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F L I G H T M A N U A L

15.7.1999

FOR THE POWERED SAILPLANE  
AEROTECHNIK CZ, s.r.o.  
686 04 KUNOVICE

RECORDED COPY

L 13 SL

Zvidovaná  
kopie č. 1

03

Translation of the Czech text

Registration:

Serial No. 8682/137 | tel: fax 537 900

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-5-

The Czech original of this Manual has been approved by the Civil Aviation Inspectorate in Prague. Original date of approval: 8.7.1992. Approved under Ref. No.: 3618/1223/92Př

Stamp:



Signature:

*[Handwritten signature]*

This English edition of the Flight Manual has been translated with care, and is accurate to best our knowledge. However, in all official matters the original Czech text is the authoritative and definite document.

This powered sailplane is to be operated in compliance with the information and limitations contained herein.

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**AUTHORIZATION PAGE - FLIGHT MANUAL**

Issue No.: 1 Supersedes issue No.: Dated: 1999-12-13

This Flight Manual is Approved for use with the Aerotechnik Model L13 SL Powered Sailplane described below.

1. Aircraft Registration ..... LN-GAW
2. Certificate of Airworthiness  
Place and date of issue: ..... Oslo, Norway ..... 1999-12-15
3. Manufacturer of Aircraft  
Name: ..... Aerotechnik  
Address: ..... Uherske Hradiste  
Kunivoce, CZECHOSLOVAKIA
4. Designation of Aircraft  
Aircraft type and serial no ..... Aerotechnik L 13 SL ..... 930508  
Year of construction: ..... 1993  
Type certificate no.: ..... Czech-Slovak CAA 92-01
5. Maximum number of seats ..... 2
6. Minimum Crew ..... 1 (Pilot)
7. Maximum take-off mass  
Landplane: ..... 720 kg / 1587 Lbs
8. Special notes

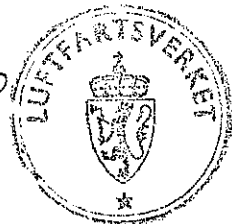
*This Flight Manual is the English edition of the Czech original dated 1992-7-8, Approval No 3618/1223/92Pr.*

Date of approval: 1999-12-13

For the Director General of Civil Aviation

*Andreas Mourud*

Andreas Mourud  
Head of Airworthiness Section  
Aeronautical Inspection Division



## 0.1. Record of revisions

Any revision of the present manual must be recorded in the following table. The new or amended text in any revised page will be indicated by a black vertical line in the left hand margin and the date will be shown on the bottom left hand of the page.

Rev. No.	No. of document -bulletin	Affected page No.	Date of Issue	Inserted Date/Sign.

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Note : Pages with text approved by CAI are on this list marked by Appr. .

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## 1. GENERAL

### 1.1. Introduction

This Flight manual provides the pilot with information for the safe and efficient operation of the L 13 SL VIVAT powered sailplane. This manual includes the material required to be furnished to the pilot by JAR-22. It also contains supplemental data supplied by the manufacturer.

### 1.2. Category of sailplane

This powered sailplane has been approved by Civil Aviation Inspectorate in Prague in accordance with JAR-22 issued in April 1980 including Change 4 dated 7 May 1987 and the Type Certificate No.: 92-01 has been issued on : 2. April 1992  
in category : UTILITY  
Noise certification basis: ICAO Annex 16  
LSL (Germany)

### 1.3. 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.

## 1.4. Technical description

L 13 SL VIVAT is a powered sailplane of all metal construction with two seats located side-by-side. The powered sailplane has wing flaps, air brakes and main landing gear of one retractable wheel, tail landing gear wheel and outriggers. L 13 SL VIVAT is powered by a 4-stroke engine LIMBACH L 2000 EO 1 engine with MTV-1-A/L 160-03 variable pitch propeller.

Wing span	55.08 ft, 16.8 m
Length	27.21 ft, 8.3 m
Height	7.54 ft, 2.3 m
Wing area	217.4 ft <sup>2</sup> , 20.2 m <sup>2</sup>
MAC length	4.1836 ft, 1.276 m
Wing loading max.	7.3 lb/ft <sup>2</sup> , 35.6 kg/m <sup>2</sup>

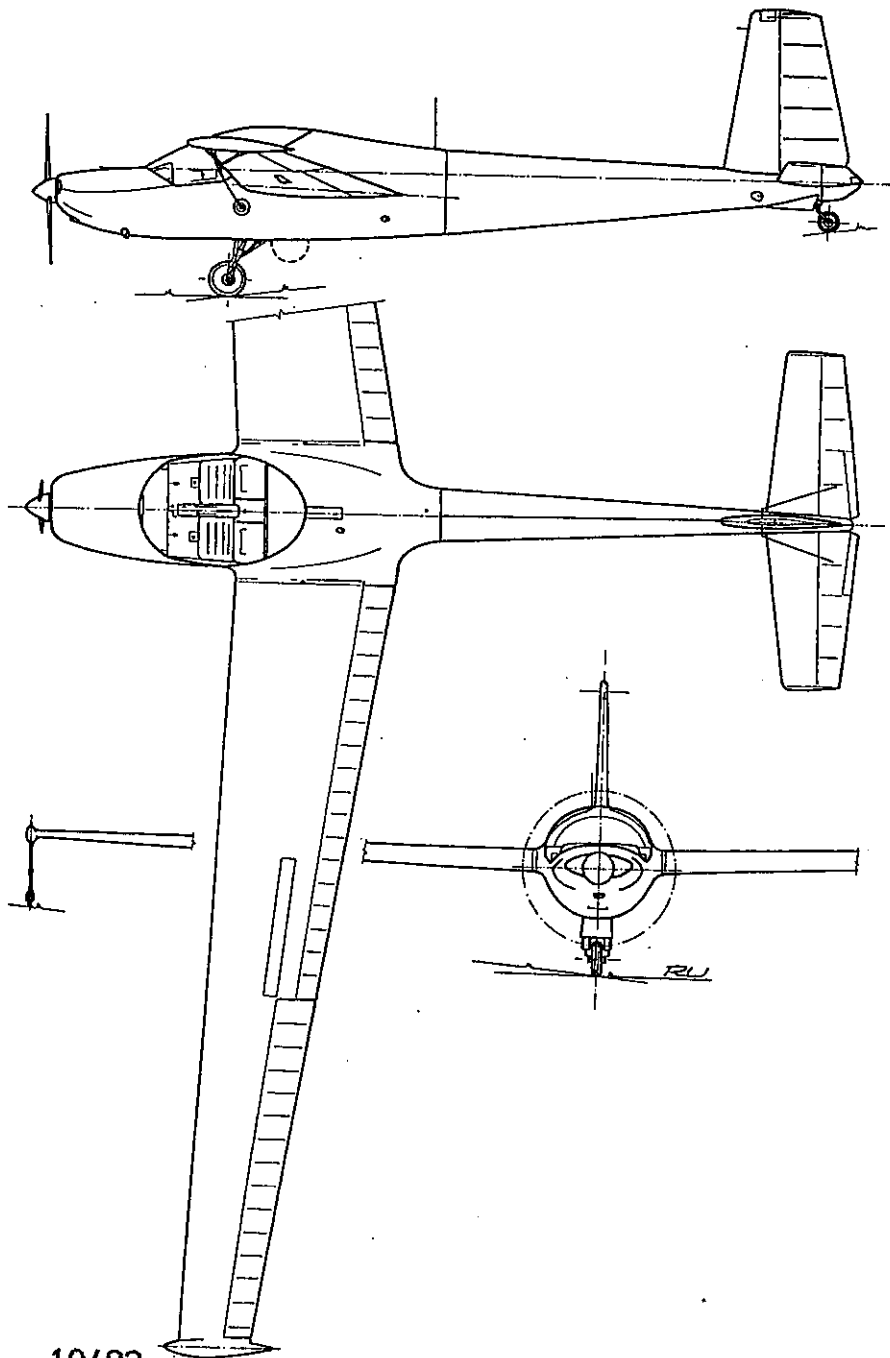
Weight of empty sailplane with standard equipment 1102 lbs, 500 kg(±3%)

Tyre inflation:

main landing g. 29+7.5 lbf/in<sup>2</sup>, 200+50 kPa  
tail landing g. 17.5+3 lbf/in<sup>2</sup>, 120+20 kPa

Technical data of power plant see in 2.4..

1.5. Three view drawing



## 2. LIMITATIONS

### 2.1. Introduction

This section includes operating limitations and instrument markings necessary for safe operation of powered sailplane and its engine, standard systems and equipment. The limitations included in this section and in section 9. have been approved by CAI.

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## 2.2. Airspeeds

Airspeed	IAS kts	IAS km/h	Remarks
VNE Never exceed speed	110	205	Do not exceed this speed in any operation
VRA Rough air speed	86	160	Exceed this speed only in smooth air and then only with caution.
VA Manoeuvring speed	86	160	Do not make full or abrupt control movement above this speed.
VFE Max. flap ext. speed	57	105	Do not exceed this speed with the flaps extended.
VLO Max. land. gear oper. speed	76	140	Do not extend or retract the landing gear above this speed.
Max. speed for engine shutdown	54	100	Do not exceed this speed during engine shutdown in flight.
Max. taxiing speed	8	15	Do not exceed this speed during taxiing

## 2.3. Airspeed indicator markings

Marking	Range or value kts IAS	Range or value IAS km/h	Significance
White arc	35-57	65-105	Positive Flap Operating Range
Green arc	41-86	75-160	Normal Operating Range
Yellow arc	86-110	160-205	Manoeuvres must be conducted with caution and only in smooth air
Red line	110	205	Never exceed speed $V_{NE}$
Blue line	54	100	Best rate-of-climb speed
Yellow triangle	54	100	Approach speed

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## 2.4. Power plant

Propeller manufacturer:  
MT-PROPELLER ENTWICKLUNG GmbH&CO.KG  
Propeller model: MTV-1-A/L 160-03  
Weight including spinner: cca 10,6 kg  
23,4 lbs  
Maximum propeller speed: 2900 RPM  
Propeller diameter: 62.99 in , 1.6 m

Engine manufacturer: LIMBACH  
Engine model: L 2000 E01  
Maximum power:  
Take-off: 50,5kW [70HP] at 2900 RPM  
Continuous: 50,5kW [70HP] at 2900 RPM

Maximum RPM:  
Permitted: 2900 RPM  
Continuous: 2900 RPM  
Idling run: 700 RPM

Maximum cyl. head temperature: 250 °C

Oil temperature:  
maximum: 120 °C  
minimum: 50 °C  
optimum: 80 °C

Oil pressure:  
maximum: 4 bar  
minimum: at 2500 RPM min. 1 bar



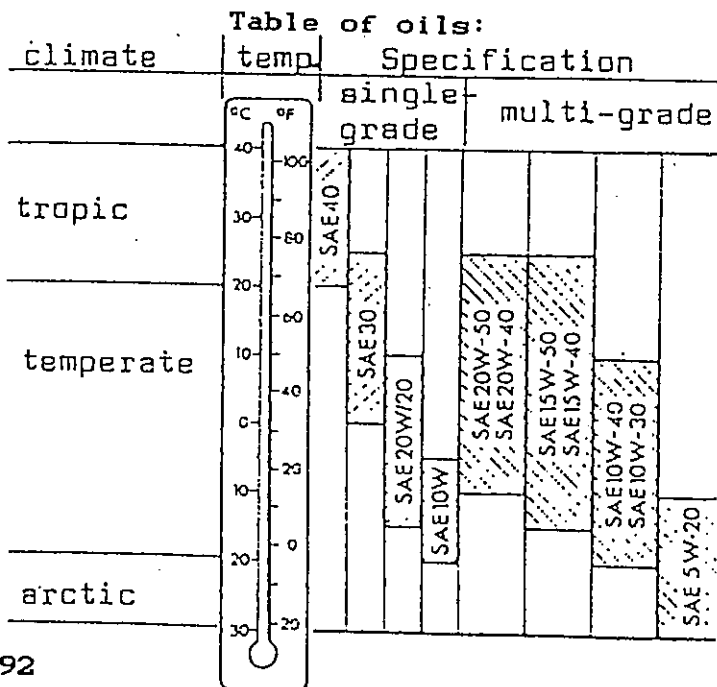
2.5. Fuel and lubricants

Fuel: AVGAS 100LL or leaded car fuel SUPER grade according to DIN 51600 at least 96 OCT (RON).

Fuel tank capacity: 50 l  
 13.2 gals U.S. 11galsUK  
 Unusable fuel : 0.15 l  
 0,04 gals U.S.

Oil: Do not use non-detergent or detergent aviation oil !  
 Use oil only, which is standard oil for car engines and marked by "SE" according to the API-system.

Capacity of oil : (marks on dip-stick are valid with level wings)  
 0,66 gals U.S. (min. 0,396 gals U.S.)  
 2.5 l (min. 1.5 l)



## 2.6. Power plant instrument markings

Instrument	Red Arc	Green Arc Norm. Operating	Yellow Arc Caution Range	Red Line Maximum Limit
Tachometer	-	700-2900 RPM	-	2900 RPM
Oil Temperature	-	50-120 °C	-	50 and 120 °C
Oil Pressure	-	1-4 bar	-	1 and 4 bar
Cyl. head Temperature	-	-	-	250 °C
Manifold press.gauge	-	15-24 inchHg	-	30 inchHg
Fuel quant. Indicator	1-81	-	-	-

Note : The fuel quantity within the 13.2 to 7.9 USgals ( 11 to 6.6 UKgals, 50 to 30 litre) range is indicated by one position on the instrument scale. The minimum fuel quantity represents a fuel reserve (2.11 USgals, 1.76 UKgals, 8 litre) for 30 min. flight at a cruise power and is indicate by illumination of the pilot lamp inside the instrument.

2.7. Mass and position of centre of gravity  
 Maximum take-off mass 1587 lbs 720 kg  
 Maximum landing mass 1587 lbs 720 kg  
 Range of C.G. in flight: 24-38.5 % of MAC  
 If the weights limits of weights of fuel, crew, baggage and maximum take-off mass are met so the centre of gravity is in the approved range.

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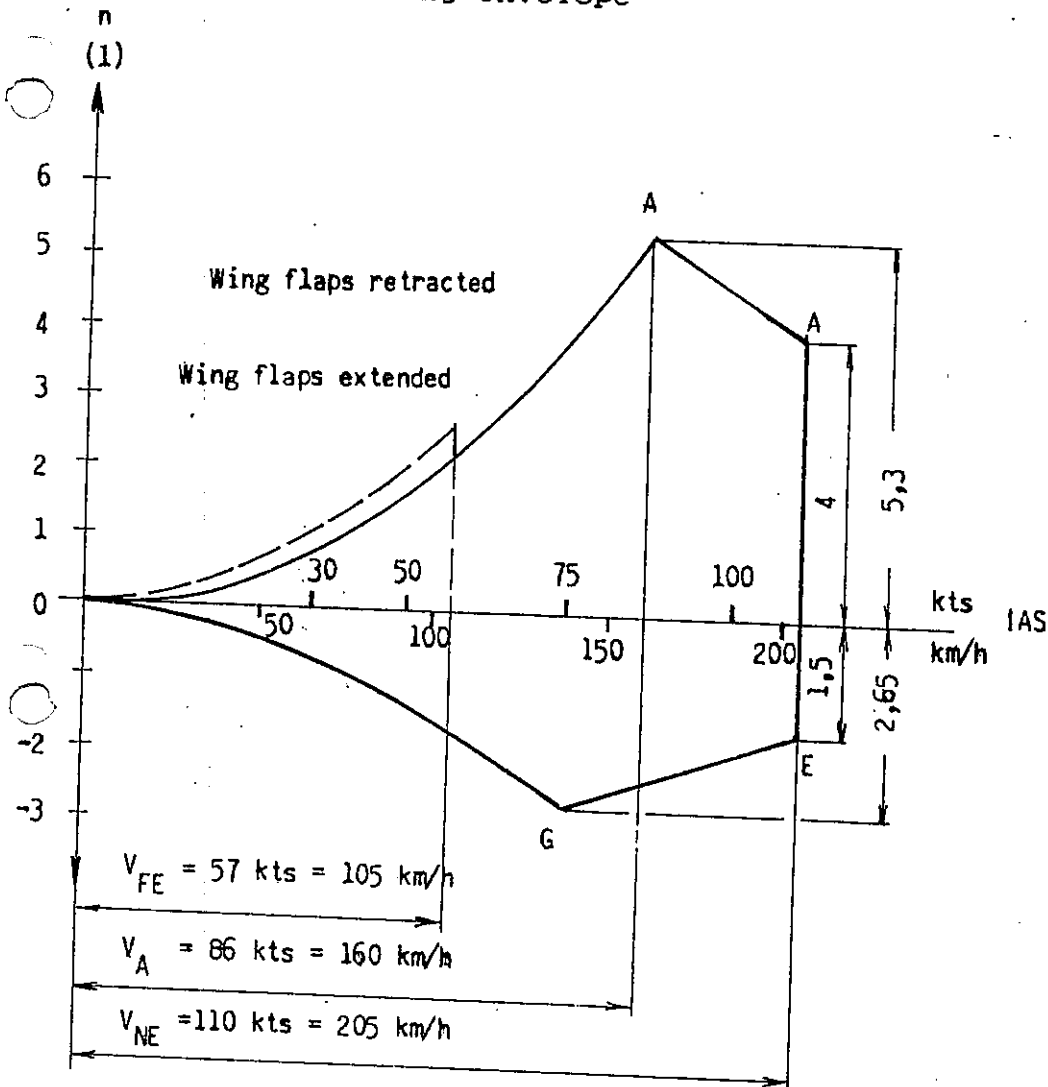
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### 2.8. Approved manoeuvres

This sailplane is certified in UTILITY category.

Approved manoeuvres are: sideslips, steep turns, spins, stalls, steep stalls, lazy eights.

### 2.9. Manoeuvring envelope



## 2.10. Crew and baggage

Minimum mass of crew	121 lbs, 55 kg
Maximum mass of crew	441 lbs, 200 kg
Maximum mass of baggage	44 lbs, 20 kg

## 2.11. Kinds of operation

Day VFR flights only. IFR, night and flights in icing conditions are PROHIBITED.

## 2.12. Minimum equipment

- Airspeed indicator
- Altimeter
- Magnetic compass
- Tachometer with elapsed time indicator
- Fuel quantity indicator
- Oil temperature indicator
- Oil pressure indicator
- Cylinder head temperature indicator
- Manifold pressure gauge
- Indicator of nitrogen pressure in wing main spar
- 2 sets of safety harness
- variometer
- Airspeed indicator (KNOTS)

## 2.13. Taxiing limitation

WING FLAPS MUST BE UP WHILE TAXIING.

## 2.14. Aerotow and winch launching

NOTE : The aircraft is not approved for aerotow or winch launching.

## 2.15. Pilot seated position

The pilot must have adequate reach to operate the landing gear handle.

### WARNING !

The forces required to lock the undercarriage in the up position and to release it from this position are high. Additional seat back cushions may be required to ensure that the pilot is seated far enough forward to apply the necessary forces.

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## 2.16. Placards in cockpit

In the cockpit as well as the placards marking controls and their position are these placards on instrument panel:

AIRSPEED km/h IAS	
205 Never Exceed	160 Manoeuvre
105 Wing Flaps Ext.	160 Rough Air
140 Land. Gear Operation	

or

AIRSPEED kts IAS	
110 Never Exceed	86 Manoeuvre
57 Wing Flaps Ext.	86 Rough Air
76 Land. Gear Operation	

APPROVED MANOEUVRES AND RECOMENDED ENTERING SPEEDS km/h IAS			
SPIN	70	CHANDELLE	190
LAZY EIGHT	120	STEEP TURN	120

or

APPROVED MANOEUVRES AND RECOMENDED ENTERING SPEEDS kts IAS			
SPIN	38	CHANDELLE	103
LAZY EIGHT	65	STEEP TURN	65

LOAD AND MASS	
MAX. TAKE-OFF MASS	720kg
EMPTY MASS	...kg
USEFULL LOAD	...kg
MAX. WEIGHT OF CREW	55-200kg

or

LOAD AND MASS	
MAX. TAKE-OFF MASS	1587 lbs
EMPTY MASS	.... lbs
USEFULL LOAD	.... lbs
MAX. WEIGHT OF CREW	121-441lbs

ENGINE SPEED AND POWER		
Max. Permitted	2900	RPM
Max. Continuous	2900	RPM
Max. Manifold Pressure	30	inchHg
Cruise Engine Speed	2500	RPM
Cruise Manifold Pressure	22-24	inchHg

Unusable quantity of fuel	0.7 litre
---------------------------	-----------

In baggage compartment shall be placards:

BAGGAGE MAX. 44 lbs
---------------------------

BAGGAGE MAX. 20 kg
--------------------------

FASTEN HEAVY ITEMS WITH STRAPS ! ONLY SOFT ARTICLES MAY BE LEFT UNFASTENED !
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### 3. EMERGENCY PROCEDURES

#### 3.1. Introduction

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

#### 3.2. Bailing out

1. Direction - uninhabited area
2. Trim - tail heavy
3. Ignition - off
4. Main switch - off
5. Fuel cock - shut off
6. Canopy lock - open
7. Canopy - push out
8. Safety harness - release
9. Bail out

NOTE : In an emergency, the procedure may be curtailed to steps 6. through 9..

#### 3.3. Stall recovery

##### 3.3.1. Stall recovery with the engine off

Push the control stick forward. After stall recovery establish a gliding attitude.

##### 3.3.2. Stall recovery with the engine running

Move the control stick forward and at the same time increase the power of the engine to the maximum.

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### 3.4. Spin recovery

To recover from a spin :

- reduce power to idle and at the same time apply full rudder opposite the direction of the spin

- retract the dive brakes (if extended) and ease the control column forward until the spinning stops

- centralize the controls, level the wings and ease out of the ensuing dive.

NOTE : During spin recovery the airspeed will probably not exceed 92 knots (170 km/hr); however, if necessary the dive brakes may be used after the spinning stops to avoid high airspeed.

### 3.5. Recovery from spiral dive

If the engine is running reduce the power to idle. Apply opposite ailerons and rudder to transition to straight flight. Ease out of the dive.

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### 3.6. Engine failure

#### 3.6.1. Engine failure during take-off

1. Speed - 54 kts (100 km/h)
2. Area for landing- prefer runway direction
3. Next procedure see in 3.8. Off airfield landing

#### 3.6.2. Engine failure or fail to start of engine in flight

1. Altitude check - 1000 ft (300 m) above ground level choose emergency landing area  
- 650 ft (200 m) above ground level no further attempts to start engine
2. Next procedure see in 3.8. Off airfield landing

### 3.7. Fire

1. Heating control - shut off
2. Fuel cock - shut off
3. Throttle - open
4. Main switch - off
5. Ignition - off (after engine stops)
6. Speed - 60 kts (110 km/h)
7. For extinguishing of fire it is possible to use the change of left and right side slip and manipulation of the cooling flap.
8. Off airfield landing see in 3.8.

**WARNING!** Do not restart engine after fire has been extinguished.

### 3.8. Off-Airfield landing

1. Wind - Note:  
direction and speed
2. Landing area - choose
3. Fuel cock - shut off
4. Ignition - off
5. Propeller - horizontal position  
using starter
6. Wing flaps - as required
7. Air brakes - as required
8. Landing gear - as required
9. Safety harness - tighten
10. Radio - transmit emergency call
11. Main switch - off (before landing)

**WARNING !** Landing on rough or wet ground should be made on retracted landing gear. Propeller must be in the horizontal position (use the starter). If possible use the radio to report the place of landing.

### 3.9. Generator failure

Deflection of pointer of the ammeter to positive values indicates recharging of the battery and deflection of the pointer to negative values indicates marks discharging of the battery. Discharging of the battery may mean failure of generator. In this case SWITCH OFF GENERATOR !

### 3.10. Propeller control failure

If there is an abnormal RPM decrease, or if RPM surging occurs - immediately pull the propeller control unit circuit breaker (located left and above the propeller controls).

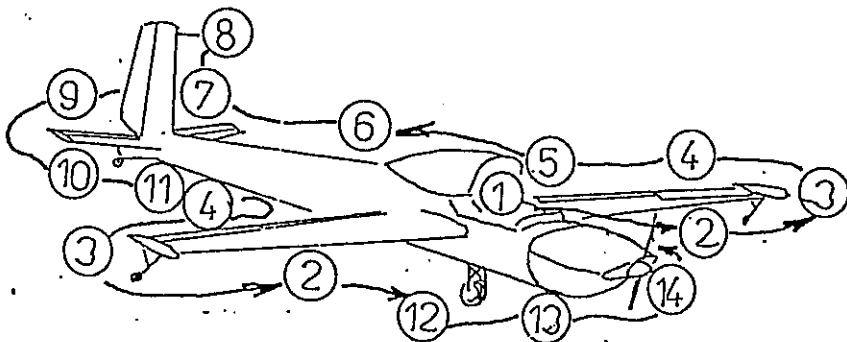
**CAUTION** : This deactivates the propeller pitch change mechanism and the propeller will stay in this position. The flight should be terminated as soon as practical. Aircraft performance will be degraded, poor acceleration (balked landing) should be anticipated and with high IAS propeller overspeed is possible.

#### 4. NORMAL PROCEDURES

##### 4.1. Introduction

Section 4. provides checklist and amplified procedures for conduct of normal operation. Normal procedures associated with optional systems can be found in Section 9.

##### 4.2. Preflight inspection



- |  |   |
|--|---|
| <p>1. Cockpit<br/>         battery -min. 10 V<br/>         ignition -off<br/>         main switch -off<br/>         landing gear-locked<br/>         safety harness condition<br/>         headset condition<br/>         nitrogen pressure check<br/>         free objects-none<br/>         canopy glass-clean</p> | <p>2. Wing<br/>         condition of leading<br/>         edge, condition of<br/>         transition tapes<br/>         wing-fuselage<br/>         condition of wing<br/>         surface</p>                               |
| <p>3. Wing tip landing gear<br/>         condition of control,<br/>         wing tip, spring and<br/>         wheel</p>  | <p>4. Aileron<br/>         condition of cover,<br/>         play and free<br/>         movement</p>   |
| <p>6. Laminated fairings<br/>         condition and clamping</p>   | <p>5. Wing flap<br/>         condition, clamping<br/>         and play</p>  |
| <p>8. Stabilizer and elevator<br/>         condition, clamping,<br/>         free movement and play</p>  | <p>7. Fin and rudder<br/>         condition of surface<br/>         and clamping, free<br/>         movement, play,<br/>         condition and<br/>         direction of Pitot<br/>         tube and VOR aerial</p>         |
| <p>9. Tail wheel unit<br/>         Condition and function<br/>         of shock absorber,<br/>         control system, tire<br/>         and tyre pressure</p>   | <p>10. Fuselage rear section<br/>         condition of cover,<br/>         attachment front-to-<br/>         rear, condition of<br/>         static pressure</p>  |
| <p>11. Main landing gear<br/>         Condition and<br/>         pressure of tire,<br/>         deflection of shock<br/>         absorber</p>  | <p>12. Engine<br/>         condition of cowling<br/>         engine support,<br/>         exhaust manifold<br/>         tightness,<br/>         oil and fuel<br/>         quantity and<br/>         contamination check</p> |
| <p>13. Propeller<br/>         inspection of blades,<br/>         hub, spinner,<br/>         condition of brush<br/>         blocks</p>   |   |

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#### 4.3. Before entering cockpit

1. Surface of glider-check, inspection panels locked
2. Cockpit - free objects
3. Battery - voltage min. 10 V
4. Ignition - off
5. Main switch - off
6. Landing gear - locked
7. Nitrogen pressure-indicator  
0,25-0,30 MPa

#### 4.4. Normal procedures and recommended speeds

##### 4.4.1. After entering cockpit

1. Rudder control - adjustment, free movement
2. Control stick - free movement
3. Trim - tail heavy
4. Wing flaps - function check retracted
5. Airbrakes - function check retracted
6. Main switch - on
7. Circuit breakers- on: accumulator, generator, COM-NAV, instruments, propeller
8. Fuel quantity - check
9. Instruments - indication check, adjustment
10. Wheel brake - function check
11. Safety harness - fasten, tighten
12. Cockpit - closed, locked

## 4.4.2.Engine starting

- |                 |  |
|-----------------|--|
| 1. Radios/NAV   | - off  |
| 2. Fuel cock    | - open   |
| 3. Ignition     | - off  |
| 4. Throttle     | - idle   |
| 5. Choke        | - as necessary   |
| 6. Cooling      | - as necessary   |
| 7. Engine       | - turn by hand   |
| 8. Propeller    | - mode "Start", wait,<br>after illumination of<br>green light change<br>over to mode "AUTO",<br>area clear |
| 8. Ignition     | - on   |
| 9. Brake        | - on   |
| 10.Start        | - push starter button  |
| 11.Engine speed | - 1000 RPM   |
| 12.Oil pressure | - within 10s min. 1 bar<br>max. 4 bar  |

CAUTION : Use the choke at temperature below 10 °C during starting and warm up.

## 4.4.3.Engine warm up

Initially warm up the engine at 1000 RPM, until the cylinder heads are at a temperature of 100°C. Increase engine to 2000 RPM until operational limits are reached.



## 4.4.4.Engine check

1. Operational min.- cyl. head temp.120 °C  
limits oil temperature 50 °C  
oil pressure 1 bar at  
2500 RPM
2. Control stick - full aft
3. Brake - wheel chocked
4. Cooling flap - open
5. Propeller - mode "AUTO",  
regulator set to  
"2900RPM", check the  
illumination of the  
green lamp
6. Full throttle - 2900+20 RPM
7. Acceleration - from idling run to  
deceleration full power  
within 2-3sec
8. Propeller check - mode "AUTO", full  
throttle, regulation  
adjust from 2900 RPM  
to 2100 RPM, check the  
reaction of propeller
9. Check of propeller feathering position-  
at 1500 RPM adjust  
to mode "FEATHER",  
after decreasing  
about 300RPM adjust  
mode "AUTO"
10. Idle run - 700+50 RPM  
cool down
11. Chocks - remove

CAUTION: Engine check shall be performed with the glider heading upwind and shall not be performed on loose terrain.

NOTE: Make function check of the RADIOS/NAV systems during the engine check.

#### 4.4.5. Taxiing

It is recommended that the aircraft not be taxied at speeds greater than 8 kts (15km/h). The outriggers are not designed for prolonged or fast taxiing particularly over rough surfaces. When possible taxi with the wings level.

If possible the inside wing outrigger should be on the ground while turning.

Wing flaps must be up while taxiing.

#### 4.4.6. Before take-off

1. Flight controls - free movement
2. Trim - neutral position
4. Wing flaps - extended about 1/3-  
Take-off position
5. Airbrakes - retracted, locked
6. Main switch - on
7. Choke - shut
8. Cooling - flap open
9. Fuel - check quantity
10. Instruments - check indication
11. Propeller - "AUTO", "2900 RPM"  
check the  
illumination of the  
green lamp
12. Safety harness - check locked
13. Canopy - closed, locked

**CAUTION - USE FLAPS FOR T/O AND LANDING**  
: The forces required to operate the flaps are high, particularly to select the Flap FULL DOWN position. The pilot must be properly positioned in the seat (fore and aft) to ensure adequate reach and leverage to operate the flaps. The use of flaps for take-off and landing will result in shorter ground rolling distances but the aircraft can be safely operated with the flaps up.

For T-0 use of 1/3 flap is recommended.

For landing the flaps should be locked full down or full up (not left in an intermediate position)

#### 4.4.7. Take-off

Gradually increasing power set the glider into motion. At a speed of approx. 10 kts (20km/h) level the wing. Then, gently push the glider to roll on the main landing gear wheel. At a speed above 38 kts (70 km/h) the glider unsticks and accelerates to the climb safety speed which is 43 kts (80 km/h). At a height above 20 ft (5m) retract the landing gear.

**WARNING !** The take-off is PROHIBITED, if:

- the engine run is unsteady
- the engine instruments values are beyond operational limits
- the pilot lamp on the fuel quantity indicator illuminates
- the engine choke is open

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## 4.4.8. After take-off

1. Airspeed - 54 knots (100 km/h)
2. Propeller - "AUTO", "2900RPM"
3. Throttle - full
4. Landing gear - retracted
5. Wing flaps - retracted as required
6. Trim - adjust
7. Instruments - indicated values within limits

CAUTION : If the temperatures of cyl. head or oil increases above operation limits increase the airspeed.

Airspeed of max. rate of climb - 54 kts (100km/h).

CAUTION : During take-off and inflight supervise RPM regularly!

## 4.4.9. Glide

1. Engine cooling down - idle run to less than 120 °C cylinder head temperature
2. Ignition - off
3. Generator - off !!!
4. Cooling flap - shut
5. Propeller - set feather position, mode "SEGEL"

CAUTION : In the glide switch off the generator and save electrical power!

CAUTION : The maximum speed for shutting down the engine in flight is 55 kts (100 km/h)!

## 4.4.10. In flight engine starting

1. Propeller - mode "START", after illumination of pilot lamp of low angle of propeller set mode "AUTO"
2. Fuel cock - open
3. Choke - as necessary
4. Ignition - on
5. Starting - push starter button
6. Engine speed - 1000 RPM
7. Generator - on
8. Cooling flap - as necessary
9. Warm up - acc. to 4.7.

WARNING ! Change of propeller blades angle from feather position to "START" position needs about 80 sec. of time and loss of altitude is about 200m. For this reason start the change of propeller setting at an altitude sufficient for propeller setting as well as for engine warm-up.

CAUTION : After a longer period of soaring in special climatic conditions, the slip-rings may have been covered with ice. In such a case, there is no power transfer and the problem can be corrected by turning the propeller with the starter until the brushes have made contact again.

## 4.4.11. Cruising regimes

Regimes in level flight see in § 5.2.6. Consumption, range and endurance.

## 4.4.12. Before landing

- |                   |                           |
|-------------------|---------------------------|
| 1. Fuel           | - check quantity          |
| 2. Cooling        | - as necessary            |
| 3. Landing gear   | - extended, locked        |
| 4. Wing flaps     | - retracted               |
| 5. Air brakes     | - retracted               |
| 6. Safety harness | - tightened               |
| 7. Brake          | - check function          |
| 8. Trim           | - adjust                  |
| 9. Circuit check  | - landing T and RWY space |
|                   | - base leg space          |

## 4.4.13. On base leg

- |               |                                       |
|---------------|---------------------------------------|
| 1. Airspeed   | - 54 knots (100 km/h)                 |
| 2. Wing flaps | - as required                         |
| 3. Trim       | - adjust                              |
| 4. Propeller  | - mode "AUTO",<br>regulation 2900 RPM |
| 5. Throttle   | - as necessary                        |

## 4.4.14. On long final

- |                 |  |
|-----------------|--|
| 1. Airspeed     | - 54 knots (100 km/h)  |
| 2. Air brakes   | - extended as required   |
| 3. Trim         | - adjust   |
| 4. Landing gear | - check extended and<br>locked by counter-<br>movement of control<br>lever |
| 5. Throttle     | - as required  |

#### 4.4.15. Landing

Adjust the glide angle by extending the air brakes. At their full extension in landing configuration the glide ratio is 1:7. In the flare out, the glider decelerates slowly until it touches down, at approx. 38 knots (70 km/h). During the landing run the glider touches the ground with the tail wheel unit without pulling of elevator control. Towards the end of landing run keep the elevator control pulled as necessary. As soon as the speed drops approx. to 15 knots (30 km/h) bank the glider to the selected side and carry out further ground movement on the out-trigger.

#### 4.4.16. After landing

1. Engine - as necessary for taxiing
2. Cooling - as necessary
3. Wing flaps - retracted, locked
4. Air brakes - retracted, locked
5. Trim - tail heavy

#### 4.4.17. Stopping of the engine

1. Radionavigation - off  
instruments
2. Ignition - off  
After stopping of the engine
3. Circuit breakers- off  
and switches
4. Fuel cock - off

## 4.4.18. Special NOTE and WARNING !

NOTE : With extended air brakes the audio signal in headset indicates retracted landing gear (if the transceiver is on).

WARNING ! Avoid large abrupt throttle movements to avoid overspeeding the engine.

## 4.4.19. Before stalling and spinning

1. Trim - middle position
2. Wing flaps - retracted, locked
3. Air brakes - retracted, locked
4. Canopy - locked, windows shut
5. Flight controls - free movement
6. Safety harness - tightened
7. Loose objects - check cockpit
8. Altitude check - safety height above ground for intended activity
9. Survey turn - surrounding space
10. Throttle - idle or engine stopped



#### 4.4.20. Level stalls

By pulling the control stick gently back bring the glider to an attitude slightly above the horizon. At a speed of 35 knots (65 km/h) stall warning buffet appears, and after reaching 32 knots (60 km/h) the stall will develop with a spontaneous drop of nose below the horizon.

#### 4.4.21. Steep stalls

If the control stick is pulled so as to produce an angle of attitude greater than 30 °, a steep stall develops without pilot intervention at the same speeds as in the case of a level stall.

#### 4.4.22. Turning flight stall

When the control stick is pulled progressively in a turn, the glider - at a speed of approx. 38 knots (70 km/h), after a preceding stall warning buffet - falls spontaneously into a steep spiral.

## 4.4:23. Spinning

Within the operational C.G. position range, the glider spins steeply without the least tendency of transition to a flat spin. The glider is introduced into the spin by pulling the control stick gently aft so as to position the glider slightly above the horizon. When the speed drops to 38kts (70 km/h) - without changing the attitude in relation to the horizon - the rudder is applied fully in the direction of the intended spin. As soon as the glider turns a bit round and banks by 15 degrees pull the control stick to the stop. To recover from a spin:

- reduce power to idle and at the same time apply full rudder opposite the direction of the spin.
- retract the dive brakes (if extended) and ease the control column forward until the spinning stops.
- centralize the controls, level the wings and ease out of the ensuing dive.

NOTE : During spin recovery the airspeed will probably not exceed 92 knots (170 km/hr); however, if necessary the dive brakes may be used after the spinning stops to avoid high airspeed.

During spin recovery spin overturn would not exceed 20°.

CAUTION: The loss of the altitude in one spin turn is 170 to 230ft (50 to 70m) when flying solo, and 260 to 300ft (80 to 90m) when flying with maximum take-off mass.

CAUTION: Intentional spins are to be entered with the engine atopped or at the idle.

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#### 4.4.24. Sideslips

In order to achieve a greater steepness of descent with fully extended wing flaps, air brakes and landing gear at an airspeed of 43-65 kts (80-120 km/h), carry out the sideslip by applying the rudder and the aileron control in opposite directions. With recommended airspeed 43 kts (80 km/h) is achieved maximum steepness of descent. Due to the change of fuselage shape the effectiveness of the rudder is reduced. During the sideslip the airspeed indicator reads wrong value. Reading is of about 10-15 knots (20-30 km/h) lower than real airspeed.

## 5. PERFORMANCES

### 5.1. General

Section 5. provides approved data for air-speed calibration, stall speeds and take-off performance and non-approved further information.

The data stated here has been computed from actual flight tests with the sailplane and engine in good condition and using average piloting techniques. The data stated here is valid in still air under ISA conditions, at maximum take-off weight and with 13.2 USgals (11 UKgals ; 50 litre) of fuel, if it is not state otherwise.

## 5.2. Approved data

## 5.2.1. Airspeed indicator system calibration

IAS km/h	70	80	100	120	140	160	180	205
CAS km/h	76	86	107	128	148	168	187	213

IAS kts	40	50	60	70	80	90	100	110
CAS kts	43	54	64	74	84	94	104	114

## 5.2.2. Stalling speeds

Configuration		Stall warning IAS km/h	Stalling speed IAS km/h
Cruise	Idle run	65	55
	75% MCP	65	53
Landing	Idle run	67	50
	75% MCP	65	55
		IAS kts	IAS kts
Cruise	Idle run	35	30
	75% MCP	35	29
Landing	Idle run	36	27
	75% MCP	35	30

( MCP - maximum continuous power )

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## 5.2.3. Take-off

Length of take-off run (ft) for aerodrome altitude (ft) and ambient temperature (°C) (Grass runway.)

Temperature °C

m ISA	-15	0	+15	+25	+35
0ft	550	620	720	800	890
500ft	580	645	750	840	935
1000ft	610	675	785	875	980
1500ft	635	700	820	910	1020
2000ft	665	725	850	950	1065
2500ft	695	750	885	985	1110
3000ft	720	780	915	1020	1155
3500ft	750	805	950	1060	1110
4000ft	780	830	980	1095	1241

Length of take-off over 50-foot obstacle (ft) for aerodrome altitude (ft) and ambient temperature (°C). (Grass runway.)

Temperature °C

m ISA	-15	0	+15	+25	+35
0ft	1106	1240	1435	1600	1795
500ft	1155	1295	1500	1670	1880
1000ft	1205	1245	1560	1740	1965
1500ft	1255	1400	1625	1815	2050
2000ft	1305	1455	1688	1885	2135
2500ft	1355	1510	1750	1960	2220
3000ft	1406	1560	1815	2030	2300
3500ft	1455	1615	1880	2105	1390
4000ft	1505	1669	1945	2175	1470

## 5.2.4. Climbing

Max. climbing speed                    590 ft/min (3 m/s)  
at airspeed IAS                         54 knots (100 km/h)

## 5.2.5. Ceiling

Service ceiling                            13 120 ft  
(4000 m)

## 5.2.6. Consumption range and endurance

(Values are valid in level 1640 ft ISA.)

Airspeed		Manifold press. inchHg	Prop. speed RPM	Consumption		Endurance	Range NM
IAS	CAS			USgal /hour	USgal 100NM		
81	84	22	2500	2.27	2.69	5h 15min	443
84	87	24	2500	2.80	3.18	4h 10min	367
89	93	26	2700	3.73	2.22	3h	286
97	102	28	2900	4.49	4.95	2h 20min	243

(Values are valid in level 500m ISA.)

Airspeed		Manifold press. inchHg	Prop. speed RPM	Consumption		Endurance	Range km
IAS	CAS			l/h	l/100		
150	156	22	2500	8.6	5.5	5h 15min	820
155	161	24	2500	10.6	6.5	4h 10min	680
165	172	26	2700	14.1	8.1	3h	530
180	188	28	2900	17.0	9.1	2h 20min	450

Endurance and range values are given with  
30min navigation reserve.

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### 5.2.7. Maximum level speed

$V_{max}(IAS) = 101.5 \text{ kts (188 km/h)}$  in 0m ISA

## 5.3. Non-approved further information

### 5.3.1. Demonstrated crosswind performance

Take-off and landing is possible to perform safety up to crosswind velocity 7m/s (13.5 knots).

### 5.3.2. Noise data

Noise of sailplane L 13 SL in take-off under methodics of ICAO Annex 16 Chapter 10 ( LSL Kapitel X ) amount to value :

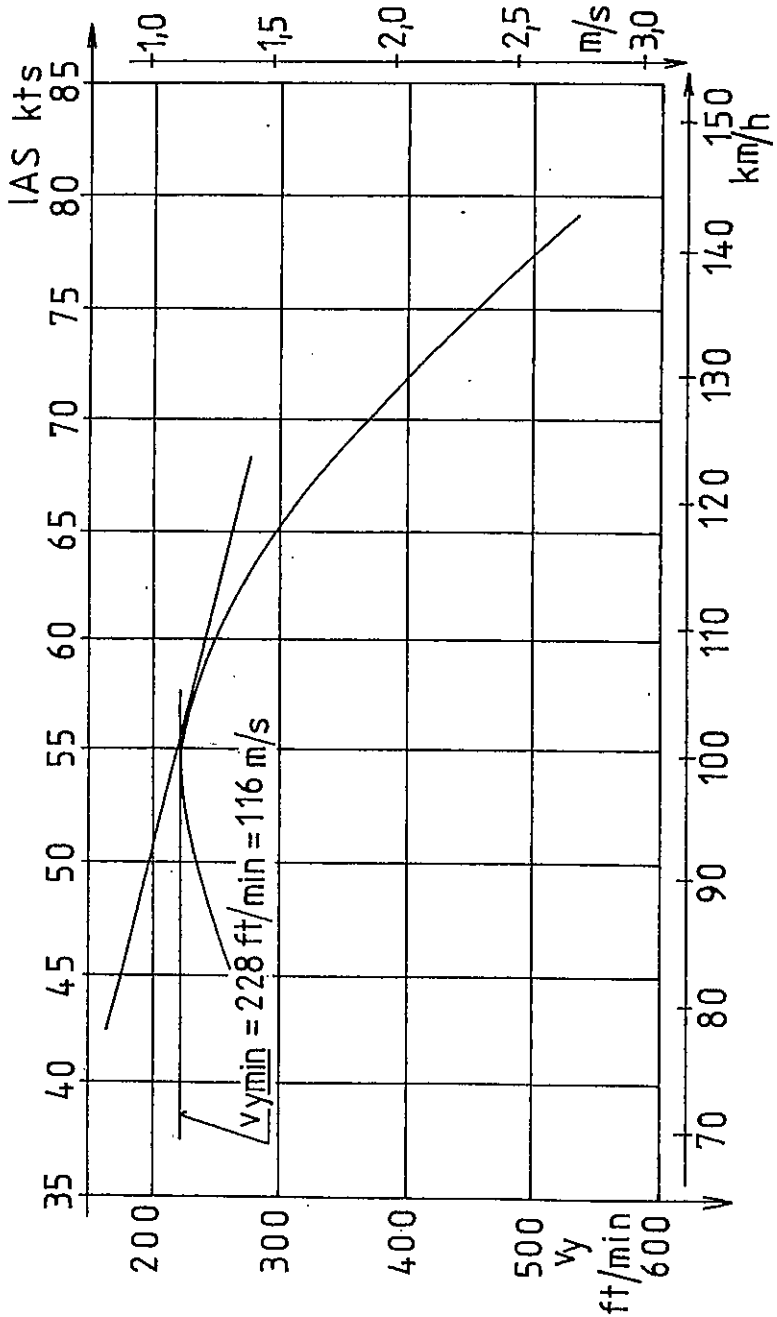
71.06 dB(A)

Noise of sailplane L 13 SL in level flight at a height of 300 m GND under methodics of LSL Kapitel VI ( ICAO Annex 16 Chapter 6 ) amount to value :

62.78 dB(A)



5.3.3. Flight polar



## 6. WEIGHT AND BALANCE

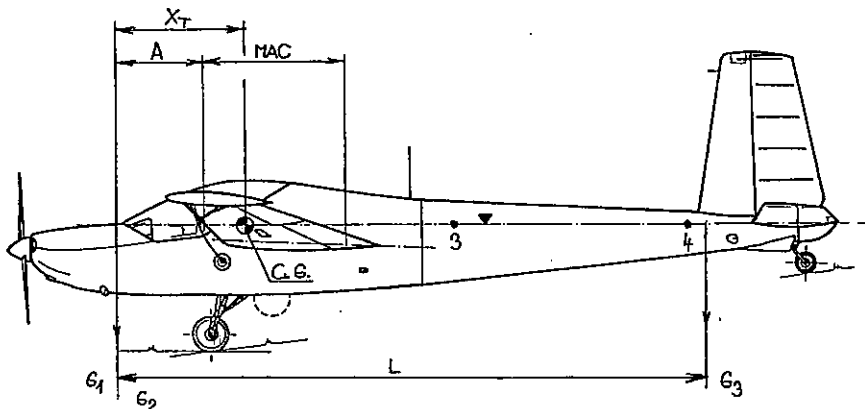
### 6.1. Introduction

This section includes weigh and balancing records.

### 6.2. Weighing of the sailplane

Empty weight is stated with full basic equipment - paint, battery, instrument, navigation equipment and maximum quantity of oil. The sailplane is without crew, parachutes, fuel and baggage. Weigh the sailplane after leveling of the sailplane to horizontal position under leveling points No. 3 and 4 and after calibration of the balance machine.

Weighing schema



$$A = 35 \frac{13}{16}'' \quad (910 \text{ mm})$$

$$MAC = 50 \frac{1}{4}'' \quad (1276.4 \text{ mm})$$

Weight	read off lbs (kg)	support lbs(kg)	clean lbs(kg)
G <sub>1</sub>			
G <sub>2</sub>			
G <sub>3</sub>			
Empty weight	G <sub>c</sub> =	lbs	G <sub>c</sub> = kg
Distance of supports	L =	in	L = mm
C.G. position	$X_T = \frac{G_3}{G_c} \cdot L;$	X <sub>T</sub> =	in mm
C.G. position in % (Distance in mm, weight in kg)		$X = \frac{X_T}{12.764} - 71.29$	
C.G. position in % (Distance in inch, weight in lbs)		$X = \frac{X_T}{50.25} - 71.29$	
X=	%SAT (33% +2,5%)		

If the position of centre of gravity is within stated range and the sailplane is not overloaded, it is not possible in every configuration to be out of permitted range of C.G. position in flight-24to38.5% of MAC (See 6.4. Permitted payload range.).

## 6.3. Weight and balance record

Date	Empty weight lbs, kg	C/G pos. in, mm	C/G pos. [%]	Approved	
				Date	Signed

## 6.4. Permitted payload range

If C.G. position of empty sailplane including all equipment and oil filling is within permitted range i.e. 30.5-35.5 % of MAC (51.14-53.66 inch, 1299-1363 mm, behind the firewall) it is guaranteed that in whatever configuration of changeable weights (crew, baggage, fuel) will be kept the permitted range of C.G. position in flight: 24-38.5 of MAC i.e. 47.87-55.15 inch, 1216-1401 mm behind the firewall. It is important to check take-off weight: 1587 lbs, 720 kg. If need be to determine the C.G. position, use following calculation.

	Weight lbs(kg)	Arm in	Arm m	Moment lbs.ft(kg.m)
Empty weight				
Crew		40.55	1,03	
Baggage		64.17	1,63	
Fuel		86.61	2,2	
Total				

NOTE : Density of fuel is of about  
3.76 lbs/gal., 0,76 kg/l.

Flight C.G. position :  
total moment

$$x_T = \frac{\text{total moment}}{\text{take-off weight}}$$

or in percent :

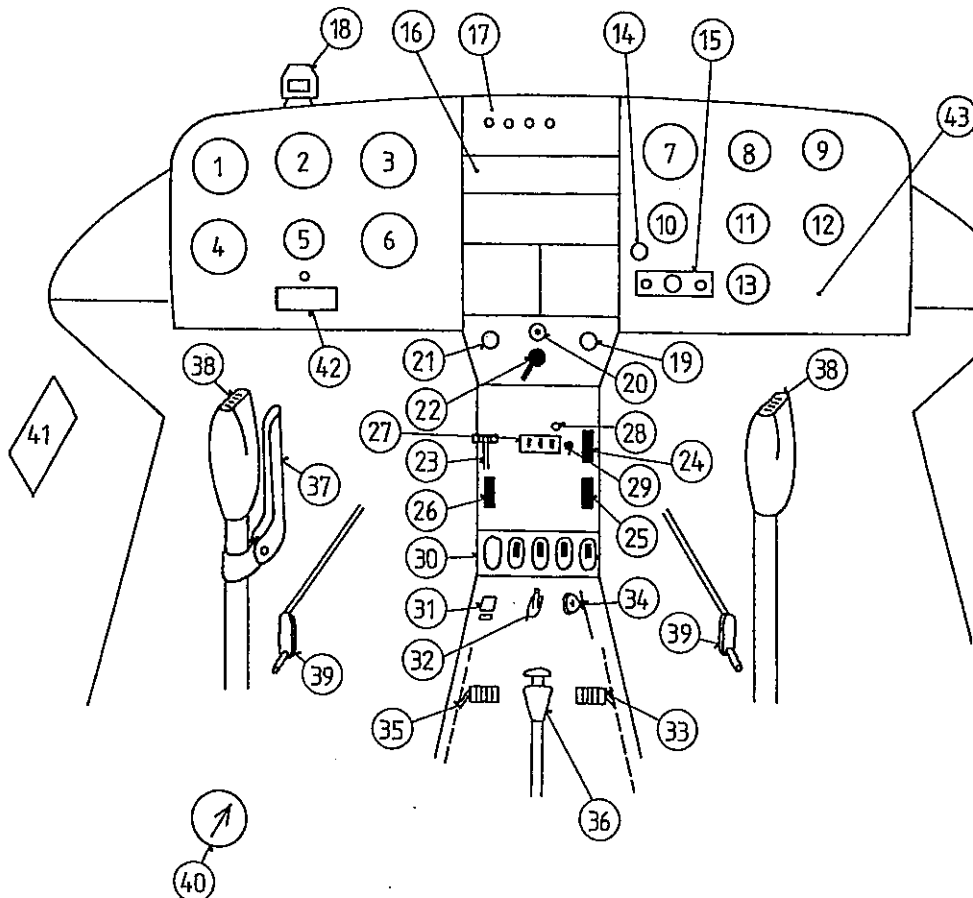
$x_T = \frac{X_T}{12.764} - 71.29$ Distance in mm.	$x_T = \frac{X_T}{50.25} - 71.29$ Distance in inch.
---	--

## 7. GENERAL SAILPLANE AND SYSTEMS DESCRIPTION

### 7.1. Introduction

Section 7. includes basis description and operation of the sailplane and its systems. Refer to Section 9. Supplements, for details of optional systems and equipment. Detail description see in L 13 SL VIVAT Technical Description, Operating and Maintenance Instructions

### 7.1. Cockpit layout

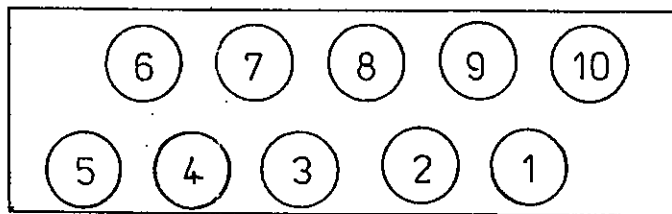


1. Airspeed indicator
2. Magnetic compass
3. Variometer (Aircraft clock)
4. Altimeter
5. Turn indicator with switch  
(Artificial horizon)
6. Variometer
7. Tachometer
8. Fuel gauge
9. V-A meter
10. Cylinder head temperature indicator
11. Oil pressure indicator
12. Oil temperature indicator
13. Manifold pressure gauge
14. Propeller control circuit breaker
15. Propeller control unit
16. Panel of RNAV instruments
17. Switches from left: intercom (or the  
switch intercom-loudspeaker), QDM-QDR,  
AUDIO, audio VOR-ADF
18. Unused (Compass)
19. Unused
20. Starter push button
21. Throttle
22. Fuel cock
23. Canopy lock
24. Heating control
25. Choke
26. Engine cooling flap
27. Switches from left: position lights,  
anticollision beacon,  
electrical fuel pump
28. Pilot lamp of electrical fuel pump
29. Push button - test of signalisation of  
retracted landing gear
30. Circuit breakers from left:  
battery, generator, instruments,  
COM-NAV
31. Ignition
32. Main switch
33. Air brakes control

34. Trim control
35. Wing flaps control
36. Landing gear control
37. Landing gear brake
38. Press to Talk (PTT) button
39. Pedal adjustment
40. Indicator of nitrogen pressure in wing main spar
41. Panel of fuses
42. Compass deviation plate
43. Limitation placards

Note: Position and number of switches in pos. 17. and 27. depend on applicated equipment.

Displacement of fuses:



Direction of flight

1. Oil pressure + fuel quantity	0,63 A
2. Turn ind. + oil temp. ind.	0,63 A
3. Signalling of the retracted landing gear	0,63 A
4. Electrical fuel pump	4,0 A
5. Position lights	6,3 A
6. Anticollision beacon	4,0 A
7. Tansceiver (COM)	x
8. VOR	x
9. ATC	x
10. ADF or altitude encoder of ATC	x

x - Fuses values depend on the model of radionavigation instruments.



## Fuses values :

Turn indicator		0,63 A
Artificial horizon		4,0 A
	<u>Becker</u>	<u>King</u>
Transceiver (COM)	3.15 A	10.0 A
VOR	1.00 A	2.00 A
ATC	2.00 A	3.15 A
ADF	2.50 A	-
ATC altitude encoder	2.00 A	
GPS Garmin	3.15 A	

If the indicators of VOR and ADF are used, the location of flight instruments is as follows:

1. Airspeed indicator
2. ADF or VOR indicator
3. VOR or ADF indicator
4. Altimeter
5. Turn indicator (artificial horizon)
6. Variometer
18. Magnetic compass

## 7.3. Seats and safety harness

Rudder control pedals on both pilot places are adjustable by using of the handle located on the floor in front of the control stick. The seats and the back-rests are not adjustable.

## 7.4. Baggage compartment

In the left-hand part of the baggage compartment there is the indicator of nitrogen pressure in the main spar flange. In the right-hand part is attached the portable fire extinguisher and in mounted flush box is placed the first-aid box basis airborne tools.

## 7.5. Power plant

The LIMBACH L2000E01 an ignition-type, four-stroke, air-cooled, flat four-cylinder engine, equipped with down-draught carburetter, ignition with one magneto, gear oil pump and diafragma fuel pump. MTV-1-A/L 160-03 is an electrically controlled variable pitch propeller. A constant speed of this propeller is controlled by electronical control unit located on instrument panel. There is one switch which set a mode of propeller - AUTO or FEATHER or START. (Feather position is marked in German: SEGEL). In the Start position is propeller on the lowest angle and this position is signalled by illumination of green diode. By setting knob are select intended speeds of propeller.

## 7.6. Electrical system

Electrical system is a single-wire type with negative connected to the airplane structure. Power supplies there are two : alternator (engine accessory) and battery 12 V 24 Ah located in engine space and attached on the firewall. The negative pole of the battery is connected with airframe by the isolation switch (relay) located on the firewall. The individual circuits are protected by the circuit breakers placed in the lower part of the middle dashboard panel. The individual sections are protected by the fusible cut-outs placed on the cockpit's left side panel. Detail description and wire scheme see in Technical Description, Operating and Maintenance Instructions L 13 SL VIVAT.

## 8. SAILPLANE HANDLING, CARE AND MAINTENANCE

### 8.1. Introduction

Section 8. contains basis manufacturer's recommended procedures for ground handling and servicing of the powered sailplane. It also identifies inspections and maintenance requirements which must be follow if the sailplane is to retain that new-plane performance and dependability.

### 8.2. Sailplane inspection periods

Periods of overall checks and contingent maintenance depends on the condition of the operation and on overall condition of the sailplane. Maintenance checks and periodic inspections must be accomplish at least in the following periods:

- a) after the first 25 flight hours
- b) after every 50 flight hours
- c) after every 100 flight hours
- d) after every 400 flight hours
- e) annual check carried out by the responsible airworthiness Authority

Details of the maintenance checks see in Technical description, operating and maintenance instructions L 13 SL VIVAT.

### 8.3. Sailplane alterations or repairs

It is essential that the manufacturer be contacted prior to any alterations on the sailplane to ensure that the airworthiness of the sailplane is not compromised. If the alteration affects mass it is necessary to weigh the sailplane and record in Section 6. §6.3. of this manual. Repairs of the sailplane are described in Technical Description, Operating and Maintenance Instructions L 13 SL VIVAT.

### 8.4. Ground handling/road transport

The towing is possible to make with a vehicle using special tow bar SW 13.916. Details see in Technical Description, Operating and Maintenance Instructions L 13 SL VIVAT.

Anchorage had to be carried out when the powered sailplane parks out of the hangar. It is necessary for the protection against the wind and gusts. When anchorage, locks the main landing gear wheel by blocks and moore the wings to the ground. Mooring eyes is possible to screw to the wings approximately in the middle of wing span. Details see in Technical Description, Operating and Maintenance Instructions L 13 SL VIVAT.

The transport on the road carries out on a special trailer after dismantling wings and swinging the horizontal tail surface upwards. Details see in Technical Description, Operating and Maintenance Instructions L 13 SL VIVAT.