0 Manual Contents

0.1 Log of Revisions

Any revision of the present manual, except actual weighing data, must be recorded in the following table and in case of approved Sections endorsed by the responsible airworthiness authority.
The new or amended text in the revised page will be indicated by a black 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.	Pages affected	Date of Issue	LBA-Approval Signature	Date of Approval	Date of Insertion	Signature
1	0-2, 0-3, 4-9 (TB 8009)	Oct. 1999		11.Jul.2000 LBA		
3	0-2, 0-3, 1-1, 2-3, 2-4, 2-5, 2-6, 2-8, 3-4, 4-2, 4-3, 4-4, 4-5, 4-8, 4-9, 4-12, 5-3, 6-1, 6-2, 8-3 (TB 8011)	Dec. 2001		25. 01. 02		

Prepared: 01.12.01	Verified:	Complies:

0.2 List of Effective Pages

Chapter	Page	Date	Chapter	Page	Date
0	Title page	April 1999	4	4-14	April 1999
	0-1	April 1999		4-15	April 1999
	0-2	*Dec. 2001*		4-16	April 1999
	0-3	*Dec. 2001*		4-17	April 1999
	0-4	April 1999			
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	3-2	April 1999			
	3-3	April 1999	8	8-1	April 1999
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	4-5	*Dec. 2001*			
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	4-9	*Dec. 2001*			
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	4-13	April 1999			

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1 General

Contents of **Section 1**:

1.1 Introduction

This sailplane Flight Manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of the **LS 8-a** sailplane.

This manual includes the material required to be furnished to the pilot by JAR Part 22. It also contains supplementary data supplied by the sailplane manufacturer.

The LS8-a is a high performance sailplane, not a basic trainer. However excellent *in* design, construction, performance and handling qualities, flying it requires a skilled pilot, who observes the limitations and recommendations set out in this manual.

1.2 Certification Basis

This type of sailplane has been approved by Luftfahrt-Bundesamt (LBA) Braunschweig in accordance with JAR-22 dated 28. October 1985, (Change 5), with the exemption of JAR 22.49(b)(2)(ii), stalling speed with air brakes extended at maximum all-up weight.

The LBA-Type Certificate No. 402 for LS 8-a *was* issued on 17.05.1996 .

Category of Airworthiness: "Utility".

This Flight Manual constitutes a FAA Approved Flight Manual for US registered sailplanes in accordance with CFR Part 21.29.

1.3 Warnings, Cautions and Notes

The following definitions apply to warnings, cautions and notes used 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.***

Cautions: **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.**

Notes: Draws the attention to any special item not directly related to safety, but which is important or unusual.

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01.12.01		

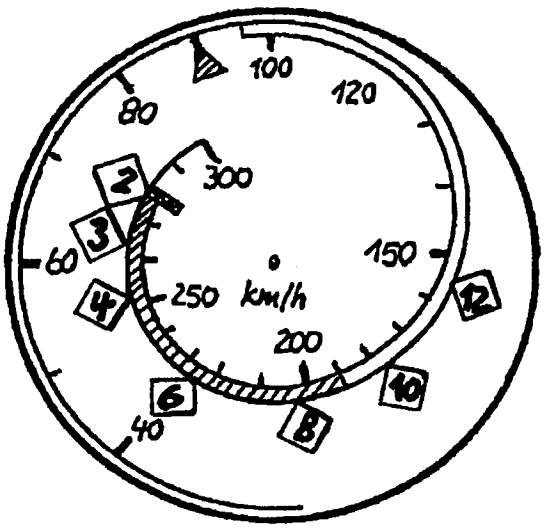
2.3 Airspeed indicator colour markings

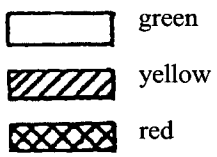
Airspeed indicator markings and their colour- code significance are shown below:

Marking	(IAS)value or range	Significance
Green arc	97-190 km/h 52-103 Kt. 60-118 mph	Normal Operating range.
Yellow arc	190-280 km/h 103-151 Kt. 118-174 mph	Manoeuvres must be conducted with caution and only in smooth air.
Red line	280 km/h 151 Kt. 174 mph	Maximum speed for all not restricted operations.
Yellow triangle	90 km/h 49 Kt. 56 mph	Recommended minimum approach speed at maximum weight without water ballast

For an example of airspeed indicator colour marking see below.

Airspeed Indicator, diameter 80 mm <3.15 in>.
(This type of marking is not possible with 57 mm <2.24 in> diameter.)





red altitude related VNE markings, here in km

Without altitude related VNE markings on the dial, a VNE placard according to page 2-8 must be on the instrument panel.

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2.4 Mass (Weight)

Maximum take-off mass including water ballast	525 kg	1157 lbs
Maximum mass without water ballast	412 kg	908 lbs
Recommended landing mass	500 kg	1102 lbs

Warning: ***It is recommended to discharge water ballast before each landing. Pilots are advised against landing with maximum all-up mass. When flying with maximum all-up mass, at least 25 Litres –6.6 US gallons, 5.5 Imp. gallons - (corresponding to about 15 Seconds of discharge time) should be discharged.***

Maximum mass of non-lifting parts	244 to 253 kg	538 to 558 lbs

Value must be determined according to table in Maintenance Manual, chapter 2, related to empty mass and empty mass C.G. position. The term "non-lifting" parts includes the following:

- Fuselage (with permanently installed instruments, canopy and main pins)
- Cockpit load (Pilot + parachute + equipment <for instance tail fin battery in baggage compartment>)
- Horizontal tail

Water ballast and battery in tail fin do not count for "non-lifting" parts, but for maximum all-up weight.

Wing water ballast (depending on loading conditions)	**max.** 190 kg	419 lbs

Warning: ***Wing water ballast must always be compensated by tail fin water ballast according to table page 4-12 .***

Tail fin water ballast (depending on wing water ballast)

Without tail fin battery box	maximum 5.5 kg	12 lbs
With tail fin battery box	maximum 3.8 kg to 4.1 kg	8.4 to 9 lbs
Integral tail fin tank	maximum 12 kg	26 lbs

Maximum mass in Baggage Compartment	max. 5.0 kg	11 lbs
Maximum mass of all instrument panel installations	max. 6.7 kg	14.8 lbs

Warning: ***The vertical tail fin battery may be removed from the tail fin to reduce Minimum Cockpit Load (see entries on page 6-1/2 for possible combinations !)***

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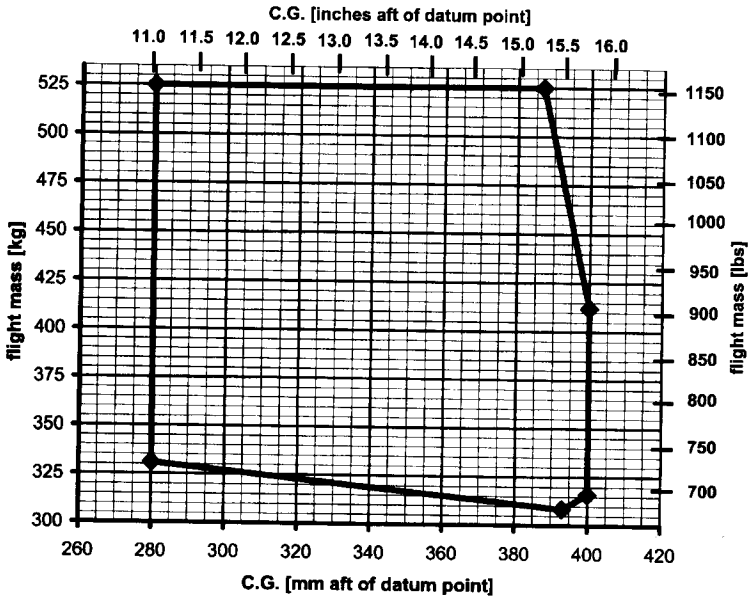
2.5 Centre of Gravity Limits

Datum Point: Leading edge of wing at root, when under side of fuselage boom is placed horizontal.



Maximum allowable forward C.G. Position at maximum Mass:
280 mm <11.024 in> aft of Datum

Maximum allowable rearward C.G. Position:
400 mm <15.748 in> aft of Datum

Take-off C.G. position [mm aft of Datum]

Warning: ***Vertical tail fin water ballast must be used to compensate C.G. displacement due to wing water ballast, surplus may be used to compensate pilot weight above Minimum Cockpit Load !***
Maximum amounts see pages 4-11/12.

2.6 Approved manoeuvres / Category of Airworthiness

The LS 8-a sailplane is certified in the U ("Utility") category according to JAR 22.

Aerobatic flight not approved.

2.7 Manoeuvring load factors

At 190 km/h, 103Kt., 118 mph.....5.3 g positive to 2.65 g negative

At 280 km/h, 151 Kt., 174 mph (Air brakes retracted).....4.0 g positive to 1.5 g negative

At 280 km/h, 151 Kt., 174 mph (Air brakes extended) .....3.5 g positive to 0.0 g negative

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2.8 Kinds of operation

The LS8-a sailplane is approved for Day-VFR
Minimum equipment see page 2-7

Use of water ballast limited to temperatures above 5° Centigrade <41° F>.
Additives to water ballast not approved.

Cloud flying only approved without water ballast
Applicable only for countries, which permit cloud flying and when minimum equipment is certified for cloud flying, see inspectors entry in inspection certificate.
Minimum equipment see page 2-7.

For USA only:
Night-VFR, IFR and Flight into known icing conditions are not approved.

2.9 Flight crew

Maximum cockpit load (Pilot + parachute + baggage + temporary equipment + tail fin battery in baggage comp.) ..... **110 kg, 242 lbs**
See entry on page 6-1/2.
Oxygen equipment see page 7-6

Minimum cockpit load (Pilot plus parachute, no baggage, no temporary equipment)
See entry on page 6-1/2

for club use and with empty tail tank
no trim ballast ..... **70 kg, 154 lbs**
with 3 trim weights ..... **55 kg, 121 lbs**
(1 Trim weight - 2.5kg, 5.5lbs - corresponds to 5 kg, 11lbs of Cockpit load)

If the sailplane does not fly in a club, it may be trimmed for a higher minimum cockpit load. See instructions in Maintenance Manual chapter 11.

Warning: ***For reasons of safety, the cockpit placarded Minimum Cockpit Load in large digits includes the full tail tank ballast and tail battery weights.***
Lighter pilots must positively check the following:
a) Tail tank empty: with discharge lever in open position the valve is really open
(with discharge lever in open position air can be blown through valve)
b) Tail battery not installed (Check by removing horizontal tail and re-installation !)
For possible combinations see Flight Manual entries on pages 6-1/2.

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2.12 Further Limitations

2.12.1 Operating Placards for Limitations

Rolladen Schneider Flugzeugbau GmbH
Type: LS 8-a Serial No.:_____

Data Placard

Airspeed Limits:	km/h	mph	Kt.
Winch launch/Auto tow	140	87	76
Aero tow	190	118	103
In rough air	190	118	103
Never exceed (VNE)	280	174	151
Max. Take-off mass	525 kg ; 1157 lbs		

Aerobatic manoeuvres **not** approved

Weight Limitations

Maximum Cockpit Load ....max._____kg/lbs
Minimum Cockpit Load min. _____kg/lbs
Minimum Cockpit Load with
empty tail tank
and without tail battery min.:_____kg/lbs
Minimum Cockpit Loads for all combinations of tail tank and tail battery see Flight Manual pages 6-1/2.
Lighter pilots must compensate lack of weight as suggested in Flight Manual

MINIMUM COCKPIT LOAD:____ kg / *lbs*
Minimum Cockpit Load with empty tail tank: ____ kg / *lbs*
under instrument panel cover

Maximum baggage weight **5** kg (11 lbs)
(Soft items only)
at baggage compartment

Altitude related VNE speeds above MSL

m	ft	km/h	mph	Kt.
Up to 2000	(6500)	- 280	174	151
Up to 3000	(9800)	- 266	165	144
Up to 4000	(13100)	- 253	157	137
Up to 6000	(19700)	- 227	141	122
Up to 8000	(26200)	- 202	126	109
Up to 10000	(32800)	- 179	111	97
Up to 12000	(39400)	- 156	97	84

near airspeed indicator
(unless marked according to page 2-3)

2.12.2 Approved Gelcoat colours for exterior surfaces

All external portions of the glider must be painted white except of wingtips, nose of fuselage and rudder.
Approved gelcoat: UP-Gelcoat Scheufler T35 white
Tone similar to RAL 9010

2.12.3 Use of water for ballast

Use of water for ballast restricted to clear water without any additives.

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3.7 Other Emergencies

3.7.1 Limitation of High Speed Flight

(a) If there are indications, that the intended air speed will be exceeded, for instance
- (1) While flying under large cloudbanks
- (2) During cloud flying *in* heavy turbulence

then: air brakes should be extended carefully in the green arc airspeed indicator range before 190 km/h (103 Kt.; 118 mph) is reached

Warning: In emergencies, air brakes can also be extended up to a speed of 280 km/h (151 Kt.; 174 mph), however pay attention to the following:

➔ extend air brakes with care

Warning: In this speed range air brakes are sucked open suddenly during unlocking, resulting in short time negative acceleration, which may support pilot induced oscillations (P.I.O.).

(b) once extended, the air brake spring loaded covers close completely at speeds below 220 km/h (119 Kt.; 137 mph)

(c) when air brakes are extended during descent **in rough air** (wave flights), a speed of 190 km/h (103 Kt.; 118 mph) – green ASI range upper limit – should not be exceeded because of possible severe turbulence.

3.7.2 Rain

During rain:

(a) expect considerable decrease of performance

(b) increase approach to landing speed by at least 10 km/h (5 Kt.; 6 mph) above **normal approach speed, because:**
- (1) stall speed increases
- (2) effectivity of controls decreases

(c) open canopy window to increase visibility

3.7.3 Inadvertent Freezing / Icing

Water ballast in wings and tail fin

Water ballast must be dumped above +5° Centigrade (41° F) outside temperature due to safety reasons, check with built in thermometer below instrument panel, because:
- (a) Dumping below 0° Centigrade (32° F), the rear fuselage may collect ice, resulting in dangerous rearward C.G. displacement
- (b) Additionally, the wing discharge system may freeze on one side only or integral tanks may be blown up by expansion of ice.

Caution: For prolonged flights below +5° Centigrade <41° F> use no water ballast.

Icing Conditions: Move control surfaces continually to avoid freezing solid. Open canopy window for better visibility.

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4.2 Rigging and De-Rigging

1. Before rigging, insert draining plugs into root ribs - grease with Vaseline if necessary – and remove valve opener.
2. Before extending landing gear check for adequate ground clearance.
3. Clean and grease all pins and matching bushes including main pins and automatic control system connectors.
4. Position control stick centrally and water ballast opening lever into **"closed"** position (cockpit lever(s) rearward).

Warning: ***When ailerons are deflected upward during rigging, then the automatic aileron connector lever strikes against the fuselage deflector and thus prevents rigging.*** **Do not use brute force !**

Warning: ***When cockpit water ballast levers are not in "closed" position, wings can not be rigged.***

5. Rig wings always without winglets; for winglet installation see page 4-3.
6. Insert right spar end into fuselage, aileron must be about neutral and watch for angle of dihedral.
7. Insert left spar end into fuselage, aileron must be about neutral and watch for angle of dihedral.
8. Insert main pins completely when *bushings* are lined up correctly.
9. Secure main pins by placing handles behind spring loaded pegs.
10. Insert battery into that place, which was defined during last C.G. weighing and calculation of cockpit load ranges (see Data Placard in cockpit or entry on page 6-1/2). Connect to system and check operation. The battery must be equipped with an appropriate main fuse!
11. Check forward horizontal tail attachment for ball being fixed.
    Warning: When ball is loose, refer to page 8-2.
11. Install horizontal tail, secure with slotted nut against tapered pins (using supplied key or suitable coin) until free from play and red marking on attachment bracket is invisible.
11. Install total energy tube, secure against turning using tape; install barograph.
11. Connect automatic parachute ripcord to red marked portion at main bulkhead using special loop only.
11. Seal wing fuselage intersection by taping upper and lower sides and cut-out on upper horizontal tail fin.
11. When using water ballast, then according to details on page 4-9 and following ones and **check:**
    (a) If tail fin valve really opens ?
    (b) Opening of wing dump valves ?
    (c) Wing system completely water tight ?

11. **Check control system functions using a helper.**
11. Perform Daily Inspection according to page 4-3

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4.2 Rigging and De-Rigging continued

Installation of Winglets

1. Insert winglet until securing nut starts catching thread.
2. Turn nut in direction that it pulls winglet into position.
3. Lock nut until winglet is free from play: zero play is reached, when force increases considerably during turning of nut with supplied key. Turn not further than next notch catching ratchet.
4. Tape wing tip intersection.

De-Rigging

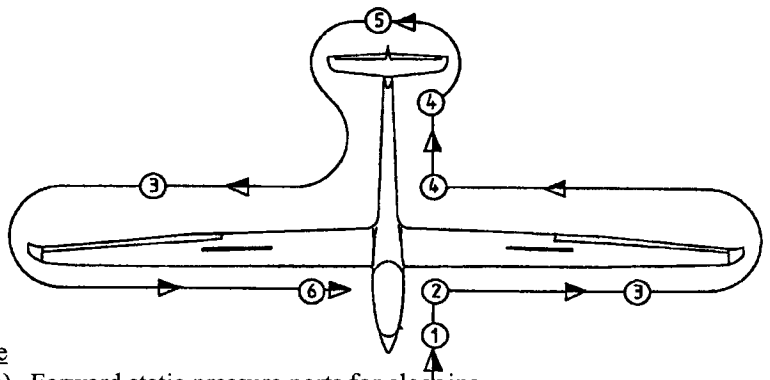
(1) Reverse **assembly** sequence.
(2) Winglets may be stored in cockpit when using some padding.
(3) Air brake system should be unlocked to avoid permanent pressure on flexible covers and resulting possible deformations (overcenter in wing).

Warning: ***With wings positioned vertical in trailers with hinged cover, the air brakes may open and and be damaged when closing the lid.***

Note: To avoid damage due to water, after de-rigging the water drain plug at the root rib forward edge should be removed and discharge openings on wing under side kept open for ventilation (use valve opener).

4.3 Daily Inspection

The Daily Inspection according to the following diagram and related checklist must be performed each day and is essential for flight safety.



1 Forward Fuselage
- (a) Forward static pressure ports for clogging
- (b) Function of nose hook

2 Landing Gear
- (a) Recommended tyre pressure 3 to 3,5 bar (44 to 51 psi)
- (b) When using water ballast increase up to 4 bar (58 psi)
- (c) Slip mark and tyre condition
- (d) C.G. hook manual and automatic operation working properly
- (e) Water drain orifices in front and behind landing gear box free from clogging

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4.3 Daily Inspection continued

3 Wings

(a) Ventilation openings and water drain orifices at root or in winglet region and at wing upper side free from clogging.
(b) Condition, gelcoat- or structural damage, pressure marks, cracks
(c) Air brakes for proper function and locking
(d) Friction damper at outer air brake edges and pads in air brake boxes free from grease, damper rod working properly

Warning: ***Grease at friction surfaces may result in oscillations during extension of air brakes.***

(e) Ailerons for unobstructed movement and free from play
(f) Winglets installation for securing and free from play

4 Fuselage

(a) Condition, gelcoat- or structural damage, pressure marks, cracks, especially on lower side
(b) Rear static ports at fuselage boom free from clogging
(c) Recommended tail wheel pressure, it fitted, 2,5 to 3,5 bar (36 to 51 psi)
(d) Water drain orifices in front of tail skid or tail wheel free from clogging
(e) Tail skid, if fitted, for proper adhesion

5 Tail unit

(a) Condition, gelcoat- or structural damage, pressure marks, cracks
(b) Total energy port at upper end of vertical tail fin leading edge free from clogging
(c) Pitot pressure port below total energy port at vertical tail fin leading edge free from clogging
(d) Charged vertical tail fin battery connected, *when this battery location was chosen for trimming of pilot weight*, see entries on page 6-1/2.
(e) Check vertical tail tank valve for proper opening:
- place tail tank filling adapter
- open cockpit lever
- if air cannot be blown into the tank, the valve is not functioning properly (for instance frozen solid or operating cable fractured)

Warning: ***Take off permitted only, when unintentional use of tail fin water ballast can be positively excluded or a battery is not unintentionally installed in the tail fin !***

(f) Amount of tail fin tank water ballast in correct relation to amount of wing water ballast and cockpit load
(g) Horizontal tail fin: no pressure marks permitted in centre portion
(h) Horizontal tail properly installed and free from play
(i) Movement of tail control surfaces unobstructed and free from play
(j) Condition of gap sealing: sealing strips should not protrude upward - danger of reduced control surface effectivity

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4.3 Daily Inspection continued

6 Cockpit

(a) Canopy cleaned, if required

(b) Check canopy locking and emergency jettison function:

(5)"Pilot" in seat, both canopy locking levers opened.

(6)Helper at front canopy end to avoid lifting of canopy by gas spring, because this would unduly deform the spring of the temporary rear end hinge.

(7)After opening emergency release, the pilot pushes the rear end temporary hinge bolt free and lifts the canopy at opening levers, the helper holds the front end on the opener.

(8)With canopy fully open, the helper pushes the connecting pin upward and engages canopy to opener by turning driving lug anti-clockwise to stop.

(c) Main pins properly secured.

(d) Proper connection of air brake and aileron system:
with control stick in centre position, ailerons must be flush with trailing edges;
air brakes must lock properly.

(e) Charged vertical tail fin battery connected, *when this battery location was chosen for trimming of pilot weight*, see entries on page 6-1/2.

(f) Thermometer on seat below instrument panel for function:
indication of surrounding air temperature.

(g) **Check for non-existence of foreign matter**

Warning: ***When parking, remember that under a certain sun angle from the rear into the opened canopy this may result in fire hazard due to convex lens effect.***

4.4 Pre-flight Check

1. Daily inspection performed
2. Control system functions checked, using a helper
3. Vertical tail fin tank valve opening positively checked (See page 4-4)
4. Water ballast system:
   (d) when filled, check for leaks
   (e) no leaks in wing system allowed to avoid unintentional rearward C.G. displacement due to tail fin tank
   (f) check proper dumping:
   tail fin system starts dumping **before** or **simultaneously with** wing system
5. Total energy tube fitted and connection properly sealed
6. Check weight and balance – especially Minimum- and Maximum Cockpit Loads, Trim Weights, amount of tail fin tank water, *Battery position*.
7. Altimeter - adjusted
8. Check other instrumentation, normally indicating zero
9. Perform radio operational check
10. Adjust backrest and check locking
11. Adjust rudder pedals and check locking
12. Check paperwork (C of A, logbook etc.) complete and valid
13. Landing gear locking without play
14. Check wheel brake operation
15. Before take-off, perform Cockpit-Checklist procedure
    (See page 4-6)

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4.5.7 Trim System

(a) Trim lever and trim-locking lever are separate
(b) Trim-locking lever is at control stick
(c) Pull locking lever to free trim knob at left cockpit side
(d) With the trim knob:
  (1) Elevator stick force can be trimmed to zero
  (2) Desired speed can be trimmed
  (3) Release locking lever after trimming to fix trim setting
  (4) Indication of trim setting shown by position of trim knob relative to neutral mark

Warning: ***Elevator trim system must not be used for compensation of minimum cockpit load deficiency.*** *(see below)*

4.5.8 Baggage Compartment

Baggage compartment should be used for soft and light materials which would not obstruct the pilot after deceleration or injure the pilot in crash landings. Maximum baggage 5 kg (11 lbs).
Baggage compartment load counts for useful load and must therefore be included, when checking loading conditions.
For permanent installation of batteries, barographs, ELT etc. see Maintenance Manual chapter 11.

4.5.9 Balancing of Pilot Weight

Balancing of pilots with insufficient weight

3 trim weights can be fitted to a threaded rod in front of rudder pedals and secured by knurled nut.

1 trim-weight of 2.45 kg <5.5 lbs> compensates 5 kg <11 lbs> of pilot weight

When **removing** the **tail fin battery** (Standard weight 2.5 to 2.7 kg <5.5 to 6 lbs>), Minimum Cockpit Load decreases by **10** kg <22 lbs>, see page 6-1/2.

Balancing of heavy pilots, who want to fly with rearward C.G. positions

(a) For 10 kg <22 lbs> of pilot weight above **Minimum Cockpit Load with empty tail fin tank** 1.5 litres <0.4 US gallons, 0.33 Imp. gallons> of water may be filled into the tail fin tank.
(b) When using wing water ballast, this balancing method may be restricted due to amount of wing water used and tail fin tank version, see also page 4-10.
(c) When discharging water ballast, this trim condition can not be kept due to quicker discharge of tail fin water ballast.
(d) **When re-installing a tail fin battery (3BR-199**, Standard weight 2.5 to 2.7 kg, <5.5 to 6 lbs>), **Minimum Cockpit Load increases by 10 kg <22 lbs>, see also entries on page 6-1/2.**

Warning: ***Item d) Re-installation is permissible only***
- when the C.G. weighing included the tail battery in this position
- when it had been removed afterwards for trimming.

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4.5.10 Water Ballast

(a) Use clear water without any additives.
(b) Increase tyre pressure to 4 bar < 58 psi>, when using full water ballast.
(c) Wing integral tanks together hold about 190 Litres <50.2 US gallons, 41.8 Imp. gallons >.
(d) Maximum permissible water ballast depends on loading conditions, see pages 4-11 ff.
(e) Two tanks per wing.
(f) **Tail tank (3.8 to 5.5 Litres <1 to 1.5 US gallons, 0.84 to 1.21 Imp. gallons>)** has 2 cockpit water ballast levers: the short one opens the outer wing tanks only, both levers open both tanks; the tail tanks always opens during operation of one of these levers.
or **Tail integral tank (12 Litres <3.2 US gallons, 2.64 Imp. gallons>)** has 1 cockpit water ballast lever operating all tanks simultaneously.

Important Note: **When using water ballast, always fill inner wing tanks first, thereafter fill outer tanks with the remaining amount.**
Inner tanks each carry about 65 Litres <17.2 US gallons, 14.3 Imp. gallons>; outer tanks each carry about 30 Litres <7.9 US gallons, 6.6 Imp. gallons>.

(g) Use as clean water as possible to avoid damage of sealing rings by foreign matter.
(h) **Filling sequence**: always tail tank first, then wing tanks.

Warning: ***Wing water ballast always must be compensated by tail tank water according to table page 4-12.***

4.5.10.1 Vertical Tail Fin Tank Loading Procedure

(a) Open dump valves by shifting lever or levers in cockpit forward.
(b) Insert tail fin tank adapter to filling funnel tube and connect to dumping outlet just inside lower right rudder cut-out, with rudder deflected to the left.
(c) Fill tail fin tank via funnel in relation to intended wing water amount, see table page 4-12.
(d) **Markings correspond to 0.5 Litres <0.13 US gallons, 0.11 Imp. gallons> steps, equivalent to 0.5 kg <1.1 lbs>**.
(e) Use water level in funnel tube relative to markings on inside of translucent right rudder gap seal to determine correct amount in relation to wing amount. Specified amount of water must be verified under the following conditions:
1. Wings level
2. Landing gear and tail end on ground
3. Filling tube near markings

(f) Upper red marking corresponds to maximum amount of tail fin water ballast:
5,5 Litres <1.45 US gallons, 1.21 Imp. gallons>
3,8 to 4,1 Litres <1.00 to 1.08 US gal., 0.84 to 0.9 Imp.gal.> for the combination of tail fin tank with tail fin battery box
12 Litres <3.17 US gal., 2.64 Imp. gal.> for the integral tail fin tank.
(g) *For trimming of heavy pilots, the* ***combination of battery and/or water can be chosen****, see also entries on page 6-1/2.*
(h) Close dump valves by shifting single or double cockpit lever backward and remove funnel from tail. For filling of wing tanks, the cockpit levers must stay in the closed position.

Warning: ***Mandatory tail tank filling always exactly to markings under right rudder seal and filling tube water level in correct relation to total wing water amount according to table page 4-12. Otherwise, keeping to the maximum approved rear C.G. position cannot be guaranteed.***

Warning: ***Filling funnel meshing is mandatory to guarantee tail fin tank valve function.***

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4.5.10.5 Maximum Tail Fin Water Ballast

Maximum tail tank capacity: ..... - without battery box .....5.5 kg <12 lbs>
- with battery box .....3.8 to 4.1 kg <8.4 to 9.0 lbs>

Maximum integral tail tank capacity .....12 kg <24.5 lbs>

Wing-Water Mass	**Specified** Tail tank-Water Mass	Total-Water-Mass
[kg]	*[kg]*	*[kg]*
25.0 -37.0	1.0	26-38
37.5 -49.5	1.5	39-51
50.0 -62.0	2.0	52-64
62.5 -74.5	2.5	65-77
75.0 -87.0	3.0	78-90
87.5 -99.5	3.5	91-103
100.0 -112.0	4.0	104-116
112.5 -124.5	4.5	117-129
125.0 -137.0	5.0	130-142
137.5 -149.5	5.5	143-155
150.0 -162.0	6.0	156-168
162.5 -174.5	6.5	169-181
175.0 -187.0	7.0	182-194
187.5 -190.0	7.5	195-197.5

Remaining volume of tail tank can be used for trimming of heavy pilots as follows:

For **10** kg of pilot mass over value of **Minimum Cockpit Load for empty tail tank** a **maximum of 1.5** Litres of water may be filled additionally.

Removing the tail fin battery (3BR-199) decreases Minimum Cockpit Load by 10 kg, see pages 6-1/2.

(see further directions page 4-9)

Wing-Water Mass	**Specified** Tail tank-Water Mass	Total-Water-Mass
[lbs]	*[lbs]*	*[lbs]*
55.1 - 81.6	2.2	57.3- 83.8
82.7 -109.1	3.3	86.0-112.4
110.2 -136.7	4.4	114.6-141.1
137.8 -164.2	5.5	143.3-169.8
165.3 -191.8	6.6	172.0-198.4
192.9 -219.4	7.7	200.6-227.1
220.5 -246.9	8.8	229.3-255.7
248.0 -274.5	9.9	257.9-284.4
275.6 -302.0	11.0	286.6-313.0
303.1 -329.6	12.1	315.3-341.7
330.7 -357.1	13.2	343.9-370.3
358.3 -384.7	14.3	372.6-399.0
385.8 -412.3	15.4	401.2-427.7
413.4 -418.9	16.5	429.9-435.4

Remaining volume of tail tank can be used for trimming of heavy pilots as follows:

For **22** lbs of pilot mass over value of **Minimum Cockpit Load for empty tail tank** a **maximum of** 0.4 US gallons, 0.33 Imp. gal.; 3.3 lbs of water may be filled additionally.

Removing the tail fin battery (3BR-199) decreases Minimum Cockpit Load by 22 lbs, see pages 6-1/2.

(see further directions page 4-9)

***Warning:* See also Inadvertent Freezing / Icing, page 3-4**

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5.3 Additional Information

5.3.1 Demonstrated Crosswind Performance

Aero Tow: ..... 20 km/h <11 Kt., 12 mph>

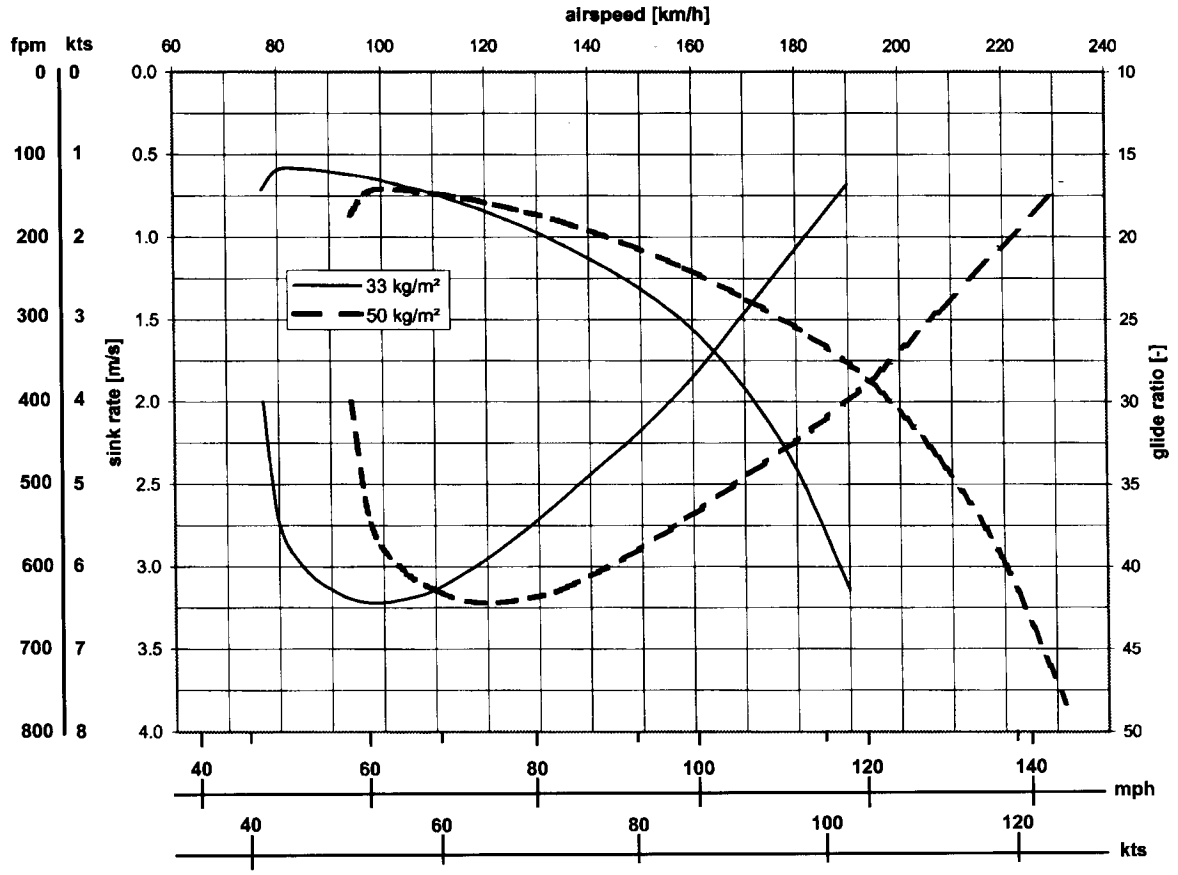
Winch Launch: ..... 30 km/h <16 Kt., 19 mph>

5.3.2 Flight Polar

The *flight polar* gives gives forward versus sinking speed. It is valid for "clean" wing. Insects and raindrops on wing decrease performance and handling, see also page 4-16, Landing.

Flight polars LS 8-a

wing loading 33 kg/m² (= without water) = 6.8 lb/ft²
and 50 kg/m² (= max. weight 525 kg; 1157 lbs) = 10.2 lb/ft²



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01.12.01		

6 Weight and Balance

Contents of **Section 6**:

6.1 Introduction

This section gives details about permissible Cockpit Loading and approved mass limitations of **this** sailplane.
Complying with these procedures, the pilot is able to load the sailplane properly without any additional calculations due to loading limits placarded in the cockpit and provided in this manual on pages 6-1 and 6-2.
The procedures for establishing the basic empty mass, mass of non-lifting parts, centre of gravity and loading limits is given in Maintenance Manual chapter 2.

6.2 Cockpit Loading plan (Pilot and parachute)

Warning: New entry with each new weighing or when changing equipment. Entry should be calculated in accordance with chapter 2 of Maintenance Manual. **State dimensions used**. State amount of permanently fitted ballast in appropriate position or none.

Serial Number: _____.

Empty Mass	C.G. position	Max. Cockpit Load	Minimum Cockpit Load *WITH* **Tail Batterie** and *Tail Tank* *full*	Minimum Cockpit Load *WITH* **Tail Batterie** and *Tail Tank* *empty)**	Minimum Cockpit Load *WITHOUT* **Tail Batterie** and *Tail Tank* *full)**	Minimum Cockpit Load *WITHOUT* **Tail Batterie** and *Tail Tank* *empty)**	Permanently fixed Ballast Mass front	Permanently fixed Ballast Mass Rear	Tail Tank Volume	Date / Inspector
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	

*)** These Minimum Cockpit Load values may only be used, when the pilot can positively exclude unintentional use of tail fin water and tail fin battery, i.e. he has checked proper valve opening by use of tubing and blowing through valve and visually checked, that no tail fin battery is installed by removing horizontal tail and re-installing.

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6.2 Cockpit Loading Plan (Pilot and Parachute) continued

Warning: New entry with each new weighing or when changing equipment. Entry should be calculated in accordance with chapter 2 of Maintenance Manual. **State dimensions used**. State amount of permanently fitted ballast in appropriate position or none.

Serial Number: _____.

Empty Mass	C.G. position	Max. Cockpit Load	Minimum Cockpit Load ***WITH*** **Tail Batterie** and ***Tail Tank*** ***full***	***empty)****	Minimum Cockpit Load ***WITHOUT*** **Tail Batterie** and ***Tail Tank*** ***full)****	***empty)****	Permanently fixed Ballast Mass front	rear	Tail Tank Volume	Date / Inspector
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	

*)** These Minimum Cockpit Load values may only be used, when the pilot can positively exclude unintentional use of tail fin water and tail fin battery, i.e. he has checked proper valve opening by use of tubing and blowing through valve and visually checked, that no tail fin battery is installed by removing horizontal tail and re-installing.

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8.3.1 Alterations or Repairs continued

Longitudinal Motion Pushrod Bearings

Important Note: **Longitudinal motion pushrod bearings should never be greased or oiled!**

Longitudinal motion pushrod bearings are being used throughout the wing control system, in the fuselage for elevator-, aileron- and landing gear drive systems. During repairs, never pull pushrods out of longitudinal motion bearings as all balls will leave their cage. To re-install them, a cut-out near each bearing must be cut and closed afterwards!

Forward Horizontal Tail Attachment

The forward horizontal tail attachment on the vertical tail consists of a special rod end bearing, which is cemented in the correctly aligned position.(See also placards pages 10-2 and 10-3 of the Maintenance Manual).
When the ball becomes loose (for instance by deliberate action or inadvertently) the attachment may be damaged during horizontal tail assembly due to non-alignment of ball and corresponding pin.

Warning: ***Ask the manufacturer for special advice if this has happened.***

8.4 Ground Handling / Road Transport

a) **Ground Towing**

- Tow at walking speed only
- Use elastic cable from tow release and helper at wingtip

or

- Use tail dolly with tow-bar and sprung wheel at one outer wing.

Warning: ***Towing backwards at too high speeds may yield undercarriage oscillation due to rough ground, resulting in overcenter, collapse and bent drive lever.***

b) **Parking**
In no case should sailplanes be parked without permanent supervision, because their weight is small compared to wing area and damage can be expected in moderate wind.

c) **Tie-down**
Tie-down out in the open as a substitute for a hangar place should never be considered: weathering marks due to changes of temperature, ultra violet radiation and humidity can result in rapid gelcoat deterioration; resulting cracks can cause eventual structural damage.

When permanent supervision can not be guaranteed, tie down as follows:
- Place tail unit about 45° into main wind direction
- Lay windward wingtip down
- Place ground anchors to both sides of rear fuselage boom and wingtip
- Strap rear fuselage and wingtip down using rope and foam to avoid scratching.

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