

Flight Manual for the
LS 8-18 Sailplane



This Manual should be carried in the sailplane at all times.

Registration: _____ Serial Number: _____

Owner:

Edition: July 1999

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

In order that the manufacturer can continue to provide essential service information, any change of ownership should be notified to the manufacturer immediately.

The translation of this manual has received our most careful attention. However, in any case of doubt or ambiguity, the original German text must be considered authoritative.

Approved as an Operating Instruction according to JAR 22.

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 right hand margin, and the revision No. and the date will be shown on the bottom left hand of the page.

Rev. No.	Pages affected	Description	Date	LBA Approval
1	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	TN8011 removal of tail fin battery may be used for trimming	Dec. 2001	25.01.2002
Rev. No.	Pages affected	Description	Date	EASA Approval
2	0-2, 0-3, 4-7, 4-13, 4-14, 7-2	TN8019 wheel brake actuated by airbrake handle	Feb. 2011	13.10.2011
3	0-2, 0-3, 4-3, 4-9	TN8020, retrofit of a 5" landing gear	Sept. 2011	14.10.2011

0.2 List of Effective Pages

Chapter	Page	Date	Chapter	Page	Date
0	Title page	July 1999	4	4-14	February 2011
	0-1	July 1999		4-15	July 1999
	0-2	September 2011		4-16	July 1999
	0-3	September 2011		4-17	July 1999
	0-4	July 1999			
1	1-1	Dec. 2001	5	5-1	July 1999
	1-2	July 1999		5-2	July 1999
				5-3	Dec. 2001
2	2-1	July 1999	6	6-1	Dec. 2001
	2-2	July 1999		6-2	Dec. 2001
	2-3	Dec. 2001	7	7-1	July 1999
	2-4	Dec. 2001		7-2	February 2011
	2-5	Dec. 2001		7-3	July 1999
	2-6	Dec. 2001		7-4	July 1999
	2-7	July 1999		7-5	July 1999
	2-8	Dec. 2001		7-6	July 1999
3	3-1	July 1999	8	8-1	July 1999
	3-2	July 1999		8-2	July 1999
	3-3	July 1999		8-3	Dec. 2001
	3-4	Dec. 2001		8-4	July 1999
	3-5	July 1999		8-5	July 1999
	3-6	July 1999		8-6	July 1999
4	4-1	July 1999	9	9-1	July 1999
	4-2	Dec. 2001			
	4-3	September 2011			
	4-4	Dec. 2001			
	4-5	Dec. 2001			
	4-6	July 1999			
	4-7	February 2011			
	4-8	Dec. 2001			
	4-9	September 2011			
	4-10	July 1999			
	4-11	July 1999			
	4-12	Dec. 2001			
	4-13	February 2011			

0.3 Table of Contents

No.	Section	Approval Status
1	General.....	non-approved
2	Limitations.....	approved
3	Emergency Procedures.....	approved
4	Normal Procedures.....	approved
5	Performance.....	partly approved
6	Weight and Balance.....	non-approved
7	Description of Systems).....	non-approved
8	Handling, Servicing and Maintenance.....	non-approved
9	Supplements.....	non-approved

1 General

Contents of **Section 1**:

1 General	1-1
1.1 Introduction	1-1
1.2 Certification Basis	1-1
1.3 Warnings, Cautions and Notes (Definitions)	1-1
1.4 Descriptive and Technical Data	1-2
1.5 Three View Drawing	1-2

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 8-18** 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 LS8-18 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 for the 15 m version.

The LBA-Type Certificate No. 402 for LS 8-18 *was* issued on 20. Jan. 2000 .

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.

1.4 Descriptive and Technical Data

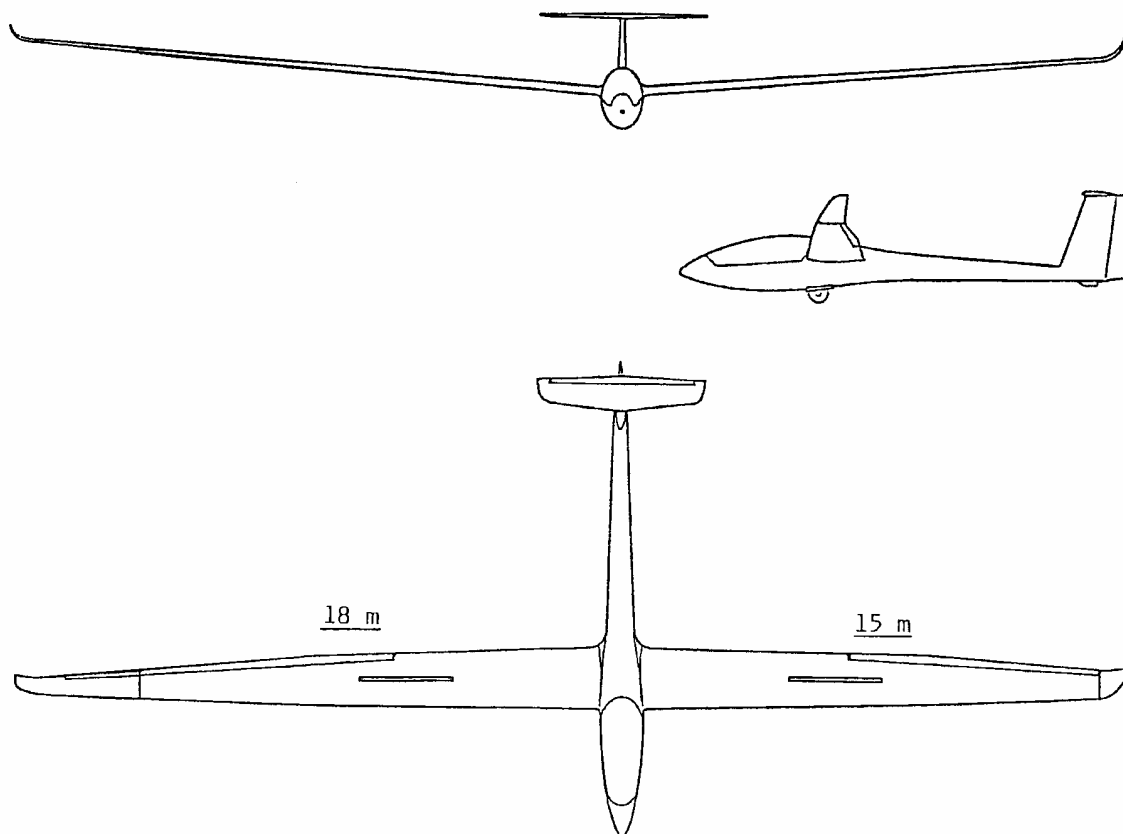
The LS 8-18 is a single seater sailplane with carbon fibre wing shell, winglets, T-tail, wing and vertical tail fin water ballast systems, retractable and sprung landing gear, and upper wing surface air brakes. The LS8-18 may be operated in 15m or 18m span and winglets in both versions

This sailplane has been produced using the latest technology of industrial fibre design (Glass-, Aramid- and Carbon fibres).

It is designed for competition flights – high performance combined with excellent handling characteristics.

Wing span	15m	49.21ft	18m	59.6ft
Length	6.66m	21.84ft	6.66m	21.84ft
Height	1.33m	4.36ft	1.33m	4.36ft
MAC	0.700m	2.3ft	0.634m	2.08ft
Wing area	10.5 m ²	113.0sq.ft	11.4 m ²	122.9sq.ft
Wing aspect ratio	21.43	21.43	28.38	28.38
Maximum gross weight	525kg	1157lbs	525 kg	1157lbs
Maximum wing loading	50.0 kg/m ²	10.3lbs/sq.ft	46.1 kg/m ²	9.4lbs/sq.ft

1.5 Three View Drawing



2 Limitations

Contents of **Section 2**:

2 Limitations	2-1
2.1 Introduction.....	2-1
2.2 Airspeeds (IAS)	2-2
2.3 Airspeed Indicator colour markings	2-3
2.4 Mass (Weight)	2-4
2.5 Centre of Gravity Limits	2-5
2.6 Manoeuvre Limits, Category of Airworthiness	2-5
2.7 Manoeuvring Load Factors	2-5
2.8 Kinds of Operation Limits	2-6
2.9 Flight Crew	2-6
2.10 Minimum Equipment List	2-7
2.11 Aero Tow, Winch Launch and Auto Tow.....	2-7
2.12 Further Limitations	2-8
2.12.1 Operating Placards for Limitations	2-8
2.12.2 Approved Gelcoats for Exterior Surfaces	2-8
2.12.3 Use of Water for Ballast	2-8

2.1 Introduction

Section 2 includes operating limitations, instrument markings and basic placards necessary for safe operation of the LS8-18 sailplane, its standard systems and standard equipment.

The limitations included in this section and in section 9 have been approved by LBA (Luftfahrt-Bundesamt Braunschweig).

The LS 8-18 sailplane has been designed and approved according to JAR 22 requirements. Factors of safety (relation of ultimate loads to permissible maximum loads occurring during operation) are 1.5 only. Thus, ultimate loads will be reached, when exceeding permissible load factors by 50%. When exceeding permissible speeds, the safety reserve is much lower.

Maximum loads should never be caused by the pilots control surface deflections – they result from severe turbulence and the necessary control surface deflections to retain the desired flight attitude. **Severe turbulence** according to airworthiness requirements includes wave rotors, cumulonimbus clouds, dust devils and turbulence when crossing mountain ridges in strong winds.

Warning: Therefore, operational limits, - speeds and load factors - must be adhered to !

2.2 Airspeeds (IAS)

Airspeed limitations and their operational significance are shown below:

	Maximum permissible Speed	IAS	Remarks
VNE	Never exceed speed in calm air and up to an altitude above MSL of: 2000m (6500ft) 3000m (9800ft) 4000m (13100ft) 6000m (19700ft) 8000m (26200ft) 10000m (32800ft) 12000m (39400ft)	Km/h Kt. mph 280 151 174 266 144 165 253 137 157 227 122 141 202 109 126 179 97 111 156 84 97	Do not exceed this speed in any operation and do not use more than 1/3 of control deflection.
VRA	Rough air speed	190 103 118	Do not exceed this speed except in calm air and then only with caution. Examples of rough air are lee wave rotor, thunderclouds, dust devils and turbulence when crossing mountain ridges in strong winds.
VA	Manoeuvring speed	190 103 118	Do not make full or abrupt control movement above this speed, because under certain conditions the sailplane may be overstressed by full control movement.
VW	Maximum winch-launching speed	140 76 87	Do not exceed this speed during winch- or auto-tow launching.
VT	Maximum aero towing speed	190 103 118	Do not exceed this speed during aero towing.
VL0	Maximum landing gear operating speed	280 151 174	Do not extend or retract the landing gear above this speed.
	Maximum air brake extension speed	280 151 174	

2.3 Airspeed indicator colour markings

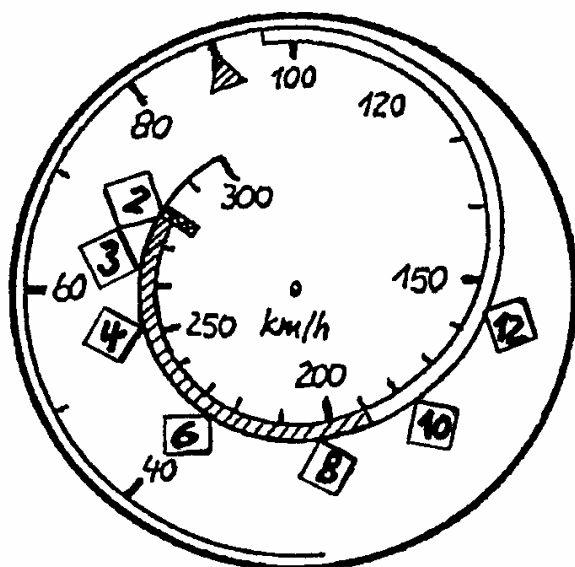
Airspeed indicator markings and their colour- code significance are shown below:

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.)



- green
- yellow
- red

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.

2.4 Mass (Weight)

<u>Maximum take-off mass including water ballast</u>	525 kg	1157 lbs
<u>Maximum mass without water ballast</u>	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.*

<u>Maximum mass of non-lifting parts</u>	239 to 249 kg	527 to 549 lbs
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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.

<u>Wing water ballast</u> (depending on loading conditions)	max. 190 kg	419 lbs
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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

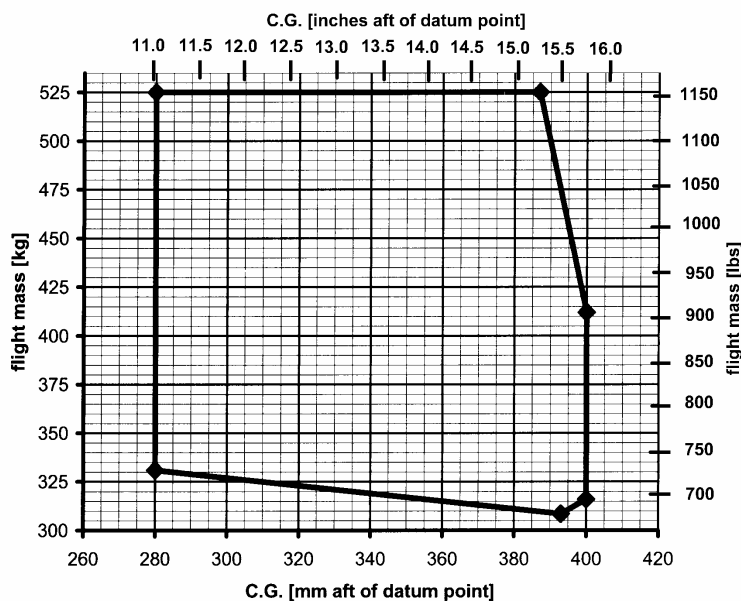
<u>Maximum mass in Baggage Compartment</u>	max. 5.0 kg	11 lbs
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<u>Maximum mass of all instrument panel installations</u>	max. 6.7 kg	14.8 lbs
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Warning: *The vertical tail fin battery may be removed from the tail fin to reduce Minimum Cockpit Load (see entries on page 6-1/2 for possible combinations !)*

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 8-18 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

2.8 Kinds of operation

The LS8-18 sailplane is approved for Day-VFR
Minimum equipment see page 2-7

Use of water ballast limited to non-freezing conditions.
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 normally without 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, 11 lbs 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 fin tank ballast and tail fin 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.

2.10 Minimum Equipment List

- Airspeed Indicator: scale 50-300 km/h (27-162 Kt.; 31-186 mph)
 Colour marking see page 2-3.
 Approved types see Master Equipment List in Maintenance Manual.
 Pressure pick-ups: vertical tail fin pitot and lower forward fuselage side statics.
- Altimeter: scale in m or ft.
- Remote indicating thermometer: approved types see Master Equipment List in Maintenance Manual.
- Four piece seat belt harness: approved types see Master Equipment List in Maintenance Manual.
- Vertical tail filling tube adapter: for checking of tail fin tank valve function (one of three removable filling funnel adapters)
- Magnetic compass: (for USA and Canada)
- Back cushion or parachute, in compressed form not thinner than 5 cm (2 in)
- Checklist, Type placard, Data and loading placard, Operating placards
- Flight Manual LS8-18

Additionally for cloud flying:

- Airspeed Indicator: recommended: scale 50-300 km/h ***with 1 turn only*** (27-162 Kt.; 30-186 mph)
- Turn and bank indicator
- Compass, compensated in sailplane
- Variometer: recommended: range at least ±10 m/s (2000 ft/min; 20 Kt.)

2.11 Aero tow, Winch-launch and Auto-tow

Maximum approved winch-launch speed:....**140 km/h (76 Kt.; 87 mph)**
 (also valid for Auto-tow)

Maximum approved aero tow speed:....**190 km/h (103 Kt.; 118 mph)**

Weak links

for **winch-launch**..... maximum **8250** Newton (825 kg; 1819 lbs)

Recommended: Tost weak link No. 3, colour code **red**,
rated break away load 7500 Newton (750 kg; 1653 lbs)

for **aero tow**..... maximum **6600** Newton (660 kg; 1455 lbs)

Recommended: Tost weak link No. 5, colour code **blue**,
 rated break away load 6000 Newton (600 kg; 1323 lbs)

Minimum tow cable length for aero tow**30** m (100 ft)
 recommended lengthup to **80** m (260 ft)

Important Note: During motor glider tow, limitations regarding weak link and tow cable length must be obeyed.

2.12 Further Limitations

2.12.1 Operating Placards for Limitations

Rolladen Schneider Flugzeugbau GmbH
 Type: LS 8-18 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 Loadmax. _____ 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)

2.12.1 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.

3 Emergency Procedures

Contents of **Section 3**:

3 Emergency procedures.....	3-1
3.1 Introduction.....	3-1
3.2 Emergency Canopy Jettison.....	3-1
3.3 Emergency Exit.....	3-2
3.4 Stall Recovery.....	3-2
3.5 Spin Recovery.....	3-3
3.6 Spiral Dive Recovery.....	3-3
3.7 Other Emergencies.....	3-4
3.7.1 Limitation of High Speed Flight.....	3-4
3.7.2 Rain.....	3-4
3.7.3 Inadvertent Freezing / Icing.....	3-4
3.7.4 Flight with asymmetric water ballast loading.....	3-5
3.7.5 Winch-launch cable failure.....	3-5
3.7.6 Emergency landing with landing gear retracted.....	3-5
3.7.7 Ground loop.....	3-5
3.7.8 Emergency landing in water.....	3-6
3.7.9 Flight in the vicinity of thunder storms.....	3-6

3.1 Introduction

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur. Emergencies caused by sailplane malfunction are extremely rare if proper pre-flight inspections and maintenance are practised.

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

3.2 Emergency Canopy Jettison

Canopy locks : pull both red and white handles **to stops**

- Right handle operates emergency canopy jettison, therefore longer travel as on left handle.
- Hand force increases for emergency jettison travel to avoid unintentional jettison during normal operation.

Canopy : push off at **both** red and white handles

- Lifting panel assists pushing off.
- spring loaded peg at canopy frame rear edge acts as temporary hinge for clean separation from fuselage.

3.3 Emergency Exit

- Canopy** - jettison
- Seat harness** - open
- Exit** - Lift with arms over cockpit rim
push yourself away from the sailplane
 - preferably dive under wing, to avoid the tail

3.4 Stall Recovery

- Warning** - slight tail shudder prior to entry
- Aileron** - effectiveness reduced by about 50%
- Sink rate** - increases considerably
- Termination** - Stick forward to neutral
- Stalling speed** - at maximum weight (525 kg, 1157 lbs),
straight flight and air brakes retracted:
 - 83 km/h** (45 Kt.; 52 mph) with 15 m (49 ft) wingspan
 - 80 km/h** (43 Kt.; 50 mph) with 18 m (59 ft) wingspanair brakes extended:
 - 87 km/h** (47 Kt.; 54 mph) with 15 m (49 ft) wingspan
 - 85 km/h** (46 Kt.; 53 mph) with 18 m (59 ft) wingspan

When during stalled flight the angle of incidence is increased considerably by further “pulling”, then –depending on C.G. position- spinning may result from asymmetric stall.

3.5 Spin Recovery

Simultaneously:

Elevator - push forward

Rudder - full rudder deflection opposite to spin rotation until rotation stops

Aileron - opposite to spin rotation for quicker termination

Until rotation stops, then:

Elevator - smooth pull-out
Altitude loss during recovery about 100 m (300 ft)

Note: According to actual aileron deflection and C.G. position, more or less pronounced floating around the pitch axis occurs during spinning.

3.6 Spiral Dive Recovery

Spiral dive may occur, when the sailplane terminates spinning on its own and not by pilots action.

Then:

Rudder - opposite to dive rotation

Aileron - opposite to angle of bank

Elevator - pull cautiously

Warning: *During dive-out be alert not to exceed maximum permissible speed
VNE = 280 km/h (151 Kt.; 174 mph) inadvertently, see also page 2-2!*

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 brakes can only be fully retracted at speeds below 220 km/h (119 Kt.; 137 mph): spring loaded covers stay open due to aerodynamic suction.

(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:

- (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.

3.7.4 Flight with asymmetric Water Ballast Loading

Uneven water dumping may be recognised as follows:

- (1) with free aileron, one wing tends downward.
- (2) for straight flight at low speeds considerable aileron deflection is required.

then:

- (a) stop further water ballast discharge to avoid even higher asymmetry due to increased weight difference
- (b) avoid stalling
- (c) for landing: Increase approach speed at least by about 10 km/h (5 Kt.; 6 mph) over normal approach speed and touch down with this increased speed.
- (d) to avoid ground looping, apply aileron shortly after in the direction as noticed before.

3.7.5 Cable failure during Winch Launch

- (a) Immediately push stick forward until airspeed indication is within ASI green range
- (b) Release cable
- (c) According to altitude:
 - (1) use short traffic pattern and make safety landing on airfield or
 - (2) extend airbrakes immediately and land in front of winch

Caution: Water ballast discharge is recommended before each landing. Landing with maximum all-up weight is not recommended. In this case at least 25 Litres (6.6 US gallons, 5.5 UK gallons) –corresponding to 15 seconds of discharge time- should be dumped prior to landing.

3.7.6 Emergency Landing with Landing Gear Retracted

Emergency landings with landing gear retracted are **not recommended**, because energy absorption of the sprung landing gear compared to the fuselage shell is higher.

If however an emergency landing with gear retracted is necessary, do not touch down with minimum speed to avoid stalling and resulting impact of cockpit region.

Warning: *Always dump as much water as possible*

3.7.7 Ground Loop

When a landing strip obviously will not be long enough for a normal landing, initiate a ground loop at least 50 m (150 ft) before the end:

- (a) steer wingtip to desired direction onto the ground, whenever possible the windward side should be preferred.
- (b) simultaneously decrease tail skid load by controlled forward stick deflection.

3.7.8 Emergency Landing on Water

During a water landing test with landing gear retracted, the sailplane used submarined completely. As submarining may be possible also with gear extended, the following procedure is recommended:

- (a) in downwind leg of your landing pattern
 - (1) extend landing gear
 - (2) open parachute harness
- (b) Touch down with gear extended and speed as low as possible.
- (c) At touch-down point use left arm to protect face against possible canopy fracture.
- (d) After touch down undo parachute and seat belt harnesses.
- (e) Leaving the cockpit under water, when the canopy has not fractured, is perhaps possible only after the forward fuselage is almost completely full of water.

3.7.9 Flight in the Vicinity of Thunder Storms

Due to lightning flash, carbon fibre structures have been destroyed again and again. Therefore, flights and especially winch launches **in the vicinity of thunder storms** should be avoided, as in important structures of the LS8-18 carbon fibres are used.

4 Normal Procedures

Contents of Section 4:

4 Normal Procedures	4-1
4.1 Introduction	4-1
4.2 Rigging and De-rigging	4-2
4.3 Daily Inspection	4-3
4.4 Pre-flight Check	4-5
4.5 Normal Procedures	4-6
4.5.1 Cockpit-Checklist	4-6
4.5.2 Adjustment of Rudder Pedals	4-6
4.5.3 Automatic Parachute Ripcord	4-6
4.5.4 Adjustment of Backrest	4-7
4.5.5 Retractable Landing Gear	4-7
4.5.6 Wheel Brake	4-7
4.5.7 Trim System	4-8
4.5.8 Baggage Compartment Loading	4-8
4.5.9 Balancing of Pilots	4-8
4.5.10 Water Ballast	4-9
4.5.10.1 Vertical Tail Fin Tank Loading Procedure	4-9
4.5.10.2 Wing Tank Loading Procedure	4-10
4.5.10.3 Loading Plan for Water Ballast	4-10
4.5.10.4 Maximum Wing Water Ballast (Table)	4-11
4.5.10.5 Maximum Tail Fin Water Ballast (Table)	4-12
4.5.10.6 Dumping of Water Ballast	4-13
4.5.11 Winch Launch / Auto Tow	4-13
4.5.12 Aero tow	4-14
4.5.13 Free Flight	4-14
4.5.14 High Altitude Flight	4-15
4.5.15 Side-slip	4-15
4.5.16 Landing	4-16
4.5.17 Flight in Rain	4-16
4.5.18 Flight in the Vicinity of Thunderstorms	4-16
4.6 Postflight Check	4-17

4.1 Introduction

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

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 in 15 m (49 ft) version and 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.*
12. 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.
13. Install total energy tube, secure against turning using tape; install barograph.
14. Connect automatic parachute ripcord to red marked portion at main bulkhead using special loop only.
15. Seal wing fuselage intersection by taping upper and lower sides and cut-out on upper horizontal tail fin.
16. 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 ?
17. **Check control system functions using a helper.**
18. Perform Daily Inspection according to page 4-3.

4.2 Rigging and De-Rigging continuedInstallation of 15 m (49 ft) or 18 m (59 ft) Winglets

1. Insert winglet until securing nut starts catching thread; when aileron pins at 18 m (59 ft) version are not correctly aligned, installation is impossible.
2. Turn nut in direction that it pulls winglet into position.
3. Lock nut until tip 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

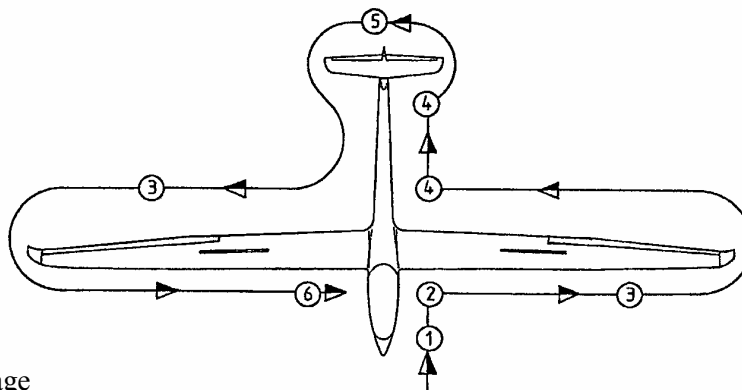
- (1) Reverse **assembly** sequence.
- (2) 15m (49 ft) winglets may be stored in cockpit when using some padding.
- (3) Air brake system should be unlocked to avoid permanent pressure on flexible covers and resulting possible deformations (overcenter in wing).

Warning: *With wings positioned vertical in trailers with hinged cover, the air brakes may open and 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

4" wheel:	3 to 3.5 bar <44 to 51 psi>
5" wheel:	3.5 bar <51 psi>
- (b) **For 4" wheel only:** When using water ballast increase up to 4 bar <58 psi>
Step (b) does not apply when TN8020 has been executed.
- (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

4.3 Daily Inspection continued3 Wings

- (a) Ventilation openings and water drain orifices at root 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, if 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

4.3 Daily Inspection continued6 Cockpit

- (a) Canopy cleaned, if required
- (b) Check canopy locking and emergency jettison function:
 - (1) "Pilot" in seat, both canopy locking levers opened.
 - (2) 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.
 - (3) 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.
 - (4) 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 battery fixed in baggage compartment and 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:
 - a) when filled, check for leaks
 - b) no leaks in wing system allowed to avoid unintentional rearward C.G. displacement due to tail fin tank
 - c) check proper dumping: tail fin system opens **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)

4.5 Normal Procedures4.5.1 Cockpit-Checklist**LS 8-18 Checklist**

This sailplane must be operated in compliance with operating limitations stated in the form of markings, placards and Flight Manual.

1. Main pins secured ?
2. Elevator secured ?
3. Winglets secured ?
4. Test controls
5. Tail fin valve operation checked ?
6. When using water ballast, then always in wing and tail !
7. Check loading conditions
8. Check tail dolly removed ?
9. Fasten seat belt harness
10. Connect parachute static line
11. Lock air brakes
12. Check trim position
13. Check release system
14. Lock canopy

4.5.2 Adjustment of Rudder Pedals

- (a) Possible in flight or on the ground
- (b) Release pressure on pedals and unlock pawl by pulling black pedal handle
- (c) Forward adjustment:
 - (1) push pedals forward with feet
 - (2) lock into desired position
- (d) Rearward adjustment:
 - (1) Pull pedals with release handle
 - (2) lock into desired position

Automatic parachute ripcord

- (a) Attach to red main bulkhead portion at left rear of pilot
- (b) Use special loop only

4.5.4 Adjustment of Backrest

Warning: *Adjust backrest in such way, that lower spine is well supported and not bent and lap belt can be adjusted tight.*

Two possibilities of adjustment, both can be used on the ground only

- (a) Lower adjustment allows use of various types of parachute (locating pegs and slotted screw)
- (b) Upper end slope adjustment

During adjustment, watch out for the following:

- (c) Locking pin behind main bulkhead must be fully engaged
- (d) Position head as high as possible for good visibility
- (e) Tow hook handle and other controls must be within easy reach
- (f) Remember colour code at backrest support to allow for easy position identification of personal adjustment.

Warning: *Moving aileron with stick fully back, the stick must not open the safety harness !*

Warning: *When the backrest is removed for huge pilots, then*

- (1) the guide tube must also be removed (it may obstruct an emergency exit)*
- (2) Additionally, an adjustable headrest according to drawing 3BR-101 must be installed.*

4.5.5 Retractable Landing Gear

- (a) Extension or retraction permitted over whole approved speed range
- (b) Rapid operation eases retraction
- (c) Handle locked in forward position = gear up
- (d) Handle locked in rearward position = gear down

Important Note: **When using the C.G. hook, retract gear after releasing tow cable, because C.G. hook is fitted to landing gear fork.**

4.5.6 Wheel Brake

Press rudder pedals with both feet to activate wheel brake.

With TN8019 executed: The wheel brake is actuated by the air brake handle, instead of by the rudder pedals.

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 pages 4-9.
- (c) When discharging water ballast, this trim condition can not be kept due to quicker discharge of tail fin water ballast.
- (d) **When installing a battery (3BR-199, Standard weight 2.5 to 2.7 kg, <5.5 to 6 lbs>) in the tail fin, 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 for trimming afterwards.

4.5.10 Water Ballast

- (a) Use clear water without any additives.
- (b) **For 4" wheel only:** Increase tyre pressure to 4 bar < 58 psi>, when using full water ballast. **Step (b) does not apply when TN8020 has been executed.**
- (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 inner 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 outer wing tanks first, thereafter fill inner tanks with the remaining amount.

Outer tanks each carry about 30 Litres <7.9 US gallons, 6.6 Imp. gallons>, inner tanks each carry about 65 Litres <17.2 US gallons, 14.3 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 thus:
 - 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.*

4.5.10.2 Wing Tank Loading Procedure (after filling of tail tank)

- (a) Always place sailplane horizontal and fill outer tank first.
- (b) Connect small diameter wing tank adapter to filling funnel, use it to open outer tank valve and brace taper into opening.
- (c) Fill half of desired total amount of water into wing via funnel.
- (d) For maximum approved amount of wing water ballast see tables on page 4-11.

Warning: Never fill wing with pressure from water pipe or from pump. Due to restricted ventilation cross section the wing shell cannot withstand the pressure increase. Therefore, always fill water using only the funnel!

- (f) When the outer integral tank is full, fill the inner tank with the rest of the desired amount using the same procedure after connecting the large adapter to the funnel and bracing the adapter by turning.
- (g) With wing tanks full, water leaks from the following position:
for both inner and outer tanks at the under side root rib draining orifice in front of the spar.
- (h) Use as clean water as possible to ensure proper valve sealing and avoid clogging of overflow pipes and draining orifices.
- (i) Fill the other wing as outlined above.

Warning: When amount of water ballast in wings is not equal, this may favour ground loop tendencies during take off.

- (j) **After filling ballast and before take-off the following must be checked:**
 - (1) Not even minor leaks at wing system allowed.
 - (2) Tail tank valve opens **simultaneously with** or **before** wing valves.

Warning: Check proper dumping, tail fin system must start dumping together with wing system to avoid C.G. shifting backwards.

Additionally see page 3.4 for freezing / icing.

4.5.10.3 Loading Plan for Water Ballast

Maximum approved capacity of integral tanks: about 95 kg <209 lbs> per wing
= total of**190.0** kg <419 lbs>

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>
Integral tank.....**12.0** kg <24.5 lbs>

Tables on page 4-11 show maximum possible wing water ballast mass. (Water in wing and tail tank) in relation to empty weight and cockpit load (Pilot + parachute + equipment + baggage compartment load).

Wing water ballast must always be compensated by tail tank water ballast according to table page 4-12; showing tail tank water amount in relation to wing water ballast amount.

4.5.10.4 Maximum Wing Water Ballast

Cockpit Load (Pilot + Parachute + equipment) <i>[kg]</i>	Empty Mass <i>[kg]</i>									
	250	255	260	265	270	275	280	285	290	295
70	<u>190</u>	<u>190</u>	<u>187</u>	<u>183</u>	<u>178</u>	<u>173</u>	<u>168</u>	<u>163</u>	<u>159</u>	<u>154</u>
75	<u>190</u>	<u>187</u>	<u>183</u>	<u>178</u>	<u>173</u>	<u>168</u>	<u>163</u>	<u>159</u>	<u>154</u>	<u>149</u>
80	<u>187</u>	<u>183</u>	<u>178</u>	<u>173</u>	<u>168</u>	<u>163</u>	<u>159</u>	<u>154</u>	<u>149</u>	<u>144</u>
85	<u>183</u>	<u>178</u>	<u>173</u>	<u>168</u>	<u>163</u>	<u>159</u>	<u>154</u>	<u>149</u>	<u>144</u>	<u>139</u>
90	<u>178</u>	<u>173</u>	<u>168</u>	<u>163</u>	<u>159</u>	<u>154</u>	<u>149</u>	<u>144</u>	<u>139</u>	<u>135</u>
95	<u>173</u>	<u>168</u>	<u>163</u>	<u>159</u>	<u>154</u>	<u>149</u>	<u>144</u>	<u>139</u>	<u>135</u>	<u>130</u>
100	<u>168</u>	<u>163</u>	<u>159</u>	<u>154</u>	<u>149</u>	<u>144</u>	<u>139</u>	<u>135</u>	<u>130</u>	<u>125</u>
105	<u>163</u>	<u>159</u>	<u>154</u>	<u>149</u>	<u>144</u>	<u>139</u>	<u>135</u>	<u>130</u>	<u>125</u>	<u>120</u>
110	<u>159</u>	<u>154</u>	<u>149</u>	<u>144</u>	<u>139</u>	<u>135</u>	<u>130</u>	<u>125</u>	<u>120</u>	<u>115</u>

Cockpit Load (Pilot + parachute + equipment) <i>[lbs]</i>	Empty Mass <i>[lbs]</i>									
	551	562	573	584	595	606	617	628	639	650
154	<u>419</u>	<u>419</u>	<u>412</u>	<u>403</u>	<u>392</u>	<u>381</u>	<u>370</u>	<u>359</u>	<u>351</u>	<u>340</u>
165	<u>419</u>	<u>412</u>	<u>403</u>	<u>392</u>	<u>381</u>	<u>370</u>	<u>359</u>	<u>351</u>	<u>340</u>	<u>328</u>
176	<u>412</u>	<u>403</u>	<u>392</u>	<u>381</u>	<u>370</u>	<u>359</u>	<u>351</u>	<u>340</u>	<u>328</u>	<u>317</u>
187	<u>403</u>	<u>392</u>	<u>381</u>	<u>370</u>	<u>359</u>	<u>351</u>	<u>340</u>	<u>328</u>	<u>317</u>	<u>306</u>
198	<u>392</u>	<u>381</u>	<u>370</u>	<u>359</u>	<u>351</u>	<u>340</u>	<u>328</u>	<u>317</u>	<u>306</u>	<u>298</u>
209	<u>381</u>	<u>370</u>	<u>359</u>	<u>351</u>	<u>340</u>	<u>328</u>	<u>317</u>	<u>306</u>	<u>298</u>	<u>287</u>
220	<u>370</u>	<u>359</u>	<u>351</u>	<u>340</u>	<u>328</u>	<u>317</u>	<u>306</u>	<u>298</u>	<u>287</u>	<u>276</u>
231	<u>359</u>	<u>351</u>	<u>340</u>	<u>328</u>	<u>317</u>	<u>306</u>	<u>298</u>	<u>287</u>	<u>276</u>	<u>265</u>
242	<u>351</u>	<u>340</u>	<u>328</u>	<u>317</u>	<u>306</u>	<u>298</u>	<u>287</u>	<u>276</u>	<u>265</u>	<u>254</u>

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

4.5.10.5 Maximum Tail Fin Water Ballast

Maximum tail tank capacity: - without battery box5.5 kg <12 lbs>
 - with battery box3.8 to 4.1 kg <8.4 to 9.0 lbs>

Maximum integral tail tank capacity12 kg <24.5 lbs>

Wing-Water Mass	Specified Tail tank-Water Mass	Total-Water-Mass
<i>[kg]</i>	<i>[kg]</i>	<i>[kg]</i>
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
<i>[lbs]</i>	<i>[lbs]</i>	<i>[lbs]</i>
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

4.5.10.6 Dumping of Water Ballast

- (a) Single ballast lever forward or both double levers forward = All ballast tanks open.
- (b) Only small lever of double levers forward = Only inner tank and tail tank open.
- (c) Discharge time about 3 Minutes, i.e. at 190 Litres <50.2 US gallons, 41.8 Imp. gallons> approx. 63 Litres <16.6 US gallons, 13.9 Imp. gallons> per minute:
 - (1) If aileron stick force is required to maintain level flight after about 3 minutes of dumping, this may indicate unequal dumping. Such **asymmetry** must be counteracted by leaving dump valves open long enough, if necessary until after landing.
 - (2) Open valves emit a buzzing sound when tank is empty.
 - (3) To avoid ground looping in case of unequal dumping, apply aileron in the direction as noticed before shortly after touchdown.

Warning: *Check thermometer regularly during flight. Dump water at +5° Centigrade <41°F>; ballast water in wing shell and tail tank should never freeze solid. (See also page 3-4).*

4.5.11 Winch Launch or Auto Tow

- (a) Trim slightly nose heavy: Trim position indicator in front of neutral-mark.
- (b) Adjust backrest properly (See page 4-7) and tighten seat belt harness to avoid sliding backwards during acceleration and steep climb.
- (c) Ask winch operator to avoid too high acceleration.
The higher the initial acceleration, the higher the pitch-up tendency.
- (d) Use wheel brake during tightening of tow cable to avoid rolling over cable.
With TN8019 executed: It's not recommended to use the wheel brake during tightening of the tow cable.
- (e) Pronounced forward stick pressure is required during transition arc.
- (f) **Minimum tow speed:**

without water ballast	90 km/h <49 Kt., 56 mph>
with water ballast	100 km/h <54 Kt., 62 mph>
- (g) Retract landing gear **after** tow, because C.G. hook is fitted to landing gear fork.

4.5.12 Aero Tow

- (a) Aero tow must be performed at the nose hook.
- (b) Trim slightly nose heavy: Trim position indicator in front of neutral mark.
- (c) Use wheel brake during tightening of tow cable to avoid rolling over rope.
With TN8019 executed: It's not recommended to use the wheel brake during tightening of the aerotow rope.
- (d) **Minimum Tow Speed:**
- | | |
|-----------------------|---------------------------|
| without water ballast | 100 km/h <54 Kt., 62 mph> |
| with water ballast | 120 km/h <65 Kt., 74 mph> |
- (e) Recommended tow cable length: 30 - 80 m <100 - 260 ft>

Warning: The C.G. hook is not approved for aero tow.

4.5.13 Free Flight

- Stalling speed (IAS) for straight and level flight and air brakes retracted:

15m <49 ft> wing span:	
Without water ballast:	68-70 km/h <37-38 Kt., 42-43 mph>
With maximum water:	82-84 km/h <44-45 Kt., 51-52 mph>
18m <59 ft> wing span:	
Without water ballast:	65-67 km/h <35-36 Kt., 40-42 mph>
With maximum water:	79-81 km/h <43-44 Kt., 49-50 mph>
- Circling flight: (Thermalling) Trim stick forces to zero.
- Best Glide Angle: between 95 to 105 km/h <51 to 57 Kt., 59 to 65 mph>
- High speed flight: Reduce stick forces by trimming. Avoid abrupt manoeuvres and check speed indication regularly to avoid exceeding limit values.

Warning: *Observe air speed limits versus altitude (see page 2-2)*

Warning: *In emergencies, air brakes can be extended up to VNE = 280 km/h <151 Kt., 174 mph> ; Extend air brakes cautiously, because in this speed range air brakes are being sucked out suddenly, causing short time negative acceleration and may initiate pilot induced oscillations (P.I.O.).*

Warning: *Check thermometer, when using water ballast, regularly during flight. When temperature is decreasing, dump water at least at +5° Centigrade <41° F> to ensure proper dumping and avoid structural damage at wing shell and vertical tail fin shell (Integral tanks).*

4.5.14 High Altitude Flight

Increasing altitude yields higher true airspeed than indicated airspeed and this difference increases with increasing altitude.

This does not influence loads on the structure, which means that colour markings on airspeed indicator are valid unless limited by red lines.

However, as flutter depends on true airspeed and flutter flight tests yielded no flutter tendencies below 280 km/h up to 2000 m above MSL, the indicated airspeed should never be above 280 km/h IAS <151 Kt., 174 mph> up to 2000 m <6500 ft> above MSL.

Using the table on page 2-2, maximum permissible airspeeds related to altitude, the pilot is able to avoid flying faster than true airspeed of 280 km/h 151 Kt., 174 mph>.

Example: Indicated airspeed of 227 km/h <122 Kt., 141 mph> at 6000 m <19700 ft> altitude above MSL corresponds to 280 km/h <151 Kt., 174 mph> true airspeed.

4.5.15 Side-slip

- (1) Side-slip can be recommended for landing only with a small amount of air brake extension, as low-speed side-slip is not possible because of nose-heavy moment of fully extended air brakes.
- (2) Side-slip speed range up to $V_A = 190$ km/h <103 Kt., 118 mph>
- (3) For a straight and steady side slip 100 % rudder and between 50% to 75% aileron deflection are necessary. During side-slip, rudder control force decreases to almost zero force.
- (4) Degradation in airspeed system goes down to zero airspeed indication. Depending on airspeed indicator, negative values may be indicated.

Pressure pick-ups: Vertical tail fin **pitot pressure**
 Forward fuselage **lower side static pressure**

- (5) Partial water ballast yields unimportant difference in side-slip handling.

4.5.16 Landing

- (a) Water ballast should normally be dumped prior to landing. Because of possible unequal dumping leave valves open, see also pages 3-5 and 4-10.

Warning: *To comply with airworthiness regulations, for the 15 m <49 ft> version and maximum all-up weight (525 kg, 1157 lbs) water should be discharged before landing at least for 25 seconds.*

- (b) Extend landing gear in time and lock (right hand gear handle).
(c) Landing with gear retracted not advisable, because pilot is much better protected by the sprung landing gear compared to the fuselage shell.
(d) Air brakes allow control of glide angle within wide limits, therefore side-slipping is not necessary.

Warning: *Minimum approach speed with air brakes fully extended:*

<i>Without water ballast</i>	<i>not below 90 km/h <49 Kt., 56 mph>.</i>
<i>With water ballast</i>	<i>not below 100 km/h <54 Kt., 62 mph>.</i>

Warning: *Minimum speed increases*

<i>With air brakes extended</i>	<i>by about 10 km/h <5 Kt., 6 mph>.</i>
<i>In rain and with air brakes extended</i>	<i>by about 20 km/h <11 Kt., 12 mph>.</i>

Warning: *Side-slip with air brakes extended is not recommended for landing, because nose heavy moment of air brakes allows no slow side-slip.*

4.5.17 Flight in Rain

Warning: *During rain expect considerable decrease of performance and effectivity of controls. Increase approach to landing speed at least by 10 km/h <5 Kt., 6 mph>, because stall speed increases and effectivity of controls decreases.*

Open canopy window to increase visibility.

4.5.18 Flight in the Vicinity of Thunderstorms

Warning: *Carbon fibre structures have been repeatedly destroyed due to lightning stroke. Therefore avoid flight and especially winch-launch in the vicinity of thunderstorms, as carbon fibres are used in important structures of the LS 8-18 sailplane.*

4.6 Postflight Checks

1. Switch off electrical instruments
2. Remove battery and charge, when necessary
3. Remove insects and dust using chamois leather (See also chapter 8, Cleaning and Care)
4. Check if moisture has accumulated in air brake boxes and remove with sponge
5. Check proper emptying of integral tanks (when disassembled and with wings vertical, drain residual water via root rib draining valve)
<Grease root rib drain valve plunger using Vaseline and re-insert before assembly!>
6. Check proper dumping of tail fin water tank.
7. Keep all water valves open for ventilation of wing water tanks and tail fin water tank.
8. Unlock wing air brake system.

For cleaning and care, see chapter 8, page 8-5 ff.

5 Performance

Contents of **Section 5**:

5.1 Introduction.....	5-1
5.2 LBA-approved Data.....	5-2
5.2.1 Airspeed Indicator System Calibration.....	5-2
5.2.2 Stalling Speeds.....	5-2
5.3 Additional Information	5-3
5.3.1 Demonstrated Crosswind Performance.....	5-3
5.3.2 Flight Polar.....	5-3

5.1 Introduction

Section 5 provides approved data for airspeed calibration and stalling speeds and additional unapproved information.

Data in the charts has been computed from actual flight tests with the sailplane in good condition and using average piloting techniques.

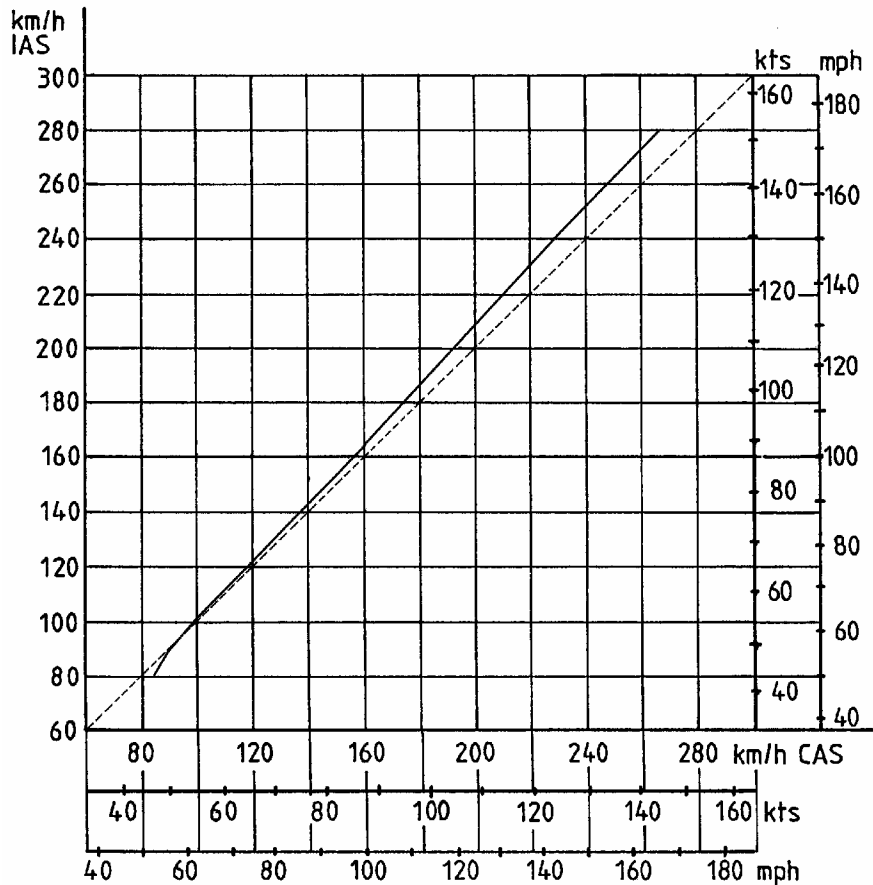
5.2 Approved Data

5.2.1 Airspeed Indicator System Calibration

Diagram on page 5-2 shows airspeed indicator error due to position of pressure ports:

Pitot pressureat vertical tail fin about 3/4 up
 Static pressure.....at lower forward fuselage sides

5.2.1 Airspeed Indicator System Calibration continued



5.2.2 Stalling Speeds

Stalling speeds (IAS) for straight and level flight:

Wing span	15 m <49 ft>	18 m <59 ft>
Without water ballast at 384 kg <847 lbs> mass	69 km/h 37 Kt., 43 mph	66 km/h 36 Kt., 41 mph
With maximum water ballast at maximum take-off mass 525 kg <1157 lbs>	83 km/h 45 Kt., 52 mph	80 km/h 43 Kt., 50 mph
Air brakes extended at 384 kg <847 lbs> mass	73 km/h 39 Kt., 45 mph	71 km/h 38 Kt., 44 mph
Air brakes extended with maximum take-off mass 525 kg <1157 lbs>	87 km/h 47 Kt., 54 mph	85 km/h 46 Kt., 53 mph

5.3 Additional Information

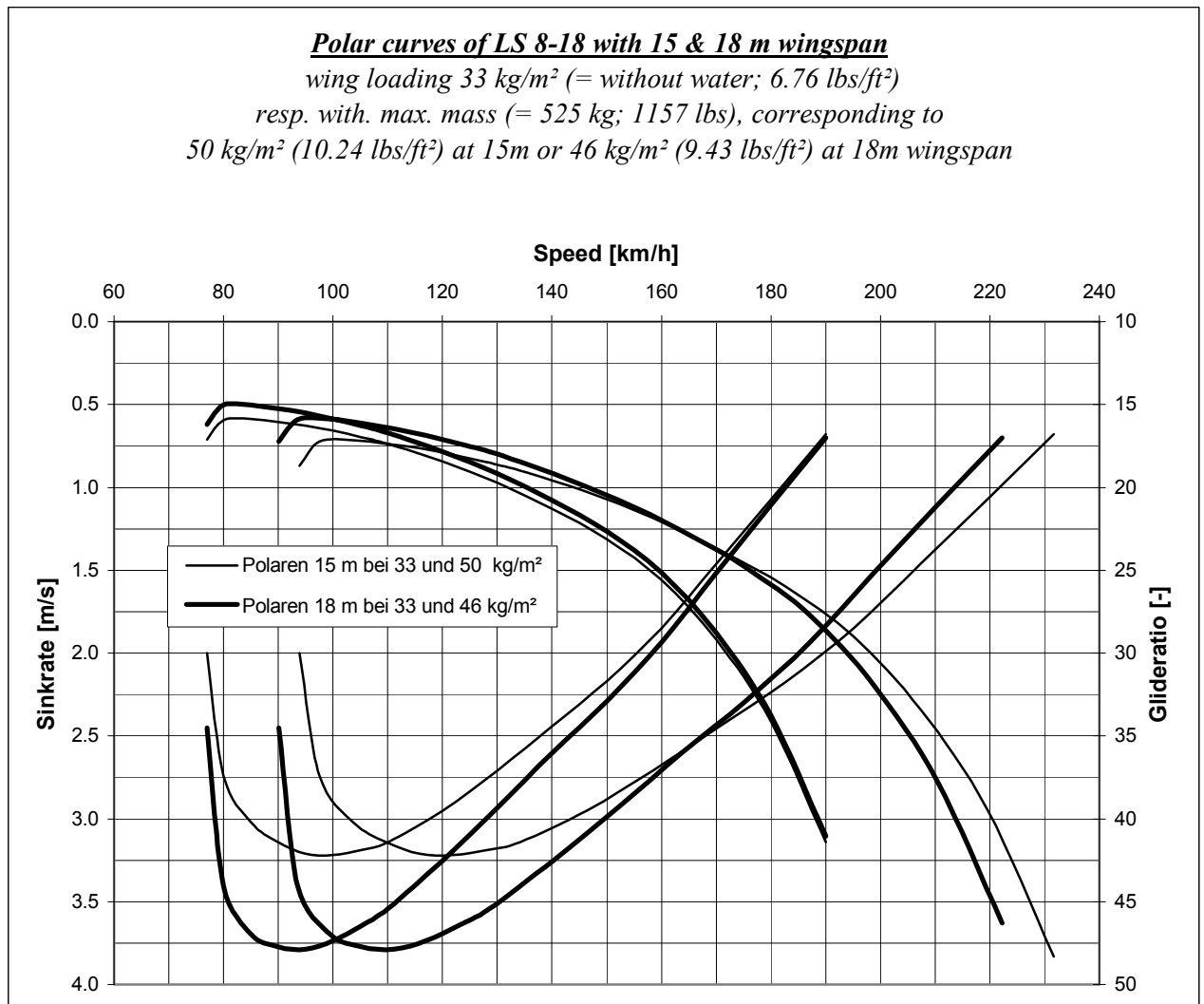
5.3.1 Demonstrated Crosswind Performance

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 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.



Conversion table for Airspeed and Sink Rate:

kmh	60	80	100	120	140	160	180	200	220	240
mph	37	50	62	75	87	99	112	124	137	149
kts	32	43	54	65	76	86	97	108	119	129
m/s	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
kts	1	2	3	4	5	6	7	8		

6 Weight and Balance

Contents of **Section 6**:

6 Weight and Balance..... 6-1
 6.1 Introduction 6-1
 6.2 Weighing Record and Loading Limits 6-1 and 6-2

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				Permanently fixed Ballast Mass		Tail Tank Volume	Date / Inspector
				<i>WITH Tail Batterie and Tail Tank full empty</i> *)		<i>WITHOUT Tail Batterie and Tail Tank full empty</i> *)		front	Rear		
	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	
15m											
18m											
15m											
18m											
15m											
18m											
15m											
18m											
15m											
18m											

*) 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.

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				Permanently fixed Ballast Mass		Tail Tank Volume	Date / Inspector
				WITH Tail Batterie and Tail Tank <i>full</i> <i>empty</i>)*		WITHOUT Tail Batterie and Tail Tank <i>full</i>)* <i>empty</i>)*		front	rear		
	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	
15m											
18m											
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)* 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.

7 Description of Systems

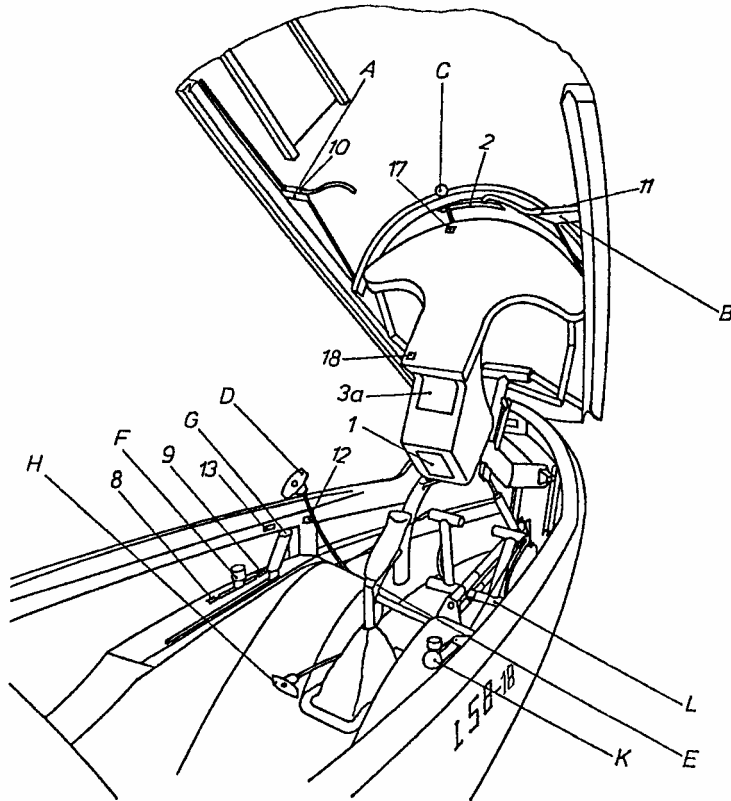
Contents of **Section 7**:

7 Systems.....	7-1
7.1 Introduction	7-1
7.2 Cockpit Controls.....	7-2
7.3 Air Brake System	7-3
7.4 Baggage Compartment	7-3
7.5 Water Ballast System and Operation.....	7-3
7.5.1 Wing Water Ballast System.....	7-4
7.5.2 Fuselage Water Ballast System	7-4
7.6 Electrical System and Operation	7-5
7.7 Pneumatic System	7-5
7.8 Various Equipment.....	7-6
7.8.1 Expendable Ballast (Trim Weights).....	7-6
7.8.2 Oxygen System.....	7-6
7.8.3 Emergency Locator Transmitter.....	7-6

7.1 Introduction

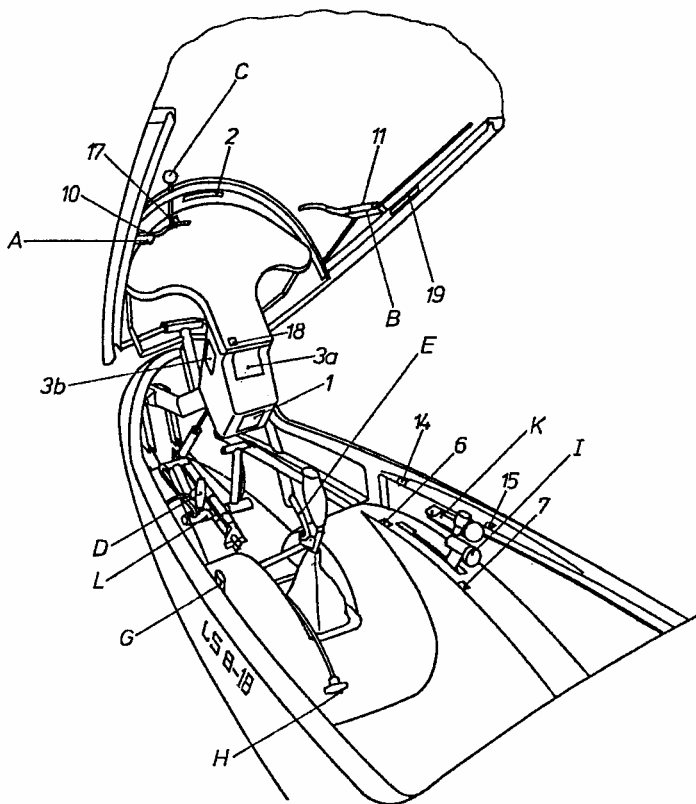
This section provides description of the sailplanes operating systems, instrumentation and other information necessary for the safe operation of the sailplane and its systems.

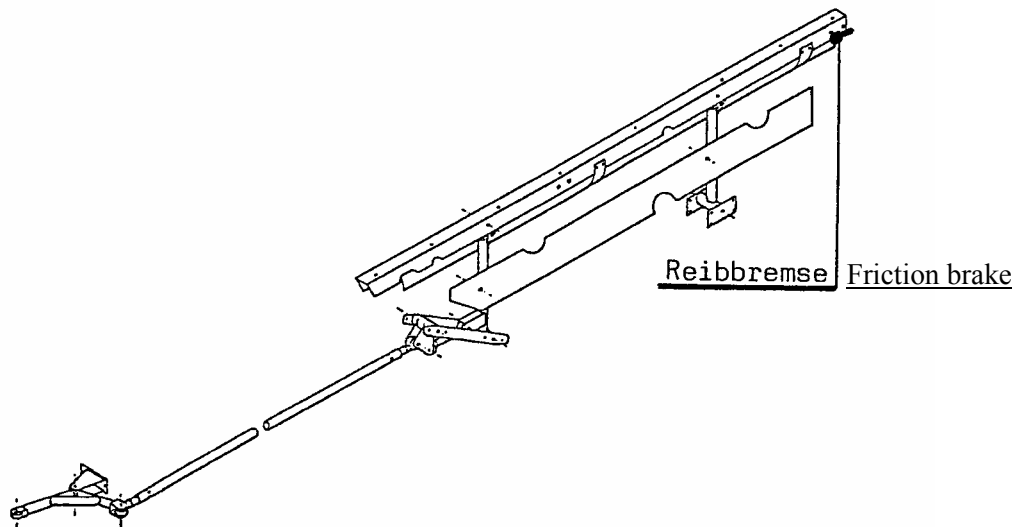
7.2 Cockpit Controls



Numbers refer to placards, see also Flight Manual, pages 2-13 and Maintenance Manual pages 10-1 and 10-2.

- A - Left canopy locking
- B - Right canopy locking and emergency jettison
- C - Ventilation
- D - Tow cable release
- E - Trim locking lever
- F - Trim lever, also indicating trim position
- G - Air brake handle
- G with TN8019 executed:**
Airbrake and wheel brake
- H - Pedal adjustment
- I - Landing gear
- K - Water ballast
- L - Rudder pedals and wheel brake (feet operated)
- L with TN8019 executed:**
Rudder pedals



7.3 Air Brake System7.4 Baggage Compartment

Baggage Compartment is accessible only on the ground after swivelling backrest forward. Loading possible **after** rigging. Equipment (for instance batteries) must be installed according to instructions in Maintenance Manual, chapter 11. Not permanently fixed, soft items count for cockpit load.

7.5 Water Ballast System and Operation

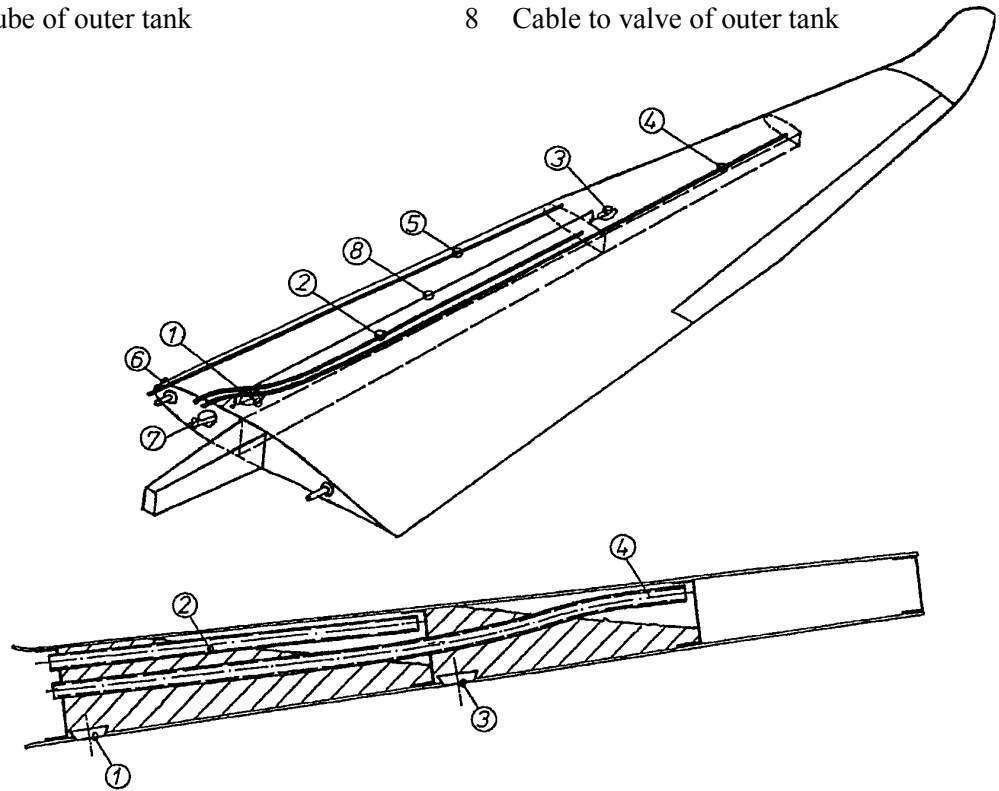
Each wing contains 2 integral tanks (inner and outer tank) with related discharge valve and ventilation. Ventilation of both tanks at forward lower wing root rib in front of spar through one common drain orifice.

A single or a double lever at right cockpit rim operates **total** water ballast system (wing tanks and tail tank). Operating the short lever alone discharges inner wing tanks and tail tank. Operating the long lever automatically includes the short one.

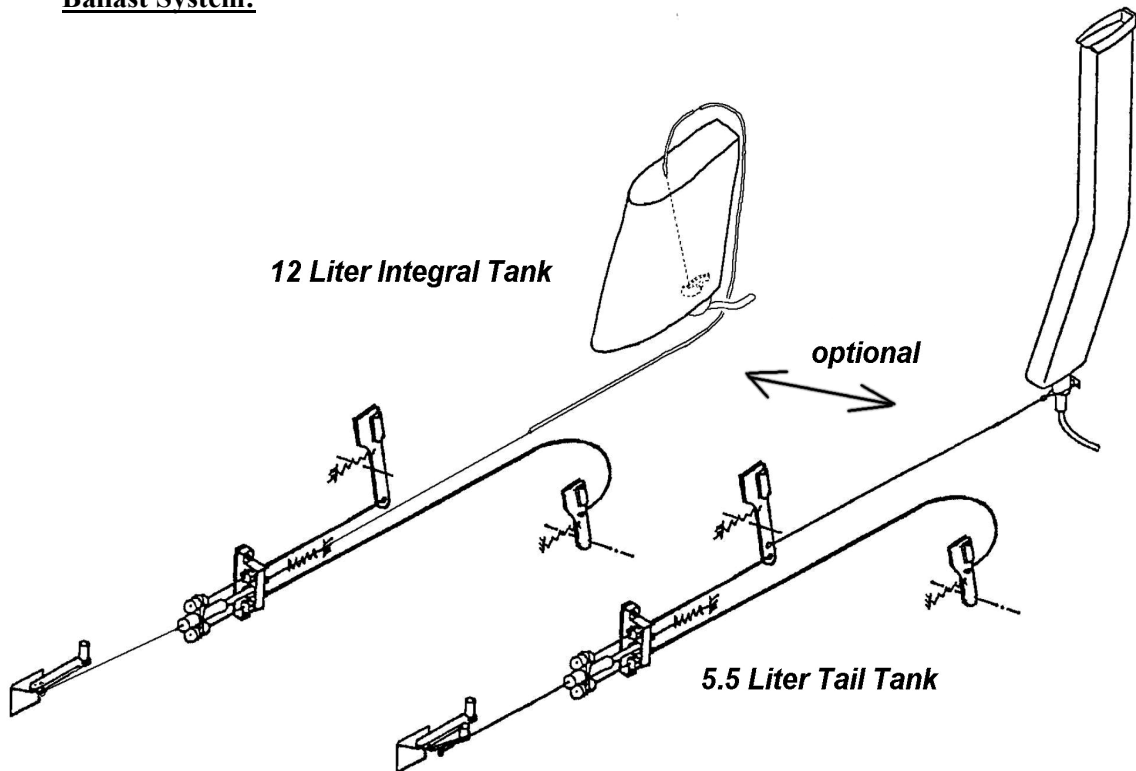
Operating system for the wing integral tanks couples automatically during rigging. Use as clean water as possible to avoid damage of seals due to foreign matter and clogging of draining and ventilation tubes.

7.5.1 Wing Water Ballast System

- | | | | |
|---|--------------------------------|---|-------------------------------|
| 1 | Valve of inner tank | 5 | Draining tube of outer tank |
| 2 | Ventilation tube of inner tank | 6 | Draining valve for both tanks |
| 3 | Valve of outer tank | 7 | Drive lever |
| 4 | Ventilation tube of outer tank | 8 | Cable to valve of outer tank |

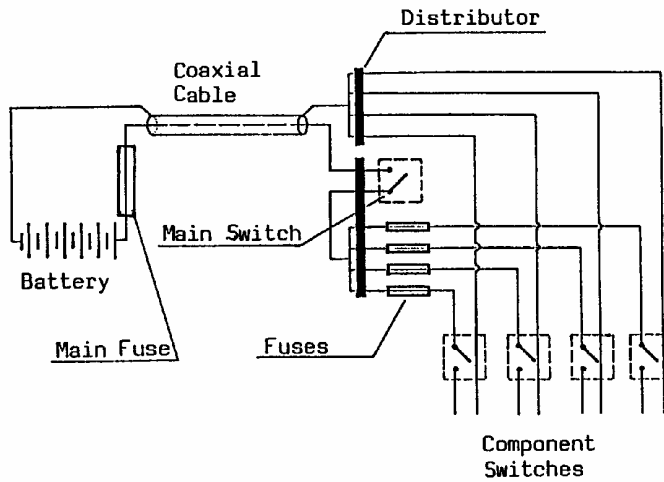


7.5.2 Fuselage Water Ballast System:



7.6 Electrical System and Operation

For electrical system principle see wiring diagram below. Power supply by 12V battery with a minimum capacity of 5.7 Ah. In case of two batteries, a three position switch may be used as main switch. A current limiting device must be used for each electrical user (microfuses or circuitbreakers). When using circuitbreakers, a separate main switch is not required.



Position of fuses:

Main fuse at battery
Single unit fuses at instrument panel lower region.

Denomination:

Microfuse 20*5 (DIN 41571)
Circuit breaker Klixon 7277-2, 7274-2 or similar

Fuse ratings:

max. 10 A for battery-main fuse
max. 5 A quick acting for radio (Becker/Dittel types)
max. 1 A quick acting for electrical variometers and turn and bank indicators

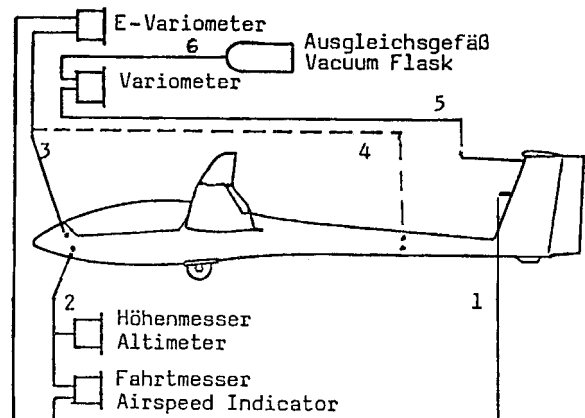
Cross section of cables:

Battery cable min. 1 mm² (corresponds to AN 20 cable)

7.7 Pneumatic System (Static- and Pitot-Pressure)

- Pitot pressure port: 1 at vertical tail fin below TE port
- Static pressure ports: 2 for airspeed indicator and altimeter – lower forward fuselage side statics
- 3 + 4 for variometers – upper forward fuselage side statics and boom
- TE-port: 5 at upper vertical tail fin end

- 1 Fin pitot **red**
- 2 Lower forward statics **blue**
for airspeed and altimeter!
- 3 Upper forward statics **clear 6mm ø**
- 4 Rear boom statics **yellow**
- 5 TE-port **green**
- 6 Vacuum bottles for variometers **clear 8mm ø**



When connecting an electrical variometer with electronic compensation, coupling boom statics (yellow) with upper forward statics (white 6 mm) near the instrument is being recommended. This results in better compensation.

7.8 Various Equipment**7.8.1 Expendable Ballast (Trim Weights)**

Expendable ballast to compensate pilot weight below Minimum Cockpit Load, may be fitted in front of rudder pedals and secured with knurled nut.

7.8.2 Oxygen System

Fiberglass receptacle at left main bulkhead for 3 or 4 Litre oxygen bottles of 100 mm <3.94 in>in diameter.

After permanent installation of an oxygen system according to its manufacturers instructions by an adequately licenced repair shop, the sailplane including oxygen system must be inspected (Weight and Balance, Loading Instructions).

When using a removable oxygen unit, its weight must be counted as useful load.

7.8.3 Emergency Locator Transmitter (ELT)

Permanent installation according to Maintenance Manual chapter 11 and to manufacturers instructions by an adequately licensed repair shop. Possible installation location in rear baggage compartment, remote control from instrument panel necessary. After installation, cockpit loading limit values must be checked according to Maintenance Manual chapter 2.

8 Handling / Servicing / Maintenance

Contents of **Section 8**:

8 Handling / Servicing / Maintenance	8-1
8.1 Introduction	8-1
8.2 Sailplane Inspection Periods.....	8-2
8.3 Preventive Maintenance (USA only).....	8-2
8.3.1 Alterations or Repairs.....	8-2
8.4 Ground Handling / Road Transport.....	8-3
8.5 Cleaning and Care	8-7

8.1 Introduction

This section contains manufacturers recommended procedures for proper ground handling and servicing of the sailplane. It also identifies certain inspection and maintenance requirements which must be followed if the sailplane is to retain that new-plane performance and dependability. It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered.

1. For service information not contained within this manual, it is recommended to contact agent or manufacturer.
2. All correspondence regarding the sailplane should carry its serial number
3. The serial number can be found on the type placard, on the right side of the main bulkhead.
4. A Maintenance Manual is issued with each sailplane.

8.2 Sailplane Inspection Periods

- (a) Annual Inspection according to checklist and inspection forms provided in Maintenance Manual, chapter 14, after performance of annual maintenance procedure (Maintenance Manual chapter 3).
- (b) Manufacturer recommended Daily Inspection, Pre-flight Check and Cockpit Checklist procedure according to checklists chapter 4.
- (c) Manufacturer recommended Extraordinary Inspection, depending on circumstances (rough landings, ground loop etc.) as provided in Maintenance Manual chapter 3.
- (d) Other inspections may be required by the issuance of airworthiness directives applicable to the aircraft or components.
- (e) It is the responsibility of the owner/operator to determine that applicable airworthiness directives are complied with.

When inspections are repetitive, inadvertent non-compliance may be prevented by adding them to the end of the annual inspection checklist or by a special inspection schedule.

8.2 Sailplane Inspection Periods continued

- (f) Life limited parts, such as tow release system components or seat belt harness may require other inspections. See chapter 9 and Maintenance Manual chapter 5.

Agency or personnel accomplishing the required inspections and most of the manufacturer recommended inspections must be properly certificated.

8.3 Preventive Maintenance that may be accomplished by a certificated pilot (**For USA only**)

- (a) A certificated pilot who owns or operates an airplane not used as an air carriers authorised by FAR Part 43 to perform limited preventive maintenance on his airplane. Refer to FAR part 43 for appropriate list.
- (b) All other maintenance required is to be accomplished by appropriately licensed personnel.
- (c) Preventive maintenance should be accomplished in accordance with the appropriate airplane Maintenance Manual, to be sure that proper procedures are followed. A Maintenance Manual is delivered with each sailplane carrying the serial number.

8.3.1 Alterations or Repairs

- (a) Alterations or repairs must be accomplished by licensed personnel.
- (b) Prior to any alteration the FAA should be contacted to make sure that airworthiness of the airplane is not violated.
- (c) For alterations or repairs a written approval from the manufacturer is required. (Special advice, drawings, etc.)
- When in doubt, whether a “small repair” or a “major repair” is necessary, contact the manufacturer.
 - “Major repairs” must be accomplished at national authority-certified repair stations rated for composite aircraft structure work in accordance with Rolladen-Schneider repair methods.

Warning: *During “major repairs” and “major modifications” airworthiness may be lost due to unqualified work.*

- Certain "major repairs" may only performed by the manufacturer due to necessary jigs. This has to be checked with the manufacturer for the case in question.

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.

8.4 Ground Handling / Road Transport continued

d) **Supporting Area to lift whole Sailplane**

1. Under wing spar near fuselage, never under nose section
2. Under fuselage shell in front of wing (main bulkhead)
3. Fuselage shell at tail skid

e) **Supporting Area for Road Transport**

Fuselage: Tail skid or tail wheel
Main wheel
Fuselage shell in front of landing gear, minimum width of support 30 cm <11.8 in>.

Wing: Right spar at inner or outer main pin hole
Left forked spar at inner main pin hole. At outer main pin hole only, when both fork ends are supported
Shell at root, minimum width of support 15 cm <5.9 in>.
Shell at outer air brake end, minimum width of support 25 cm <10 in>.

Horizontal Tail Unit: At any place, minimum width of support 8 cm <3.2 in>.

Note: Always keep wing discharge orifices open for ventilation during trailer storage.

8.5 Cleaning and Care

Important Warning:

Unless regularly polished with hard wax after each cleaning, sanded gelcoat shows distinctive weathering marks due to changes of temperature, ultra violet radiation and humidity (Wax at least twice a year!).

Humidity enters resin structure after prolonged application and causes swelling up. High temperatures at the same time speed this process up. Conserving gelcoat with wax decelerates this process, but is unable to stop it completely.

Therefore, try to remove water whenever it enters interior as far as possible using a sponge.

Drain wing integral water tanks and tail fin tank regularly and keep discharge orifices open for ventilation.

If need be, store in dry environment for drying.

Therefore, avoid unnecessary long periods out in the open.

Ultra Violet Radiation (Sunlight, particularly strong during high altitude flights!) causes the polyester coat to embrittle and become yellow. Therefore, avoid unnecessary exposure to sunlight (for instance outside parking instead of packing into the trailer).

Self Adhesive Tape residue should only be wiped off using white gasoline (see also following recommendations from paint manufacturer).

For **Canopy** (Plexiglas) care never use dry cloth because of resulting static charge, consequent collection of dust particles and scratching. Cleanse with clear water and clean chamois leather, use anti-static fluid (for instance Plexiklar) afterwards.

Cleaning and Care Recommendations according to paint manufacturers:

- | | |
|--|--|
| Suitable: | - Water with washing-up liquid, added in recommended quantities |
| | - Car polish with or without silicone. |
| | - Car hardwax. |
| Suitable with
Reservations: | - Tar remover for cars based on petrol or white gasoline. |
| | - Alcohol, like spirit or isopropyl alcohol. |
| | <u>Reservations are, that these liquids should only be used for wiping off, not for soaking with rags.</u> |
| Unsuitable: | - Strong solvents and thinners (Acetone) |
| | <u>These items may decompose gelcoat and cause local shrinking.</u> |
| Completely
unsuitable: | - Trichlorethylene |
| | - Carbon tetrachloride or similar hydrocarbon chlorides |
| | <u>These liquids destroy the gelcoat.</u> |

Other over the counter products must be tested before being used!

8.5 Cleaning and Care continued

Pins, Bushes and Control System Connectors

Due to required tolerances not all these items can be protected against corrosion. Therefore cover regularly with non-corrosive grease.

Seat Belt Harness

Check regularly for condition (fraying of edges), mildew and wear.

Check fittings and buckle regularly for corrosion and proper function. (See also excerpt of harness manufacturers maintenance instructions, accompanying this manual).

Control Surface Gap Sealing

When de-rigged, fix control surfaces to zero deflection to avoid loss of initial tension of elastic tapes and consequent inability to seal.

Tow Hooks

Clean regularly by blowing out and lubricate with spray oil. See also maintenance instructions of manufacturer.

Longitudinal Motion Pushrod Bearings

These bearings should never be greased or oiled, their plastic balls and aluminium alloy bearing surfaces will soon be destroyed due to collection of foreign matter.

These bearings are used throughout the wing control systems, in the fuselage for the elevator-, aileron- and landing gear systems.

Long Term Storage

Preparation

- (a) Remove instrumentation and store separately.
- (b) Close external pressure ports (see page 7-5 of Maintenance Manual) and inner tube ends.
- (c) Protect all metal parts using acid-less spray oil or non-corrosive grease (Vaseline).
- (d) Close all orifices (including **all opened water ballast valves**) without preventing air circulation using wire cloth or similar means to prevent entry of small animals.
- (e) Store in as dry as possible environment.

Return to Service

- (a) Inspection according to annual inspection, See Maintenance Manual page 3-1 and blank inspection forms in chapter 14.
- (b) Inspect inside of fuselage for small animals (Mice, birds etc.) and/or nests.
- (c) Check compass deviation and update deviation table.

