# Pilot Operating Handbook
# for aeroplane VL-3E-1

Registration number :

Serial number : **VL-3-**

Date :

# 0. Table of Contents

# 1. General

## 1.1 Introduction

This Pilot Operating Handbook provides information useful for the safe and efficient operation of VL-3E-1 Evolution 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 more or less 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-3E-1 Evolution aeroplane is intended for recreational and cross-country flying. It is not approved for aerobatic operation.

VL-3E-1 Evolution is a single engine, composite aeroplane with two side-by-side seats. The aeroplane is equipped with retractable 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, rudder drive is controlled by cables and on the right elevator is trim connected by 2 cables with trim lever. 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 $m^2$

M.A.C. …….. 1,236 m

loading …….. 46 $kg/m^2$

*Ailerons*

area ……... 0.207 $m^2$

*Flaps*

area ……0.8 $m^2$

*Fuselage*

length ..…… 6.2 m

width …….. 1.15 m

height ……... 1.5 m

*Horizontal tail unit*

span …….. 2.68 m

area ……1.69 $m^2$

elevátor area …….. ……..... 0.73 $m^2$

*Vertical tail unit*

height …… 1.03 m

area ……..…….. 0.876 $m^2$

rudder area …….. .0.309 $m^2$

*Landing gear*

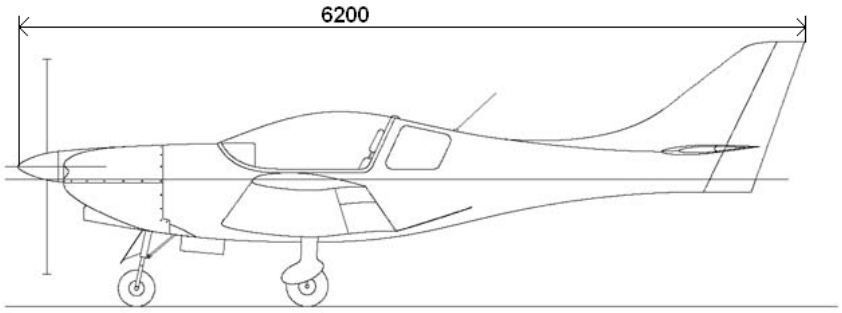
wheel track ……..1.83 m

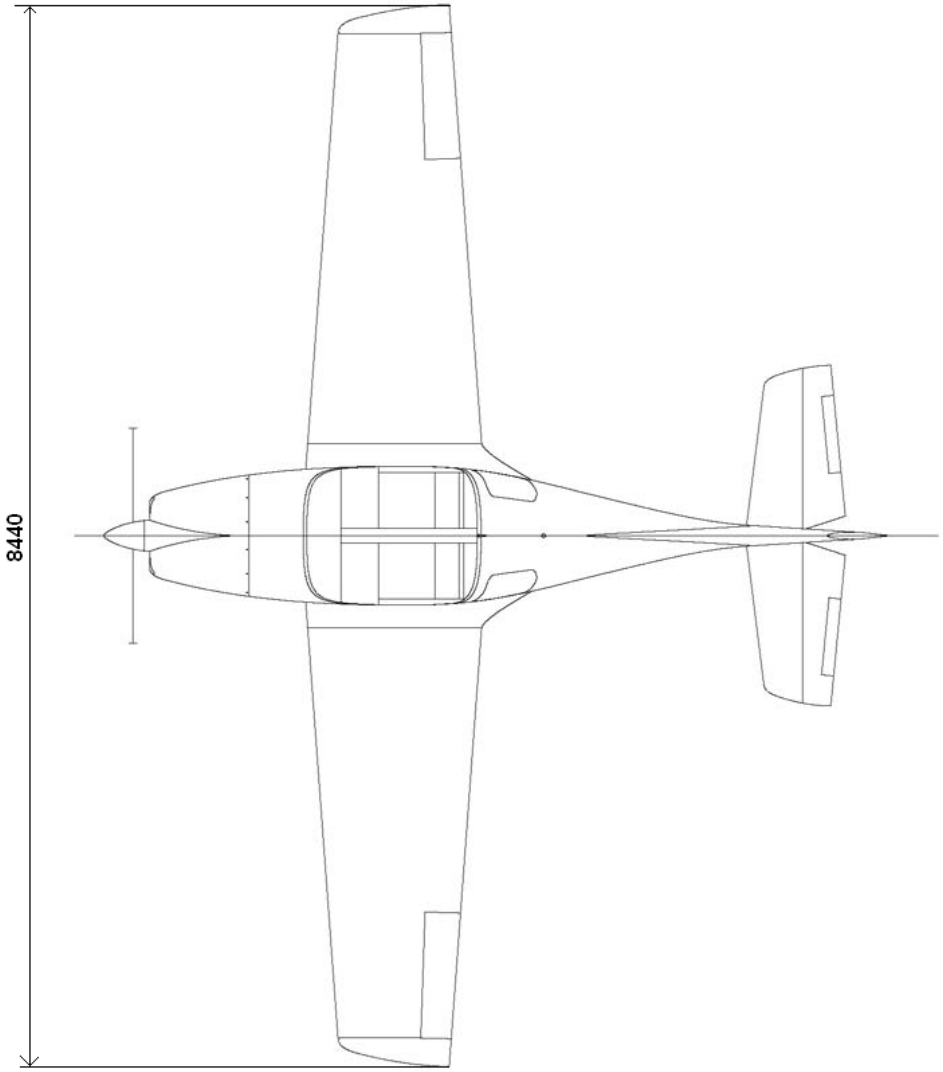
wheel base ……..1.285 m

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 limits

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 | **235** | 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 |
| $V_{LE}$ | Maximum landing gear extension speed | **150** | Do not exceed this speed with undercaridge extended |

## 2.3 Airspeed indicator markings

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

| Marking | Range or value [IAS km/h] | Significance |
|---|---|---|
| **White arc** | **57 - 120** | Positive Flap Operating Range |
| **Green arc** | **75 – 235** | Normal Operating Range |
| **Yellow arc** | **235 – 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 in 5500 rpm
- Cruising : 66 kW / 90 hp in 4800 rpm

Engine RPM :

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

Cylinder head temperature :

- Minimum : 60 °C
- Maximum : 120 °C

Oil temperature :

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

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

- Minimum : 0,15 bar
- Maximum : 0,40 bar
- Fuel : see chapter 2.13
- Oil : (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]** | 74 | 74-110 | 100-110 | 120 |
| **Oil Temperature [°C]** | 50 | 88-110 | 110-130 | 130 |
| **Oil Pressure [bar]** | 2,0 | 2,0 – 5,0 | 5,0 – 7,0 | 7,0 cold engine starting |

## 2.6 Miscellaneous instrument marking

Fuel Level Indication

Used floater fuel indication system does not allow to indicate exact fuel level in whole range (the floater contacts the upper wall of the tank before the tanks is filled full). From this reason the following states of fuel in the tanks are recognised:

| | Left tank | | Right tank | |
|---|---|---|---|---|
| | Liter | US gallon | Liter | US gallon |
| Full tank | 59 | 15.6 | 59 | 15.6 |
| Upper indicating limit | 40 | 10.5 | 40 | 10.5 |

Individual fuel level gauges (separate instruments on instrument panel):
The following colour ranges are marked in EMS diagrams for both tanks

| | minimum | | maximum | |
|---|---|---|---|---|
| | Liter | US gallon | Liter | US gallon |
| Green range | 16 | 4.2 | maximum | |
| Yellow range | 8 | 2.1 | 16 | 4.2 |
| Red range | 0 | 0 | 8 | 2.1 |

Low fuel level indicators (yellow LEDs on instrument panel):
When low fuel level indicator (yellow LED) on the instrument panel starts to light up – in the fuel tank is min. 5 liters (1,32 US gallon) of fuel.

## 2.7 Weight

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

Max. take-off weight ……..…….…. 472.5 kg

Max landing weight ……..……... 472.5 kg

Max. baggage weight ……..…….. 15 kg

## 2.8 Centre of gravity

Empty aeroplane C.G. position (undercarriage retracted)…... xxxx %MAC

Empty aeroplane C.G. position (undercarriage extended)…... xxxx %MAC

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

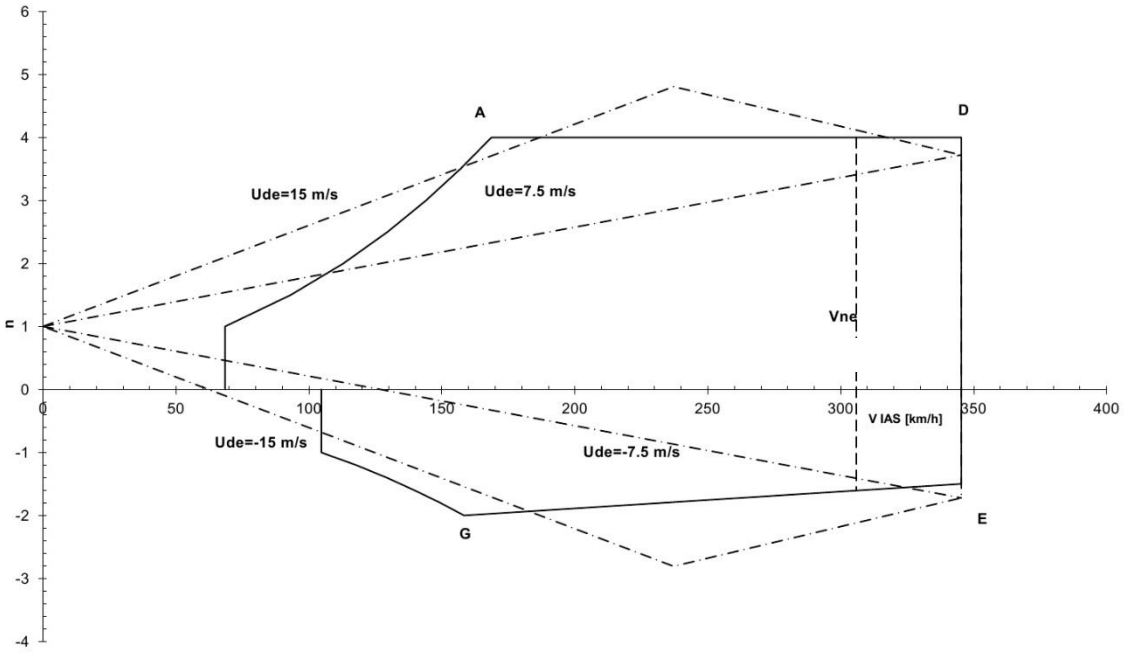
## 2.9 Approved manoeuvres

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 Take-off Weight

## 2.12 Kinds of operation

Day VFR flights only.

Instruments and equipment for VFR flights:

1 Airspeed indicator (marked according to 2.3)
1 Altimeter
1 Vertical speed indicator
1 Compass
2 Safety harnesses

## 2.13 Fuel

**WARNING!**

**Based on experience from the operation of aircraft VL-3 we strongly recommend to use quality prescribed fuel only! Using the poor quality fuel can cause a major failure in the fuel system!**

**Don't use fuels than contain more then 10% of ethanol! These fuels have not been tested by ROTAX company and are not permited for use!**

**Recommended fuels:**

- 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
- Mogas European standart EN 228 Super, EN 228 Super Plus
- BA 95 Natural is recommended for Czech Republic

**For other suitable fuel types refer to the engine ROTAX Operator's Manual and ROTAX Service instruction SI-912-016 for selection of the correct fuel.**

## 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 | xxxx KG |
| MAX.TAKE-OFF WEIGHT | 472,5 KG |
| MIN.CREW WEIGHT | 65,0 KG |
| MAX. BAGGAGE WEIGHT | 15,0 KG |

| | |
|---|---|
| NEVER EXCEED SPEED | $V_{NE}$ = 305 KM/H |
| MANOEUVRING SPEED | $V_A$ = 165 KM/H |
| DESIGN CRUISING SPEED | $V_C$ = 235 KM/H |
| MAX. FLAPS EXTENSION SPEED | $V_{FE}$ = 120 KM/H |
| STALL SPEED | $V_{S0}$ = 57 KM/H |

| Power | RPM [1/min] | manifold pressure [in Hg] |
|---|---|---|
| Take-off | 5800 | 27.5 |
| continuing | 5500 | 27 |
| 75% | 5000 | 26 |
| 65% | 4800 | 26 |
| 55% | 4300 | 24 |

# 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.

## 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 50 m (165 ft) : land in take-off direction |
| | - over 50 m (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 | |

### 3.2.3 Engine failure in flight (Forced landing)

| | |
|---|---|
| 1. Speed | - gliding at 100km/h (55 kts) |
| 2. Altitude | - below 50 m (165 ft) : land in take-off direction |
| | - over 50 m (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 | |

### 3.2.4 In-flight engine 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 | - turn switch box key |

## 3.3 Smoke and fire

### 3.3.1 Fire on ground

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

### 3.3.2 Fire during take-off

1. Fuel valve - off
2. Throttle - full
3. Speed - 120 km/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.

### 3.3.3 Fire in flight

1. Fuel valve - off
2. Throttle - full
3. Ignition - off after using up fuel in carburetors and engine stopping
4. Master switch - off
5. Choose of area - heading to the nearest airport or choose emergency landing area
6. Emergency 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.

## 3.4 Glide

Gliding may be used in case of engine failure.

1. Speed - ~ 140 km/h (75 kts)
2. Flaps - retracted
3. Instruments - within permitted limits

## 3.5 Landing emergencies

### 3.5.1 Emergency landing

An emergency landing may be carried out due to engine failure and when the engine cannot be restarted.

1. Speed - 100 km/h (55 kts)
2. Trim - trim the aeroplane
3. Safety harness - tighten
4. Landing gear - go to the open position - see 4.3.8.
   If landing gear can not be extended, or field is not acceptable for landing with open landing gear, do not extend the landing gear!
5. Flaps - as needed
6. COMM - if installed - report your location if it is possible
7. Transponder - if installed – if necessary set transponder to 7700 (ICAO worldwide emergency code)
8. Fuel valve - off
9. Ignition - off
10. Master switch - off

### 3.5.2 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 60 kts to thoroughly inspect the area
4. Perform flight around the chosen area
5. Landing gear go to the down position - see 4.3.8.
   If landing gear can not be extended, or field is not acceptable for landing with open landing gear, do not extend the landing gear!
6. Perform an approach at increased idling with fully extended flaps
7. Reduce power to idle when over the runway threshold and touch-down at the very beginning
   of the chosen area
8. After stopping the aeroplane switch off all switches, shut off the fuel valve, lock the aeroplane
   and look for a help

### 3.5.3 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

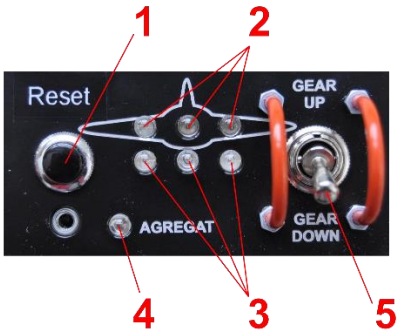
### 3.5.4 Landing with a defective landing gear

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

### 3.5.5 Landing with landing gear in retracted position

1. Approach - normal
2. Touch down - touch down with minimum speed.

### 3.5.6 Landing gear emergency extension




**Landing gear controler:**

(1) – „Reset“ button
(2) – Three red lights for „GEAR UP“ position
(3) – Three green lights for „GEAR DOWN“ position
(4) – Red light „AGREGAT“
(5) – Switch for retraction and extension of landing gears

This procedure is necessary to use if you don't see the three green lights on the „Landing gear controler“ during the landing gears extension. The hydraulic system for landing gears opening is programmed to run 30 sec. If after this period the „Landing gear controler“ don't indicate all three landing gear sensors in the right position, the red light „agregat“ (4) start flashing and the system will set himself into „standby status“. In this case push once again the button „Reset“ (1) on the „Landing gear controler“ and the system will start new cycle of landing gears opening. If the three green lights appears, landing gears are open and in the right position. After landing of aeroplane is necessary make detail inspection of undercarriage opening system and find a cause of the defect!

If after reset of „Landing gear controler“ you don't see the three green lights you must use the hand pump for „Emergency releace of gears“ (see chapter 7.3 pos.22) for manuel opening of landing gears – follow next steps:

1. Check fuel level - for estimating the time, you have for an emergency landing
2. Airspeed 120 km/h (65 kts)
3. Switch (5) of „Landing gear controler“ toggle to position „gear down“
4. Landing flaps open to „15°“
5. By the right hand, hold the control stick to fly the plane and by the left hand to grab the handle of hand pump.
6. By pulling pump handle up, tear off safety wire!
7. Start pumping down untill the hand pump stops (min.35 cycles of compression) and until the three green lights appears on „Landing gear controler“- it indicate, that landing gears are open and in the right position.
8. When appears three green lights on the „Landing gear controler“ you can safely land.
9. If THREE green lights will not appears, ask air traffic control tower for visual inspection of landing gears position. If the air traffic control tower confirm you right position of all three open landing gears you can safely land.
10. If the air traffic control tower does not confirm you right position of all three landing gears, is the best solution retract all wheels and make emergency landing without landing gears.

## 3.6 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

## 3.7 Other emergencies

### 3.7.1 Vibration

If vibrations appears:

1. Set aeroplane speed and engine speed to power setting where the vibrations are the lowest.
2. Land at the nearest airfield or perform a precautionary landing according to 3.5.2

### 3.7.2 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 condition 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

### 3.7.3 Alternator or power supply failure

1. Switch off immidiately all electric instruments which are not important for flight.
2. Check voltage of the battery and to land soonest on the nearest airport!

### 3.7.4 Cabin opening in flight

1. Reduce speed - to 100 km/h (55 kts)
2. Landing flaps - on „15°“
3. Trim the plane
4. Close cabin again and resume flight if no damage is observed.
5. Control cabin frame and lock before next flight.

### 3.7.5 Tranceiver communication failure

In the case of radio communication failure follow next steps:

1. Check power supply – status of fuse.
2. Check communication with another ATC.
3. In the case of no communication set tranceiver to 7600 (ICAO worldwide emergency code) to inform ATC, that your transceiver is out of order.
4. To land soonest on the nearest airport!

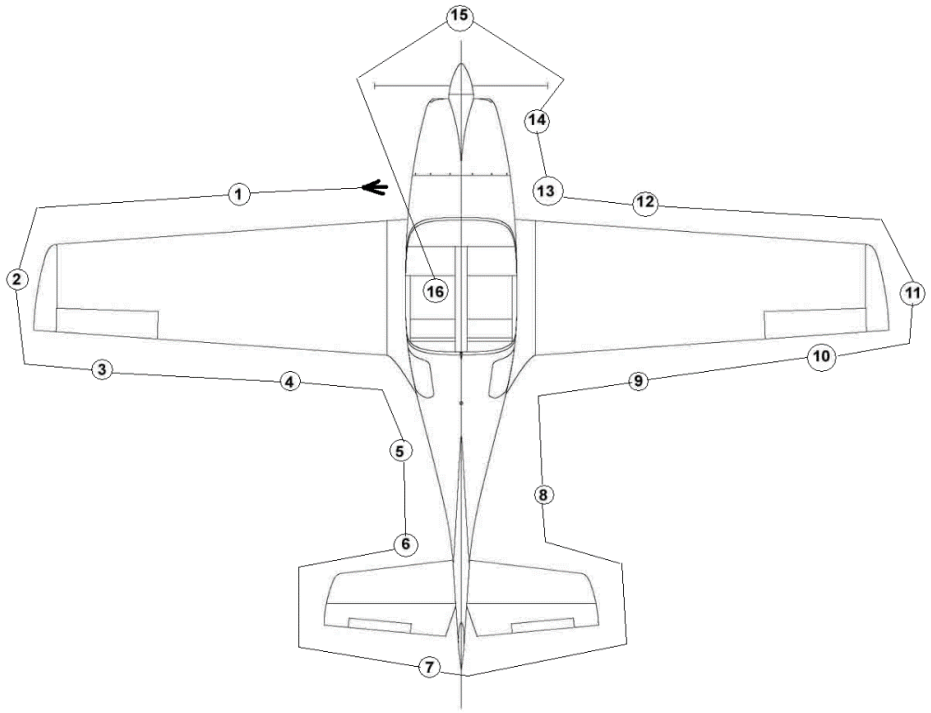
# 4. Normal procedures

## 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:




⇒ Before pre-flight inspection check in the cockpit if ignition box is switched-off!

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 and controls condition
   - Attachment
   - Play
4. Flap
   - Surface and controls condition
   - Attachment
   - Play

5. Fuselage rear
   - Surface condition
6. Vertical tail unit
   - Surface and controls condition
   - Play
   - Free movement
7. Horizontal tail units
   - Surface and controls condition
   - Attachment
   - Play
   - Free movement
   - check if the elevator control is correctly connected
8. see item 5.
9. see item 4.
10. see item 3.
11. see item 2.
12. see item 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
    - Condition and attachment of hydraulic parts and undercarridge mechanisms
14. Engine
    - Engine cowlings condition
    - Engine mount condition
    - Engine attachment check
    - Oil quantity check (after 1 minute engine run)
    - Fuel and Electrical system visual check
    - Hydraulic system - visual check quantity of hydraulic fluid
    - Fuel system - draining
15. Propeller
    - Propeller attachment
    - Blades, Hub, Spinner condition
16. Cockpit
    - Ignition box - off and key pull out
    - Master switch - off
    - Instruments - check of condition
    - Fuel gauge - check fuel quantity (for check of fuel quantity switch-on Master switch and Avionic master switch, if aeroplane is equiped by „glass cockpit“, then both master switches turn-off!)
    - Controls - visual check
      - check for proper function
      - check of plays
      - check of flaps extension
      - check of free movement up to the stops
    - Check for loose items - secure papers
    - Canopy - condition of attachment, cleanliness
    - Emergency rescue system - check if safety pin is removed before flight!

## 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
2. Brakes - check of function
3. Hand control - free movement check
4. Trim - check control movement
5. Flaps - check of function
6. Undercarridge - **GEAR DOWN!**
7. Engine controls - throttle and choke lever movement
8. Fuel valve - off
9. Fuel gauge - fuel quantity check
10. Switch box - off
11. Circuit breakers - off
12. Ignition - off
13. Instruments, COMM - condition check
14. Safety harness - check of integrity and attachment
15. Cockpit - condition and canopy lock function

### 4.3.3 Before engine starting and starting of engine

1. Fuel valve - on
2. Switch box - turn the key
3. Circuit breakers - on
4. Propeller - minimum propeller pitch
5. Throttle - set for idling
6. Choke - according to engine temperature
7. Control stick - fully pulled
8. Check free area - clear
9. Master switch - on
10. Ignition box - on (both circuit) by turning the key in two steps to the right
11. Brakes - fully applied
12. Start - by turning the key to the right, untill the engine start and then release pressure on the key
13. After starting - set throttle to idling
14. Oil pressure - within 10 sec. min. pressure
15. Choke - off
16. Engine warm - according to 4.3.4

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

1. Lock the main wheels by means of wheel chocks before engine check. Refer to the Engine Manual for warming.
2. Set max. power.
3. 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 Taxying

The maximum recommended taxiing speed is 15km/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. Undercarridge - three green lights, switch „down“ position
6. Propeller - minimum propeller pitch
7. Flaps - "15°" position
8. Engine controls - choke off
9. Fuel valve - open
10. Fuel gauge - fuel quantity check
11. Circuit breakers - on
12. Instruments, COMM - within limits, frequency set
13. Safety harness - secured and tightened
14. Cockpit - canopy condition, lock take-off
15. 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 110 km/h (60 kts). Refer to the par. 5.2.5 for optimum climb speed. max. flaps extended speed is 120 km/h (65 kts).

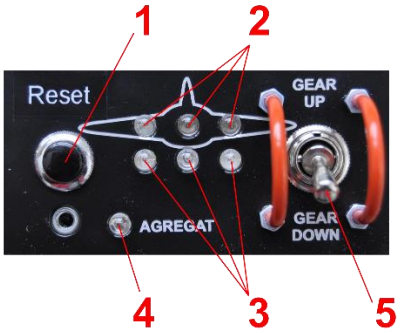
> **Warning**
> The take-off is prohibited if:
> - the engine run is unsteady
> - the engine instruments values are beyond operating limits
> - the engine choke is on
> - the crosswind velocity exceed permited limits 5.3.2
> - three green lights on Landing gear controler don‘t shine, switch is in “gear up“ position or red light „agregat“ is shining

### 4.3.7 Climb

1. Throttle - maximal continuous power
2. Speed - 140 km/h (75 kts)
3. Trim - adjust as needed to reduce stick pressure
4. Landing gear - up see 4.3.8. Max.speed for open landing gear is 150 km/h (80 kts)
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..

### 4.3.8 Retraction and extension of the landing gear




**Landing gear controler:**

(1) „Reset“ button
(2) Three red lights for „gear up“ position
(3) Three green lights for „gear down“ position
(4) Red light „agregat“
(5) Switch for retraction and extension of landing gears

For retraction and extension of the landing gears follow next steps:

1. Airspeed max. 150 km/h (80 kts)
2. Toggle switch (5) of „Landing gear controler“ to required position (gear up – gear down). Red light „agregat“ (4) start shining and hydraulic power unit start to extends or retracts landing gears.
3. If the three red lights (2)/three green lights (3) appears on the „Landing gear controler“, landing gears reached the required end position – retracted/extended.

To avoid landing with recracted landing gears, are landing flaps connected with landing gears. If the landing gears are closed and pilot open landing flaps, three red lights on „Landing gear controler“ start flashing and sound alarm turns on. After toggle „switch“ (5) to position „gear down“ sound alarm turns off and landing gears are going to „down“ position – three red lights are still flashing! When landing gears reached the required end position, on the „Landing gear controler“ appears three green lights.

For turning off alarm during flight with open landing flaps push the button „Reset“ (1).

If is not possible extend landing gears by this normal procedure use emergency procedure - see chapter 3.5.6. Landing gear emergency extension

#### 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 - 140 km/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. Undercarridge - open- see 4.3.8. max.speed for open undercarridge 150 km/h(80 kts)
4. Propeller - minimum propeller pitch
5. Brakes - check function
6. Trim - adjust as required
7. Landing area check - runway
8. Base leg

#### 4.3.12 On base leg

1. Speed - 110 km/h (60 kts)
2. Flaps - extend to "38°" position
3. Trim - adjust as required
4. Throttle - as necessary
5. Instruments - within limits

#### 4.3.13 On final

1. Speed - 90 – 100 km/h (50 - 55 kts)
2. Flaps - "55°" 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 57 km/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 or „go around“

1. Throttle - full
2. Engine speed - 5700 rpm
3. Flaps - set at the "15°" position at a speed of 90 km/h (50 kts)
4. Trim - as necessary
5. Flaps - retract at a height of 50 m (165 ft)
6. Trim - as necessary
7. Engine speed - maximal continuos power
8. Instruments - within limits
9. Climb - at 120 km/h (65 kts)
10. Landing gear - go to the up position

#### 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 shut-down

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

#### 4.3.18 Emergency rescue system

1. Rescue system - secure emergency rescue system by safety pin!

#### 4.3.19 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

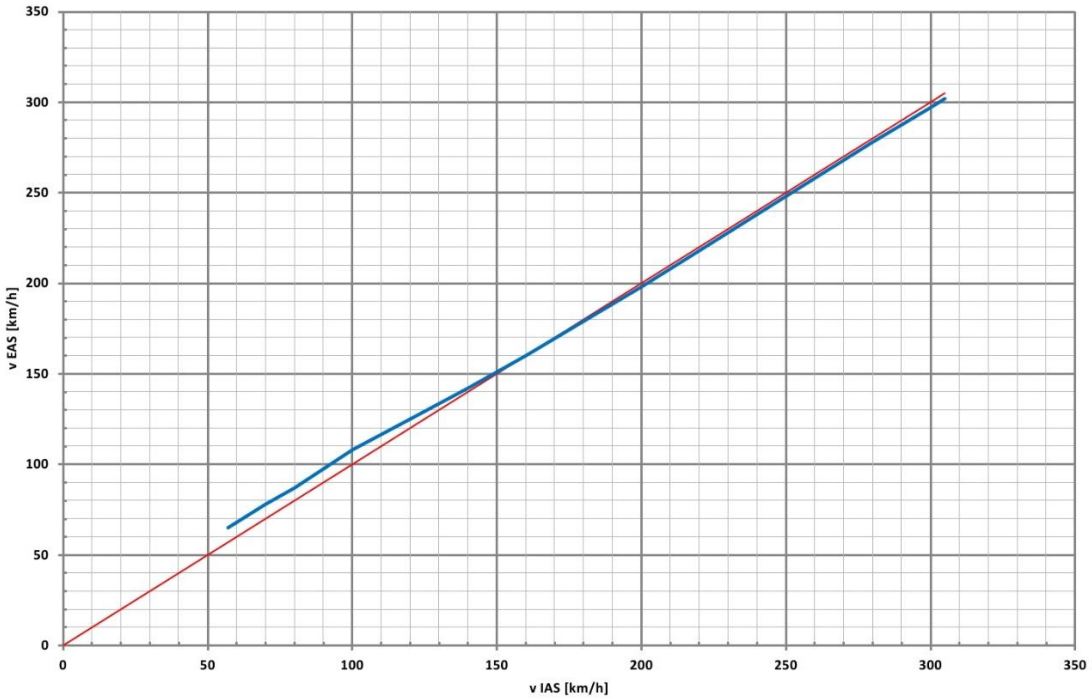
Section 5 provides approved data for airspeed calibration, stall speeds and take-off performance and additional information.

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] | IAS [kts] | EAS [kts] |
|---|---|---|---|
| 57 | 65 | 31 | 35 |
| 70 | 78 | 38 | 42 |
| 80 | 87 | 43 | 47 |
| 100 | 108 | 54 | 58 |
| 120 | 125 | 65 | 67 |
| 140 | 142 | 76 | 77 |
| 160 | 160 | 86 | 86 |
| 180 | 179 | 97 | 96 |
| 200 | 198 | 108 | 107 |
| 220 | 218 | 119 | 118 |
| 240 | 238 | 130 | 128 |
| 260 | 258 | 140 | 139 |
| 280 | 278 | 151 | 150 |
| 300 | 297 | 162 | 160 |
| 305 | 302 | 165 | 163 |

### 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 | **57** | **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 15 m obstacle [m] |
|---|---|---|
| Grass | 150 | 280 |

### 5.2.4 Landing

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

| | Landing distance over 15 m obstacle [m] | Landing run distance (full braking) [m] |
|---|---|---|
| Grass | 270 | 100 |

### 5.2.5 Climb performance

Best Rate-of-climb speed is 140 km/h (75 kts) IAS, corresponding rate of climb is 6,5m/s (21 ft/s).

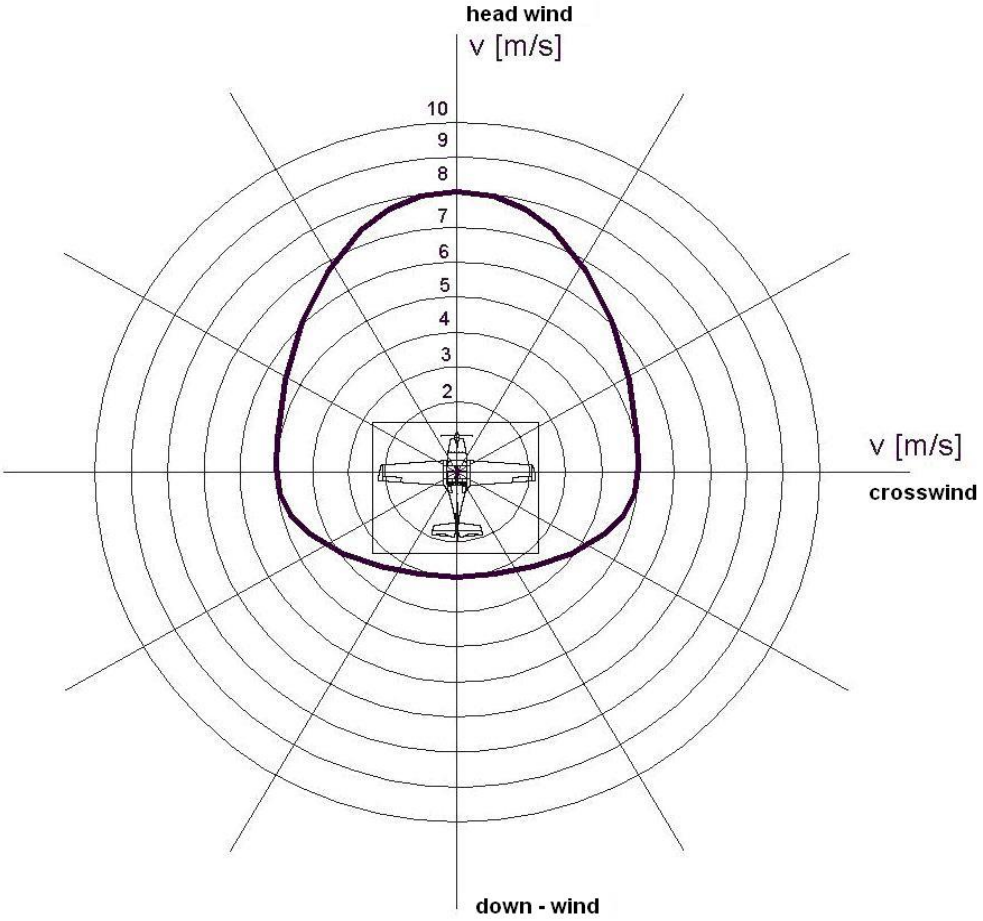
## 5.3 Additional information

### 5.3.1 Cruise

| Regime | Economy Cruise | Max. Continuous Power | Max. Take-Off Power |
|---|---|---|---|
| Time limitation | unlimited | unlimited | max. 5 min. |
| Engine speed | 4300 | 5500 | 5800 |
| Manifold pressure [inHg] | 24 | 27 | 27.5 |
| IAS [km/h] | 210 | 260 | 280 |

### 5.3.2 Demonstrated crosswind performance

Max. permitted cross wind velocity for take-off and landing 5 m/s (10 kts)
Max. permitted head wind velocity for take-off and landing 8 m/s (15 kts)



# 6. Weight and balance

## 6.1 Introduction

This sections contains the payload range within which the VL-3 Evolution aeroplane may be safely operated. Procedure of weighting the empty aeroplane is showen in the VL-3 Maintenance Manual – chapter 1.5 Aeroplane empty weight and centre of gravity.

## 6.2 Permitted payload range

### 6.2.1 Weight limitations

Maximum take-off weight …….…….. 472.5 kg

Operating C.G. range ……... 21 - 34 % M.A.C

### 6.2.2 CG 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 aeroplane (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

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

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

**Example**

| | |
|---|---|
| Empty weight | $m_{pr}$ = 301kg |
| Pilot weight | $m_{p1}$ = 100 kg |
| Copilot weight | $m_{p2}$ = 0 kg |
| Fuel quantity | vp = 45 litrs |
| Baggage weight | $m_z$ = 10 kg |
| C.G. of empty aeroplane | $x_{bsat}$ = 17.1 % M.A.C |

Take off 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

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

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

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

**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 Airframe

VL-3 Evolution airframe is all-carbonfibre monocoque construction.
For more information see VL-3 aeroplane Maintenance Manual.

### 7.2.1 Fuselage

All composite sandwich construction.
For more information see VL-3 aeroplane Maintenance Manual.

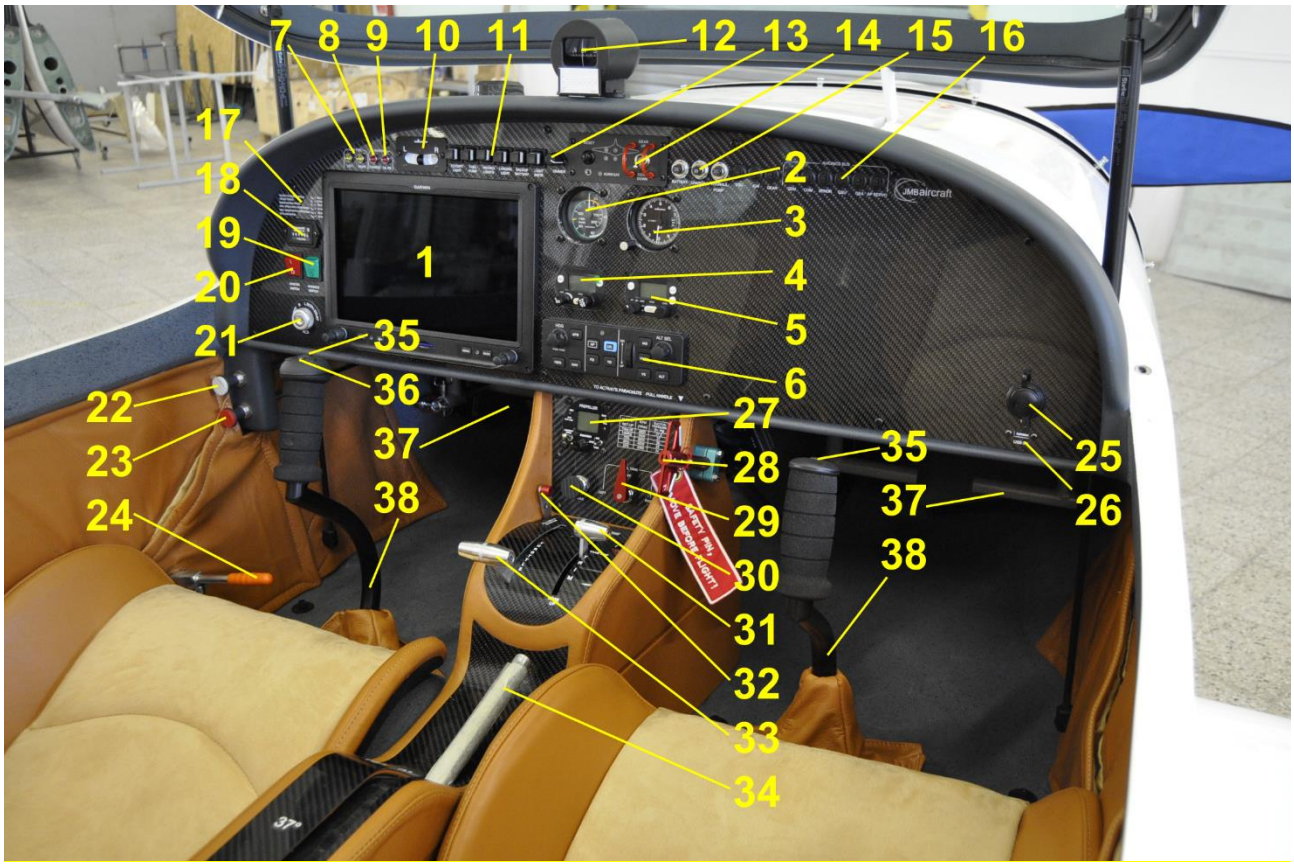
### 7.2.2 Wing

The composite wing has one main spar with carbon flanges, no ribs; the stressed skin is of sandwich construction with a foam core. For more information see VL-3 aeroplane Maintenance Manual.

### 7.2.3 Horizontal Tail Unit

Horizontal tail units have same construction like wing.
For more information see VL-3 aeroplane Maintenance Manual.

## 7.3 Instrument panels and controls in the cockpit




| | | | | | |
|---|---|---|---|---|---|
| 1 | Efis – Garmin GDU 460 | 14 | Landing gear controler | 27 | Constant speed unit |
| 2 | Aispeed indicator | 15 | Fuses | 28 | Parachute rescue system |
| 3 | Altimeter | 16 | Circuit breakers | 29 | Main tank fuel selector |
| 4 | Transceiver | 17 | Airspeed limits | 30 | Choke control |
| 5 | Transponder | 18 | Hobbs – engine run hours | 31 | Trim lever |
| 6 | Autopilot control GMC 307 | 19 | Avionic master switch | 32 | Parking brake control |
| 7 | Low fuel indicator | 20 | Master switch | 33 | Throttle control |
| 8 | Batery charge indicator | 21 | Ignition box | 34 | Wing flaps lever |
| 9 | Low oil pressure indicator | 22 | Ventilation control | 35 | PTT switch |
| 10 | Turn and band indicator | 23 | Heating control | 36 | Autopilot disc switch |
| 11 | Switches | 24 | Emergency relace of gears | 37 | Rudder pedals |
| 12 | Magnetic compass | 25 | 12V socket | 38 | Control stick |
| 13 | Cockpit light dimmer | 26 | 5V USB socket | | |

## 7.4 Landing gear

The aeroplane 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 pedals.

Recommended pressure for BERINGER wheels:

- main wheels **3,0+-0,3 bars (44 psi)**
- nose wheel **2,5+-0,3 bars (36 psi)**

## 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 forward.

## 7.8 Engine

There is installed Rotax 912 engine in VL-3 evolution aeroplane.
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 drain of main fuel tanks use drain valves located on the bottom of the wing.

## 7.10 Electrical system

Complete electric documenation you can find in the „Aeroplane electric documentation“

## 7.11 Hydraulic system

The hydraulic system of aircraft consist of hydraulic power unit, 3 hydraulic actuators, 3 hydraulic locks, 2 throttle-valves, emergency hand pump and hydraulic hoses. The hydraulic system is filled with hydraulic liquid Shell Aerofluid 41. For the proper functioning of the hydraulic system during the aircraft operation must be periodically checked correct level of hydraulic liquid!

Maintenance of hydraulic system is mentioned in Maintenance Manual VL-3. In case of problems with the hydraulic system immediately contact VL-3 service center.

## 7.12 Pitotstatic system

The pitot-static system consists of a Prandtl tube under the wing, pressure lines (plastic pipes) for connection with airspeed indicator, altimeter and avionic pressure transducer. For more informantion please see aeroplane VL-3 Maintenance Manual.

## 7.13 Miscellaneous equipment

Besides the standard instruments the VL-3 evolution aeroplane is fitted with the following equipment:

- See chapter 7.3 Instrument panel

## 7.14 Avionics

**Flight instruments :**

- See chapter 7.3 Instrument panel

**Engine instruments :**

- See chapter 7.3 Instrument panel

# 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

For more information about servicing, Maintenance and periodical inspections of aeroplane see VL-3 Maintenance Manual.

## 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.

**WARNING!**
If the aeroplane weight is affected by an alternation, a new weight and balance measurement must be done! 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 wings or fuselage, 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.

You can also use hand towing bar for aeroplane moving.

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 Parking

It is advisable to park 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 canopy, and if possible, the entire aeroplane using a suitable cover. For parking use parking brake.

### 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 this reason is the aeroplane equipped by 2 tying lugs on the wing tips.

Procedure of tying-down:

1. Check the following:
   Fuel valve - off
   Circuit breakers - off
   Master switch - off
   Avionic master - off
   Ingnition box - off
2. Block the control stick up (by means of safety harness)
3. Close and lock cockpit
4. Close all the ventilation windows
5. Tie-down both wings of the aeroplane to the ground by 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 Lifting

Because the empty weight of this aeroplane is relatively low it is easy to lift the aeroplane using 2 persons. On the aeroplane are 3 supporting point – 2 points on the front of fuselage, on the lower side of engine frame and 1 point back on the underside of the fuselage.

> **Caution**
> Never lift the aeroplane by the wing tips or tail units!

Procedure of lifting:

1. Prepare 3 suitable jacks for aeroplane support.
2. Press-down the rear of the fuselage in front of the fin, lift the nose of the aeroplane and support under the firewall by 2 jacks.
3. To lift the rear of the fuselage grab the fuselage near the auxiliary tail skid, lift it upward and support end of fuselage by 1 jack.

### 8.4.5 Road transport

The aeroplane may be transported in a suitable trailer. It is necessary to dismantle the aeroplane before loading - the wings (and also tail units - if it is necessary) must be disassambled according the procedures described in aeroplane Maintenace Manual. The aeroplane wings and tail units must be safely placed to prevent their damage during transport.

### 8.4.6 Aeroplane disassembly and assembly

For disassembly and assembly of the aeroplane - see the VL-3 Maintenance Manual.

# 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 |
|---|---|
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### 9.3 Supplements inserted