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Effectivity: The L33 SÓLO Sailplane Flight Manual
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Reason: Minor changes.

Description: The Flight Manual holders shall replace old pages by the new ones enclosed to this bulletin - 0-1, 0-2, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 4-7, 4-8, 4-9, 4-11, 4-12, 5-3, 6-1, 6-2, 6-3, 6-4, 6-5 dated Oct 31/95.

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Nov. 23, 1995

Civil Aviation Inspectorate



SAILPLANE FLIGHT MANUAL

0.1 RECORD OF REVISIONS

Any revision or amendment of the present Manual will be issued in the form of Bulletins, approved by the Civil Aviation Inspectorate of the Czech Republic, supplement of which will contain new (revised) pages. User's duty is to make a note about revisions in the Record of revisions and to replace existing pages with revised and effective ones. Revised or amended parts of the text will be indicated by a vertical line in the left hand margin and the revision No. and the date will be shown on the bottom left hand of the page.

Rev. No.	Affected Section	Affected pages	Date of issue	Bulletin No.	Date of Bulletin approval	Date of insertion and signature
1	0, 2, 4, 5, 6	0-1, 0-2, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 4-7, 4-8, 4-9, 4-11, 4-12, 5-3, 6-1, 6-2, 6-3, 6-4, 6-5	Oct 31/95	L33/003a	Nov 15/95	



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0.2 LIST OF EFFECTIVE PAGES

Pages identified as "Appr." provide information required to be furnished by the Federal Aviation Regulations.

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2.1 INTRODUCTION

Section 2 includes operating limitations, instrument markings, and basic placards necessary for safe operation of the sailplane, its standard systems and standard equipment. The limitations in this section are FAA approved by the CAI, Czech Republic.

2.2 AIRSPEED

Speed		KIAS (km/h IAS)	Remarks
V _{NE}	Never exceed speed	134 (248)	Do not exceed this speed in any operation and do not use more than 1/3 of control deflection
V _{RA}	Rough air speed	85 (158)	Do not exceed this speed except in smooth air, and then only with caution. Examples of rough air are lee-wave rotor thunderclouds etc.
V _A	Manoeuvring speed	85 (158)	Do not make full or abrupt control movement above this speed, because under certain conditions the sailplane may be overstressed by full control movement
V _W	Maximum winch-launching speed	70 (130)	Do not exceed this speed during winch- or autotow-launching
V _T	Maximum aerotowing speed	85 (158)	Do not exceed this speed during aerotowing

Pay attention to the fact that with increasing altitude the true air speed (TAS) increases as the indicated airspeed (IAS) decreases. This fact does not interfere with the strength and load factor of the sailplane, though to protect from aeroelastic buffeting the following indicated airspeed (IAS) must not be exceeded.

V_{NE} airspeed limits above 13,780 ft Pressure Altitude are reduced as follows: * Altimeter setting at 29.92 in. Hg.

Pressure Altitude ft*	15 000	20 000	25 000	30 000	35 000
V _{NE} KIAS	133	131	129	127	125

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2.3 AIRSPEED INDICATOR MARKINGS

Marking	KIAS(km/h IAS) (value -range)	Significance
Green arc	46 ÷ 85 (85 ÷ 158)	Normal Operating Range. (Lower limit is maximum weight 1.1 vs ₁ at most forward c.g. Upper limit is rough air speed)
Yellow arc	85 ÷ 134 (158 ÷ 248)	Manoeuvres must be conducted with caution and only in smooth air.
Red line	134 (248)	Maximum speed for all operations
Yellow triangle	49 (90)	Minimum approach speed at maximum weight.

2.4 WEIGHT

Maximum take-off and landing weight 750 lb (340 kg)

Empty weight with standard equipment 463 lb (210 kg) ± 3%

Maximum weight of all non lifting parts 518 lb (235 kg)

Pilot's weight range 121 ÷ 243 lb (55 ÷ 110 kg)

It is necessary to use a secured removable cushion with ballast of 16 lb (7 kg) when flown by a pilot (including parachute) weighing less than 137 lb (62 kg)see section 7.8.

Maximum load in baggage compartment 44 lb (20 kg)

WARNING

SUM OF BALLAST WEIGHT, BAGGAGE WEIGHT AND PILOTS WEIGHT (INCLUDING PARACHUTE) MUST NOT EXCEED 287 lb (130 kg).

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NOTE

Installation of the front seat ballast is described in Section 7, paragraph 7.8 this Flight Manual.

2.5 CENTRE OF GRAVITY

Reference Datum: Levelling point No. 1- red marked rivet located on the bulkhead No. 1 see fig. 6 - 1.

Centre of gravity position

corresponding to empty weight with stand. equipm. $x_T = 69.5 \% \pm 1\%MAC$
i.e. 84.63 in ± 0.32 in
(2149.5 mm ± 8 mm)
behind the Datum

Centre of gravity position range

forward margin 21% i.e. 68.89 in (1750 mm) behind the Datum

rear margin 39% i.e. 74.73 in (1898 mm) behind the Datum

2.6 APPROVED MANOEUVRES

The sailplane is certified in the Utility Category.

The following manoeuvres are permitted (see Normal Procedures Sec.4)

Manoeuvre	Entry speed KIAS (km/h IAS)	Procedures
Chandelle	97 (180)	Section 4.6 item A
Steep turn	97 (180)	Section 4.6 item B
Lazy eight	97 (180)	Section 4.6 item C
Spin	38 (70)	Section 4.6 item D
Loop	92 (170)	Section 4.6 item E
Stall turn	92 (170)	Section 4.6 item F



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2.7 MANOEUVRING LOAD FACTORS

The following load factors must not be exceeded in manoeuvres.

- | At a speed of $V_A = 85$ KIAS (158 km/h IAS) $n = +5.3$
 $n = -2.65$
- | At a speed of $V_{NE} = 134$ KIAS (248 km/h IAS) $n = +4$
 $n = -1.5$

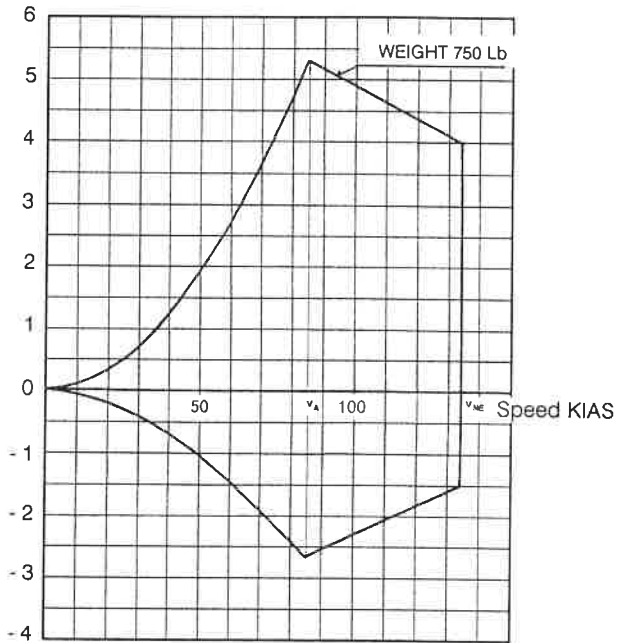


FIG. 2 - 1



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2.8 FLIGHT CREW

One pilot.

2.9 KINDS OF OPERATION

The sailplane is approved for Day VFR operations. Cloud-flying is permitted where operational regulations permit, and when the minimum required equipment is installed and operable. Operations in icing conditions are prohibited.

2.10 MINIMUM EQUIPMENT

Instruments and minimum equipment must be approved types.

A. VFR operations

- 1 Airspeed indicator with colour-marking according to sect. 2.3.
- 1 Altimeter
- 1 Four - point safety harness
- 1 Automatic or manual parachute and/or backrest
- 1 Magnetic direction indicator
- 1 Variometer (vertical speed indicator)

B. Cloud-flying

(added to minimum equipment as per para A)

- 1 Turn and bank indicator
- 1 VHF transceiver

Other recommended equipment for cloud-flying:

- 1 Attitude-gyro
- 1 clock
- 1 Accelerometer



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2.11 AEROTOW AND WINCH-LAUNCHING

A. Aerotow

The safety tow-hook TOST "G 88" type is used for aerotow. It is located in the lower fuselage part in front of landing gear wheel. The "E85" nose-hook may be installed, too.

- maximum strength of rope or weak-link is 1124 lb (5000 N)
- maximum permissible speed $V_T = 85$ KIAS (158 km/h IAS)
- the minimum rope length is 50 ft (15 m), recommended rope length is 98 - 131 ft (30 - 40 m).

B. Winch launching

A safety launching hook TOST "G 88" type is used for winch launching. It is located in the lower fuselage part in front of the landing gear wheel.

- maximum strength of rope or weak-link is 1124 lb (5000 N)
- maximum permissible speed $V_W = 70$ KIAS (130 km/h IAS)

WARNING

**NOSE HOOK MUST NOT BE USED FOR
WINCH LAUNCHING.**

2.12 OTHER LIMITATIONS

Maximum crosswind component (angle 90°) for take-off and landing: 8 kt (15 km/h).



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4.5 NORMAL PROCEDURES AND RECOMMENDED SPEEDS

4.5.1 Take-off and climb

A. Aerotow launching

Aerotow maximum speed $V_T = 85$ KIAS (158 km/h IAS)

Use launching hook attachment located in the centre of gravity, or the nose launching hook attachment if installed for aerotow. For take-off set the trim lever to take-off position (TO), hold the control stick in the neutral position. To keep rope in tension, use wheel brake smoothly to avoid tow-rope overriding. After unsticking the sailplane at a speed of ≈ 42 KIAS (78 km/h IAS), (as per weight) it is possible to trim the sailplane for climbing speed. When releasing tow-rope, pull the yellow handle of the tow-hook control several times to the stop. Perform next manoeuvre only after you are assured that the rope is released.

In take - off with a cross wind unstick the sailplane at a higher speed than normal and bank the wing into the wind direction at the moment of unsticking.

(cont.)

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B. Winch - launching

Maximum speed for winch-launch $V_w = 70$ KIAS (130 km/h IAS).

WARNING

WINCH - LAUNCHING BY THE NOSE HOOK IS PROHIBITED!.

Trim in neutral position (0). To keep rope in tension, use wheel brake smoothly to avoid tow-rope overriding. Unstick at a speed of about 42 KIAS (78 km/h IAS) with the control stick pushed almost fully forward in case of aft centre of gravity position, or slightly pulled aft in case of forward centre of gravity position.

Having reached safe altitude increase pitch attitude for climbing by pulling slightly aft on the control stick.

After reaching maximum height the rope will be switched off automatically. If necessary to secure a manual release pull several times tow-rope handle to the stop.

4.5.2 Flight

The sailplane is well manoeuvrable and controllable within whole range of airspeed, configuration and centre of gravity position. During roll from 45° bank to opposite bank the ailerons are effective without noticeable slip tendency. The ailerons and rudder can be fully deflected - at airspeeds below 85 KIAS (158 km/h IAS).



4.5.3 Approach and landing

The recommended approach speed with retracted air brakes is 49 KIAS (90 km/h IAS), with fully extended air brakes is 59 KIAS (110 km/h IAS). Extend the air brakes slowly.

Slip is well controllable and it is possible to use it as an efficient means for landing path shortening when simultaneously extending the air brakes. The recommended attitude for landing should allow the main gear wheel to touchdown before the tail wheel contacts the ground. To avoid long ground-run after landing touch the ground at the lowest safe speed (about 38 KIAS (70 km/h IAS)).

NOTE

Due to great effectivity of air brakes it is recommended to handle very carefully at altitudes just above the ground.

4.5.4 High speed features

In flight at a high speed up to 134 KIAS (248 km/h IAS) the sailplane is well controllable. Full deflection of the elevator and rudder are permissible only up to speed $V_A = 85$ KIAS (158 km/h IAS). One-third deflection is permissible at a speed of V_{NE} . It is necessary to avoid abrupt and violent motions of elevator.

In rough air, i.e. in lee-wave rotor, thunderclouds, visible vortices or during flight across mountain ranges maximum speed $V_{RA} = 85$ KIAS (158 km/h IAS) must not be exceeded.

Air brakes may be opened up to a speed of V_{NE} . At this speed air brakes should be used only in emergency or at non-intended exceeding of the maximum airspeed. Quick opening results in high loads and abrupt air braking on account of great air brakes efficiency.

A dive should be recovered less abruptly with air brakes extended than with retracted air brakes (see section 2.7 Manoeuvring load factors).

With air brakes extended dive at a speed of 118 KIAS (220 km/h IAS) with the nose attitude near 45° below the horizon. No loose objects should be in the cockpit.



A. Chandelle

Increase air speed of the sailplane to 97 KIAS (180 km/h IAS) by pushing the control stick. Do transition to a steep climb at an angle near 45° by pulling back the stick smoothly and continuously.

At 54 KIAS (100 km/h IAS) apply the rudder to the selected side of the turn and by coordinated positive use of the ailerons do a transition to level gliding flight in the opposite direction at a minimum speed of 43 KIAS (80 km/h IAS).

B. Steep turn

To perform this manoeuvre keep the entry speed of 97 KIAS (180 km/h IAS). Enter the climb simultaneously with a bank of approx 45° . After turning by about 150° start a transition to a level glide mode of flight in such a way that the manoeuvre will be finished in the opposite direction with the speed not decreasing below 43 KIAS (80 km/h IAS).

C. Lazy eight

Move the control stick slowly forward to attain an entry speed of 97 KIAS (180 km/h IAS). Perform a steep climbing turn to the selected side, smoothly pulling the control stick with simultaneous coordinated use of ailerons and rudder. At maximum bank and 54 KIAS (100 km/h IAS) do transition to a descent and after reaching 120 KIAS (222 km/h IAS) and wings level perform the steep turn to the opposite side, pulling smoothly the control stick with simultaneous coordinated use of ailerons and rudder.

The flight path intersects at the lowest point of the manoeuvre.

D. Spin

The spin manoeuvre may not be possible unless the centre of gravity is well aft in the approved centre of gravity range.

At more forward centre of gravity positions, the manoeuvre may only result in a spiral dive.

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Pull the control stick slowly back to approach the stall, use the full deflection of the rudder at 38 KIAS (70 km/h IAS) and pull the control stick to the stop.

To initiate recovery from the spin, check ailerons neutral, apply rudder opposite to the direction of the spin, then ease the control stick forward until rotation ceases. After rotations stops centralise rudder and apply aft stick pressure to recover from the ensuing dive.

It will require approximately 492 feet (150 m) of altitude loss for each turn in a spin. The recovery will require approximately 492 feet (150 m) to recover to a level flight altitude at about 81 KIAS (150 km/h IAS).

E. Loop

Enter a moderate dive by pushing the control stick to gain a speed of 92 KIAS (170 km/h IAS). Raise the nose of the sailplane by slightly pulling the control stick taking care to comply with "g-load" limits. The control force drops slightly due to speed decrease. After passing the inverted position the speed will increase and the control stick must be eased aft gradually so that the flight path is smooth and regular.

F. Stall turn

This manoeuvre should begin at a speed of 92 KIAS (170 km/h IAS). Pull the control stick gently backward to bring the nose to a wings level position of about 60° to 70° above the horizon. As soon as the speed falls to 65 KIAS (120 km/h IAS) start to apply the rudder slowly in the required direction of the turn while allowing some bank into the turn direction to maintain airspeed control without entering a spin. As the force on the rudder decreases, gradually apply full rudder. To keep proper turning plane use opposite deflection of the ailerons as necessary. When approaching the reciprocal heading with the nose down, control correct direction and pitch by normal use of controls. Take care not to exceed "g" limits.



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5.2.2 Stall speeds (KIAS)

The effect of weight on stall speed is given in Fig. 5 - 2.

There is a distinctive stall warning at the maximum take-off weight and forward centre of gravity position at a speed of 40 KIAS (75 km/h IAS). At a speed of 38 KIAS (70 km/h IAS) the sailplane begins to lose altitude without downward pitching motion. The full effectiveness of control surfaces is maintained during this manoeuvre.

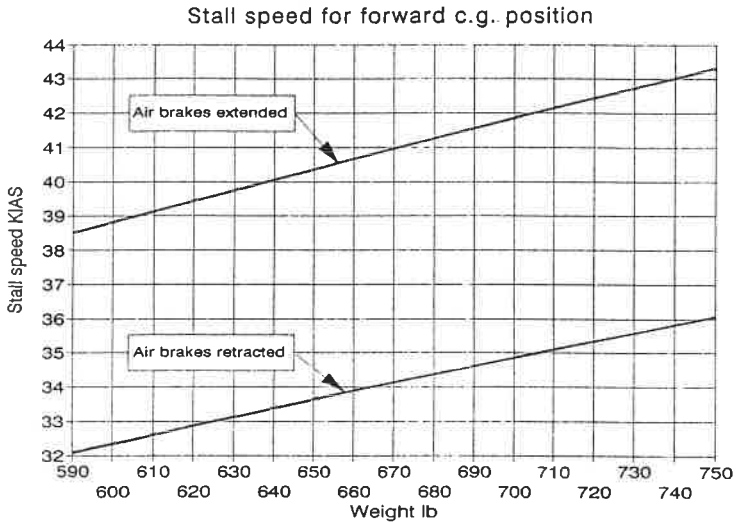


FIG. 5 - 2

5.3 NON - APPROVED FURTHER INFORMATION

Maximum demonstrated operating altitude 18,045 ft (5500 m).



L 33 SOLO

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SECTION 6

Weight and balance

Contents

6.1 Introduction

6.2 Weighing and moment record

6.3 Equipment list

6.4 Weight and balance loading form



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6.1 INTRODUCTION

This Section describes the procedures for establishing the basic empty weight and moment of the sailplane. Procedures for calculating the weight and moment are also provided in "Maintenance Manual for the L 33 sailplane".

6.2 WEIGHING AND MOMENT RECORD

Empty weight (standard)	463 lb (210 kg) ± 3%
Moment	39 134 lb.in

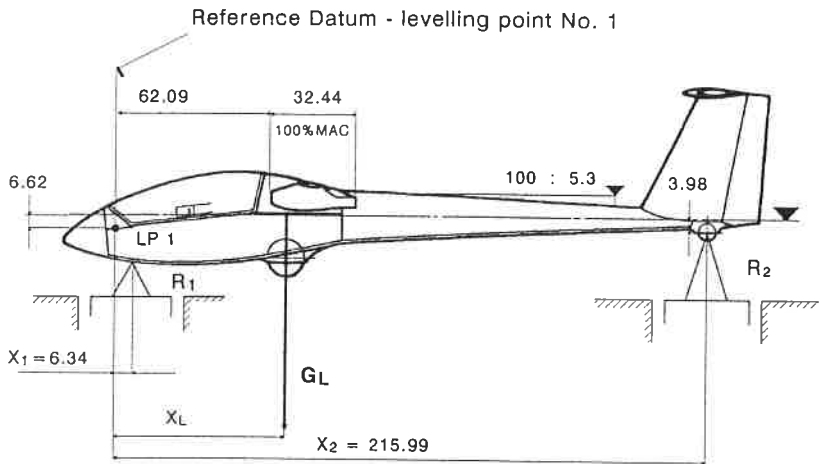


FIG. 6 - 1

The weighing record is on page 6-5 and the calculating procedure of centre of gravity position (moment) is provided in "Maintenance Manual for the L 33 sailplane".



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6.3 EQUIPMENT LIST

Standard (S) items must be installed for all operations. Optional (O) items are available for installation. Installed items for each sailplane equipment list will be marked with an "X" and included in the Empty Weight/c.g. pos of the Weight and Balance Record.

	S	O	Subject	Type	Weight lb	Arm from the reference datum (levlling point No. 1) in	Date of installation
1	X		Airspeed indicator	LUN 1106.13-8	0.88	19.9	
2	X		Vertical speed indicator ± 1000 ft/min	LUN 1141.02	1.06	19.9	
			or Vertical speed indicator ± 10 knots	LUN 1141.04	1.06	19.9	
3	X		Altimeter			19.9	
4	X		Mag. direction indicator	LUN 1225	0.22	18.4	
5	X		Lower hook	TOST G- 88/1-83	1.98	53.0	
6		O	Electric turn-and-bank/side indicator	LUN 1211.1	0.81	19.5	
7		O	Vertical speed indicator ± 6000 ft/min	LUN 1147.12-8	1.10	19.9	
			or Vertical speed indicator ± 60 knots	LUN 1147.23-8	1.10	19.9	

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	S	O	Subject	Type	Weight lb	Arm from the reference datum (levlling point No. 1) in	Date of installation
8		O	Forward hook	TOST E- 85/1-85	1.76	10.1	
9		O	VHF transceiver	AR 3201	9.15	52.8	
10		O	Accelerometer	AM-10	0.55	20.67	
11		O	Paint	white			
12							
13							

6.4 WEIGHT AND BALANCE LOADING FORM

	Weight G (lb)	Arm X (in)	Moment M (lb.in)
Empty weight			
Pilot		39.21	
Luggage		70.709	
Totals Σ			

$$\Sigma X = \frac{\Sigma M}{\Sigma G}$$

Totals must be within approved weight and C.G. limits.



Date	Empty weight lb (kg)	c/g Pos. % MAC	Permitted pilot weight lb (kg)				Approved	
			Max. baggage 44 lb (20 kg)		No baggage		Date	Signed
			Max.	Min.	Max.	Min.		