degrees).

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

# Cruise

Aircraft at MTOM, recommended cruise power of 5300 RPM at 15°C / 59°F at sea level altitude, flaps set to negative position (-5 degrees):

Virus	912 LSA
cruise airspeed	116 kts

Best economy cruising level is 7500 ft . There, cruise performance is equivalent or better than above due to IAS-TAS relation, but fuel consumption is lower.

At these parameters the fuel burn is 3.2 USgal (12.2l) per hour. For detailed fuel consumption determination for various cruising regimes consult the Rotax 912 UL/ULS Operators manual.

# Descent

Typical sink rate, with flaps set to 2<sup>nd</sup> position and airbrakes fully extended, measures 980 fpm (4.9 m/h) at 50 kts (92 km/h) and 1160 fpm (5.8 m/s) at 60 kts (110 km/h).

Virus 912 LSA	912 LSA
max. sink rate with airbrakes extended at 90 km/h (48 kts), full flaps	980 fpm (4.9 m/s)
sink rate at 50 kts (92 km/h), no airbrakes, full flaps	440 fpm (2.2 m/s)

# The glide

The glide is defined as unpowered wings-level flight at speed providing best lift over drag ratio or minimum sink rate.

Should the engine become inoperative in flight, as a result of either intended or unintended actions, and it cannot be restarted, react as follows:

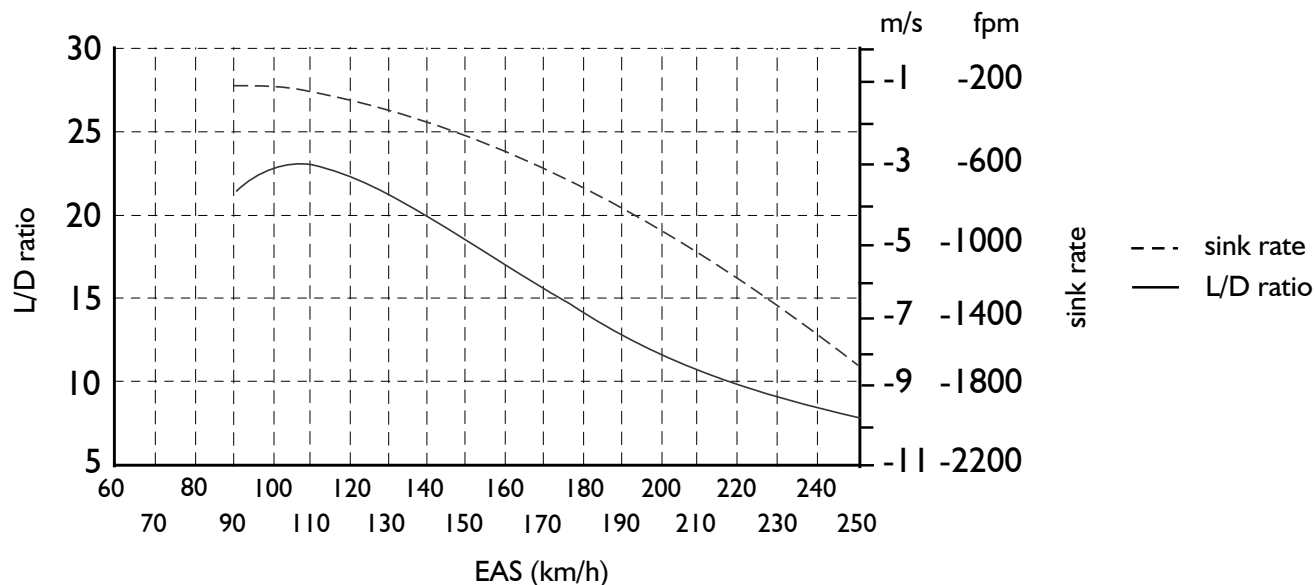
**establish wings-level flight at the speed providing best lift over drag ratio**, if you desire to glide the greatest distance from a given altitude.

**establish wings-level flight at speed providing minimum sink rate**, if you desire do stay airborne for the longest time. This may come in handy in case you will be forced to give way to other aircraft or if you simply need time to determine the most appropriate site to land on.

Virus	912 LSA
minimum sink speed	52 kts (96 km/h)
minimum sink rate	410 fpm (2.05 m/s)
best lift/drag ratio speed	59 kts (110 km/h)
best lift over drag ratio (propeller unfeathered)	21:1
best lift over drag ratio (propeller feathered)	24:1
lift over drag ratio at 80 kts (150 km/h) (propeller feathered)	14:1

**CAUTION:** If the engine fails, especially in climb, the aircraft always loses some 30 meters (100 feet) of altitude before reaching best glide speed in wings-level unpowered flight.

## Speed polar (propeller feathered)



## Landing performance

Final approach speed should always be 55 kts (102 km/h) with full flaps, regardless of the approaching with zero or full airbrakes. Landing runway length may also vary depending on the elevation, gross weight, touchdown velocity, wind direction and how aggressive the braking action is.

In following conditions: aircraft at MTOM, airport at sea level, wind calm; the landing roll measures 410 feet (125 meters). Should you be flying solo, the length shortens by another 30 feet (10 meters).

**WARNING!** Runway size must be in excess of 820 x 65 feet with no obstacles in 4° range off runway heading in order ensure safe flying activity. Use of shorter airstrips should be considered a major exception and is allowed for experienced pilots at their own risk only.

## Crosswind takeoffs/landings

Maximum allowed crosswind speed on takeoff and landing with flaps in 2<sup>nd</sup> position is 15 kts. The runway length required is increased by 10 % for every 5 kts of crosswind component.

# ***6 Emergency procedures***

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**Introduction (6-2)**

**Stall recovery (6-2)**

**Spin recovery (6-2)**

**Engine failure (6-3)**

**Emergency landing /  
Landing out (6-3)**

**Engine fire (6-3)**

**Smoke in cockpit (6-4)**

**Carburetor icing (6-4)**

**Electrical system failure (6-5)**

**Flutter (6-5)**

**Exceeding VNE (6-5)**

**Ditching (6-5)**

**Icing/Pneumatic failure  
(6-5)**

# Introduction

This sections provides information for coping with emergencies that may occur. Emergencies caused by airplane or engine malfunctions are extremely rare if proper preflight inspections and maintenance are practiced. Enroute weather emergencies can be minimized or eliminated by careful flight planning and good judgment when unexpected weather is encountered. In any emergency, the most important task is continued control of the airplane and maneuvering to execute a successful landing.

## Stall recovery

First reduce angle of attack by pushing the control stick forward, then

- 1. Add full power (throttle lever in full forward position).**
- 2. Resume horizontal flight.**

## Spin recovery

Virus 912 LSA is constructed in such manner that it is difficult to be flown into a spin, and even so only at aft centre of gravity positions. However, once spinning, intentionally or unintentionally, react as follows:

- 1. Set throttle to idle (lever in full back position).**
- 2. Apply full rudder deflection in the direction opposite the spin.**
- 3. Lower the nose towards the ground to build speed (stick forward).**
- 4. As the aircraft stops spinning neutralise rudder deflection.**
- 5. Slowly pull up and regain horizontal flight.**

Virus 912 LSA tends to re-establish righted flight by itself usually after having spinned for a mere 45°-90°.

**WARNING!** Keep the control stick centred along its lateral axis (no aileron deflections throughout the recovery phase! Do not attempt to stop the aircraft from spinning using ailerons instead of rudder!

**WARNING!** After having stopped spinning, recovering from the dive must be performed using gentle stick movements (pull), rather than overstressing the aircraft. However, VNE must not be exceeded during this manoeuvre.

When the aircraft is wings-level and flies horizontally, add throttle and resume normal flight.

# Engine failure

## Engine failure during takeoff

Ensure proper airspeed first (55 kts) and land the aircraft on runway heading, avoiding eventual obstacles in your way. Shut both fuel valves and set master switch to OFF position (key full left).

**WARNING!** DO NOT CHANGE COURSE OR MAKE TURNS IF THIS IS NOT OF VITAL NECESSITY!  
After having landed safely, ensure protection of aircraft and vacate the runway as soon as possible to keep the runway clear for arriving and departing traffic.

## Rough engine operation or engine failure in flight

First ensure proper airspeed (64 kts), then start analyzing terrain underneath and choose the most appropriate runway or site for landing out.

**Provided the engine failed aloft, react as follows:**

Make sure the master switch is in the ON position, magneto switches both set to ON and both fuel valves OPEN. Attempt to restart the engine. If unsuccessful, begin with the landing out procedure immediately.

# Emergency landing / Landing off airport

1. Shut both fuel valves.
2. Master switch OFF.
3. Approach and land with extreme caution, maintaining normal airspeeds.
4. After having landed leave the aircraft immediately.

The landing off airport manoeuvre MUST be performed with regard to all normal flight parameters.

# Engine fire

## Engine fire on ground

This phenomenon is very rare in the field of sport aviation. However, if an engine fire on ground occurs, react as follows:

1. Shut both fuel valves.
2. Come to a full-stop, engage starter and set throttle to full power (lever full forward).
3. Disconnect the battery from the circuit (pull battery disc. ring on the switch column)
4. Master switch OFF immediately after the engine has stopped.
5. Abandon the aircraft and start extinguishing the fire.

**WARNING!** After the fire has been extinguished DO NOT attempt to restart the engine.

## Engine fire in flight

1. Shut both fuel valves and set magnetos to OFF.
2. Set full power (throttle lever in full forward position).
3. Disconnect the battery from the circuit (pull battery disc. ring on the switch column)
- 3b. Keep avionics ON and master ON as required, on approach set both OFF.
4. Set ventilation for adequate breathing. Keep in mind that oxygen intensifies fire.
5. Perform side-slip (crab) manoeuvre in direction opposite the fire.
6. Perform emergency landing out procedure.

## Smoke in cockpit

Smoke in cockpit is usually a consequence of electrical wiring malfunction. As it is most definitely caused by a short circuit it is required that the pilot reacts as follows:

1. Master switch to I (key in central position). This enables unobstructed engine operation while at the same time disconnects all other electrical devices from the circuit. Verify that the 12 V and optional Pitot heat are OFF as well.
2. Disconnect the battery from the circuit (pull battery disconnection ring on the instrument panel's switch column).
3. Land as soon as possible.

In case you have trouble breathing or the visibility out of the cockpit has degraded severely due to the smoke, open the cabin door and leave it hanging freely. Flying with the door open, do not, under any circumstances exceed 60 kts (110 km/h).

## Carburetor icing

First noticeable signs of carburetor icing are rough engine running and gradual loss of power.

Carburetor icing may occur even at temperatures as high as 50°F (10°C), provided the air humidity is increased.

The carburetor air-intake in the Virus 912 LSA is preheated, running over the water cooling radiator before entering the carburetors. Therefore the possibility of carburetor icing is minute.

**Should you be suspecting carburetor icing to take place, descend immediately into warmer and/or less humid air!**

**In case of complete power loss perform emergency landing procedure.**

## Electrical system failure

The engine will continue to function due to the onboard alternator and battery. In case of battery failure, be aware that the engine can keep running, however a re-start will not be possible. In event of alternator failure, the battery will support the onboard avionics. In event of double power source failure, use analogue on-board instruments and land normally.

# Flutter

Flutter is defined as the oscillation of control surfaces. It is most cases caused by abrupt control deflections at speeds close or in excess of VNE. As it occurs, the ailerons, elevator or even the whole aircraft start to vibrate violently.

Should flutter occur, increase angle of attack (pull stick back) and reduce throttle immediately in order to reduce speed and increase load (damping) on the structure.

**WARNING!** Fluttering of ailerons or tail surfaces may cause permanent structural damage and/or inability to control the aircraft. After having landed safely, the aircraft **MUST** undergo a series of check-ups performed by authorised service personnel to verify airworthiness.

# Exceeding VNE

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 authorised service personnel.

# Ditching

Should you be forced to land in a body of water, use the same emergency procedure as above for the "Emergency landing / Landing out" case. In addition, make sure to open both doors fully before hitting the water, disconnect the battery from the circuit (pull ring on electrical panel). Touch the water with the slowest possible speed, possibly from a high-flare situation.

# Icing/Pneumatic instrument failures

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 and Pitot heat (optional) ON. Watch for signs of icing on the pitot tube. In case of pneumatic instrument failures, use the GPS (optional) 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.

Manoeuvre the aeroplane gently and leave the wing flaps retracted. When ice is built up at the horizontal stabiliser, the change of pitching moment due to flaps extension may result of loss of elevator control. Approach at elevated speeds (70 kts, also if using the GPS as a reference).

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



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# ***7 Normal procedures***

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**Daily inspection (7-2)**

**Preflight inspection (7-2)**

**Normal procedures and  
recommended speeds (7-5)**

# Daily Inspection

The daily check-up matches the preflight inspection.

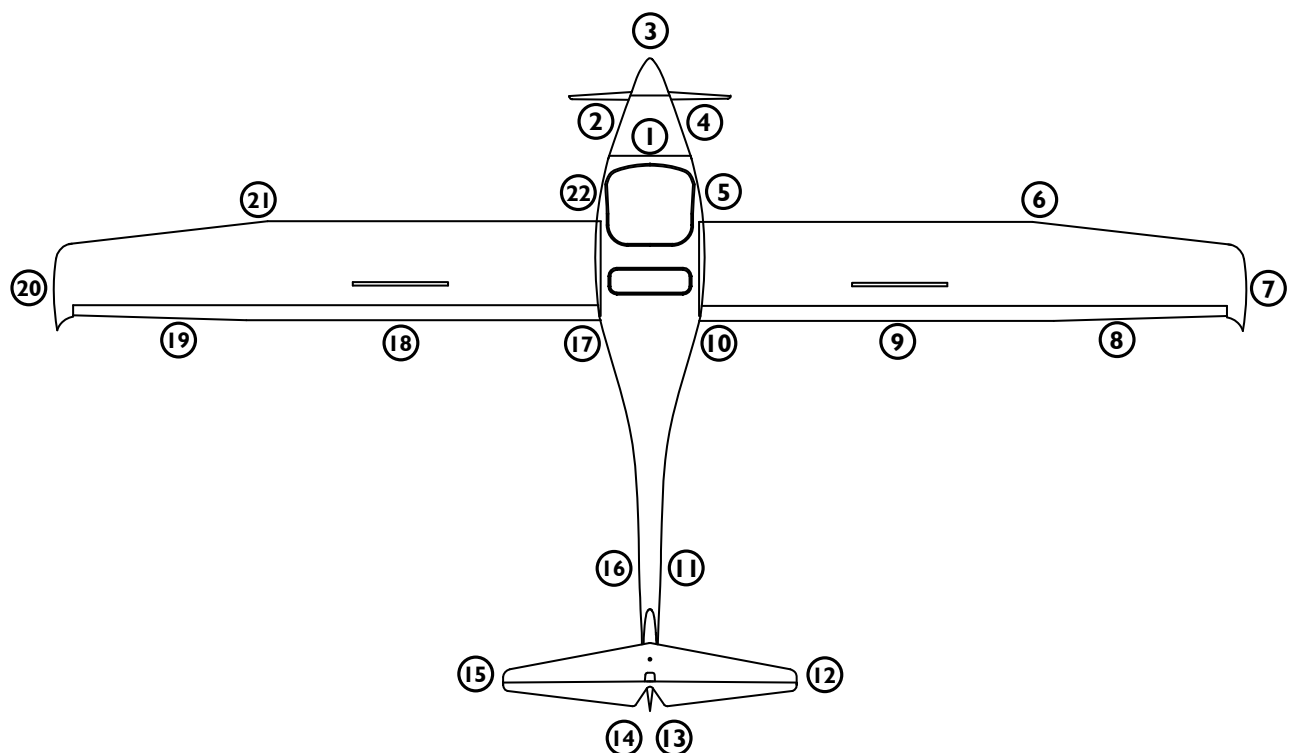
## Preflight inspection

**WARNING!** Every single inspection mentioned in this chapter must be performed prior to EVERY FLIGHT, regardless of when the previous flight took place!

**The person responsible for the preflight inspection is the pilot, who is required to perform the check-up in the utmost thorough and precise manner.**

Provided the status of any of the parts and/or operations does not comply with conditions stated in this chapter, the damage **MUST** be repaired prior to engine start-up. Disobeying this instructions may result in serious further damage to the plane and crew, including injury and loss of life!

### Schematic of preflight inspection



- |                             |                                |                               |
|-----------------------------|--------------------------------|-------------------------------|
| 1 Engine, engine cover      | 8 Right wing - trailing edge   | 15 Hor. tail surfaces (left)  |
| 2 Gascolator                | 9 Right air brake              | 16 Fuselage, continued (left) |
| 3 Spinner, Nose wheel       | 10 Fuselage (RH side)          | 17 Fuselage (LH side)         |
| 4 Propeller                 | 11 Fuselage, continued (right) | 18 Left air brake             |
| 5 Undercarriage, RH wheel   | 12 Hor. tail surfaces (right)  | 19 Left wing - trailing edge  |
| 6 Right wing - leading edge | 13 Vert. tail surfaces (right) | 20 Left wingtip, lights       |
| 7 Right wingtip, lights     | 14 Vert. tail surfaces (left)  | 21 Left wing - leading edge   |
|                             |                                | 22 Undercarriage, LH wheel    |

## Engine, engine cover ①

**Cooling fluid level:** half way to the top

**Oil quantity:** within designated limits

**Throttle, choke and oil pump wires:** no mechanical damage, smooth and unobstructed movement

**Radiators and hoses:** no mechanical damage and/or leakage, air filters clean and intact

**Exhaust pipes and muffler:** firmly in position, no cracks, springs intact and in position, rubber dumpers intact

**Fuel and/or oil leakage:** no fluid on hoses, engine housing or engine cover

**Reduction gearbox:** check for eventual oil leakage, all bolts and plugs attached firmly

**Fasteners and engine cover screws:** tightened, engine cover undamaged

## Gascolator ②

Drain approximately 1 cup of fuel and check for contamination.

## Spinner ③

**Spinner:** no mechanical damage (e.g. cracks, impact spots), screws tight

**Bolts and nuts:** secured

**Nose wheel:** grab aircraft's propeller and push it towards the ground to verify proper nose wheel suspension operation. Then lift the nose wheel off the ground and check for nose leg strut free play.

**Bolts:** fastened

**Tire:** no cracks, adequate pressure

**Wheel fairing:** undamaged, firmly attached, clean (e.g. no mud or grass on the inside)

## Propeller ④

**Hub and blades:** no mechanical damage (e.g. cracks), both immaculately clean

**Bolts and nuts:** secured

**Autofeathering mechanism (optional):** smooth travel of propeller pitch, adequate spring tension

## Undercarriage, wheels ⑤ ②②

**Bolts:** fastened

**Landing gear strut:** no mechanical damage (e.g. cracks), clean

**Wheel:** no mechanical damage (e.g. cracks), clean

**Wheel axle and nut:** fastened

**Oil line (hydraulic brakes):** no mechanical damage and/or leakage

**Tire:** no cracks, adequate pressure

**Wheel fairing:** undamaged, firmly attached, clean (e.g. no mud or grass on the inside)

## Wings' leading edge ⑥ ②1

**Surface condition:** pristine, no cracks, impact spots, no paint and/or edge separations

**Pitot tube:** firmly attached, no mechanical damage or bendings. Remove protection cover and make sure it is not blocked or full of water.

**Wing drain holes:** make sure they are not blocked and clean accordingly.

## Wingtip, lights ⑦ ②0

**Surface condition:** pristine, no cracks, impact spots or bumps, no paint separations

## Wings' trailing edge ⑧ ①9

**Surface condition:** pristine, no cracks, impact spots, no paint and/or edge separations

**Mylar sealing tape between wing and aileron:** undamaged and in position

**Aileron:** pristine surface, no cracks and/or impact spots, no paint abnormalities and edge separations, no vertical or horizontal free play, smooth and unobstructed deflections

## Airbrakes, fuel reservoir cap ⑨ ①8

**Air brakes:** firm, smooth, equal and unobstructed extension, tightly fitted when retracted, springs stiff and intact.

**Fuel reservoir cap:** fastened. Make sure the vent pipe is completely clean.

## Fuselage, antenna, rescue parachute cover ⑩ ①7

**Self-adhesive tape:** in position, no separations

**Controls' cap, antenna:** firmly attached

**Station 17 - optional side access door to the cargo compartment:** closed and locked

## Fuselage, continued ⑪ ①6

**Surface condition:** pristine, no cracks, impact spots or bumps, no paint separations

## Horizontal tail surfaces ⑫ ①5

**Surface condition:** pristine, no cracks, impact spots or bumps, no paint and/or edge separations

**Hinges:** no free play in any direction

**Central securing screw on top of the horizontal stabilizer:** fastened and secured

**Self-adhesive tape covering the gap between horizontal and vertical tail surfaces:** in position

**Elevator:** smooth and unobstructed up-down movement, no side-to-side free play

## Vertical tail surfaces ⑬ ①4

**Vertical fin bottom part:** no cracks, impact spots or paint separations along main chord

**Surface condition:** pristine, no cracks, impact spots or bumps, no paint separations

**Hinges:** no free play in any direction

**Rudder cable endings:** intact, bolts in position

**CAUTION!** Preflight inspection should be performed following stations 1 through 22!

## Cockpit preflight inspection

**Instrument panel and instruments:** checked

**Fuses:** checked

**Battery disconnection lever:** in position for battery operation (lever deflected towards the firewall)

**Master switch OFF (key in full left position):** no control lights and/or electronic instrument activity

**Master switch ON (key in full right position):** control lights and electronic instrument active

**Make sure you have set all instruments to correct initial setting.**

**Main wing spars and connectors:** no visible abnormalities of metal parts, spars, pins and bolts; all bolts and nuts in position and tightened

**Fuel hoses, pitot-static lines and electrical cables:** correctly connected and in position

**Transparent plastic providing visual fuel quantity monitoring:** clean with no cracks

**Safety harness:** undamaged, verify unobstructed harness opening; fastening points intact

**Doors and windshield:** perfect closing at all three points, smooth opening, hinges firmly attached; immaculately clean with no cracks.

**Flap handle:** button spring firm, locking mechanism working properly, smooth movement along full deflections, no free play or visible damage.

**Airbrakes handle:** full-up and locked

**Radio wiring:** test the switches, check connectors and headset, perform radio check

**Battery (some models):** firmly in position, check water level (if not dry version), joints clean with wires connected

**Emergency parachute release handle (optional):** safety pin removed.

Make sure unobstructed access is provided.

## Normal procedures and recommended speeds

To enter the cabin first lift the door all the way to the bottom wing surface. The silver knob will grab and secure the door in position. Sit onto the cabin's edge and support your body by placing hands onto this same cabin edge. Drag yourself into the seat lifting first only one leg over stich for best position. Immediately after having sat into the seat, check rudder pedals' position to suit your size and needs. To lower the door DO NOT attempt to grab and pull door's handle but gently pull the silver knob instead. To close the door securely, rotate the handle so that it locks (click here to see picture) and verify that all three closing points are secured.

Fasten the safety harnesses according to your size.

Adjust the rudder pedals according to your required legroom. The aircraft is equipped with in-flight adjustable rudder pedals, which adjust as follows:

Sit inside the cockpit and release the pressure off the pedals. Pull the black knob in front of the control stick to bring the pedals closer to you. To move the pedals further away, first release the pressure of the pedals, then pull on the knob slightly (this will release the lock in the mechanism). Now push the pedals forward using with your feet, while keeping the black adjustment knob in your hand.

**WARNING!** The safety harness must hold you in your seat securely. This is especially important when flying in rough air, as otherwise you may bump into the tubes and/or spars overhead. Make sure you tighten the bottom straps first, then shoulder straps.

## Engine start-up

### Before engine start-up

**CAUTION!** To ensure proper and safe use of aircraft it is essential for one to familiarise yourself with engine's limitations and engine manufacturer's safety warnings. Before engine start-up make sure the area in front of the aircraft is clear. It is recommended to start-up the engine with aircraft's nose pointing against the wind.

Make sure the fuel quantity is sufficient for the planned flight duration.

Make sure the pitot tube is uncovered and rescue parachute safety pin removed.

Engage wheel brakes. If equipped with the parking brake, engage parking brake.

### Engine start-up

Make sure both fuel valves are open and master switch in OFF position (key full left).

Should the engine be cold, apply choke (lever full back).

Set master switch ON (key in full right position). Set both magneto switches ON. Avonics OFF.

Engage engine starter and keep it engaged until the engine starts.

Set throttle to 2500 RPM.

Slide the choke lever forward gradually.

**CAUTION!** When the engine is very cold, the engine may refuse to start. Should this occur, move the choke handle fully backwards and hold it there for some 20 seconds to make mixture richer.

### Engine warm-up procedure

The engine should be warmed-up at 2500 RPM up to the point working temperature is reached.

Warming-up the engine you should:

1 Point aircraft's nose into the wind.

2 Verify the engine temperature ranges within operational limits.

**CAUTION!** Avoid engine warm-up at idle throttle as this causes the spark plugs to turn dirty and the engine to overheat.

With wheel brakes engaged and control stick in full back position, first set engine power to 4000 RPM in order to perform the ignition check. Set the ignition switches OFF and back ON one by one to verify RPM drop of not more than 300 RPM.

When the ignition check has been completed, add full power (throttle lever full forward) and monitor engine's RPM. Make sure they range between maximum recommended and maximum allowable RPM limits.

Note that engine does not reach 5800 RPM on ground. Engines are factory set to reach maximum ground RPM of 5300 - 5500 at sea level at 68° F. Maximum ground RPM may vary depending on the season and service elevation.

**CAUTION!** Should engine's RPM be lower than the recommended on ground amount (min. 5100 RPM) or in excess of maximum allowable RPM on ground (5800) during this manoeuvre, check engine and wiring for correct installation.

## Taxi

Release parking brake if fitted. Taxiing technique does not differ from other aircraft equipped with a steerable nose wheel. Prior to taxiing it is essential to check wheel brakes for proper braking action.

In the case you expect to taxi a long way, take engine warm-up time into account and begin taxiing immediately after engine start-up. Warm-up the engine during taxiing not to cause engine overheating because of prolonged ground operation.

## Holding point

Make sure the temperatures at full power range are within operational limits.

Make sure the safety harnesses are fastened and doors closed and secured at all three closing points.

Set flaps to 2<sup>nd</sup> position (flap handle full up).

Power idle.

**CAUTION!** Should the engine start to overheat because of long taxi and holding, shut down the engine and wait for the engine temperatures drop to reasonable values. If possible, point the aircraft's nose into the wind. This will provide radiators with airflow to cool down the engine faster.

## Take-off and initial climb

Before lining-up verify the following:

**Parking brake (if applicable):** disengaged (full forward)

**Air brakes (if applicable):** retracted and secured

**Fuel valves:** fully open

**Fuel quantity:** sufficient

**Safety harnesses:** fastened

**Cabin doors:** closed securely

**Trim handle:** in neutral position or slightly forward

**Flap handle:** 2<sup>nd</sup> position (flap handle full up)

**Runway:** clear

Release brakes, line up and apply full power.

Verify engine for sufficient RPM at full throttle (min 5100 RPM).

**CAUTION!** Keep adding power gradually.

**WARNING!** Should engine RPM not reach more than 5000 RPM when at full throttle, ABORT TAKE-OFF IMMEDIATELY, come to a standstill and verify that the propeller is at minimum pitch setting .

Start the takeoff roll pulling the control stick one third backward and lift the nose wheel off the ground as you accelerate. Reaching 40-43 kts, gently pull on the stick to get the aircraft airborne.

**CAUTION!** Crosswind (max 15 kts) takeoff should be performed with the control stick pointed into the wind. Special attention should be paid to maintaining runway heading!

## Initial climb

When airborne, engage brakes momentarily to prevent in-flight wheel spinning.

Accelerate at full power and later maintain proper climbing speed.

As you reach 50 kts (90 km/h) at above 150 ft (50 m), set flaps to 1<sup>st</sup> stage, reaching 60 kts (110 km/h) at 300 ft (100 m) set flaps to neutral position. Reduce RPM by 10% or below 5500 RPM and continue climbing at 70 kts (130 km/h).

Adjust the trim to neutralize the stick force if necessary.

Remember to keep the temperatures and RPM within operational limits during climb out.

**CAUTION!** Reduce power and lower the nose to increase speed in order to cool the engine down if necessary.

Should you be climbing for a cross-country flight, consider climbing at 100 kts (185 km/h) as this will greatly increase your overall travelling speed.

Reaching cruise altitude, establish horizontal flight and set engine power to cruise (5300 RPM).

## Cruise

When horizontal flight has been established, verify on-board fuel quantity again.

Keep the aircraft balanced while maintaining desired flight parameters.

Should you desire to cruise at low speed (up to 80 kts (150 km/h)), set flaps to neutral position otherwise flaps should be set to negative position (flap handle full down).

Check engine operation and flight parameters regularly! Recommended cruise is at 5300 RPM, with a fuel burn of 3.3 USgal per hour.

**CAUTION!** It is not recommended to fly the aircraft at speeds exceeding 80 kts (150 km/h) using flap setting other than negative.

Flying in cruise, check fuel levels as well. Because of the fuel system design, the fuel tends to gradually cross-flow from the right tank to the left. To prevent this, shut the right fuel valve and open it again when the fuel level inside left tank has lowered.

**CAUTION!** If the fuel quantity in a fuel tank is low, it is possible that the engine starts to suck air into the fuel system. To prevent this and consequent engine failure, always close the fuel valve of the tank where the fuel quantity is very low.

## Cruising in rough conditions

Should you experience turbulence, reduce airspeed and continue flying with flaps set to neutral position.

**CAUTION!** In rough air, reduce engine power if necessary to keep airspeed below VRA.

## Descent and final approach

Descent at speeds at or below VRA and flaps in negative stage. To expedite descents use airbrakes (if applicable) and keep airspeed below VAE.

For approach reduce speed to 70 kts (130 km/h) and set flaps to 1<sup>st</sup> position only after turning to base leg.

Adjust engine power to maintain proper airspeed. Set trim to neutralise stick force if necessary. During the descent monitor temperatures and keep within operational limits.

**CAUTION!** During the descent engine power **MUST** be reduced. Should you be forced to descend at idle power, make sure you keep adding throttle for short periods of time, not to turn the spark plugs dirty.

**CAUTION!** With flaps in 2<sup>nd</sup> position only half way of the available deflection is permitted.

On final, set flaps to 2<sup>nd</sup> position.

Align with the runway and reduce power to idle.

Extend airbrakes (if applicable) and maintain an airspeed of 55 kts (102 km/h).

Instead of throttle use airbrakes (if applicable ) to control your descent glide path, otherwise control your attitude and crab if necessary.

**CAUTION!** Crosswind landings require higher final approach speeds to ensure aircraft's safe manoeuvrability. Increase the approach speed by 1 kts for every 1 kts of crosswind component e.g. in case of 5 kts crosswind component, increase the approach speed by 5 kts.

## Roundout and touchdown

**CAUTION!** See chapter "Performance" for landing performance.

Roundout and touchdown (flare) occurs at following airspeeds:

Calm air, aircraft at MTOM	40 kts (75 km/h) IAS
Rough air, aircraft at MTOM (incl. strong crosswinds up to 34 km/h (18 kts))	42 kts (78 km/h) IAS

**CAUTION!** Land the aircraft in such a manner that the two main wheels touch the ground first, allow the nose-wheel touchdown only after speed has been reduced below 25 kts. When lowering the nose wheel to the runway, rudder **MUST NOT** be deflected in any direction (rudder pedals centred).

When on ground, start braking action holding the control stick in full back position. Steer the aircraft using brakes and rudder only. Provided the runway length is sufficient, come to a complete standstill without engaging the brakes holding the control stick slightly backwards as you decelerate.

**WARNING!** After touchdown, **DO NOT** retract airbrakes immediately, as this causes sudden lift increase and the aircraft may rebound off the ground. Should this occur, hold the elevator steady; under no circumstances attempt to follow aircraft's movement with elevator movements, for Virus 912 LSA tends to stabilize rebounding by itself. However, it is important to maintain runway heading using the rudder at all times. Retract air brakes only after the aircraft has come to a complete standstill.

**CAUTION!** Should you be performing the touch-and-go manoeuvre, retract air brakes carefully before re-applying full power.

## Crosswind approach and roundout

**CAUTION!** Crosswinds prolong landing runway length due to elevated airspeed that should be used, see previous page.

Performing a crosswind landing, the wing-low method should be used. When using the wing-low method it is necessary to gradually increase the deflection of the rudder and aileron to maintain the proper amount of drift correction.

**WARNING!** If the crab method of drift correction has been used throughout the final approach and roundout, the crab must be recovered before touchdown by applying rudder to align the aircraft's longitudinal axis with its direction of movement.

## Parking

Come to a complete standstill by engaging brakes. Re-check RPM drop by switching ignition OFF and back ON, one by one. Leave the engine running at idle RPM for a minute in order to cool it down. Set master switch and ignition switches OFF.

Unlock air brakes (handle hanging down freely) and insert parachute rescue system handle's safety pin (if rescue system installed). Apply parking brake, if fitted. Open cabin door, unfasten safety harnesses and exit the cockpit (watch for the wheel fairings!). Block the wheels and secure the pitot tube by putting on a protection cover.

Fit the tubes onto fuel tank vents so that fuel will not spill onto the wing in event of full fuel tanks, temperature expansion of fuel and/or parking on a slope. It is recommended to shut both fuel tank valves.

**CAUTION!** Should the aircraft be parked on a slope it is recommended to shut one of the fuel valves to prevent overflowing of the adjacent fuel tank.

## Stopping / restarting the engine in flight

This procedure applies only for stopping and restarting the engine following an intentional unpowered flight.

Reduce speed to 50 kts (90 km/h) or below.  
Apply normal engine shut down or start-up procedure.

Upon restart, should the engine cool down during unpowered flight, apply choke. Always start the engine at idle throttle.

**CAUTION!** Do not add full power while the engine is still cool. Fly at lower airspeeds at low power engine setting to warm it up instead (e.g. 50 kts (90 km/h) at 3000 RPM).

# **8 Handling and maintenance**

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**Special inspections (8-2)**

**Draining and refuelling  
(8-2)**

**Connecting Auxiliary  
power supplies (8-3)**

**Tie down (8-4)**

**Storage (8-4)**

**Cleaning (8-4)**

**Keeping your aircraft in  
perfect shape (8-5)**

# Special inspections

## After having exceeded VNE or landed in a rough manner:

Check the undercarriage, fuselage & wing surfaces and main spars for abnormalities. It is highly recommended to have the aircraft verified for airworthiness by authorised service personnel.

## Clicking noise overhead

The wings are factory fitted to the fuselage to make a tight fit at approximately 70° F. When exposed to low temperatures, materials shrink. Therefore, flying in the winter or in cold temperatures, you may encounter "click-clack" like noises above your head. The remedy for this unpleasant noises is to add washers, typically of 0,5 mm thickness in-between wing and fuselage. Washers must be added both at rear and front bushings at one side of the fuselage only!

**WARNING!** It is mandatory to consult the manufacturer or authorised service personnel before applying washers!

# Draining and refuelling

Whenever draining or refuelling make sure master switch is set to OFF (key in full left position).

## Draining the fuel system

The gascolator is located beneath the bottom engine cover on the left hand side of the fuselage. To drain the fuel system, open the drain valve on the gascolator. Drain approximately 1/2 cup of fuel. Try to prevent ground pollution by collecting the fuel with a canister. To close the valve simply turn it in the opposite direction. **Do not use force or special tools!**

**CAUTION!** Always drain the fuel system before you have moved the aircraft from a standstill to prevent mixing of the fuel and eventual water or particles.

## Refuelling

**CAUTION!** Before refuelling it is necessary to ground the aircraft!

Refuelling can be done by pouring fuel through the fuel tank openings on top of the wings or by using the single point fueling valve on the lower firewall.

### Refuelling using the electrical fuel pump:

Firstly make sure the fuel hoses are connected to wing connectors and that both fuel valves are open.

Connect one end of the fuel pump to the valve beneath the bottom engine cowl. Submerge the other end of the fuel pump, which has a filter attached, into the fuel container.

Engage the fuel pump by engaging the 12 V socket switch on the instrument panel.

After refuelling it is recommended to eliminate eventual air pockets from inside the fuel system. To do that, drain some fuel with both fuel valves fully open.

Also, leave the engine running at idle power for a couple of minutes prior to taking-off and test the engine at full power for a minimum of 30 seconds.

Should you be experiencing slow refuelling with the electrical fuel pump, you should replace the filter. You can use any fuel filter for this application.

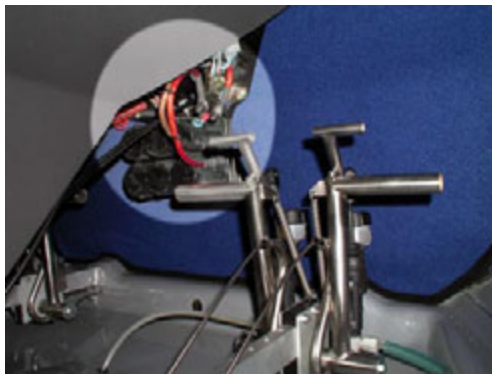
It is recommended to use additional plastic tubes attached to the fuel tank vents and leading to the ground in order to avoid over-spills of fuel onto the airframe when filling the tanks completely

**CAUTION!** Use authorised plastic containers to transport and store fuel only! Metal canisters cause for water to condensate on the inside, which may later result in engine failure.

## Connecting Auxilliary power supplies

Should you be unable to start the engine due to a weak battery, auxilliary power supplies can be connected to help starting the engine.

### Battery's & Relay's location



### Battery (black) & Relay (top-right)



### Top-left nipple (c. positive (+) wire here)



### Exhaust (connect negative (-) wire here)



To connect an auxilliary power supply use battery connector cables with clamps at either ends. Connect the negative (-) wire to aircraft's exhaust (sticking out below the engine cowlings). The positive (+) wire leads inside the cockpit to the relay mounted top-right of the aircraft's battery on the firewall. This relay has 3 nipples; the positive (+) wire must be connected to the upper-left nipple, the only one to which 2 cables are connected to. After you have connected the wires correctly, start the engine normally by pressing the starter button in the cockpit.

**WARNING!** The pilot must be in cockpit when starting the engine. The person who will disconnect the cables after the engine has started must be aware of the danger of spinning propeller nearby.

## Tie down

Point the aircraft into the wind and retract flaps fully. Chock all three wheels. Remove the caps covering mounting holes on the bottom part of the wing (located 15 ft from the fuselage) and carefully screw in the two screw-in rings provided.

Secure tie-down ropes to the wing tie-down rings at an approximately 45-degree angle to the ground. When using rope of a non-synthetic material, leave sufficient slack to avoid damage to the aircraft, should the ropes contract. To tie down the tail, tie a rope through the tail skid and secure it to the ground. At the end, cover the pitot tube with a protection cover.

## Storage

The aircraft is ideally stored in a hangar. For increased in-hangar manoeuvrability use of original push-cart is recommended.

Even for over-night storage it is recommended to leave the airbrakes handle unlocked - hanging down freely in order to reduce pressure on plate springs and maintain their original stiffness.

If a parachute rescue system is installed in your aircraft, make sure the activation handle safety pin is inserted every time you leave the aircraft.

Apply the tubes onto fuel tank vents so that fuel will not spill onto the wing in event of full fuel tanks, temperature expansion of fuel and/or parking on a slope.

Also, disconnect the battery from the circuit to prevent battery self-discharge (pull battery disconnection ring on the instrument panel's switch column) during storage period.

**CAUTION!** Should the aircraft be stored and/or operated in areas with high atmospheric humidity pay special attention to corrosion of metal parts, especially inside the wings. Under such circumstances it is necessary to replace the airbrakes connector rod every 2 years.

## Cleaning

Use fresh water and a soft piece of cloth to clean the aircraft's exterior. If you are unable to remove certain spots, consider using mild detergents. Afterwards, rinse the entire surface thoroughly.

Lexan glass surfaces are protected by an anti-scratch layer on the outside and an anti-fog coating on the inside of the cabin. Always use fresh water only to clean the glass surfaces, not to damage these protection layers and coatings.

To protect the aircraft's surface (excluding glass surfaces) from the environmental contaminants, use best affordable car wax.

The interior is to be cleaned with a vacuum cleaner.

# Keeping your aircraft in perfect shape

## Precautions

- 1) Eliminate the use of ALL aggressive cleaning solutions and organic solvents, also the window cleaning spray, benzene, acetone, aggressive shampoos etc.
- 2) If you must use an organic solvent (acetone) on small areas remove certain glue leftovers or similar, the surface in question MUST be polished thereafter. The only section where polishing should be avoided is the edge on the wing where the sealing gasket is applied.
- 3) When flying in regions with a lot of bugs in the air, you should protect the leading edges of the airframe before flight (propeller, wings, tail) with Antistatic furniture spray cleaner: "Pronto (transparent), manufacturer: Johnson Wax (or anything equivalent) – Worldwide", approximate price is only \$3 USD / €3 EUR for a 300 ml spray bottle. Using such spray, do not apply it directly onto the wing but into a soft cloth instead (old T-shirts are best).
- 4) After having finished with flight activity for the day, clean the leading edges of the airframe as soon as possible with a lot of water and a drying towel (chamois, artificial leather skin). This will be very easy to do if you applied a coat of Pronto before flight.

## Detailed handling (Airframe cleaning instructions)

### Every-day care after flight

Bugs, which represent the most of the dirt to be found on the airframe, are to be removed with clean water and a soft cloth (can be also drying towel, chamois, artificial leather skin). To save time, soak all the leading edges of the airframe first. Make sure to wipe ALL of the aircraft's surface until it is completely dry.

Clean the propeller and the areas with eventual greasy spots separately using a mild car shampoo with a wax.

**CATUION!** Do not, under any circumstances attempt to use aggressive cleaning solutions, as you will severely damage the lacquer, which is the only protective layer before the structural laminate.

When using the aircraft in difficult atmospheric conditions (intense sunshine, dusty winds, coastline, acid rains etc.) make sure to clean the outer surface more thoroughly.

If you notice you cannot remove the bug-spots from the leading edges of the aircraft, this means the lacquer is not protected any more, therefore it is necessary to polish these surfaces.

**CAUTION!** Do not, under any circumstances attempt to remove such bug-spots with abrasive sponges and/or rough polishing pastes.

### Periodical cleaning of all outer surfaces with car shampoo

Clean as you would clean your car starting at the top and working your way downwards using a soft sponge. Be careful not to use a sponge that was contaminated with particles e.g. mud, fine sand) so not to grind the surface. While cleaning, soak the surface and the sponge many, many times. Use a separate sponge to clean the bottom fuselage, as is it usually more greasy than the rest of the airframe. When pouring water over the airframe, be careful not to direct it over the fuel reservoir caps, wing-fuselage joining section, parachute rescue system straps and cover, pitot tube, tail static probe and engine covers.

Always rinse the shampooed surfaces again before they become dry! Thereafter, wipe the whole of the aircraft dry using a drying towel, chamois or artificial leather skin.

Also, clean the Mylar seals on the wing and tail control surfaces. Lift the seals gently and insert ONE layer of cloth underneath, then move along the whole span of the seal. Ultimately, you may wish to apply Teflon grease (in spray) over the area where the seal touch the control surfaces.

## **Polishing by hand**

Use only the highest quality polishing compounds WITHOUT abrasive grain, such as Sonax Extreme or similar. Start polishing on a clean, dry and cool surface, never in the sunshine!

Machine polishing requires more skills and has its own particularities, therefore it is recommended to leave it to a professional.

## **Cleaning the Lexan transparent surfaces**

It is most important to use really clean water (no cleaning solutions are necessary) and a really clean drying towel (always use a separate towel ONLY for the glass surfaces). Should the glass surfaces be dusty, remove the dust first by pouring water (not spraying!) and gliding your hand over the surface. Using the drying towel, simply glide it over the surface, then squeeze it and soak it before touching the glass again. If there are bugs on the windshield, soak them with plenty of water first, so less wiping is necessary. Ultimately, dry the whole surface and apply JT Plexus Spray (\$10 USD / €10 EUR per spray) or at least Pronto antistatic (transparent) spray and wipe clean with a separate soft cotton cloth."

# **9 Appendix**

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**Parachute rescue system:  
use, handling and  
maintenance (9-1)**

**How fast is too fast (9-4)**

**Myth: I can fully deflect  
the controls below  
maneuvering speed! (9-7)**

**Training supplement (9-8)**

**Conversion tables (9-12)**

**Preflight check-up pictures  
(9-18)**

# Parachute rescue system: use, handling and maintenance

## System description

The GRS rocket charged parachute rescue system provides you with a chance to rescue yourself from an unexpected situation.

The system is placed inside a durable cylinder mounted on the right hand side of the baggage compartment. Inside this cylinder is the parachute which is stored inside a deployment bag with a rocket engine underneath.

This brand new design deploys a canopy that is not gradually drawn from the container, exposed to distortion by air currents, but it is safely open after 0,4 to 0,7 seconds in distance of 15-18 metres above the aircraft. It is carried there in a special deployment bag, which decreases the risk of aircraft debris fouling the canopy.

The parachute rescue system is activated manually, by pulling the activation handle mounted on the back wall above. After being fired, the main canopy is open and fully inflated in about 3.2 seconds.

**WARNING!** Activation handle safety pin should be inserted when the aircraft is parked or hangared to prevent accidental deployment. However, the instant pilot boards the aircraft, safety pin **MUST** be removed!

## Use of parachute rescue system

**Typical situations for use of the parachute rescue system are:**

- structural failure
- mid-air collision
- loss of control over aircraft
- engine failure over hostile terrain
- pilot incapacitation (incl. heart attack, stroke, temp. blindness, disorientation...)

**Prior to firing the system, provided time allows:**

- shut down the engine and set master switch to OFF (key in full left position)
- shut both fuel valves
- fasten safety harnesses tightly
- protect your face and body.

**To deploy the parachute jerk the activation handle hard to a length of at least 1 foot towards the instrument panel.**

Once you have pulled the handle and the rocket is deployed, it will be about two seconds before you feel the impact produced by two forces. The first force is produced by stretching of all the system. The second force follows after the inflation of the canopy from opening impact and it will seem to you that the aircraft is pulled backwards briefly. The airspeed is reduced instantly and the aircraft now starts to descent underneath the canopy.

As a pilot you should know that the phase following parachute deployment may be a great unknown and a great adventure for the crew. You will be getting into a situation for the first time, where a proper landing and the determination of the landing site are out of your control.

**CAUTION!** Should you end up in power lines (carrying electrical current), DO NOT under any circumstances touch any metal parts inside or outside the cockpit. This also applies to anyone attempting to help or rescue you. Be aware that anyone touching any part of the aircraft while standing on the ground will probably suffer major injury or die of electrocution. Therefore, you are strongly encouraged to confine your movements until qualified rescue personnel arrives at the site to assist you.

After the parachute rescue system has been used or if you suspect any possible damage to the system, do not hesitate and immediately contact the manufacturer!

## Handling and maintenance

Prior to every flight all visible parts of the system must be checked for proper condition. Special attention should be paid to corrosion on the activation handle inside the cockpit. Also, main fastening straps on the outside of the fuselage must be undamaged at all times.

Furthermore, neither system, nor any of its parts should be exposed to moisture, vibration and UV radiation for long periods of time to ensure proper system operation and life.

**CAUTION!** It is strongly recommended to thoroughly inspect and grease the activation handle, preferably using silicon spray, every 50 flight hours.

**All major repairs and damage repairs MUST be done by the manufacturer or authorised service personnel.**

For all details concerning the GRS rescue system, please see the "GRS - Galaxy Rescue System Manual for Assembly and Use".

# How fast is too fast?

Based on two recent unfortunate events, where two pilots lost their newly acquired Sinus and Virus aircraft, the team of Pipistrel's factory pilots decided to stress the importance of airspeed even more. Do read this passage thoroughly as everything mentioned below affects you as the pilot directly!

## The two events

Both the events took place **during the first couple of hours** pilots flew with their new aircrafts. Therefore it is definite they had not become completely familiar with all the flight stages Sinus and Virus offer. The circumstances of both the events were remarkably similar. Soon after the pilots picked up their new aircraft at the distributor's, the aircraft were severely damaged aloft. One during the first home-bound cross country flight and the other during the first flights at domestic airfield. Please note the distributor independently tested both mentioned aircraft up to VNE at altitudes reaching 300 to 500 metres (900 to 1500 feet) with great success.

Pilots flew their machines at reasonably **high altitudes** but at **very high speeds**. One of them deployed airbrakes (spoilers) at the speed of 285 km/h (155 kts) - where the VNE of the aircraft is 225 km/h (122 kts), the other was flying at 3000 m (10.000 ft) at 270 km/h (145 kts) IAS - where the VNE of the aircraft was 250 km/h (135 kts).

They both encountered **severe vibrations** caused by **flutter**. Because of this one aircraft's fuselage was shredded and broken in half just behind the cabin (the crew saw saved thanks to the parachute rescue system), other suffered inferior damage as only the flapperon control tubes went broken. The pilot of the second machine then landed safely using elevator and rudder only. Fortunately both pilots survived the accident without being even slightly injured.

Thanks to the Brauniger ALPHAmfd's integrated Flight Data Recorder, we were able to reconstruct the flights and reveal what had really happened.

### What was the reason for the flutter causing both accidents?

**Both pilots greatly exceeded speed which should never be exceeded, the VNE. With the IAS to TAS correction factor taken into consideration, they were both flying faster than 315 km/h (170 kts)!**

You might say: "Why did they not keep their speed within safe limits? How could they be so thoughtless to afford themselves exceeding the VNE?" Speaking with the two pilots they both confessed they went over the line unwarily. "**All just happened so suddenly!**" was what they both said. Therefore it is of vital importance to be familiar to all factors that might influence your flying to the point of unwarily exceeding the VNE.

## Human factor and performance

The human body is not intended to be travelling at 250 km/h (135 kts), nor is it built to fly. Therefore, in flight, the **human body** and its signals **should not be trusted** at all times!

To determine the speed you are travelling at, you usually rely on two senses – the ear and the eye. The faster the objects around are passing by, the faster you are travelling. True. The stronger the noise caused by air circulating the airframe, the faster the airspeed. True again. But let us confine ourselves to both events' scenarios.

**At higher altitudes, human eye loses it's ability to determine the speed of movement precisely.**

Because of that pilots, who are flying high up feel like they are flying terribly slow. At high speeds the air circulating the airframe should cause tremendous noise. Wrong! In fact the noise is caused by drag. **Modern aircraft like Sinus and Virus**, manufactured of composite materials, have so little drag, that they actually **sound quieter than you would expect**. Especially if you are used to wearing a headset when flying **you must not rely on your ear** as the instrument for determining speed.

**REMEMBER! When flying high the only reliable tool to determine airspeed is the cockpit instrument - the airspeed indicator!**

## How to read and understand what the airspeed indicator tells you?

Let us first familiarise with the terms used below:

**IAS:** stands for Indicated AirSpeed. This is the speed the airspeed indicator reads.

**CAS:** stands for Calibrated AirSpeed. This is IAS corrected by the factor of aircraft's attitude. No pitot tube (device to measure pressure used to indicate airspeed) is positioned exactly parallel to the air-flow, therefore the input speed – IAS – must be corrected to obtain proper airspeed readings. With Sinus and Virus, IAS to CAS correction factors range from 1,00 to 1,04.

**TAS:** stands for True Airspeed. TAS is often regarded as the speed of air to which the aircraft's airframe is exposed. To obtain TAS you must have CAS as the input value and correct it by pressure altitude, temperature and air density variations.

The maximum structural speed is linked to **IAS**. But light planes, manufactured of carbon reinforced plastics, with long, slick wings are more prone to flutter at high speeds than to structural failure. So **flutter is the main factor of determining VNE** for us and most other carbon-reinforced-plastic aircraft producers. **Flutter speed is linked to TAS**, as it is directly caused by small differences in speed of air circulating the airframe. Hence air density is not a factor. For all who still doubt this, here are two quotes from distinguished sources on flutter being related to TAS:

*"Suffice to say that flutter relates to true airspeed (TAS) rather than equivalent airspeed (EAS), so aircraft that are operated at or beyond their VNE at altitude - where TAS increases for a given EAS – are more susceptible to flutter..."*

*New Zealand CAA' Vector Magazine* (full passage at page 5 of <http://www.caa.govt.nz/fulltext/vector/vec01-4.pdf>)

*"The critical flutter speed depends on TAS, air density, and critical mach number. The air density factor is almost canceled out by the TAS factor; and most of us won't fly fast enough for mach number to be a factor. So TAS is what a pilot must be aware of!"*

*Bob Cook, Flight Safety International*

**The airspeed indicator shows you the IAS, but this is sadly NOT the speed of air to which the aircraft's airframe is exposed.**

**IAS and TAS** are almost the same at sea level but **can greatly differ** as the altitude increases. So flying at high altitudes, where the air is thinner, results in misinterpreting airspeed which is being indicated. The indicated airspeed value may actually be pretty much lower than speed of air to which the aircraft is exposed, the TAS.

**So is VNE regarded as IAS or TAS? It is in fact regarded as TAS above 4000m/13100 ft!!! You should be aware of that so that you will not exceed VNE like the two pilots mentioned have.**

## How much difference is there between IAS and TAS in practical terms?

Data is for standard atmosphere. To obtain correct speeds for particular atmospheric conditions please take advantage of the table on page 85 of this manual.

The table below indicates how fast you may fly at a certain altitude to maintain constant True AirSpeed (TAS).

		TAS [km/h (kts)]	IAS [km/h (kts)]	TAS [km/h (kts)]	IAS [km/h (kts)]
1000 m	3300 ft	250 (135)	<b>237 (128)</b>	270 (145)	<b>256 (138)</b>
2000 m	6500 ft	250 (135)	<b>226 (122)</b>	270 (145)	<b>246 (133)</b>
3000 m	10000 ft	250 (135)	<b>217 (117)</b>	270 (145)	<b>235 (126)</b>
4000 m	13000 ft	250 (135)	<b>206 (111)</b>	270 (145)	<b>226 (121)</b>
5000 m	16500 ft	250 (135)	<b>195 (105)</b>	270 (145)	<b>217 (117)</b>
6000 m	19700 ft	250 (135)	<b>187 (101)</b>	270 (145)	<b>205 (110)</b>
7000 m	23000 ft	250 (135)	<b>178 (96)</b>	270 (145)	<b>196 (103)</b>
8000 m	26300 ft	250 (135)	<b>169 (91)</b>	270 (145)	<b>185 (98)</b>

The table below indicates how TAS increases with altitude while keeping IAS constant.

		IAS [km/h (kts)]	TAS [km/h (kts)]	IAS [km/h (kts)]	TAS [km/h (kts)]
1000 m	3300 ft	250 (135)	<b>266 (144)</b>	270 (145)	<b>289 (156)</b>
2000 m	6500 ft	250 (135)	<b>279 (151)</b>	270 (145)	<b>303 (164)</b>
3000 m	10000 ft	250 (135)	<b>290 (157)</b>	270 (145)	<b>316 (171)</b>
4000 m	13000 ft	250 (135)	<b>303 (164)</b>	270 (145)	<b>329 (178)</b>
5000 m	16500 ft	250 (135)	<b>317 (171)</b>	270 (145)	<b>345 (186)</b>
6000 m	19700 ft	250 (135)	<b>332 (179)</b>	270 (145)	<b>361 (195)</b>
7000 m	23000 ft	250 (135)	<b>349 (188)</b>	270 (145)	<b>379 (204)</b>
8000 m	26300 ft	250 (135)	<b>366 (198)</b>	270 (145)	<b>404 (218)</b>

As you can see from the table above the **differences between IAS and TAS are not so little and MUST be respected at all times!**

### REMEMBER!

- Do not trust your ears.
- Do not trust your eyes.
- Trust the instruments and be aware of the IAS to TAS relation!

**Always respect the limitations prescribed in this manual!  
Never exceed the VNE as this has proved to be fatal!**

Keep that in mind every time you go flying. Pipistrel wishes you happy landings!

# Myth: I can fully deflect the controls below maneuvering speed!

## WRONG! BELIEVE THIS AND DIE!

The wing structure in light planes is usually certified to take +3.8 G's, -1.52 G's (plus a certain safety factor). Put more load on the wing than that and you should consider yourself dead.

But here is the nice part: Below a certain speed, the wing simply cannot put out a full 3.8 G's of lift! It will **stall** first! This speed is called **Maneuvering Speed** or **Va**.

Maneuvering Speed is defined as the maximum speed the plane can be flying at and still **stall** before the **wing breaks** no matter how much you pull back on the stick. If you are going **slower** than the **Va** and you pull the stick all the way back, the wing will stall **without braking physically**. If you are going **faster** than the **Va** and you pull the stick all the way back, the wing can put out **so much lift** that it can be expected to **break**. Therefore people think they can deflect the stick as much as they desire below Maneuvering Speed and stay alive.

## Wrong! The Maneuvering Speed is based on pulling back on the stick, not pushing it forward!

Note what was said above: The Va is defined as how fast you can fly and not be able to put out more than 3.8 G's of lift. But while the plane is certified for **positive 3.8 G's**, it is only certified for a **negative G-load of 1.52 G's!** In other words, **you can fail the wing** in the negative direction **by pushing forward** on the stick well **below the Va!** Few pilots know this.

Also, for airliners, certification basis require that the rudder can be fully deflected below Maneuvering Speed, but only if the plane is not in a sideslip of any kind! (e.g. crab method of approach) Does this make sense at all? Why would you need to fully deflect the rudder if not to re-establish wings-level flight?

In a wonderfully-timed accident shortly after Sept. 11<sup>th</sup>, 2001 of which everybody thought might be an act of terrorism, an Airbus **pilot stomped the rudder** in wake turbulence while the plane was **in a considerable sideslip**. The **combined loads** of the **sideslip** and the **deflected rudder** took the vertical stabilizer to its **critical load**. A very simple numerical analysis based on the black box confirmed this. The airplane lost its vertical stabilizer in flight and you know the rest.

Also, if you are at your **maximum allowable g-limit** (e.g. 3.8) and you **deflect the ailerons even slightly**, you are actually asking for **more lift from one wing than the allowable limit!** **Therefore combined elevator and aileron deflections can break the plane, even if the elevator is positive only!**

## SO, WHEN YOU THINK THAT YOU CAN DO AS YOU PLEASE WITH THE CONTROLS BELOW MANEUVERING SPEED, YOU ARE WRONG!

Please reconsider this myth and also look at the Vg diagram and the aircraft's limitations to prove it to yourself.

# Training/Familisation Supplement

*This chapter has been written to assist owners/pilots/instructors of Virus 912 LSA on their quest to learn how to safely and efficiently fly this aircraft in addition to the information already assembled in the rest of this POH. This section will cover most operations the aircraft offers in an order established in section Normal procedures and recommended speeds. Please consider what follows as an add-on to that chapter.*

## Engine start-up

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

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

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

## Taxi

Taxiing with the Virus 912 LSA is rather simple considering the steerable nose wheel. **For sharper turns** on the ground you can also **use wheel brakes** to assist yourself. It is recommended you **taxi slow**, up to 10 km/s (5 kts), while holding the stick back fully to ease the pressure of the nose wheel.

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

## Take off and initial climb

Having checked and set all engine and aircraft parameters, you should be ready for take off by now. **Reverify both fuel valves be open and the airbrakes retracted and locked (handle full up). Trim lever should be in the middle.**

**Start the take-off roll gradually.** Keep adding throttle slowly and smoothly full power. There are two reasons for this. First, you change flight stage from zero movement to acceleration slowly; this provides you with time to react to conditions. Second, especially if taking-off from a gravel runway, this method of adding full throttle will prevent the little stones on the runway from damaging the propeller. Extremely short runways are an exception. There you should line up the aircraft, set flaps to 2<sup>nd</sup> stage, step on the brakes, apply full power and release the brakes.

**As you start to move, pull the stick 1/3 of elevator's deflection backwards** to ease the pressure on the nose wheel and lift it off the runway slightly. **Do not use full back deflection as this will cause the aircraft's tail to touch the ground.**

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

**Having lifted off the ground, gently push the stick forward just a bit to accelerate.** At some 90 km/h (50 kts) set flaps to 1<sup>st</sup> stage, at 110 km/h (60 kts) set them to neutral.

## Climb

A comfortable setting for climb is flaps in neutral position, speed of 70 kts (130 km/h) at or slightly below 5500 RPM. In summer time or **when outside temperature exceeds 30°C** you should **consider climbing at some 85 kts (160 km/h)** to provide more airflow to the engine radiators. Trim the aircraft for comfortable stick forces.

## Cruise

**Passing through 85 kts (160 km/h), set flaps to negative position (handle full down).** A comfortable cruise setting is 5300 engine RPM. **As the Virus is sensitive to flap settings, especially when it comes to fuel efficiency, ALWAYS use negative stage of flaps beyond 85 kts (160 km/h) and neutral for level flight below 70 kts (130 km/h).**

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

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

## Descent

Descending with the Virus is the stage of flight where the most care should be taken. As the aircraft is essentially a glider, it is very slippery and builds up speed very fast.

**Start the descent by reducing throttle and keep your speed below VRA.**

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

**Also, keep in mind you need to begin your descent quite some time before destination.** A comfortable rate of descent is 500 fpm (2.5 m/s). So it takes you some 2 minutes for a 1000 ft (300 m) drop. At 105 kts (200 km/h) this means 3.6 NM for each 1000 ft drop.

**Entering the traffic pattern the aircraft must be slowing down.** In order to do this, hold your altitude and reduce throttle to idle. When going below 80 kts (150 km/h), set flaps to neutral position. Set proper engine RPM to maintain speed of 70 kts (130 km/h). Trim the aircraft for comfortable stick forces.

**Before turning to base-leg, reduce power to idle and set flaps to 1<sup>st</sup> stage at 60 kts (110 km/h).** Once out of the turn, reduce speed towards 55 kts (100 km/h). Power remains idle from the point of turning base all the way to touch-down. If you plan your approach this way, you will always be on the safe side - even if your engine fails, you will still be able to safely reach the runway!

**Turn to final at 55 kts (100 km/h). When in runway heading, set flaps to 2<sup>nd</sup> stage.** Operate the airbrakes to obtain the desired descent path (if applicable).

**How to determine how much airbrakes you need for a certain airspeed?**

Open them half-way and observe the runway. If the runway threshold is moving up, you are dropping too fast - retract the airbrakes a little. If the runway threshold is disappearing below your aircraft, you are dropping too slowly - extend airbrakes further. **When working on airbrakes, it is important to keep the airspeed/pitch angle constant throughout final all the way to flare! The airbrakes will not impact your speed, just rate (angle) of descent.** For pilots who are not used to operating airbrakes but throttle instead, keep in mind that airbrakes in Virus work just like throttle does: handle back equals less throttle, handle forward equals more throttle.

**CAUTION! Never drop the airbrakes handle when using them, keep holding the handle even if you are not moving it!**

## Roundout (Flare) and touchdown

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

**Should you bounce off the runway after touch-down, do not, under any circumstances, push stick forward or retract airbrakes.** Spoilers (airbrakes) stay fully extended, the stick goes backwards slightly. Bouncing tends to reduce by itself anyhow.

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

## Crosswind landings on paved runways (asphalt, concrete, tarmac...)

In this case, special attention must be paid to straightening the aircraft before touchdown in order not to damage the undercarriage because of increased surface grip on impact.

Should the crosswind component be strong (8 kts and over), it is recommended to gently **flare in such a manner, that one of the main wheels touches-down an instant before the other** (e.g. if there is crosswind from your left, the left wheel should touch down just before the right wheel does). This way the undercarriage almost cannot be damaged due to side forces on cross-wind landings.

## Landing in strong turbulence and/or gusty winds

First of all **airspeed must be increased** for half of the value of wind gusts (e.g. if the wind is gusting for 6 kts, add 3 kts to the final approach speed). In such conditions I would also recommend to only **use 1<sup>st</sup> stage of flaps for increased manoeuvrability**. In very strong winds (20 kts and more), use **neutral flaps (0 deg.) for the complete approach and roundout**.

## Parking

Nothing special to add here. Taxi to the apron with flaps in negative position (minimum lift) and spoilers retracted. Again, taxi slow for reasons mentioned under "Taxi". **Come to a standstill, shut down the engine, insert the parachute rescue system activation handle's safety pin, unlock and leave the airbrakes handle hanging down freely** (this reduces stress to airbrake plate's springs and maintains their stiffness). It is recommended to shut both fuel valves for longer parking or when parked on a slope.

# Conversion tables

## kilometers per hour (km/h) - knots (kts) - metres per sec. (m/s)

km/h	kts	m/s	km/h	kts	m/s	km/h	kts	m/s
1,853	1	0,37	63,00	34	18,34	124,16	67	36,15
3,706	2	1,07	64,86	35	18,88	126,01	68	36,69
5,560	3	1,61	66,71	36	19,42	127,87	69	37,23
7,413	4	2,15	68,56	37	19,96	129,72	70	37,77
9,266	5	2,69	70,42	38	20,50	131,57	71	38,31
11,11	6	3,23	72,27	39	21,04	133,43	72	38,86
12,97	7	3,77	74,12	40	21,58	135,28	73	39,39
14,82	8	4,31	75,98	41	22,12	137,13	74	39,93
16,67	9	4,85	77,83	42	22,66	138,99	75	40,47
18,53	10	5,39	79,68	43	23,20	140,84	76	41,01
20,38	11	5,93	81,54	44	23,74	142,69	77	41,54
22,23	12	6,47	83,39	45	24,28	144,55	78	42,08
24,09	13	7,01	85,24	46	24,82	146,40	79	42,62
25,94	14	7,55	87,10	47	25,36	148,25	80	43,16
27,79	15	8,09	88,95	48	25,90	150,10	81	43,70
29,65	16	8,63	90,80	49	26,44	151,96	82	44,24
31,50	17	9,17	92,66	50	26,98	153,81	83	44,78
33,35	18	9,71	94,51	51	27,52	155,66	84	45,32
35,21	19	10,25	96,36	52	28,05	157,52	85	45,86
37,06	20	10,79	98,22	53	28,59	159,37	86	46,40
38,91	21	11,33	100,07	54	29,13	161,22	87	46,94
40,77	22	11,81	101,92	55	29,67	163,08	88	47,48
42,62	23	12,41	103,77	56	30,21	164,93	89	48,02
44,47	24	12,95	105,63	57	30,75	166,78	90	48,56
46,33	25	13,49	107,48	58	31,29	168,64	91	49,10
48,18	26	14,03	109,33	59	31,83	170,49	92	49,64
50,03	27	14,56	111,19	60	32,37	172,34	93	50,18
51,80	28	15,10	113,04	61	32,91	174,20	94	50,72
53,74	29	15,64	114,89	62	33,45	176,05	95	51,26
55,59	30	16,18	116,75	63	33,99	177,90	96	51,80
57,44	31	16,72	118,60	64	34,53	179,76	97	52,34
59,30	32	17,26	120,45	65	35,07	181,61	98	52,88
61,15	33	17,80	122,31	66	35,61	183,46	99	53,42

**knots (kts) - metres per second (m/s)**

	0	1	2	3	4	5	6	7	8	9
0	0	0,51	1,02	1,54	2,05	2,57	3,08	3,60	4,11	4,63
10	0,51	5,65	6,17	6,66	7,20	7,71	8,23	8,74	9,26	9,77
20	10,28	10,80	11,31	11,83	12,34	12,86	13,37	13,89	14,40	14,91
30	25,43	15,94	16,46	16,97	17,49	18,00	18,52	19,03	19,54	20,06
40	20,57	21,09	21,60	22,12	22,63	23,15	23,66	24,17	24,69	25,20
50	25,72	26,23	26,75	27,26	27,76	28,29	28,80	29,32	29,83	30,35
60	30,86	31,38	31,89	32,41	32,92	33,43	33,95	34,46	34,98	35,49
70	36,00	36,52	37,04	37,55	38,06	38,58	39,09	39,61	40,12	40,64
80	41,15	41,67	42,18	42,69	43,21	43,72	44,24	44,75	45,27	45,78
90	46,30	46,81	47,32	47,84	48,35	48,87	49,38	49,90	50,41	50,90

**metres per second (m/s) - feet per minute (100 ft/min)**

m/sec.		100 ft/min	m/sec.		100 ft/min	m/sec.		100 ft/min
0,50	1	1,96	10,66	21	41,33	20,82	41	80,70
1,01	2	3,93	11,17	22	43,30	21,33	42	82,67
1,52	3	5,90	11,68	23	45,27	21,84	43	84,64
2,03	4	7,87	12,19	24	47,24	22,35	44	86,61
2,54	5	9,84	12,75	25	49,21	22,86	45	88,58
3,04	6	11,81	13,20	26	51,18	23,36	46	90,53
3,55	7	13,78	13,71	27	53,15	23,87	47	92,52
4,06	8	15,74	14,22	28	55,11	24,38	48	94,48
4,57	9	17,71	14,73	29	57,08	24,89	49	96,45
5,08	10	19,68	15,24	30	59,05	25,45	50	98,42
5,58	11	21,65	15,74	31	61,02	25,90	51	100,4
6,09	12	23,62	16,25	32	62,92	26,41	52	102,3
6,60	13	25,51	16,76	33	64,96	26,92	53	104,3
7,11	14	27,55	17,27	34	66,92	27,43	54	106,2
7,62	15	29,52	17,78	35	68,89	27,94	55	108,2
8,12	16	31,49	18,28	36	70,86	28,44	56	110,2
8,63	17	33,46	18,79	37	72,83	28,95	57	112,2
9,14	18	35,43	19,30	38	74,80	29,46	58	114,1
9,65	19	37,40	19,81	39	76,77	29,97	59	116,1
10,16	20	39,37	20,32	40	78,74	30,48	60	118,1

## ICAN (international comitee for air navigation) temperatures, relative pressure, relative density and CAS to TAS correction factors as related to altitude

Altitude		Temperature		Relative pressure	Relative density	Cor. factors
feet	metres	°C	°F			
-2.000	-610	18,96	66,13	1,074	1,059	0,971
-1	-305	16,98	62,56	1,036	1,029	0,985
0	0	15	59	1	1	1
1.000	305	13,01	55,43	0,964	0,971	1,014
2.000	610	11,03	51,86	0,929	0,942	1,029
3.000	914	9,056	48,30	0,896	0,915	1,045
4.000	1219	7,075	44,73	0,863	0,888	1,061
5.000	1524	5,094	41,16	0,832	0,861	1,077
6.000	1829	3,113	37,60	0,801	0,835	1,090
7.000	2134	1,132	34,03	0,771	0,810	1,110
8.000	2438	-0,850	30,47	0,742	0,785	1,128
9.000	2743	-2,831	26,90	0,714	0,761	1,145
10.000	3090	-4,812	23,33	0,687	0,738	1,163
11.000	3353	-6,793	19,77	0,661	0,715	1,182
12.000	3658	-8,774	16,20	0,635	0,693	1,201
13.000	3916	-10,75	12,64	0,611	0,671	1,220
14.000	4267	-12,73	9,074	0,587	0,649	1,240
15.000	4572	-14,71	5,507	0,564	0,629	1,260
16.000	4877	-16,69	1,941	0,541	0,608	1,281
17.000	5182	-18,68	-1,625	0,520	0,589	1,302

## metres (m) to feet (ft) conversion table

metres (m)		feet (ft)	metres (m)		feet (ft)	metres (m)		feet (ft)
0,304	1	3,280	10,36	34	111,5	20,42	67	219,81
0,609	2	6,562	10,66	35	114,8	20,72	68	223,09
0,914	3	9,843	10,97	36	118,1	21,03	69	226,37
1,219	4	13,12	11,27	37	121,3	21,33	70	229,65
1,524	5	16,40	11,58	38	124,6	21,64	71	232,94
1,828	6	19,68	11,88	39	127,9	21,91	72	236,22
2,133	7	22,96	12,19	40	131,2	22,25	73	239,50
2,438	8	26,24	12,49	41	134,5	22,55	74	242,78
2,743	9	29,52	12,80	42	137,7	22,86	75	246,06
3,048	10	32,80	13,10	43	141,1	23,16	76	249,34
3,352	11	36,08	13,41	44	144,3	23,46	77	252,62
3,657	12	39,37	13,71	45	147,6	23,77	78	255,90
3,962	13	42,65	14,02	46	150,9	24,07	79	259,18
4,267	14	45,93	14,32	47	154,1	24,38	80	262,46
4,572	15	49,21	14,63	48	157,4	24,68	81	265,74
4,876	16	52,49	14,93	49	160,7	24,99	82	269,02
5,181	17	55,77	15,24	50	164,1	25,29	83	272,31
5,48	18	59,05	15,54	51	167,3	25,60	84	275,59
5,791	19	62,33	15,84	52	170,6	25,90	85	278,87
6,096	20	65,61	16,15	53	173,8	26,21	86	282,15
6,400	21	68,89	16,45	54	177,1	26,51	87	285,43
6,705	22	72,17	16,76	55	180,4	26,82	88	288,71
7,010	23	75,45	17,06	56	183,7	27,12	89	291,99
7,310	24	78,74	17,37	57	187,0	27,43	90	295,27
7,620	25	82,02	17,67	58	190,2	27,73	91	298,55
7,948	26	85,30	17,98	59	193,5	28,04	92	301,83
8,220	27	88,58	18,28	60	196,8	28,34	93	305,11
8,530	28	91,86	18,59	61	200,1	28,65	94	308,39
8,830	29	95,14	18,89	62	203,4	28,90	95	311,68
9,144	30	98,42	19,20	63	206,6	29,26	96	314,96
9,448	31	101,7	19,50	64	209,9	29,56	97	318,24
9,750	32	104,9	19,81	65	213,2	29,87	98	321,52
10,05	33	108,2	20,12	66	216,5	30,17	99	324,80

## air pressure as related to altitude

altitude (m)	pressure (hPa)	pressure (inch Hg)	altitude (m)	pressure (hPa)	pressure (inch Hg)
-1000	1139,3	33,6	1300	866,5	25,6
-950	1132,8	33,5	1350	861,2	25,4
-900	1126,2	33,3	1400	855,9	25,3
-850	1119,7	33,1	1450	850,7	25,1
-800	1113,2	32,9	1500	845,5	25,0
-750	1106,7	32,7	1550	840,3	24,8
-700	1100,3	32,5	1600	835,2	24,7
-650	1093,8	32,3	1650	830	24,5
-600	1087,5	32,1	1700	824,9	24,4
-550	1081,1	31,9	1750	819,9	24,2
-500	1074,3	31,7	1800	814,8	24,1
-450	1068,5	31,6	1850	809,8	23,9
-400	1062,3	31,4	1900	804,8	23,8
-350	1056,0	31,2	1950	799,8	23,6
-300	1049,8	31,0	2000	794,9	23,5
-250	1043,7	30,8	2050	790,0	23,3
-200	1037,5	30,6	2100	785,1	23,2
-150	1031,4	30,5	2150	780,2	23,0
-100	1025,3	30,3	2200	775,3	22,9
-50	1019,3	30,1	2250	770,5	22,8
0	1013,3	29,9	2300	165,7	22,6
50	1007,3	29,7	2350	760,9	22,5
100	1001,3	29,6	2400	756,2	22,3
150	995,4	29,4	2450	751,4	22,2
200	989,4	29,2	2500	746,7	22,1
250	983,6	29,0	2550	742,1	21,9
300	977,7	28,9	2600	737,4	21,8
350	971,9	28,7	2650	732,8	21,6
400	966,1	28,5	2700	728,2	21,5
450	960,3	28,4	2750	723,6	21,4
500	954,6	28,2	2800	719	21,2
550	948,9	28,0	2850	714,5	21,1
600	943,2	27,9	2900	709,9	21,0
650	937,5	27,7	2950	705,5	20,8
700	931,9	27,5	3000	701,0	20,7
750	926,3	27,4	3050	696,5	20,6
800	920,0	27,2	3100	692,1	20,4
850	915,2	27,0	3150	687,7	20,3
900	909,0	26,9	3200	683,3	20,2
950	904,2	26,7	3250	679,0	20,1
1000	898,7	26,5	3300	674,6	19,9
1050	893,3	26,4	3350	670,3	19,8

# ICAO standard atmosphere

h (m)	h (ft)	T (°C)	T (°K)	T/T <sub>0</sub>	P (mmHg)	P (kg/m <sup>2</sup> )	P/P <sub>0</sub>	r (kgs <sup>2</sup> /m <sup>3</sup> )	g (kg/m <sup>4</sup> )	d	l/S d	V <sub>s</sub>	n*10 <sup>6</sup> (m <sup>2</sup> /s)
-1000	-3281	21,5	294,5	1,022	854,6	11619	1,124	0,137	1,347	1,099	0,957	344,2	13,4
-900	-2953	20,8	293,8	1,020	844,7	11484	1,111	0,136	1,335	1,089	0,958	343,9	13,5
-800	-2625	20,2	293,2	1,018	835	11351	1,098	0,134	1,322	1,079	0,962	343,5	13,6
-700	-2297	19,5	292,5	1,015	825,3	11220	1,085	0,133	1,310	1,069	0,967	343,1	13,7
-600	-1969	18,9	291,9	1,013	815,7	11090	1,073	0,132	1,297	1,058	0,971	342,7	13,8
-500	-1640	18,2	291,2	1,011	806,2	10960	1,060	0,131	1,285	1,048	0,976	342,4	13,9
400	-1312	17,6	290,6	1,009	796,8	10832	1,048	0,129	1,273	1,039	0,981	342	14,0
300	-984	16,9	289,9	1,006	787,4	10705	1,036	0,128	1,261	1,029	0,985	341,6	14,1
200	-656	16,3	289,3	1,004	779,2	10580	1,024	0,127	1,249	1,019	0,990	341,2	14,3
100	-328	15,6	288,6	1,002	769,1	10455	1,011	0,126	1,237	1,009	0,995	340,9	14,4
0	0	15	288	1	760	10332	1	0,125	1,225	1	1	340,5	14,5
100	328	14,3	287,3	0,997	751,0	10210	0,988	0,123	1,213	0,990	1,004	340,1	14,6
200	656	13,7	286,7	0,995	742,2	10089	0,976	0,122	1,202	0,980	1,009	339,7	14,7
300	984	13,0	286,0	0,993	733,4	9970	0,964	0,121	1,191	0,971	1,014	339,3	14,8
400	1312	12,4	285,4	0,991	724,6	9852	0,953	0,120	1,179	0,962	1,019	338,9	14,9
500	1640	11,1	284,7	0,988	716,0	9734	0,942	0,119	1,167	0,952	1,024	338,5	15,1
600	1969	11,1	284,1	0,986	707,4	9617	0,930	0,117	1,156	0,943	1,029	338,1	15,2
700	2297	10,4	283,4	0,984	699,0	9503	0,919	0,116	1,145	0,934	1,034	337,8	15,3
800	2625	9,8	282,8	0,981	690,6	9389	0,908	0,115	1,134	0,925	1,039	337,4	15,4
900	2953	9,1	282,1	0,979	682,3	9276	0,897	0,114	1,123	0,916	1,044	337	15,5
1000	3281	8,5	281,5	0,977	674,1	9165	0,887	0,113	1,112	0,907	1,049	336,6	15,7
1100	3609	7,8	280,8	0,975	665,9	9053	0,876	0,112	1,101	0,898	1,055	336,2	15,8
1200	3937	7,2	280,2	0,972	657,9	8944	0,865	0,111	1,090	0,889	1,060	335,8	15,9
1300	4265	6,5	279,5	0,970	649,9	8835	0,855	0,110	1,079	0,880	1,065	335,4	16,0
1400	4593	5,9	278,9	0,968	642,0	8728	0,844	0,109	1,069	0,872	1,070	335	16,2
1500	4921	5,2	278,2	0,966	634,2	8621	0,834	0,107	1,058	0,863	1,076	334,7	16,3
1600	5249	4,6	277,6	0,963	626,4	8516	0,824	0,106	1,048	0,855	1,081	334,3	16,4
1700	5577	3,9	276,9	0,961	618,7	8412	0,814	0,106	1,037	0,846	1,086	333,9	16,6
1800	5905	3,3	276,3	0,959	611,2	8309	0,804	0,104	1,027	0,838	1,092	333,5	16,7
1900	6234	2,6	275,6	0,957	603,7	8207	0,794	0,103	1,017	0,829	1,097	333,1	16,9
2000	6562	2	275	0,954	596,2	8106	0,784	0,102	1,006	0,821	1,103	332,7	17,0
2100	6890	1,3	274,3	0,952	588,8	8005	0,774	0,101	0,996	0,813	1,108	332,3	17,1
2200	7218	0,7	273,7	0,950	581,5	7906	0,765	0,100	0,986	0,805	1,114	331,9	17,3
2300	7546	0,0	273,0	0,948	574,3	7808	0,755	0,099	0,976	0,797	1,120	331,5	17,4
2400	7874	-0,6	272,4	0,945	576,2	7710	0,746	0,098	0,967	0,789	1,125	331,1	17,6
2500	8202	-1,2	271,7	0,943	560,1	7614	0,736	0,097	0,957	0,781	1,131	330,7	17,7
2600	8530	-1,9	271,1	0,941	553,1	7519	0,727	0,096	0,947	0,773	1,137	330,3	17,9
2700	8858	-2,5	270,4	0,939	546,1	7425	0,718	0,095	0,937	0,765	1,143	329,9	18,0
2800	9186	-3,2	269,8	0,936	539,3	7332	0,709	0,094	0,928	0,757	1,149	329,6	18,2
2900	9514	-3,8	269,1	0,934	532,5	7239	0,700	0,093	0,918	0,749	1,154	329,2	18,3

### Engine cover

①



### Gascolator

②



### Propeller, Spinner

③



④



### Undercarriage

⑤



### Undercarriage, RH wheel

⑤



### Right wing - leading edge

⑥



### Right wingtip - lights

⑦



### Right wing - trailing edge

⑧



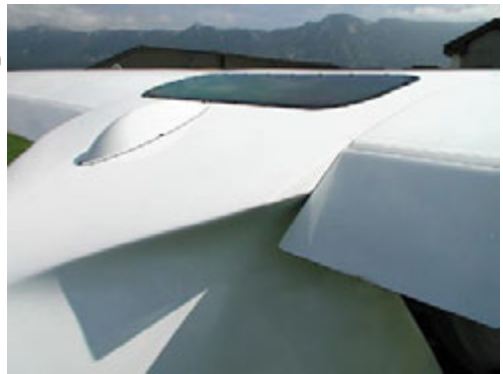
**Right spoiler**

9



**Fuselage (RH side)**

10



**Fuselage**

10



**Fuselage, continued**

11



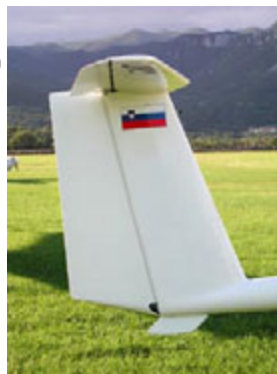
**Horizontal tail surfaces**

12



**Vertical tail surfaces**

13



**Incorrect - door not secured**

X



**Correct - door secured**

OK





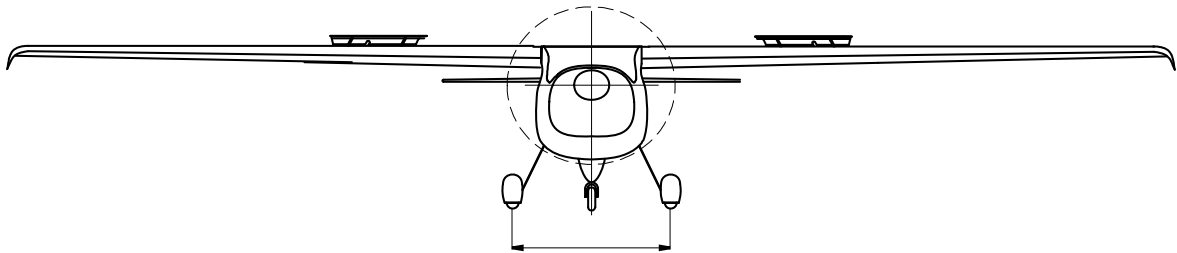
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# Supplemental sheet

for

## Virus 912 LSA tail-wheel edition



**This supplemental sheet provides changes and additions to Virus 912 LSA and LSA-GLIDER versions of Flight manual and Maintenance manual.**

This supplemental sheet contains four (4) valid pages.

**This is the original document issued by Pipistrel LSA s.r.l.**  
Should third-party translations to other languages contain any inconsistencies,  
Pipistrel LSA denies all responsibility.

### **WARNING!**

This leaflet **MUST** be present inside the cockpit at all times!  
Should you be selling the aircraft make sure this supplemental sheet is handed over to the new owner.

# Understanding the Supplemental sheet

The following Supplemental Sheet contains additional information needed for appropriate and safe use of Virus 912 LSA tail-wheel edition.

**DUE TO THE SPECIFIC NATURE OF THE AIRCRAFT IT IS MANDATORY TO STUDY  
THE Virus 912 LSA / LSA-GLIDER POH AND  
THIS SUPPLEMENTAL SHEET VERY CAREFULLY  
PRIOR TO USE OF AIRCRAFT**

In case of aircraft damage or personal injury resulting from disobeying instructions in this document PIPISTREL LSA denies any responsibility.

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## Notes and remarks

### Safety definitions used in the manual

**WARNING!** Disregarding the following instructions leads to severe deterioration of flight safety and hazardous situations, including such resulting in injury and loss of life.

**CAUTION!** Disregarding the following instructions leads to serious deterioration of flight safety.

### Markings

All **changes** to the manual are marked in **red**, all **additions** in **blue**.

## Normal procedures

### Page 58. - Preflight check-up

**Vertical tail surfaces, tail wheel** ⑬ ⑭

#### Tail wheel

**Neutral positioning ball bolt:** tightened

**Wheel fairing:** undamaged, firmly attached, clean (e.g. no mud or grass on the inside)

**Tire:** no cracks, adequate pressure

**Wheel fork and fork base:** nut tightened, no abnormalities, bearing and positioning ball in position  
**The aircraft is equipped with a steerable tail wheel,** check the spring and release mechanism condition.

**Lift the tail high enough so that the tail wheel is not touching the ground** and make sure the wheel side-to-side deflections are smooth and unobstructed.

# Page 63, 65. - Normal procedures and recommended speeds

## Taxi

Taxing technique does not differ from other tail wheel aircraft equipped with a steerable tail wheel. Prior to taxiing it is essential to check wheel brakes for proper braking action.

## Take-off and initial climb

Start the takeoff roll pushing the elevator one third forward and lift the tail wheel off the ground as you accelerate. Reaching  $V_{R1}$  gently pull on the stick to get the aircraft airborne.

## Roundout and touchdown

**CAUTION!** Land the aircraft in such a manner that all three wheels touch the ground at exactly the same time. When touching down, rudder MUST NOT be deflected in any direction (rudder pedals centred).

When on ground, start braking action holding the control stick in full back position. Stear the aircraft using brakes and rudder only. Provided the runway length is sufficient, come to a complete standstill without engaging the brakes but holding the control stick slightly forward not to overstress the tail wheel.

# Weight and balance

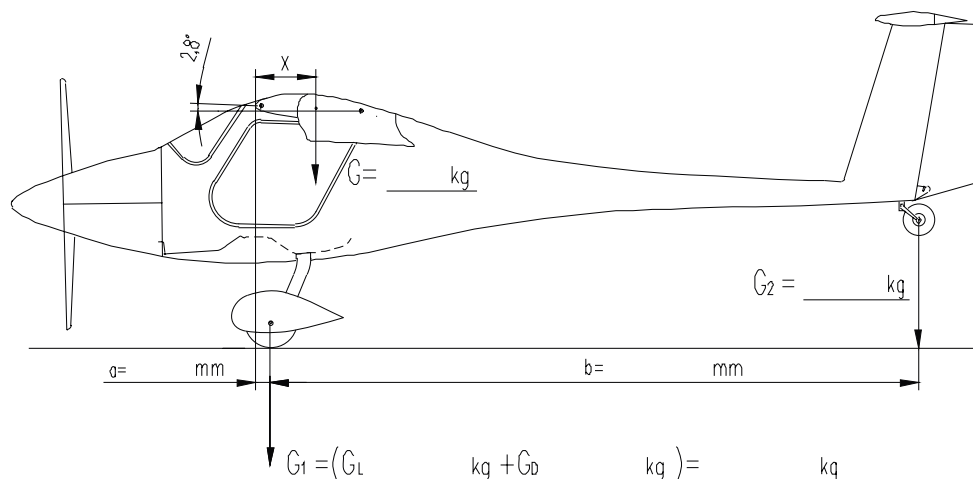
## Page 40. - Weighing procedure

Calculate the lever arm of CG using this formula:

$$\text{Lever arm of CG (X)} = ((G_1 \times a) + (G_2 \times (a+b))) / G$$

## Weighing form

Weighing point and symbol	Scale reading	Tare	Nett
right main wheel ( $G_D$ )			
left main wheel ( $G_L$ )			
tail wheel ( $G_2$ )			
total ( $G = G_D + G_L + G_2$ )			



# Aircraft and systems on board

## Page 22. - Undercarriage

The undercarriage is a taildragger type with two main brake-equipped wheels mounted on struts and a free-spinning or rudder-guided tail wheel.

distance between main wheels	1,60 m
distance between main and tail wheel	4,27 m
tire	4,00" x 6" (mail wh.), 2,50" x 4" (tail wh.)
tire pressure:	1,0 - 1,2 kg/cm <sup>2</sup> (main wh.), 0,6 kg/cm <sup>2</sup> (tail wh.)
brakes	drum or disk type, driven by brake pedals located on both rudder pedals
brake fluid	DOT 3 or DOT 4
main wheel axis to tail wheel distance	4,25 m

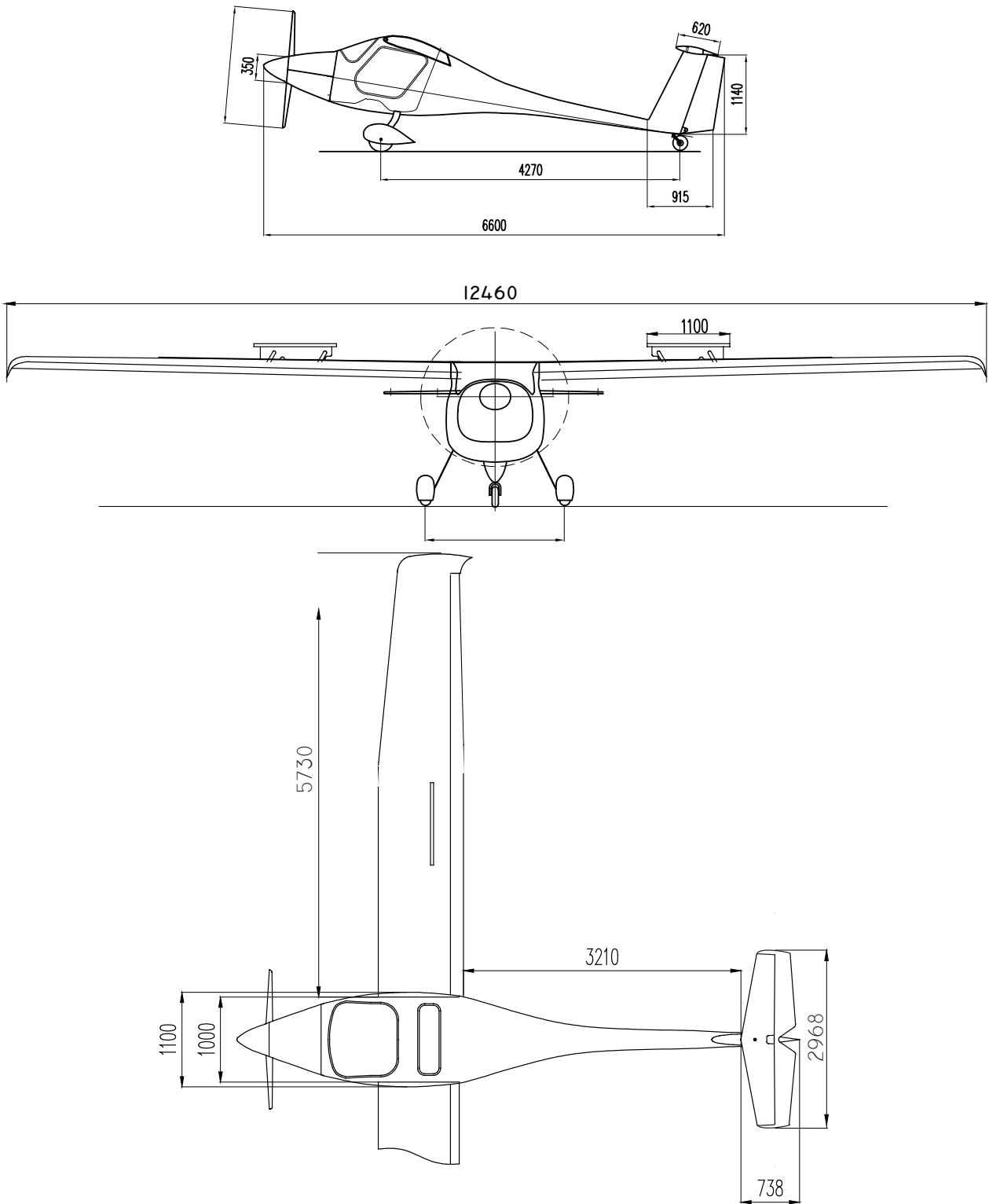
# Handling and maintenance

## Page 84. - Undercarriage

### Adjustment of tail wheel steering clutch stiffness

To adjust the stiffness of tail wheel steering clutch you need two allen keys (a.k.a. hex-wrench, inbus-key). On top of the wheel fork you will notice a ring with two tubes welded to each side with hex-bolts inside. First disconnect the springs at the tubes, then use an allen key into each of these tubes to tighten or loosen the screw inside. Tightening or loosening, make sure you apply equal number of screw rotations at both sides. To check if the steering clutch is stiff enough, lift the tail and rotate the fork left and right. At the end reattach both springs to the tubes again.

# 3-view drawing





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# Virus 912 LSA checklist

fold here

fold here

## Before start-up

Fuel system drain	PERFORMED
Doors	CLOSED
Rudder pedals & hear rest position	SET
Seat belts	FASTENED
Parachure rescue system safety pin	REMOVED
Pitot tube protection cover	REMOVED
Spoilers (if applicable)	RETRACTED
Brakes	SET
Flaps	2 <sup>nd</sup> POSITION
Battery switch	ON (PUSH)
Instruments	CHECKED
COM, NAV	SET

## Engine start-up

Area in front of aircraft	CLEAR
Fuel valves	BOTH OPEN
Throttle	IDLE
Choke	AS REQUIRED
Master switch	ON
Magnetos	ON
AC lights	ON

## After start-up

Warm up at	2500 / 3500 RPM
Magneto RPM drop	VERIFIED, MAX 300 RPM
Engine & Propeller check	RPM within limits

## Before takeoff

Fuel valves	BOTH OPEN
Spoilers (if applicable)	RETRACTED
Doors	CLOSED
Flight controls	CHECKED
Flaps	2 <sup>nd</sup> POSITION
Elevator trim	SET

## After takeoff

Elevator trim	SET
Flaps	UP

## Descent - Approach

Throttle	IDLE
Flaps	NEUTRAL
Instruments	SET
Spoilers (if applicable)	AS DESIRED

## Landing

Throttle	IDLE
Flaps	2 <sup>nd</sup> POSITION
Spoilers	AS DESIRED

## Shutdown

Brakes	SET
Spoilers	RETRACTED
Flaps	NEGATIVE
AC lights	OFF
Magnetos	OFF
Master switch	OFF
Fuel valves	CLOSED





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## Warranty statement

Warranty applies to individual parts and components only.

The warranty does not include costs related to the transport of the product, goods and spare parts as well as costs related to the merchandise' temporary storage. Pipistrel d.o.o. does not offer guarantee for the damage caused by every day use of the product or goods. Pipistrel d.o.o. does not guarantee for the lost profit or other financial or non-financial damage to the client, objects or third party individuals .

## Warranty voids:

- in case that the customer has not ratified the General Terms of ownership with his/her signature;
- in case the aircraft or the equipment is not used according to the Pipistrel d.o.o.'s instructions or aircraft's manual and eventual supplemental sheets;
- in case when the original additional and/or spare parts are replaced with non-original parts;
- in case additional equipment is built-in without Pipistrel d.o.o.'s prior knowledge;
- in case the purchased goods were changed or modified in any way;
- in case when the defect is caused by user's deficient maintenance, inappropriate care and/or cleaning, user's negligent handling, user's inexperience, due to use of product and/or its individual parts or components in inadequate conditions, due to prolonged use of the product or goods, due to product and/or parts' over-stressing (even for a short duration), due to the fact a repair was not carried out neither by Pipistrel d.o.o. nor by its authorised personnel;
- in case parts that become worn out by every day use (e.g. the covers, pneumatics, electric instruments, electric installation, bonds and bindings, cables, brake plates, capacitors, cooling devices, various pipes, spark-plugs, exhaust systems...)
- the owner must ensure regular engine check-outs and maintenance. Some maintenance works that are demanded by the engine manufacturer must be carried out at Rotax's authorised service centres.

**In case the written above is not fulfilled, warranty voids.**



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