Flight manual for aeroplane
VL – 3B-3

Registration number :

Serial number : VL-3-71

Date : 28.4.2010

0. Table of Contents

1. General

1.1 Introduction

This Flight Manual provides information useful for the safe and efficient operation of VL-3B aeroplane.
It also contains supplemental data supplied by the aeroplane manufacturer.

1.2 Warnings, cautions and notes

The following definitions apply to warnings, cautions and notes in the flight manual.

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

Caution
Means that the non-observation of the corresponding procedure leads to a minor or to a long term degradation of the flight safety.

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

1.3 Descriptive data

1.3.1 Aeroplane description

VL-3B airplane is intended for recreational and cross-country flying. It is not approved for aerobatic operation.

VL-3B is a single engine, composite aeroplane with two side-by-side seats. The aeroplane is equipped with fixed tricycle landing gear with a steerable nose wheel. The fuselage is a carbon shell with carbon/kevlar seats integrated

The wing is a monospar construction with a sandwich skin composed of two layers of carbon and special foam. Control surfaces and empennage is of the same construction.

The aeroplane is controlled by dual push-pull control system, only rudder drive is controlled by cable. The ailerons and elevator are controlled by the control stick located between the pilot's legs (co-pilot's). The rudder is controlled by the rudder pedals, flaps are manyally operated by a control lever located between the pilots on the fuselage main spar.

1.3.2 Basic Technical data

Wing

span ……	8,44 m
area of wing …….	9,8 m²
M.A.C. ……	1,236 m
loading ……	46 kg/m²

Ailerons

area ……	0.207 m²

Flaps

area ……	0.8 m²

Fuselage

length ..……	6,2 m
width ……..……1.15 m	
height ……..……...	1,5 m

Horizontal tail unit

span ……	2.68 m
area ……	1.69 m²
elevátor area ……..……....	0.73 m²

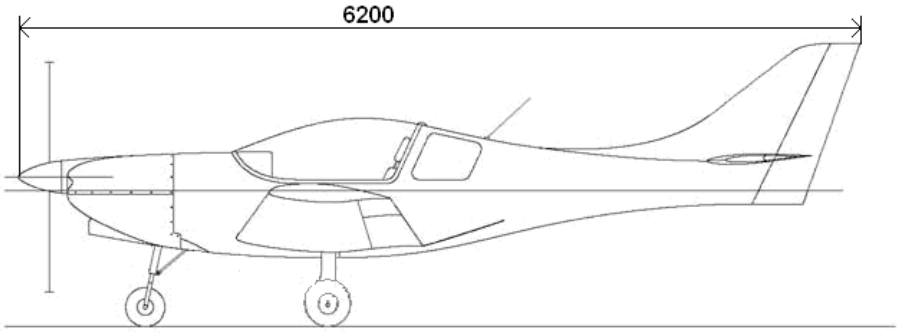
Vertical tail unit

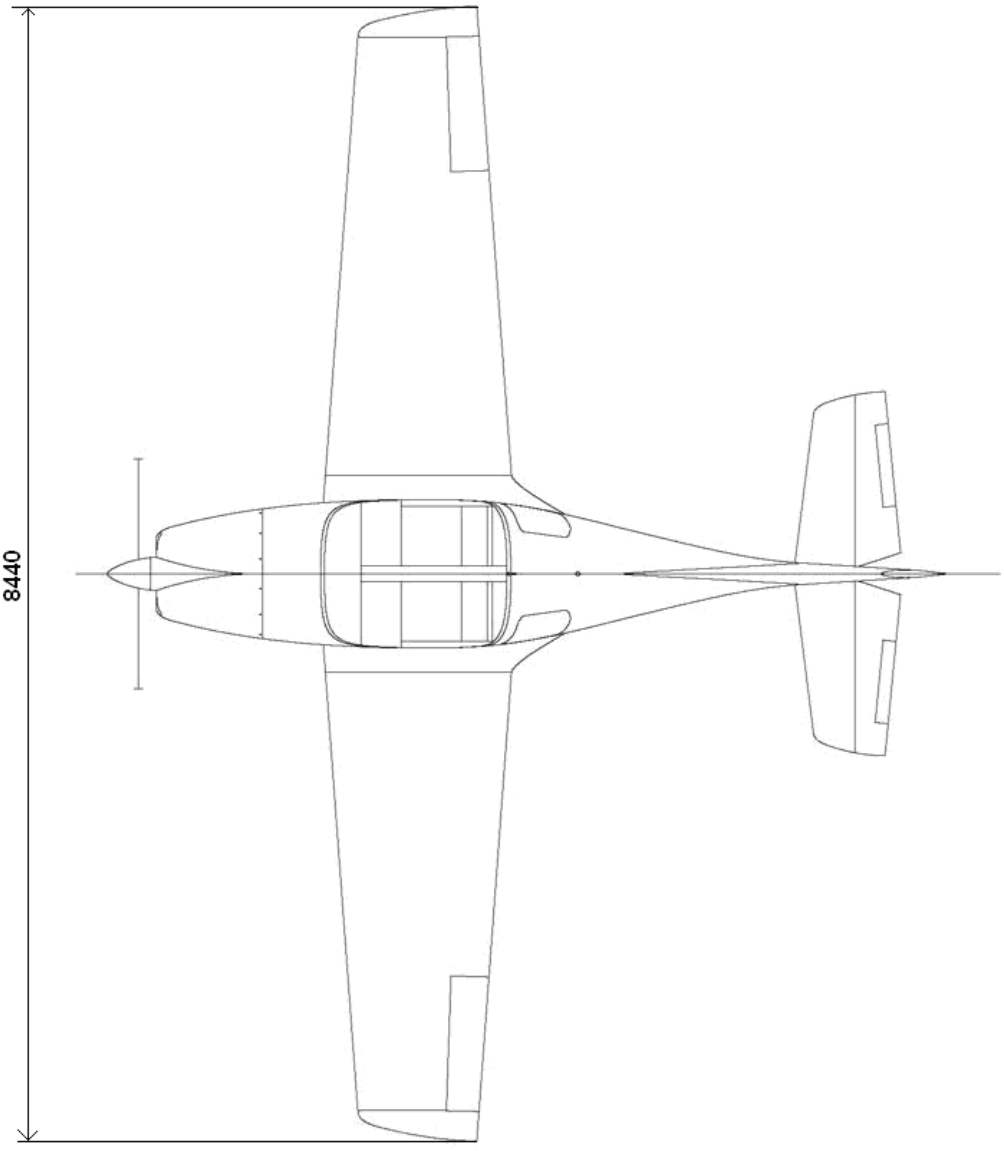
height ……	1,03 m
area ……..……..	0.876 m²
rudder area ……..……..	.0.309 m²

Landing gear

wheel track ……..	1.83 m
wheel base ……	1.285 m
main wheel diameter …….	0.35 m
nose wheel diameter ……..	0.3 m

1.4 Two-view drawing





2. Limitations

2.1 Introduction

Section 2 includes Operating limitations, instrument markings, and basic placards necessary for safe operation of the aeroplane, its engine, standard systems and standard equipment.

2.2 Airspeed

Airspeed limitations and their operational significance are shown below:

Airspeed		IAS [km/h]	Remarks
V_{NE}	Never exceed speed	305	Do not exceed this speed in any operation.
V_A	Manoeuvring speed	165	Do not make full or abrupt control movement above this speed, because under certain conditions the aircraft may be overstressed by full control movement.
V_{NO}	Maximum structural cruising speed	210	Do not exceed this speed except in smooth air, and then only with caution.
V_{FE}	Maximum flap extension speed	120	Do not exceed this speed with flaps extended

2.3 Airspeed indicator markings

Airspeed indicator markings and their colour-code significance are shown below:

Marking	Range or value [km/h IAS]	Significance
White arc	55-120	Positive Flap Operating Range
Green arc	75-210	Normal Operating Range
Yellow arc	210-305	Manoeuvres must be conducted with caution and only in smooth air.
Red line	305	Maximum speed for all operations.

2.4 Powerplant

Engine Manufacturer : Bombardier-Rotax GMBH

Engine Model : Rotax 912 ULS

Power :

- Max. Take - off : 73.5 kW / 100 hp
- Max. Continuous : 69 kW / 95 hp @ 5500 rpm
- Cruising : 66 kW / 90 hp @ 4800 rpm

Engine RPM :

- Max. Take-off : 5800 ot/min max 5 mins
- Max. Continuous : 5500 ot/min
- Cruising : 4800 ot/min
- Idling : 1400 ot/min

Cylinder head temperature:

- Minimum : 60 °C
- Maximum : 135 °C

Oil temperature:

- Minimum : 50 °C
- Maximum : 130 °C
- Optoperating : 90 °C – 100 °C

Fuel pressure (if the fuel gauge and sensor are instaled) :

- Minimum : 0,15 bar
- Maximum : 0,4 bar
- Fuel : viz. 2.13
- Druh oleje (refer to engine Operator's Manual).

Warning
This engine has not been certified as an aircraft engine and its failure may occur at any time. The pilot is fully responsible for consequences of such a failure.

2.5 Engine instrument markings

Function	Minimum Limit	Normal Operating Range	Caution Range	Maximum Range
Engine speed (RPM)	1400	1400-5500	5500-5800	5800
Cylinder Head Temperature (CHT) [°C]	60	60-100	100-135	135
Oil Temperature [°C]	50	90-110	110-130	130
Oil Pressure [bar]	1	1,5-5,0	5,0-7,0	7,0 cold engine starting

2.6 Miscellaneous instrument marking

Fuel Level Indication

	Left tank		Right tank	
	Liter	U.S.gallon	Liter	U.S.gallon
Full tank	44	11.6	44	11.6
3/4	32	8.4	30	7.9
1/2	23	6	21	5.5
1/4	10	2.6	9	2.4
Fuel warning light	8	2.1	7	1.8

2.7 Weight

Empty weight (standard equipment) ….…… 303 kg

NOTE
Actual empty weight is stated in SECTION 6, par. 6.2

Max. take-off weight ……..…… 472 kg
Max landing weight ……..……..…… 472 kg

Max. baggage weight ……..……..…. 15 kg

2.8 Centre of gravity

Empty aeroplane C.G. position…….…. 17.6 %MAC.

Operating C.G. range ……..……. 21 - 34 %MAC.

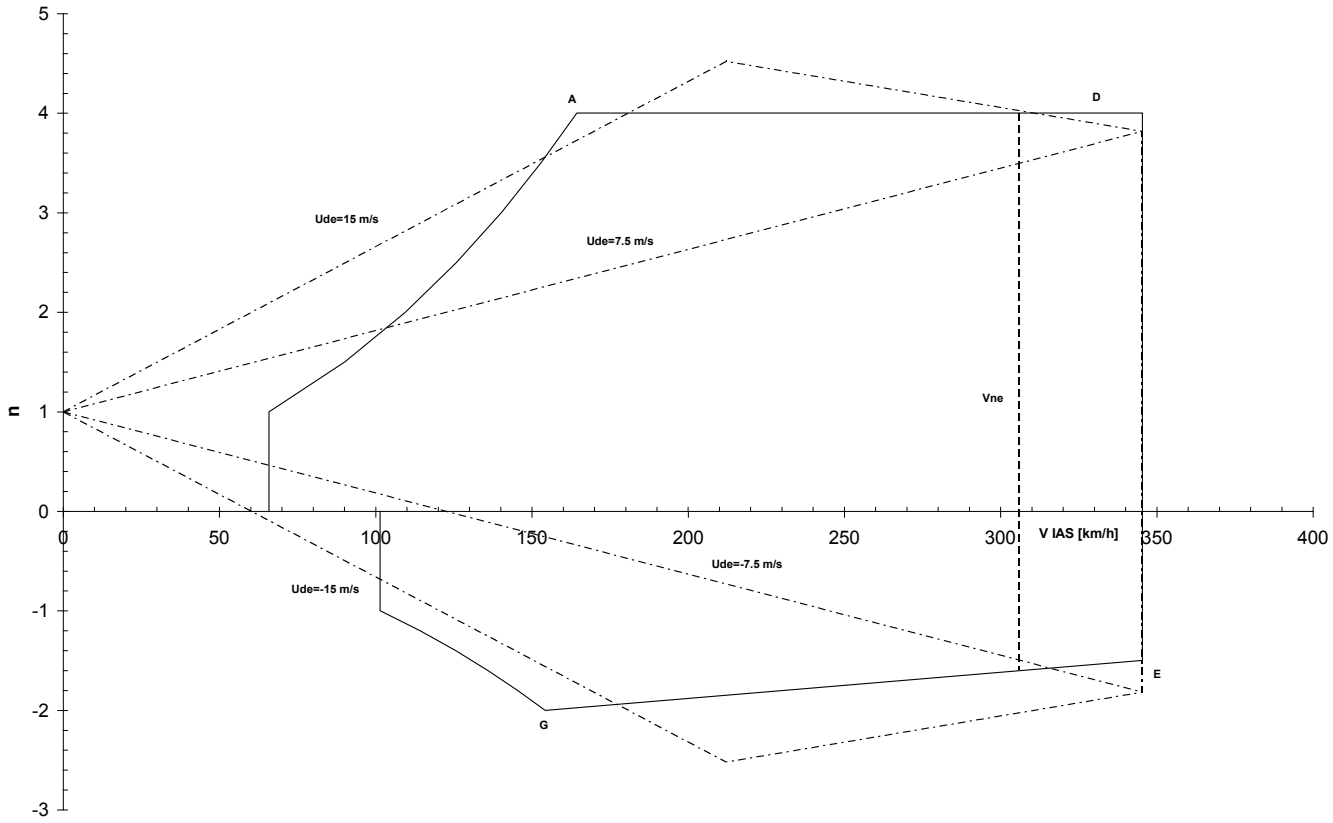
2.9 Approved manoeuvres

Aeroplane Category: NORMAL
The aeroplane is approved for Normal and Manoeuvres listed below:

- Steep turn not exceeding 60° bank

Warning
Aerobatics, intentional spins and stalls
are prohibited!

2.10 Manoeuvring load factors



2.11 Crew

Numer of seats…….. 2

minimum crew weight …… 65 kg

maximum crew weight …… see. 6.2

Warning
Never exceed Maximum Také-off Weight

2.12 Kinds of operation

Day VFR flights only.

2.13 Fuel

- automotive premium grade gasoline, leaded, according to DIN 516000,Ö-NORM C 1103
- EUROSUPER RON 95 unleaded accord. to DIN 51607,Ö-NORM 1100
- AVGAS 100 LL
- Due to higher lead content in AVGAS, the wear of valve seats and deposits in the combustion chamber will increase. Therefore, use AVGAS only if other fuel types are not available.

(Refer to the Rotax 912S Series Engine Operating Manual for limitations and recommendations relating to fuel grades used)

2.14 Other limitations

- No smoking aboard the aeroplane.

2.15 Limitation placards

Caution
The owner (aeroplane operating agency) of this aeroplane is responsible for placards readability during aeroplane service life.

EMPTY WEIGHT	**303**	**kg**
MAX. TAKÉ-OFF WEIGHT	**472**	**kg**
MIN. CREW WEIGHT	**65**	**kg**
MAX. BAGGAGE WEIGHT	**15**	**kg**

NEVER EXCEED SPEED	**VNE= 305 Km/h**
MANOEURING SPEED	**VA = 165 Km/h**
DESIGN CRUISING SPEED	**VC = 210 Km/h**
MAX. FLAP EXTENSION SPEED	**VFE = 120 Km/h**
STALL SPEED	**VS0 = 55 Km/h**

3. Emergency procedures

3.1 Introduction

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur.

Emergencies caused by aeroplane or engine malfunctions are extremely rare if proper pre-flight inspections and maintenance are practised.

However, should an emergency arise, the basic guidelines described in this section should be considered and applied as necessary to correct the problem.

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3.2 Engine failure

3.2.1 Engine failure during take-off run

1. Throttle	- retard to idle
2. Ignition	- off

3.2.2 Engine failure immediately after take-off

1. Speed	- gliding at 100km/h (55 kts)
2. Altitude	- below 50m (165 ft): land in take-off direction
	- over 50m (165 ft): choose landing area
3. Wind	- evaluate direction and velocity
4. Landing area	- choose free area without obstacles, into wind
5. Flaps	- extend as needed
6. Fuel valve	- off
7. Ignition	- off
8. Safety harness	- tighten
9. Master switch	- switch off before landing
10. Land	

Note

Skip 6-10 if necessary.

3.2.3 Engine failure in flight (Forced landing)

1. Speed	- gliding at 100km/h (55 kts)
2. Altitude	- below 50m (165 ft): land in take-off direction
	- over 50m (165 ft): choose landing area
3. Wind	- evaluate direction and velocity
4. Landing area	- choose free area without obstacles
5. Flaps	- extend as needed
6. Fuel valve	- off
7. Ignition	- off
8. Safety harness	- tighten
9. Master switch	- off before landing
10. Land	

3.3 In-Flight start

1. Speed	- gliding at 120km/h (65 kts)
2. Altitude	- check
3. Landing area	- choose according to altitude (safest area)
4. Master switch	- on
5. Fuel valve	- open
6. Choke	- as necessary (for cold engine)
7. Throttle	- for 1/3 power
8. Ignition	- on
9. Starter	- engage

3.4 Smoke and fire

3.4.1 Fire on ground

1. Fuel valve - off
2. Throttle - full
3. Master switch - off
4. Ignition - off
5. Abandon the aeroplane
6. Extinguish fire if possible or call fire department.

3.4.2 Fire during take-off

1. Fuel valve - off
2. Throttle - full
3. Speed - 120km/h (65 kts)
4. Master switch - off
5. Ignition - off
6. Land and brake
7. Abandon the aeroplane
8. Extinguish fire if possible or call fire department.

3.4.3 Fire in flight

1. Fuel valve - off
2. Throttle - full
3. Master switch - off
4. Ignition - off after using up fuel in carburettors and engine stopping
5. Choose of area - heading to the nearest airport or choose emergency landing area
6. Emerg. landing - perform according to par.3.6.1
7. Abandon the aeroplane
8. Extinguish fire if possible or call fire department.

Note
Estimated time to pump fuel out of carburettors is of 30 sec.

3.5 Glide

Gliding may be used in case of engine failure.

1. Speed - ~110km/h (60 kts)
2. Flaps - retracted
3. Instruments - within permitted limits

3.6 Landing emergencies

3.6.1 Emergency landing

1. An emergency landing may be carried out due to engine failure and when the engine cannot be restarted.
2. Speed - 100km/h (55 kts)
3. Trim - trim the aeroplane
4. Safety harness - tighten
5. Flaps - as needed
6. COMM - if installed - report your location if it is possible
7. Fuel valve - off
8. Ignition - off
9. Master switch - off

3.6.2 Precautionary landing

A precautionary landing may be carried out due to low fuel and/or bad weather conditions.

1. Choose landing area, determine wind direction
2. If a COMM is installed - report your plan to land and land area location to nearest ATC
3. Perform low-altitude passage into wind over the right-hand side of the chosen area with flaps extended to the take-off position at a speed of 110km/h (60 kts) to thoroughly inspect the area
4. Perform flight around the chosen area
5. Perform an approach at increased idling with fully extended flaps
6. Reduce power to idle when over the runway threshold and touch-down at the very beginning of the chosen area
7. After stopping the aeroplane switch off all switches, shut off the fuel valve, lock the aeroplane and look for a help

Note
Watch the chosen area continuously during precautionary landing.

3.6.3 Landing with a flat tire

1. Approach - Normal
2. Touch down - good tire first, keep the damaged wheel above ground as long as possible using ailerons
3. Maintain the direction at landing run, applying braking control

3.6.4 Landing with a defective landing gear

1. If the main landing gear is damaged, perform touch-down at the Lowest speed possible and maintain direction during landing run, if possible
2. If the nose wheel is damaged perform touch-down at the lowest speed possible and hold the nose wheel off the runway by means of the elevator control as long as it is possible

3.7 Recovery from unintentional spin

There is no tendency of spontaneous uncontrollable spin entry if normal pilot techniques are used.

Warning
Intentional spins are prohibited !

Should an inadvertent spin occur, the following recovery procedure should be used:

1. Throttle - retard to idle
2. Control stick - hold ailerons neutralized
3. Rudder pedals - apply full opposite rudder
4. Control stick - forward elevator control as required to break the spin
5. Rudder pedals - immediately after the stopping of a rotation neutralise the rudder
6. Recover from dive

3.8 Other emergencies

3.8.1 Vibration

If vibrations appear::

1. Set engine speed to power setting where the vibrations are the lowest.
2. Land at the nearest airfield or perform a precautionary landing according to 3.6.2

3.8.2 Carburettor icing

Carburettor icing mostly occurs when getting into an area of ice formation. The carburettor icing shows itself through a decrease in engine power and an increase of engine temperatures.

To recover the engine power, the following procedure is recommended:

1. Speed - 110km/h (60 kts)
2. Throttle - set for 1/3 power
3. If possible, leave the icing area
4. Gradually increase the engine power to cruise conditions after 1-2 minutes.

If you fail to recover the engine power, land at the nearest airfield (if possible) or depending on circumstance, execute a precautionary landing according to 3.6.2

3.8.3 Alternator or power supply failure

1. Switch off all electrical instruments which are not important for flight.
2. Land at the soonest

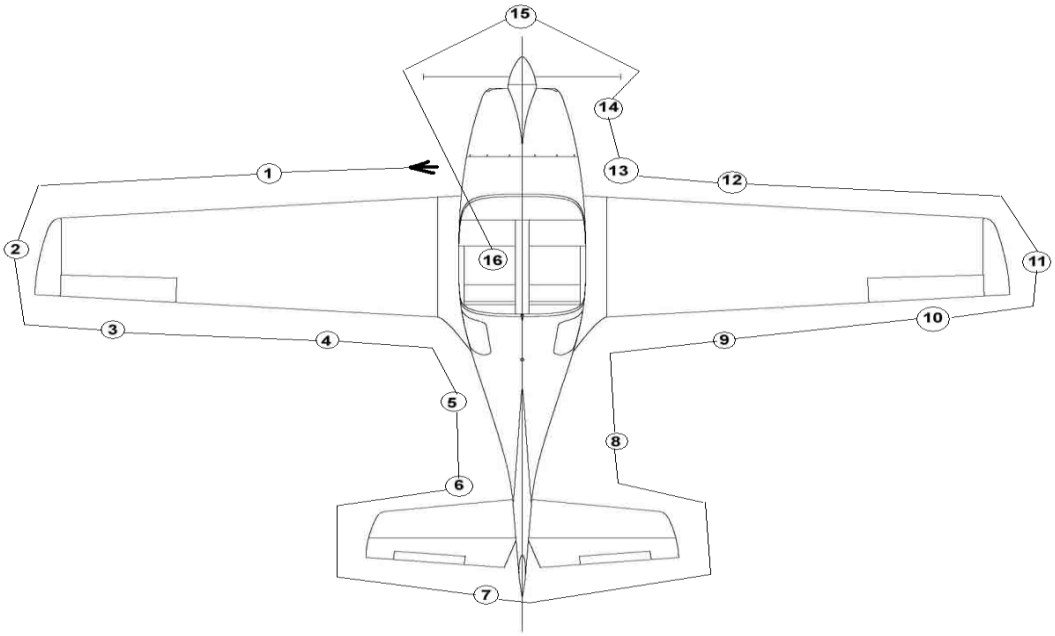
4. Normal procedures

4.1 Introduction

Section 4 provides checklist and amplified procedures for the conduct of normal operation.

4.2 Pre-flight inspection

The pre-flight inspection is very important because an incomplete or careless inspection could allow aeroplane failure. The following pre-flight inspection procedure is recommended by the aeroplane Manufacturer:



⇒ Check if ignition is switched off in the cockpit

1. Wing
   - Wing surface condition
   - Leading edge condition
   - check if the flap and aileron controls are correctly connected
   - pitot-static tube condition

2. Wing tips
   - Surface condition
   - Check of tips attachment
   - Condition and attachment of position lights (if installed)

3. Aileron
   - Surface condition
   - Attachment
   - Play

4. Flap
   - Surface condition
   - Attachment
   - Play

5. Fuselage rear
   - Surface condition

6. Vertical tail unit
   - Surface condition
   - Play
   - Free movement

7. Horizontal tail
   - Surface condition
   - Attachment
   - Play
   - Free movement
   - check if the elevator and trim tab controls are correctly connected

8. see. 5
9. see. 4
10. see. 3
11. see. 2
12. see. 1

13. Landing gear
    - Check of main and nose landing gear attachment
    - nose wheel steering
    - Condition and inflation of tires
    - Condition and attachment of wheel fairings

14. Engine
    - Engine cowlings condition
    - Engine mount condition
    - Engine attachment check
    - Turn propeler until gurgling sound is heard and then check the oil. (usually 20-30 lades station)
    - Fuel and Electrical system visual check
    - Fuel system drain

> Caution
> It is advisable to turn the propeller by hand with ignition off if the engine has been out of operation for a long time.
> Avoid excessive pressure on a blade tip and trailing edge.

15. Propeller
    - Propeller attachment
    - Blades, Hub, Spinner condition

16. Cockpit
    - Ignition - OFF
    - Switch box - OFF
    - Master switch - OFF
    - Instruments - check of condition
    - Fuel gauge - fuel quantity check (for fuel quantity check switch on Switch box and Master switch, then switch off!)
    - Controls - visual check
        - check for proper function
        - check for play in each kontrol circuit
        - check of flaps extension
        - check of free movement up to the stops
    - Check for loose items - secure papers
    - Canopy - Condition of attachment, cleanliness

4.3 Normal procedures

4.3.1 Before entering cockpit

1. Aeroplane surface - check of covers and caps
2. Cockpit - items inside the cockpit
3. Ignition - OFF
4. Master switch - OFF

4.3.2 After entering cockpit

1. Rudder control - free movement check - Correct?
2. Brakes - check of function
3. Control Stick - free movement check - Correct?
4. Trim - check control movement
5. Flaps - check of function
6. Engine controls - throttle and choke lever movement
7. Fuel valve - OFF
8. Fuel gauge - fuel quantity check
9. Switch box - OFF
10. Circuit breakers - OFF
11. Ignition - OFF
12. Instruments, COMM- condition check
13. Safety harness - check of integrity and attachment
14. Cockpit - condition and canopy lock function

4.3.3 Before engine starting and Engine starting

1. Fuel valve - ON
2. Master swich - Batt & Alt ON
3. Circuit breakers - in
4. Throttle - set for idling
5. Choke - according to engine temperature
6. Control stick - fully pulled
7. Check of free area - clear
8. Master switch - ON
9. Ignition - ON
10. brakes - fully applied
11. Starter - engage

12. After starting - set throttle to idle
13. Oil pressure - within 10 sec. min. pressure
14. Choke - OFF
15. Engine warm - according to 4.4.4

> Caution
> The starter should be activated for max.10 sec., then 2 min. pause for engine cooling.
> After engine starting adjust the throttle for smooth running at 1 500 rpm. Check oil pressure which should increase within 10 sec. Increase engine speed after oil pressure reaches2 bars and is steady.
> Only one magneto should be switched on (off) during ignition magneto check.

4.3.4 Engine warm up, Engine check

Lock the main wheels by means of wheel chocks before engine check. Refer to the Engine Manual for warming .

Set max. power.

Check acceleration from idling to max. power. If necessary cool the engine prior to its shutdown.

> Caution
> Engine check should be performed with the aeroplane pointing upwind and not on loose terrain (the propeller will pick up debris which can damage the propeller).

4.3.5 Taxiing

The maximum recommended taxiing speed is15km/h (8 kts). The direction of taxiing can be controlled by the steer able nose wheel and rudder or by brakes.

4.3.6 Before take-off

1.	Brakes	- fully applied
2.	Rudder control	- check of free movement
3.	Hand control	- check of free movement
4.	Trim	- neutral position
5.	Flaps	- "15°" position
6.	Engine controls	- choke off
7.	Fuel valve	- open
8.	Fuel gauge	- fuel quantity check
9.	Circuit breakers	- in
10.	Instruments, COMM,	- within limits, frequency set
11.	Safety harness	- secured and tightened
12.	Cockpit	- canopy condition, lock

4.3.7 Take-off

Gradually increase the throttle (max. power) to set the aeroplane into motion.

The direction of take-off run can be controlled by steer able nose wheel and rudder. Slightly pull the stick to lift the nose wheel. The aeroplane takes-off at a speed above 70km/h (38 kts), then slightly push forward the stick to reach climb speed of 110km/h (60 kts). Refer to the par. 5.2.5 for optimum climb speed. Max. flaps extended speed is 120km/h (65 kts).

Warning

The Take-off is prohibited if:

- The engine run is unsteady
- The engine instruments values are beyond operational limits
- The engine choke is on
- The crosswind velocity exceeds permitted limits. 5.3.3

4.3.8 Climb

1. Throttle - Max. Continuous Power
2. Speed - 120km/h (65 kts)
3. Trim - adjust as needed to reduce stick pressure
4. 5. Instruments - CHT, Oil temp. and pressure within limits.

Caution

If cylinder head or oil temperature exceed limits, reduce the angle of climb to increase airspeed and allow better cooling..

4.3.9 Cruise

The aeroplane flight characteristics are very forgiving within permitted limits of airspeeds, configurations and C/G range. The aeroplane can be controlled very easily. Refer to the Section 5 par. 5.3.1.

4.3.10 Descent

1.	Throttle	- idling
2.	Speed	- 140km/h (75 kts)
3.	Trim	- as necessary to reduce stick pressure
4.	Instruments	- within limits

> Caution
> When on long final or descending from a very high altitude, it is not advisable to reduce the engine Throttle control lever to idle. The engine becomes overcooled and a loss of power occurs. When descending, apply increased idle so that engine instrument readings stay within the limits for normal use.

4.3.11 Check before landing

1.	Fuel	- fuel quantity check
2.	Safety harness	- tightened
3.	Brakes	- check function
4.	Trim	- adjust as required
5.	Landing area check	- runway
		- Base leg

4.3.12 On base leg

1.	Speed	- 110km/h (60 kts)
2.	Flaps	- extend to "15°“ position
3.	Trim	- adjust as required
4.	Throttle	- as necessary
5.	Instruments	- within limits

4.3.13 On final

1.	Speed	- 90-100km/h (50 - 55 kts)
2.	Flaps	- „55°“ or „38° “ position
3.	Trim	- adjust as required
4.	Throttle	- as necessary
5.	Instruments	- within limits

4.3.14 Landing

The airspeed during final is slowly reduced, so that the touch down speed is about 65km/h (35 Kts.)

Gradually pull the stick after touch down to hold the nose wheel up as long as possible. Push the control stick forward when the nose wheel touches. The landing run can be shortened by braking.

4.3.15 Balked landing

1.	Throttle	- full
2.	Engine speed	- Full Throttle
3.	Flaps	- set at the "15°" position at a speed of 90km/h (50 kts)
4.	Trim	- as necessary
5.	Flaps	- retract at a height of 50m (165 m)
6.	Trim	- as necessary
7.	Engine speed	- Max. cont. power
8.	Instruments	- within limits
9.	Climb	- at 120km/h (65 kts)

4.3.16 After landing

1.	Engine speed	- set as necessary for taxiing
2.	Flaps	- retracted and locked
3.	Trim	- neutral position

4.3.17 Engine shutdown

1.	Engine speed	-idling
2.	Instruments	- engine instruments within limits
3.	COMM + intercom	- OFF
4.	Ignition	- OFF
5.	Circuit breakers	- OFF
6.	Master switch	- OFF
7.	Switch box	- turn the key to switch off
8.	Fuel valve	- OFF

4.3.18 Flight in rain

When flying in the rain, no additional steps are required. Aeroplane qualities and performance are not substantially changed

5. Performance

5.1 Introduction

Section 5 provides approved data for airspeed calibration, stall speeds and take-off performance and additional information.

The data in the charts has been computed from actual flight tests with the aeroplane and engine in good condition and using average piloting techniques.

If not stated otherwise the performance data given in this section is valid for max. takeoff weight and under International Standard Atmosphere (ISA) conditions

5.2 Performance

5.2.1 Airspeed indicator system calibration

IAS [km/h]	EAS [km/h]
57	65
70	78
80	87
100	108
120	125
140	142
160	160
180	179
200	198
220	218
240	238
260	258
280	278
300	297
305	302

5.2.2 Stall speeds

Stall	Flaps position	Engine Power	Stalling Speed	
			IAS [km/h]	CAS [km/h]
Wing level stall	RETRACTED	idling	75	82
	"TAKE-OFF"	idling	65	73
	"LANDING"	idling	55	65

5.2.3 Take-off performance

Take-off distances stated in the following table are valid at sea level.

	Take-off run distance [m]	Take-off distance over 15m obstacle [m]
Grass	160	290

5.2.4 Landing

Landing distances stated in the following table are valid at sea level.

	Landing distance over 15m obstacle [m]	Landing run distance (full braking) [m]
Grass	270	90

5.2.5 Climb performance

Best Rate-of-climb speed is 130km/h (65 kts) IAS, corresponding Rate of climb is 6m/s

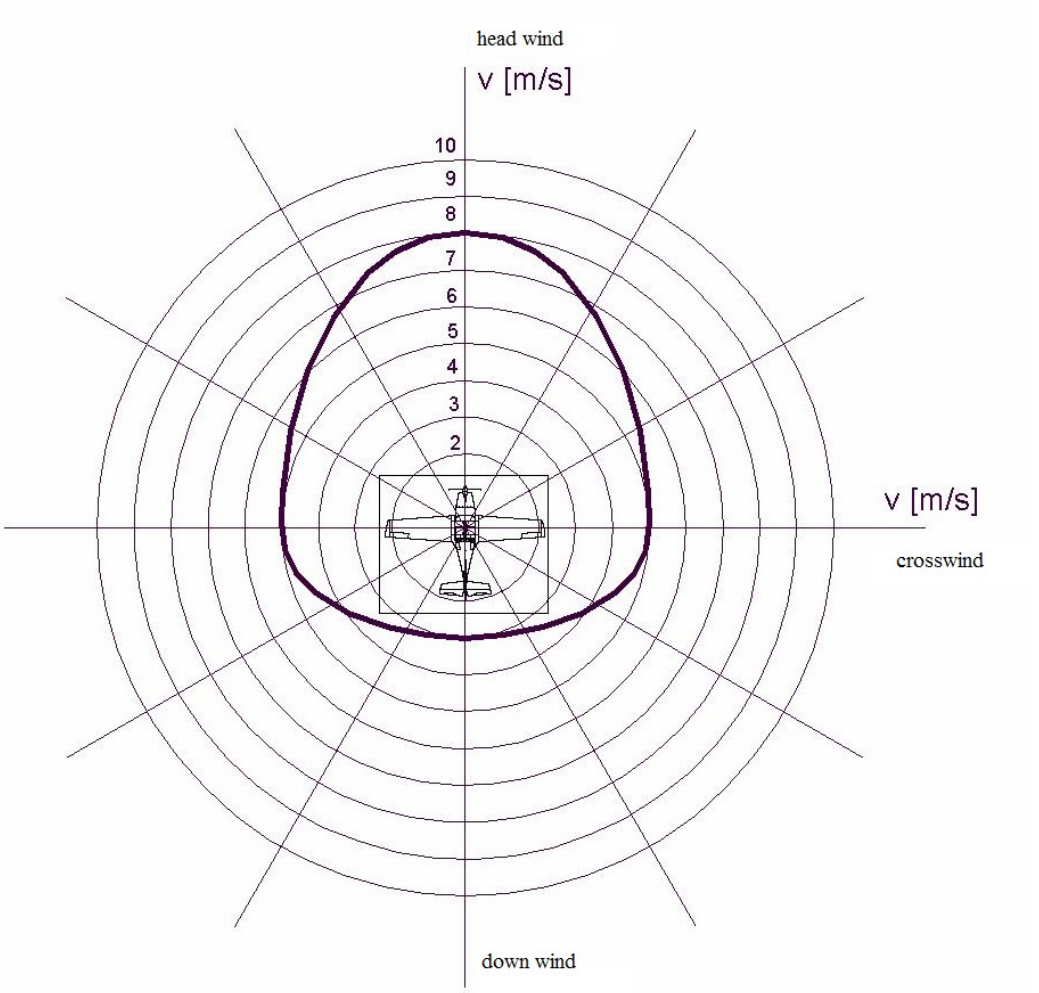
5.3 Additional information

5.3.1 Cruise

Regime	Economy Cruise	Max. Continuous Power	Max. Take-Off Power
Time limitation	unlimited	unlimited	max. 5 min.
Engine speed	4800	5500	5800
manifold pressure [inHg]	24	27	27.5
IAS [km/h]	185	235	250

5.3.2 Demonstrated crosswind performance

Max. permitted cross wind velocity for take-off and landing 5m/s
Max. permitted head wind velocity for take-off and landing 8m/s



6. Weight and Balance

6.1 Introduction

This sections contains the payload range within which the VL-3 aeroplane may be safely operated.

Procedures for weighing the aeroplane and the calculation method for establishing the permitted payload range are contained in the Technical Description, Operating, Maintenance and Repair Manual for VL-3 ultralight aeroplane.

6.2 Permitted payload range

6.2.1 Weight limitations

maximum take-off weight …… 472 kg

Operating C.G. range …….. 21 - 34 %MAC

6.2.2 C.G. calculation

Empty weight (see 2.7)	m_{pr} [kg]
Pilot weight	m_{p1} [kg]
Copilot weight	m_{p2} [kg]
Fuel quantity	vp [litr]
Baggage weight	m_z [kg]
C.G. of empty airplane (see 2.8)	x_{bsat} [%]
Wing leading edge position	x_{NH} = 540 mm
M.A.C. displacement	x_{SAT} = 68 mm
M.A.C.	b_{SAT} = 1236 mm

Weight $m = m_{pr}+m_{p1}+m_{p2}+vp*0{,}725+m_z$

C.G. position

$$x = \frac{m_{pr} \cdot \left(\frac{x_{bsat} \cdot b_{sat}}{100} \right) + m_{p1} \cdot 682 + m_{p2} \cdot 682 + vp \cdot 0.725 \cdot 215 + m_z \cdot 1467}{m}$$

$$xt = \frac{x}{b_{SAT}} \cdot 100$$

Example

Empty weight	m_{pr} = 301kg
Pilot weight	m_{p1} = 100 kg
Copilot weight	m_{p2} = 0 kg
Fuel quantity	vp = 45 litrů
Baggage weight	m_z = 10 kg
C.G. of empty airplane	x_{bsat} = 17.1 % b_{sat}

Weight

$m = m_{pr}+m_{p1}+m_{p2}+vp*0,725+m_z = 301+100+0+45*0,725+10 = 443,6kg$

C.G. position

$$x = \frac{m_{pr} \cdot \left(\frac{x_{bsat} \cdot b_{sat}}{100} \right) + m_{p1} \cdot 682 + m_{p2} \cdot 682 + vp \cdot 0.725 \cdot 215 + m_z \cdot 1467}{m}$$

$$x = \frac{301 \cdot \left(\frac{17.1 \cdot 1236}{100} \right) + 100 \cdot 682 + 0 \cdot 682 + 45 \cdot 0.725 \cdot 215 + 10 \cdot 1467}{443.6} = 346mm$$

$$xt = \frac{x}{b_{SAT}} \cdot 100 = \frac{346}{1236} \cdot 100 = 28\% b_{SAT}$$

Warning

If C.G. position and take-off weight are not in operating range (see 6.2.1.) Do not fly !

The Center of the Gravity must be inside operating range (see 6.2.1.) during the whole flight!

7. Aeroplane and Systems Description

7.1 Introduction

This section provides description and operation of the aeroplane and its system.

Refer to Section 9, Supplements, for details of optional systems and equipment.

7.2 Airfram

VL-3 airframe is all-carbonfibre monocoque airframe

7.2.1 Fuselage

All composite sandwich construction.

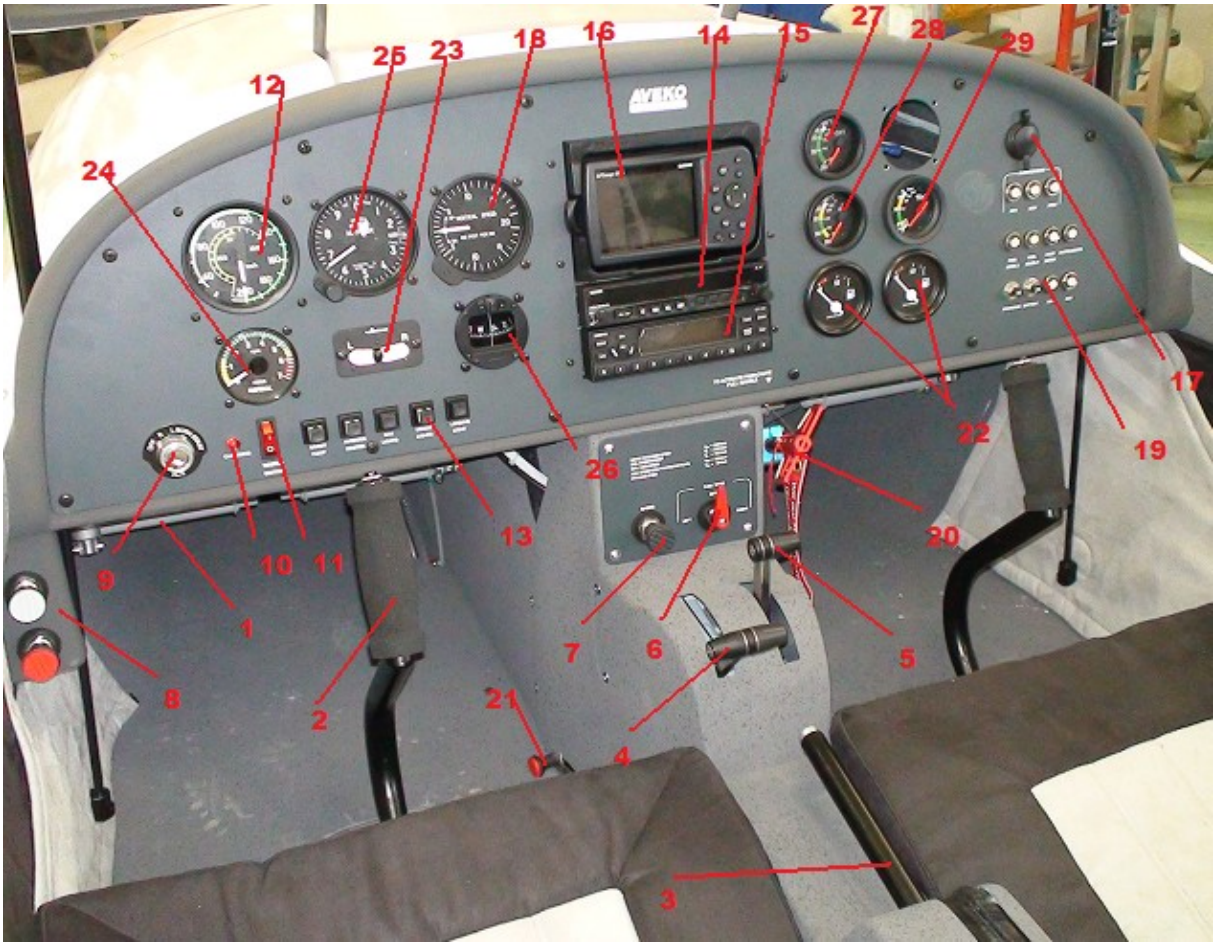
7.2.2 Wing

The composite wing has one main spar with carbon flanges, no ribs; the stressed skin is of sandwich construction with a foam core.

7.2.3 Horizontal Tail Unit (HTU)

HTU has same construction like wing.

7.3 Instrument panels and controls in the cockpit



1	Rudder pedals	16	Garmin 496
2	Control stick	17	12V socket
3	Flaps control	18	Verical speed indicator
4	Throttle	19	Circuit breakers
5	Trim control	20	Rescue parachute
6	Fuel tanks valve	21	Parking brake
7	Choke	22	Fuel indicators
8	Heating + ventilation	23	Turn-indicator
9	Magnetos+starter	24	Tachometer
10	Charging pilot-light	25	Altimeter
11	Baterry switch	26	Compass
12	Airspeed indicator	27	Head of cylinder thermometer
13	Switches	28	Oil thermometer
14	Comm	29	Oil pressure gauge
15	Transponder		

7.4 Landing gear

The plane has a tricycle retractable landing gear with a nose wheel. The main fibreglass legs, main wheel size 350x100, hydraulically operated brakes. The steer able nose wheel of 300 x 100 size has a shock absorber and is controlled by the rudder pedále

Recommended pressure:

- main wheels **1,6 ± 0,1 atm (bar)**
- nose wheel **1,6 ± 0,1 atm (bar)**

7.5 Seats and Safety harness

The seats and back rests are formed by a composite skeleton covered with upholstery. Four points safety harness with a central lock

7.6 Baggage compartment

Baggage compartment is space behind seats.

7.7 Canopy

Canopy is made from the clear Plexiglas. The canopy frame is formed by a composite profile. The canopy is tilted forvard.

7.8 Engine

There is installed Rotax 912 engine in VL-3B airplane.

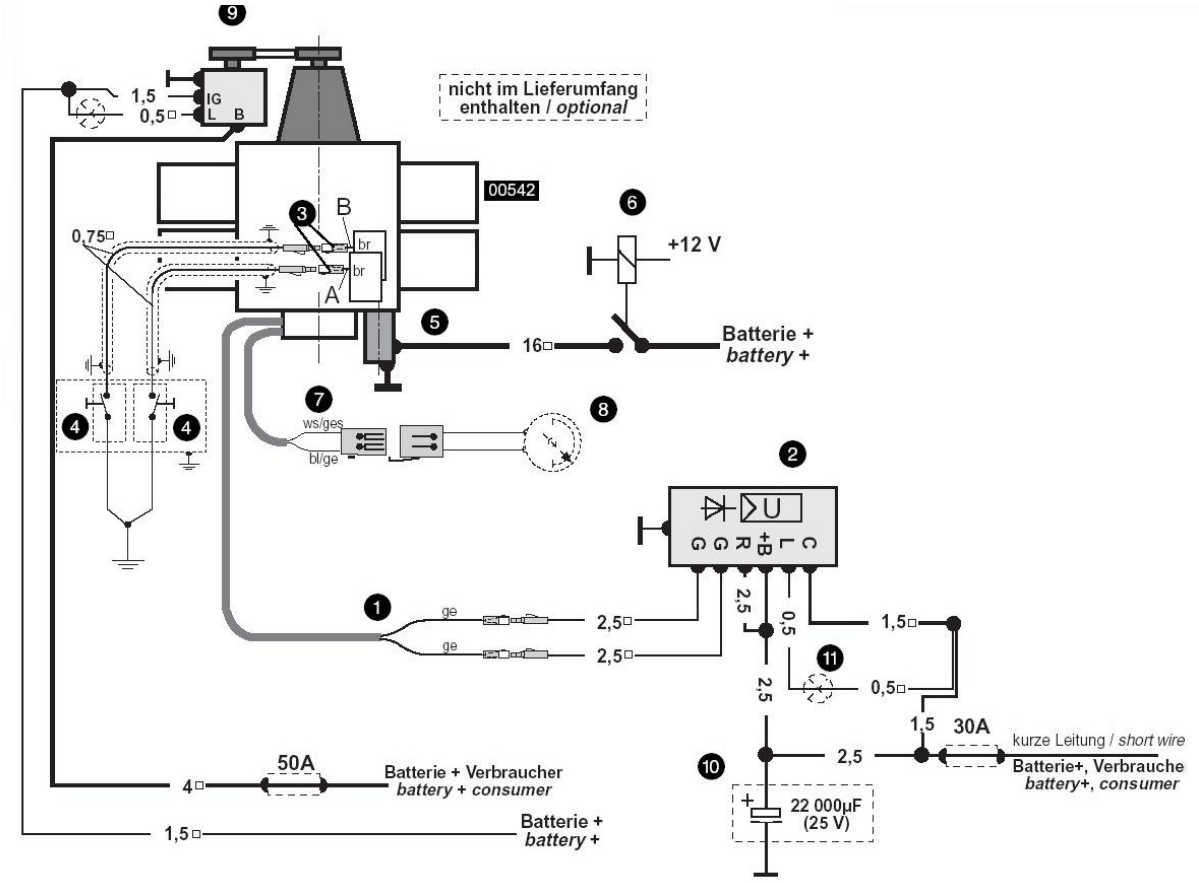
Rotax 912 is 4-stroke, 4 cylinder horizontally opposed, spark ignition engine .

7.9 Fuel system

The main fuel tanks are an integral part of the wings, a fuel quantity sensor is located inside the wing. Further a coarse filter, fuel valve, and fine filter are parts of the fuel system.

For draing use blow down valve located on the bottom of the wing.

7.10 Electrical system



7.11 Pitotstatic system

The pitotstatic system consists of a Prandtl tube under the wing.

Keep the system clear to assure its correct function. If water gets inside the system disconnect hoses from the instruments and slightly blow into the system.

8. Aeroplane handling, servicing and maintenance

8.1 Introduction

This section contains factory-recommended procedures for proper ground handling and servicing of the aeroplane.

It also identifies certain inspection and maintenance requirements which must be followed if the aeroplane is to retain that new-plane performance and dependability.

It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered.

8.2 Aeroplane inspection periods

Refer to the Operating, Maintenance and Repair Manual for VL-3 aeroplane for more details about periodical inspections.

8.3 Aeroplane alterations or repairs

It is essential that the aeroplane manufacturer be contacted prior to any alternations on the aeroplane to ensure that airworthiness of the aeroplane is not compromised

If the aeroplane weight is affected by an alternation, a new weight and balance will be necessary. A revised "Weight and Balance Record / Permitted payload range" and Placard "LOAD LIMITS" must be filled out and attached to the aeroplane.

8.4 Ground handling / Road transport

8.4.1 Towing

It is easy to tow the aeroplane a short distance by holding the blade root because the empty weight of this aeroplane is relatively low.

Suitable surfaces to hold the aeroplane airframe are the rear part of the fuselage before the fin and wing roots“

Caution
Avoid excessive pressure at the aeroplane airframe - especially at the wing tips, elevator, rudder, trim etc.

Caution
Handle the propeller by holding the blade root - never the blade tip! If starting the engine manually - always handle the propeller on a blade surface i.e. do not hold only an edge

8.4.2 Parkin

It is advisable to parking the aeroplane inside a hangar or eventually inside other weather proof space (such as a garage) with a stable temperature, good ventilation, low humidity and dust-free environment.

It is necessary to tie-down the aeroplane when parking outside.

When the plane must be tied-down outdoors for extended periods, it is advisable to cover the cockpit canopy, and if possible, the entire aeroplane using a suitable cover.

8.4.3 Tying-Down

The aeroplane is usually tied-down after a flight day or when needed. The tying-down is necessary to protect the aeroplane against possible damage caused by wind gusts.

For reason the aeroplane is equipped with tie-down strips on the wing tips and tail.

Procedure: :

- Check: Fuel valve off, Circuit breakers and Master switch off, Switch box off.
- Block the control stick up e.g. by means of safety harness
- Close and lock cockpit
- Shut all the ventilation windows
- Tie-down the aeroplane to the ground by means of the strips. It is also necessary to tie-down the fuselage rear and nose wheel landing gear (lace a rope through the wheel and fork).

> Note
> It is advisable to cover cockpit canopy, if possible the whole aeroplane, by means of a suitable covering material attached to the airframe for long term outside parking.

8.4.4 Jacking

Because the empty weight of this aeroplane is relatively low it is easy to lift the aeroplane using 2 persons.

First prepare two suitable jacks to support the aeroplane.

The aeroplane should be lifted by the following parts:

- Press-down on the rear of the fuselage in front of the fin to lift the front and then support under the firewall.
- To jack the rear of the fuselage grab the fuselage near the auxiliary tail skid, lift it upward and support.

To lift the wings, push on the wings lower surface at the main spar. Do not lift by the wing tips

8.4.5 Road transport

The aeroplane may be transported in a suitable trailer. It is necessary to dismantle aeroplane before loading.

8.4.6 Aeroplane Assembly

Refer to the Operating, Maintenance and Repair Manual for VL-3

8.4.7 Aeroplane Disassembly

Refer to the Operating, Maintenance and Repair Manual for VL-3

8.5 Cleaning and care

Use cleaning detergents to clean aeroplane surface. Oil spots on aeroplane surface (except the canopy!) may be cleaned with appropriate degreasers.

The canopy clean should be cleaned only by washing it with lukewarm water and mild detergents, using clean, soft cloth sponge or deerskin. Then use suitable polishers to clean the canopy.

> Caution
> Never clean the canopy under "dry" conditions (it will scratch) and never use gasoline or chemical solvents!

Upholstery and covers may be removed from the cockpit, brushed or washed in lukewarm water with mild detergents. Dry the upholstery before reinstalling inside the cockpit.

> Caution
> For long term storage cover the canopy to protect the cockpit interior from the direct sunshine..

9. Supplements

9.1 Introduction

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

9.2 List of inserted supplements

Date	Title of inserted supplement

9.3 Supplements inserted