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FLIGHT MANUAL

FOR THE

SAILPLANES

LS8-s AND *LS8-sb*

Type:	LS8
Versions:	LS8-s LS8-sb (Commercial Designation: LS8-sc from ser.no. 8527 on)
TCDS No.:	EASA TCDS No. A.047
Serial-No.:	_____
Registration Signs:	_____
Edition:	April 2005

Pages marked “EASA-approved“ are approved by:

(Signature)

(Authority)

(Stamp)

(Date of Approval) 19.August 2005

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

Warnings

- Each sailplane is a highly complex unit. It may threaten your health or endanger your life, when being used improperly or outside its approved operating range or being maintained improperly.
- Before using the plane, study all manuals thoroughly. Especially take note of warnings, cautions and notes provided.
- Never fly without a thorough pre-flight check according to the Flight Manual!
- Always stay within safety altitudes.
- Always make sure to be able to perform a safe out landing.
- Respect stall speeds. Always use a safety margin above the stall speed related to the flight condition, especially at low altitudes and in the mountains.
- Only use battery chargers specified in the Manual.
- Do not work on control systems apart from lubrication.
- Maintenance and repairs should only be accomplished by the manufacturer or at certified repair stations rated for these types of work. A list of stations with experience at LS aircraft may be obtained from DG Flugzeugbau.
- Even if no annual inspections are required in your country, have your aircraft checked annually, see Maintenance Manual chapter 2.
- Please pay attention to our web-site www.dg-flugzeugbau.de. There you will find the latest technical notes and service information for your glider: www.dg-flugzeugbau.de/tech-mitteilungen-e.html. The „DG Pilot Info“ informs you immediately by e-mail about the publication of new technical notes and service information. If you don’t receive this info service, please send a mail to weber@dg-flugzeugbau.de with subject "DG Newsletter please" to receive this service free of charge.

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 on the right 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	EASA Approval
1	0-1,0-2,0-3, 0-4, 0-5, 4-15, 4-27, 4-28, 4-32, 7-2, 7-3	TN8019, wheel brake actuated by airbrake handle	Feb. 2011	13.10.11
2	Title page, 0-1 ÷ 0.3, 0-5, 4-4, 4-9, 7-2, 7-3, 7-5, 7-13a, 7-14	ÄM LS8-1, Miscellaneous improvements from ser. No. 8527 on	Dezember 2011	14.02.12

0.2 List of Effective Pages

Chapter	Page	Edition	Edition	Edition	Edition
0	Titel page	April 2005			
	Warnings	April 2005			
	0-1	See log of revisions			
	0-2	See log of revisions			
	0-3	See log of revisions			
	0-4	See log of revisions			
	0-5	See log of revisions			
	0-6	April 2005			
1	1-1	April 2005			
	1-2	April 2005			
	1-3	April 2005			
	1-4	April 2005			
	1-5	April 2005			
2	2-1	April 2005			
	2-2	April 2005			
	2-3	April 2005			
	2-4	April 2005			
	2-5	April 2005			
	2-6	April 2005			
	2-7	April 2005			
	2-8	April 2005			
	2-9	April 2005			
	2-10	April 2005			
	2-11	April 2005			
	2-12	April 2005			

0.2 List of Effective Pages continued

Chapter	Page	Edition	Edition	Edition	Edition
3	3-1	April 2005			
	3-2	April 2005			
	3-3	April 2005			
	3-4	April 2005			
	3-5	April 2005			
	3-6	April 2005			
	3-7	April 2005			
	3-8	April 2005			
	3-9	April 2005			
	3-10	April 2005			
	3-11	April 2005			
	3-12	April 2005			
	3-13	April 2005			
	4-1	April 2005			
	4-2	April 2005			
	4-3	April 2005			
	4-4	April 2005	Dec. 2011		
	4-5	April 2005			
	4-6	April 2005			
	4-7	April 2005			
	4-8	April 2005			
	4-9	April 2005	Dec. 2011		
	4-10	April 2005			
	4-11	April 2005			
	4-12	April 2005			
	4-13	April 2005			
	4-14	April 2005			
	4-15	April 2005	Feb. 2011		
	4-16	April 2005			
	4-17	April 2005			
	4-18	April 2005			
	4-19	April 2005			
	4-20	April 2005			

0.2 List of Effective Pages continued

Chapter	Page	Edition	Edition	Edition	Edition
4	4-21	April 2005			
	4-22	April 2005			
	4-23	April 2005			
	4-24	April 2005			
	4-25	April 2005			
	4-26	April 2005			
	4-27	April 2005	Feb. 2011		
	4-28	April 2005	Feb. 2011		
	4-29	April 2005			
	4-30	April 2005			
	4-31	April 2005			
	4-32	April 2005	Feb. 2011		
	4-33	April 2005			
	4-34	April 2005			
5	5-1	April 2005			
	5-2	April 2005			
	5-3	April 2005			
	5-4	April 2005			
	5-5	April 2005			
	5-6	April 2005			
6	6-1	April 2005			
	6-2	April 2005			
	6-3	April 2005			
	6-4	April 2005			
	6-5	April 2005			

0.2 List of Effective Pages continued

Chapter	Page	Edition	Edition	Edition	Edition
7	7-1	April 2005			
	7-2	April 2005	Feb. 2011	Dec. 2011	
	7-3	April 2005	Feb. 2011	Dec. 2011	
	7-4	April 2005			
	7-5	April 2005	Dec. 2011		
	7-6	April 2005			
	7-7	April 2005			
	7-8	April 2005			
	7-9	April 2005			
	7-10	April 2005			
	7-11	April 2005			
	7-12	April 2005			
	7-13	April 2005			
	7-13a	Dec. 2011			
	7-14	April 2005	Dec. 2011		
8	8-1	April 2005			
	8-2	April 2005			
	8-3	April 2005			
	8-4	April 2005			
	8-5	April 2005			
	8-6	April 2005			
	8-7	April 2005			
	8-8	April 2005			
	8-9	April 2005			
	8-10	April 2005			
	8-11	April 2005			
9	9-1	April 2005			
	9-2	April 2005			
	9-3	April 2005			
	9-4	April 2005			
	9-5	April 2005			
	9-6	April 2005			

0.3 TABLE OF CONTENTS

1 General

Contents of **Chapter 1**: Page

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-s and LS8-sb** sailplanes.

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-s** or **LS8-sb** is a high performance sailplane, not a basic trainer. However excellent its 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

These sailplanes with the type designation **LS8-s** or **LS8-sb** have been approved by EASA in accordance with JAR-22 dated 28. October 1985, (Change 5).

The EASA-Type Certificate No. A.047 for **LS 8-s** and **LS8-sb** has been issued on 19.August 2005.

Category of Airworthiness: "Utility".

1.3 WARNINGS, CAUTIONS AND NOTES (Definitions)

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.***

Caution: Means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation of the flight safety.

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

1.4 DESCRIPTIVE AND TECHNICAL DATA

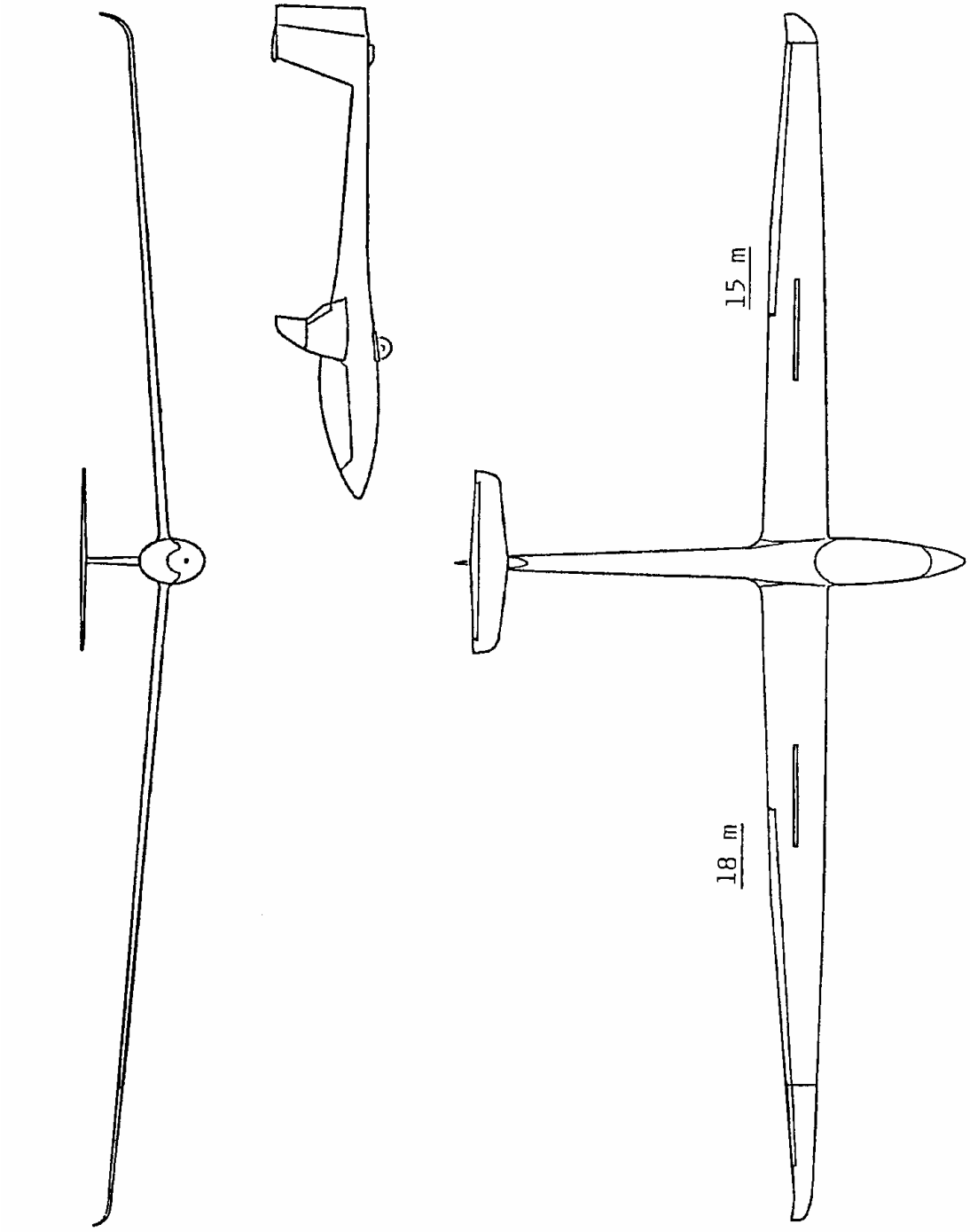
The **LS 8-s** and **LS8-sb** are single-seater sailplanes with carbon fibre wing shell, winglets, T-tail, wing and vertical tail fin water ballast systems, retractable and sprung landing gear, and upper wing surface air brakes. They may be operated in 15m or 18m span and winglets in both versions. The fuselage structure of LS8-s and LS8-sb is different, because the LS8-sb is prepared for later engine installation. Otherwise both planes are structurally identical.

These sailplanes have been produced using the latest technology of industrial fibre design (Glass-, Aramid- and Carbon fibres).

Models **LS8-s** and **LS8-sb** are designed for competition flights – high performance combined with excellent handling characteristics.

Wing span	15 m	49,2 ft	18 m	59,6 ft
Length	6,74 m	22,11 ft	6,74 m	22,11 ft
Height	1,33 m	4,36 ft	1,33 m	4,36 ft
MAC	0,700 m	2,30 ft	0,634 m	2,08 ft
Wing Area	10,5 m²	113,0 sq. ft	11,40 m²	122,9 sq. ft
Wing aspect ratio	21,43	21,43	28,38	28,38
Maximum gross weight	525 kg	1157 lbs	575 kg	1267 lbs
Max. wing loading	50 kg/m²	10,2 lbs/sq. ft	50,4 kg/m²	10,3 lb/sq. ft

1.5 THREE VIEW DRAWING



2 LIMITATIONS

Contents of **Chapter 2**:

2.1 INTRODUCTION

Section 2 includes operating limitations, instrument markings and basic placards necessary for safe operation of the LS8-s and LS8-sb sailplanes, their standard systems and standard equipment.

The limitations included in this section have been approved by EASA.

The LS 8-s and LS8-sb sailplanes have 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)

	Maximum permissible speed	IAS km/h	IAS Kt	IAS MPH	Remarks
VNE	Never exceed speed in calm air and up to an altitude above MSL of:				Do not exceed this speed in any operation and do not use more than 1/3 of control deflection.
	2000 m (6500 ft)	280	151	174	
	3000 m (9800 ft)	266	144	165	
	4000 m (13100 ft)	253	137	157	
	6000 m (19700 ft)	227	122	141	
	8000 m (26200 ft)	202	109	126	
	10000 m (32800 ft)	179	97	111	
	12000 m (39400 ft)	156	84	97	
VRA	Rough air speed	195	105	121	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	195	105	121	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	195	105	121	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 AIR SPEED INDICATOR COLOUR MARKINGS

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

Marking	(IAS) range or value	Significance
Green arc	97-195 km/h 52-105 Kt 60-121 MPH	Normal operating range (Air brakes retracted)
Yellow arc	195-280 km/h 105-151 Kt 121-174 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	95 km/h 51 Kt 59 MPH	Recommended minimum approach speed at maximum weight without water ballast

For an example of airspeed indicator colour marking see Maintenance Manual chapter 8.

2.4 MASS (WEIGHT)

Maximum take-off masses

Maximum take-off mass (15m wing span) .....525 kg <1157 lbs>
Maximum take-off mass (18m wing span) .....575 kg <1267 lbs>

Important Note: **When landing on airfields, water ballast should preferably be dumped. Before outlandings, water ballast must always be dumped.** ***Pilots are advised against landing with maximum all-up mass.***

LS8-s: Maximum weight of non-lifting parts..... 255 - 263 kg <562 – 580 lbs>
LS8-sb: Maximum weight of non-lifting parts..... 280 - 288 kg <617 – 635 lbs>

Value must be determined according to table in Maintenance Manual, chapter 5, related to empty mass and empty mass C.G. position. The term "non-lifting" parts includes the following:

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

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

continued next page

2.6 MASS (WEIGHT) (continued)

Water ballast in wings
(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 4.7.10.5 .***

Tail fin water ballast (depending on wing water ballast)

LS8-s with integral tail fin tank .....max. 12 kg <26,5 lbs>
LS8-sb with integral tail fin tank .....max. 7,5 kg <16,5 lbs>

Note: Due to production tolerances, the tail fin tank can take some more water. Therefore the actually filled amount of water must be positively checked!

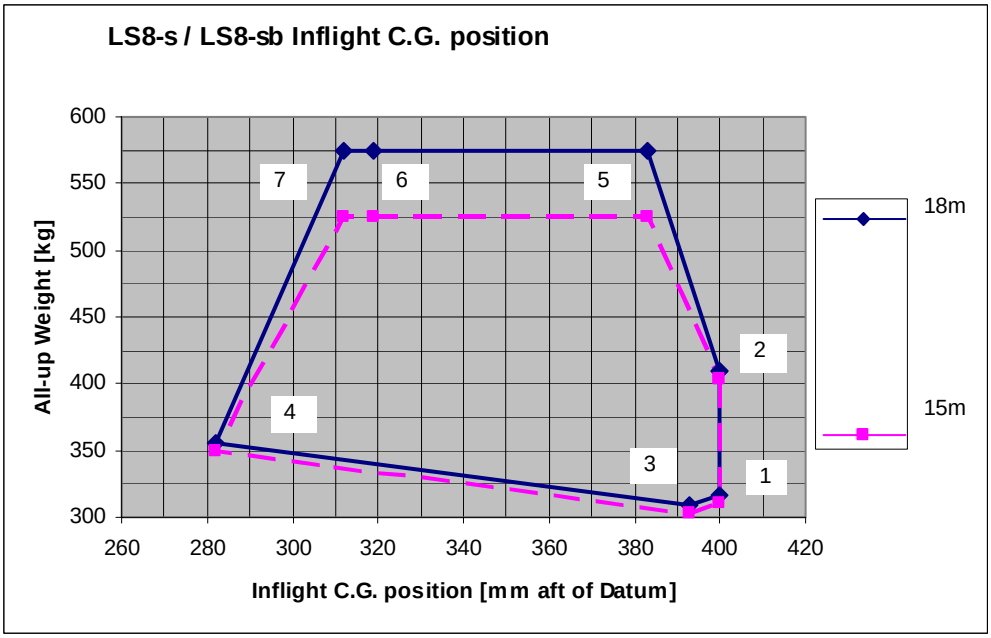
Maximum mass in Baggage Compartment: ..... max. 5.0 kg <11 lbs>

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 section 6.2 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.
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**

Warnung: ***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 "Normal procedures" sections 4.7.10.4 and 4.7.10.5/6.

2.6 APPROVED MANOEUVRES / CATEGORY OF AIRWORTHINESS

The sailplanes LS8-s and LS8-sb are approved for normal soaring flight (category "Utility") .

Aerobatic flight not approved.

2.7 MANOEUVRING LOAD FACTORS

At 195 km/h <105 Kt, 121 MPH>.....+5.3 g to -2.65 g

At 280 km/h <151 Kt, 174 MPH>
(air brakes retracted) .....+4.0 g to -1.5 g

At 280 km/h <151 Kt, 174 MPH>
(air brakes extended) .....+3.5 g to -0.0 g

2.8 KINDS OF OPERATION

a) With water ballast:
- Day-VFR-Flight
- Aero tow
- Winch- and auto tow launch

Use of water ballast limited to temperatures above +5°C <41°F>
Additives to water ballast not approved!

b) Only without water ballast:
- Cloud flying (during day), when required equipment is installed (see section 2.10)

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, batteries in baggage compartment [The tail fin battery installed in the tail does not count for cockpit load; it counts, when the tail battery is installed in the baggage compartment for trim reason]
trim weights)

.....max. **110 kg <242 lbs>**

See entries in chapter 6
Oxygen equipment see section 7.13

Minimum cockpit load (Pilot + parachute)

see Cockpit placarding & entries in chapter 6

Guiding values for modification of Minimum Cockpit Load:
Installation of 1 front trim ballast weight 2.5 kg <5.5 lbs> decreases Cockpit Load by 5 kg <11 lbs>. (max. 3 front trim weights can be installed).
Further data regarding Cockpit Load see chapter 6.

Warning: ***Guiding values for modification of Minimum Cockpit Load always refer to conditions of last C.G. weighing. These conditions can be taken from entries in chapter 6.***

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 opened, air can be blown through valve using tail tank adaptor)

b) Tail battery not installed:
(Check with elevator removed)

For possible combinations see entries section 6.2.

2.10 MINIMUM EQUIPMENT

- Airspeed Indicator: scale 50-300 km/h <27-162 Kt.; 31-186 MPH>
  Colour marking see chapter "Limitations" 2.3
  Approved types and example of colour marking see
  Master Equipment List in Maintenance Manual chapter 6.
  Pressure pick-ups see section 7.9.
- Altimeter: scale in m or ft.
  Pressure pick-ups see section 7.9.
  When an altimeter of up to 20000 ft only is being used, a placard must be near the altimeter stating: Maximum flying altitude 20000 ft.
- Thermometer: Types and position of temperature pick-up see Maintenance Manual.
- Four piece seat belt harness: approved types see Master Equipment List in Maintenance Manual.
- Vertical tail filling tube adaptor: for checking of tail fin tank valve function.
- Back cushion or parachute, in compressed form not thinner than 5 cm <2 in>.
- Checklist, Type placard, Data and Loading placard, Operating placards
- Operational VHF radio system, depending on national legislation requirements
- Flight Manual LS8-s / LS8-sb

Additionally for cloud flying:

- Airspeed Indicator:
  recommended: scale 50-300 km/h ***with maximum 1 turn only***
  <27-162 Kt.; 30-186 MPH>
- Turn and bank indicator
- Compass, compensated
- Variometer: recommended: range at least ±10 m/s <2000 ft/min; 20 Kt.>
- Additionally ATC equipment, for instance VHF-radio and transponder, are recommended.

Manufacturer approved instruments and radios are listed in Maintenance Manual chapter 6 (*Master Equipment List*).

2.11 AERO TOW, WINCH-LAUNCH AND AUTO-TOW

2.11.1 Maximum approved tow speeds

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

Maximum approved aero tow speed:..... **195 km/h <105 Kt.; 121 MPH>**

2.11.2 Weak Links

For **Winch launch** .....max. **8250** Newton <825 kg, 1819 lbs>

Recommended: Tost weak link No. 3, colour code **red**,
.....rated break away load 7500 ±750N
.....<750 ±75 kg; 1653 ±165 lbs>

For **Aero tow** .....max. **6600** Newton <660 kg, 1455 lbs>

Recommended: Tost weak link No. 5, colour code **blue**,
.....rated break away load 6000 ±600N
.....<600 ±60 kg; 1323 ±132 lbs>

Minimum tow cable length for aero tow.....**30** m <100 ft>
recommended length..... up to **80** m <260 ft>

Important Note: During motor glider tow, limitations regarding weak link and tow cable length must be complied with (See Manual of towing motor glider).

2.12 Further Limitations

2.12.1 OPERATING PLACARDS FOR LIMITATIONS

2.12.1.1 LS8-s

DG-Flugzeugbau GmbH
Type: LS8-s Serial No.:_____

Data Placard

Airspeed Limits:	km/h	Kt	MPH.
Winch launch/Auto tow	140	76	87
Aero tow	195	105	121
In rough air	195	105	121
Never exceed (VNE)	280	151	174

	m	ft	kg	lbs
Max. Take-off Mass *)	15	42	525	1157
with 5"-wheel:	18	59	575	1267

*) including water ballast

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
Valid for equipment configuration according to Flight Manual chapter 6.

Lighter pilots must compensate lack of weight

M I N I M U M C O C K P I T L O A D:___ kg / *lbs*
Minimum Cockpit Load with empty tail tank: ___ kg / *lbs*
Valid for equipment configuration according to Flight Manual chapter 6.

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

Near airspeed indicator unless marked internally

2.12.1.1 LS8-sb

DG-Flugzeugbau GmbH
Type: LS8-sb Serial No.:_____

Data Placard

Airspeed Limits:	km/h	Kt	MPH.
Winch launch/Auto tow	140	76	87
Aero tow	195	105	121
In rough air	195	105	121
Never exceed (VNE)	280	151	174

	m	ft	kg	lbs
Max. Take-off Mass *)	15	42	525	1157
	18	59	575	1267

*) including water ballast

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
Valid for equipment configuration according to Flight Manual chapter 6.

Lighter pilots must compensate lack of weight

M I N I M U M C O C K P I T L O A D:___ kg / *lbs*
Minimum Cockpit Load with empty tail tank: ___ kg / *lbs*
Valid for equipment configuration according to Flight Manual chapter 6.

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	Kt	MPH
Up to	2000 (	6500)	-	280	151	174
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Up to	8000 (	26200)	-	202	109	126
Up to	10000 (	32800)	-	179	97	111
Up to	12000 (	39400)	-	156	84	97

Near airspeed indicator Unless marked internally

3 EMERGENCY PROCEDURES

Contents of **Chapter 3**:

3.1 INTRODUCTION

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

3.2 EMERGENCY CANOPY JETISSON

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

- Right handle operates emergency canopy jettison, therefore longer travel as left handle.

- Hand force increases for emergency jettison travel to avoid unintentional jettison during normal operation.

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

- the lifting instrument 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 - jetisson

Seat harness - open

Exit - Lift with arms over cockpit rim and 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 until normal flight speed is achieved.

Stalling speeds: see section 5.2.2

Caution: **When during stalled flight the angle of attack is increased considerably by further "pulling", then – depending on C.G. position- spinning may result from asymmetric stall.**

To avoid unintentinal spinning, the plane should never be stalled. Fly with enough speed reserve in rough air and especially in final approach to landing.

3.5 SPIN RECOVERY

Simultaneously:

Elevator - push forward

Rudder - full rudder deflection opposite to spin rotation

Aileron - neutral or opposite to spin rotation for quicker termination

Until rotation stops, then:

Elevator - smooth but swift pull-out
Altitude loss during recovery:
about 100-150 m <300-450 ft>
Recovery speed up to 195 km/h <105 Kt., 121 MPH>

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

Warning: ***During dive-out be alert not to exceed maximum permissible speed VNE = 280 km/h <151 Kt.; 174 MPH> inadvertently, see also chapter "Limitations", section 2.2!***

Warning: ***Intentional spinning with full water ballast is prohibited!***

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

When rotation has stopped:

Elevator - pull cautiously, but swift

Warning: ***During dive-out be alert not to exceed maximum permissible speed VNE = 280 km/h <151 Kt.; 174 MPH> inadvertently, see also chapter "Limitations", section 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 195 km/h <105 Kt.; 121 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 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 195 km/h <105 Kt.; 121 MPH> – green ASI range upper limit – should not be exceeded because of possible severe turbulence.

3.7 OTHER EMERGENCIES (continued)

3.7.2 RAIN

(a) expect considerable decrease of performance.

(b) increase approach and 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 OTHER EMERGENCIES (continued)

3.7.3 INADVERTENT FREEZING / ICING

Water ballast in wings and tail fin

Water ballast must be dumped at +5° Centigrade <41° F> OAT due to safety reasons:

(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: Therefore use no water ballast for prolonged flights below +5° Centigrade <41° F>.

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

3.7 OTHER EMERGENCIES (continued)

3.7.4 FLIGHT WITH ASYMMETRIC WATER BALLAST LOADING

Total water dumping takes about 3 minutes. 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, when not all water has already been dumped.

(b) avoid stalling, especially in banked flight.

(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 touch down in the direction as noticed before.

3.7.5 CABLE FAILURE DURING WINCH LAUNCH

(a) Immediately push stick forward beyond normal attitude until airspeed indication is within ASI green range.

(b) Release cable

(c) Depending on altitude, wind and airfield conditions:

(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 landing on an airfield. Water ballast must be discharged before outlandings!
Pilots are advised against landing with maximum all-up mass.

3.7 OTHER EMERGENCIES (continued)

3.7.6 EMERGENCY LANDING WITH LANDING GEAR RETRACTED

Emergency landings **always with landing gear extended**, because energy absorption of the sprung landing gear compared to the fuselage shell is much higher.

If however an emergency landing with gear retracted is necessary, touch down under shallow angle. Do not touch down with minimum speed to avoid stalling.

Warning: ***Always dump as much water as possible before emergency landings.***

3.7.7 GROUND LOOP

When a landing strip obviously will not be long enough for a normal landing, initiate a controlled ground loop at least 50 m <150 ft> in front of 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 OTHER EMERGENCIES (continued)

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 (not the seat harness)
  (3) tighten seat belt 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-s and
LS8-sb carbon fibres are used.

4 NORMAL PROCEDURES

Contents of **Chapter 4**:

Contents of **Chapter 4**: (continued)

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, remove valve openers at root ribs.
   Up to S/N 8500 only: insert draining plugs into root ribs - grease with vaseline, when necessary.
2. Before extending landing gear, check for adequate ground clearance.
3. Clean and grease all pins and matching bushes including main pins and all 4 automatic control system connectors
4. Position control stick centrally and water ballast opening lever into "**closed**" position (cockpit lever to rear !).

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 "Normal Procedures" at section 4.2.1.
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 entries in chapter 6). Connect to system and check operation. The battery must be equipped with an appropriate main fuse!
    From ser.no. 8527 on (ÄM LS8-1): If an optionally battery will be installed in the fin the locking bow (part 10L35 made from piano wire) must be removed. The locking bow prevents the installation of a battery and serves as indicator if a battery is installed, as its ends are visible from the outside.
    After removing the battery reinstall the locking bow.

4.2 RIGGING AND DE-RIGGING (continued)

11. Check forward horizontal tail attachment for ball being fixed.

    Warning: When ball is loose, refer to section 8.3.1.

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, logger etc. in baggage compartment .
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 in section 4.5.10 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 section 4.3.

4.2 RIGGING AND DE-RIGGING (continued)

4.2.1 INSTALLATION OF 15 M <49 FT> OR 18 M <59 FT> WINGLETS

1. Insert winglet until securing nut starts catching thread; when aileron pins of 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.

4.2.2 DE-RIGGING

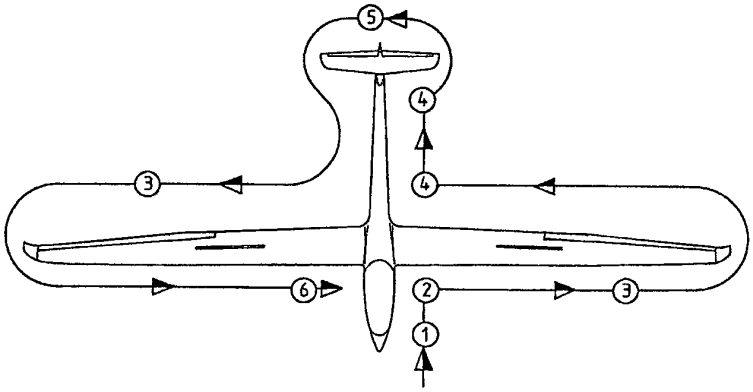
(1) Reverse **assembly** sequence.
(2) 15m <49 ft> winglets may be stored in cockpit, when using some padding.
(3) Air brake system should be unlocked to avoid permanent pressure on flexible covers and resulting possible deformations (overcenter in wing).

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 (only valid up to S/N 8500) and discharge openings on wing under side kept open for ventilation (use valve openers provided).

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) LS8-sb only: pitot pressure pick-up for free passage (ASI must indicate when blowing cautiously (!) into front end pitot pressure pick-up).
(c) Function of nose hook

2 Landing Gear

(a) Tyre pressure 5“-wheel: Main wheel 3,5 bar <51 psi>.
(b) Slip mark and tyre condition.
(c) C.G. hook manual and automatic operation working properly.
(d) Water drain orifices in front and behind landing gear box free from clogging .

4.3 DAYLI INSPECTION (continued)

3 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) Winglet installation for securing and free from play.

4 Rear Fuselage – Fuselage boom region

(1) Condition, gelcoat- or structural damage, pressure marks, cracks, especially on lower side.
(2) Rear static ports at fuselage boom free from clogging.
(3) Recommended tail wheel pressure, it fitted, 2,5 to 3,5 bar <36 to 51 psi>.
(4) Water drain orifices in front of tail skid or tail wheel free from clogging.
(5) Tail skid, if fitted, for proper adhesion and cable deflector at front end.

4.3 DAYLI INSPECTION (continued)

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 (An option only for LS8-sb).
(d) **From ser.no. 8527 on (ÄM LS8-1):** Check if a fin battery is installed: If the ends of the locking bow are visible on both sides in the fairings at the upper end of the fin this is the indication that no battery is installed.
All ser. No.'s: Charged vertical tail fin battery connected, when this battery location was chosen for trimming of pilot weight, see entries in chapter 6.
(e) Check vertical tail tank valve for proper opening:
- place tail tank filling adapter into discharge tube.
- open cockpit lever.
- if air cannot be blown into the tank, the valve is not functioning properly (for instance frozen solid or operating cable snapped).

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 specified 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) Horizontal tail: Condition of gap sealing: sealing strips should not protrude upward - danger of reduced control surface effectivity.

4.3 DAYLI INSPECTION (continued)

6 Cockpit

(a) Canopy cleaned, if required.

(b) Check function of canopy locking (before each flight session) and emergency jettison (at least every 3 months):

1) "Pilot" in seat, both canopy locking levers opened.
2) Helper at front canopy end to prevent 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 lifting 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 position was chosen for trim reason, see also entries in section 6.2).

(f) Check thermometer at seat front below instrument panel for function: Indication of ambient 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 chapter 4, item 4.3.5).
(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 water, tail battery position, additional battery positions
    (Take note of chapter 6 entries !!)
(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 checked.
(14) Check wheel brake operation.
(15) Before take-off, perform Cockpit-Checklist procedure
    (See section 4.7.1 “Cockpit-Checklist”).

4.5 NORMAL PROCEDURES

4.5.1 COCKPIT-CHECKLIST

LS8-s and LS8-sb 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.

4.5.3 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). Use ratchet key provided or suitable coin.

(b) Upper end slope adjustment.

During adjustment, watch out for the following:

(a) Locking pin behind main bulkhead must be fully engaged.

(b) Head of pilot should be as high as possible for good visibility.

(c) Tow hook handle and other controls must be within easy reach.

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 support tube must also be removed (it may obstruct a required emergency exit.

(2) 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: During winch launch, retract gear after releasing tow cable, because C.G. hook is fitted to landing gear fork.
When operating landing gear at high speeds, avoid unintentional elevator movements.

4.5.6 WHEEL BRAKE

Press rudder pedals with both feet to activate wheel brake.

Important Note: For safe braking, place pedals during take-off and landing nearer to the pilot.

With TN8019 executed: The wheel brake is actuated by the air brake handle, instead of by the rudder pedals.
The important note above is not valid.

4.5.7 TRIM SYSTEM

(a) Trim lever and trim-locking lever are in separate positions.
(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 (amount of nose or tail heavy).

Warning: Elevator trim system must not be used for compensation of minimum cockpit load deficiency!
(see section 4.5.9 "Trimming of pilots")

4.5.8 BAGGAGE COMPARTMENT

Baggage compartment should be used for soft and light materials only, which would not obstruct the pilot after negative-g accelerations 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, etc. see Maintenance Manual chapter 4.

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 entries in chapter 6.

The cockpit provided Minimum Cockpit Load always relates to the conditions of the last C.G. weighing, see entries in chapter 6; there also can be found further details regarding Minimum Cockpit Load.

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, see also details in section 4.5.10.
(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 the 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 in chapter 6.**

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

4.5.10.1 GENERAL

(a) Use clear water **without** any **additives**.
(b) Check correct tyre pressure 3,5 bar <51 psi>.
(c) Wing integral tanks together hold about 190 Litres <50.2 US gallons, 41.8 Imp. gallons >. Two tanks per wing (Outer tank about 30 Litres < 7,9 US gallons, 6,6 Imp. gallons>, inner tank about 65 Litres <17,2 US gallons, 14,3 Imp. gallons>).
(d) **Tail fin integral tank:**
LS8-s: 7.5 Litres <1.98 US gallons, 1.65 Imp. gallons>
LS8-sb: 12 Litres <3.17 US gallons, 2.64 Imp. gallons>
(e) **One** cockpit water ballast lever operates all tanks simultaneously. Maximum permissible water ballast depends on loading conditions, see section 4.5.10.5 and following ones.
(f) Valid for S/N up to 8500 only: Root rib drain plugs, greased with vaseline if necessary, must be fitted into root ribs before rigging.
(g) **Filling sequence**: always tail tank first, then wing starting with outer tanks.
(h) Use as clean water as possible to avoid damage of sealing rings by foreign matter.

Important Note: When using water ballast, always fill outer wing tanks first, thereafter fill inner tanks with the remaining amount.

Warning: Wing water ballast always must be compensated by tail tank water according to section 4.5.10.4 and tables 4.5.10.5/6 .

4.5.10.2 VERTICAL TAIL FIN TANK LOADING PROCEDURE

(a) Open dump valves by shifting lever on right cockpit side 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 4.5.10.6.
(d) **Markings** near right side rudder sealing **correspond to 0.5 Litre <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 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 held as short as possible and near markings.
(f) Upper red marking corresponds to maximum amount of tail fin water ballast:
    LS8-s: 7.5 Litres <1.98 US gallons, 1.65 Imp. gallons>
    LS8-sb: 12 Litres <3.17 US gallons, 2.64 Imp. gallons>
(g) For trimming of heavy pilots, the **combination of tail battery and/or tail fin water can be chosen**, see also entries in chapter 6.
(h) Close dump valves by shifting cockpit lever backward and remove funnel from tail. For filling of wing tanks, the cockpit lever must stay in the closed position.

Warning: ***Mandatory tail tank filling always exactly to markings near right rudder seal and filling tube water level in correct relation to total wing water amount according to table section 4.5.10.6. Otherwise, keeping to the maximum approved rear C.G. position cannot be guaranteed.***

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

4.5.10.3 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 wing water into wing via funnel. For maximum approved amount of wing water ballast see tables section 4.5.10.5.

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

(d) 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 the knurled ring.
(e) With wing tanks full, water leaks from the following position: for both inner and outer tanks at the under side root rib drain orifice in front of the spar.
(f) Use as clean water as possible to ensure proper valve sealing and avoid clogging of overflow pipes and drain orifices.
(g) 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.***

Note: With wing tanks filled, one wing tip on the ground and again placed horizontal, a small amount of water discharges through the ventilation tubes.

4.5.10.3 WING TANK LOADING PROCEDURE (continued)

(h) **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.***

(i) Additionally see Emergency Procedures section 3.7.3 for freezing / icing.

4.5.10.4 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:

LS8-s (Integral tank) .....**12** kg <26.5 lbs>

LS8-sb (Integral tank) .....**7.5** kg <16.5 lbs>

Tables section 4.5.10.5 show maximum possible wing water ballast mass (water in wings 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 section 4.5.10.6, showing tail tank water amount in relation to wing water ballast amount.

4.5.10.5a MAXIMUM WING WATER BALLAST FOR 15M WING SPAN 525 kg <1157 lbs> MAX. ALL-UP WEIGHT

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

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

Warning: ***Wing water ballast must always be compensated with tail fin water ballast according to tables 4.5.10.6.***

4.5.10.5b MAXIMUM WING WATER BALLAST FOR 18 M WING SPAN 575 kg <1267 lbs) MAX. ALL-UP WEIGHT

Cockpit Load (Pilot +Parachute + Equipm.) *[kg]*	**Empty Mass** *[kg]*									
	250	255	260	265	270	275	280	285	290	295
70	190	190	190	190	190	190	190	190	190	190
75	190	190	190	190	190	190	190	190	190	190
80	190	190	190	190	190	190	190	190	190	190
85	190	190	190	190	190	190	190	190	190	187
90	190	190	190	190	190	190	190	190	187	183
95	190	190	190	190	190	190	190	187	183	178
100	190	190	190	190	190	190	187	183	178	173
105	190	190	190	190	190	187	183	178	173	168
110	190	190	190	190	187	183	178	173	168	163

Cockpit Load (Pilot +Parachute Equipm.) *[lbs]*	**Empty Mass** *[lbs]*									
	551	562	573	584	595	606	617	628	639	650
154	419	419	419	419	419	419	419	419	419	419
165	419	419	419	419	419	419	419	419	419	419
176	419	419	419	419	419	419	419	419	419	419
187	419	419	419	419	419	419	419	419	419	412
198	419	419	419	419	419	419	419	419	412	403
209	419	419	419	419	419	419	419	412	403	392
220	419	419	419	419	419	419	412	403	392	381
231	419	419	419	419	419	412	403	392	381	370
242	419	419	419	419	412	403	392	381	370	359

Warning: ***Wing water ballast must always be compensated with tail fin water ballast according to tables 4.5.10.6.***

4.5.10.6a MAXIMUM TAIL FIN WATER BALLAST

Maximum integral tail tank capacity **LS8-s** .....12 kg <26.5 lbs>
Maximum integral tail tank capacity **LS8-sb** .....7.5 kg <16.5 lbs>

Wing water mass	**Specified max. tail tank water mass**	Total water mass
[kg]	*[kg]*	*[kg]*
25 - 37	1.0	26-38
37.5 - 49.5	1.5	39-51
50 - 62	2.0	52-64
62.5 - 74.5	2.5	65-77
75 - 87	3.0	78-90
87.5 - 99.5	3.5	91-103
100 - 112	4.0	104-116
112.5 - 124.5	4.5	117-129
125 - 137	5.0	130-142
137.5 - 149.5	5.5	143-155
150 - 162	6.0	156-168
162.5 - 174.5	6.5	169-181
175 - 187	7.0	182-194
187.5 - 190	7.5	195-197.5

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

- For **10** kg <22 lbs> of pilot mass over value of **Minimum Cockpit Load for empty tail tank** a **maximum of 1.5** Litres <0,4 US gallons, 0,33 Imp. gallons> of water may be filled additionally.

- Removing the tail fin battery (3BR-199) decreases **Minimum Cockpit Load by 10 kg <22 lbs>**, see entries chapter 6.

See further directions section 4.5.9.

Warning: ***See also Inadvertent Freezing / Icing, section 3.7.3.***

4.5.10.6b MAXIMUM TAIL FIN WATER BALLAST

Maximum integral tail tank capacity **LS8-s** .....26,5 lbs <12 kg>
Maximum integral tail tank capacity **LS8-sb** .....16,5 lbs <7.5 kg>

Wing-Water Mass	**Specified** Tail tank-Water Mass	Total-Water-Mass
[lbs]	***[lbs]***	***[lbs]***
55.1 - 81.6	2.2	55.1
82.7 -109.1	3.3	82.7
110.2 -136.7	4.4	110.2
137.8 -164.2	5.5	137.8
165.3 -191.8	6.6	165.3
192.9 -219.4	7.7	192.9
220.5 -246.9	8.8	220.5
248.0 -274.5	9.9	248.0
275.6 -302.0	11.0	275.6
303.1 -329.6	12.1	303.1
330.7 -357.1	13.2	330.7
358.3 -384.7	14.3	358.3
385.8 -412.3	15.4	385.8
413.4 -418.9	16.5	413.4

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

- For **22 lbs** <10 kg> of pilot mass over value of **Minimum Cockpit Load for empty tail tank** a **maximum of 1.5** Litres <0,4 US gallons, 0,33 Imp. gallons> of water may be filled additionally.

- Removing the tail fin battery (3BR-199) decreases **Minimum Cockpit Load by 22 lbs <10 kg>**, see entries chapter 6.

See further directions section 4.5.9.

Warning: ***See also Inadvertent Freezing / Icing, section 3.7.3.***

4.5.10.7 DUMPING OF WATER BALLAST

(a) Ballast lever forward = All ballast tanks –wings and tail- open.

(b) 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. Procedure to continue flight with assymmetrical water ballast see section 3.10.4.

(2) Open valves emit a buzzing sound when tank is empty.

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 section 3.7.3).***

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 section 4.5.4) 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 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	110 km/h <59 Kt., 68 mph>

(g) Retract landing gear **after** tow, because C.G. hook is fitted to landing gear fork.

Warning: ***Winch launch with high flight mass should only be performed on appropriately powered winches***!

4.5.12 AERO TOW

(a) Aero tow is approved only 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 aero tow 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: ***Aero tow with high flight mass should only be performed behind appropriately powered tow planes. Limitations regarding tow load of tugs must be complied with!***

4.5.13 FREE FLIGHT

- Stalling:

  Stalling characteristics (Straight- and banked flight)
  During stalling the LS8-s and LS8-sb initially show a distinctive warning in the form of tail buffeting. When the elevator is pulled further, stalling symmetrically or asymmetrically may result.
  Pushing the stick forward and deflecting rudder against direction of stall, normal flight attitude can be regained with little loss of altitude. Rain has negligible influence. Loss of altitude about 30 m <100 ft>.

  For stalling speeds see section 5.2.2.

- Circling flight: (Thermalling) Trim stick force to zero.
- Best glide angle: between 95 and 105 km/h <51-56 Kt., 59-65 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 table chapter 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).***

4.7.14 HIGH ALTITUIDE FLIGHT AND AT LOW TEMPERATURES

With temperatures below 0° C <32° F>, for instance during high wave flights or during winter time, ease of control system operation may decrease. Make sure that all control surfaces are free from moisture to avoid any chance of freezing solid.
To avoid air brake covers freezing solid in wing cut-outs, use vaseline along whole length. Control surfaces should be moved regularly at short intervals.

Caution hints:

1. Temperatures below -20° C <-4° F> can result in surface paint cracks.
2. 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, this yielded altitude related maximum speeds provided in section 2.2, which enable the pilot to avoid flying faster than true airspeeds tested as flutter proof.

Example: Indicated airspeed of 227 km/h <123 Kt., 141 mph> at 6000 m <19700 ft> altitude above MSL corresponds to 280 km/h <151◦Kt., 174 mph> true airspeed.

Table from section 2.2:

Altitude Above MSL	m	2000	3000	4000	6000	8000	10000	12000
	ft	**6500**	**9800**	**13100**	**19700**	**26200**	**32800**	**39400**
Max. permissible speed	Km/h	280	266	253	227	202	179	156
	Kt.	**151**	**144**	**137**	**123**	**109**	**97**	**84**
	MPH	174	165	157	141	126	111	97

4. Before freezing conditions are reached, water ballast must be dumped or flight altitude reduced, see section 3.7.3.
5. Do not enter temperature zones below 0° C <32° F> with a wet airplane (for instance after rain).

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 VA = 195 km/h <105 Kt., 121 mph>.

(3) For a straight and steady side slip 100 % rudder and between 50% to 75% aileron deflection are required. 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

(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, see also "Emergency Procedures", section 3.7.4 and "Normal Procedures", section 4.5.10.7.

Caution: Water ballast discharge is recommended before landing on an airfield. Water ballast must be discharged before outlandings! ***Pilots are advised against landing with maximum all-up mass.***

(b) Extend landing gear in time and lock (right hand gear handle).

(c) Place pedals near enough to pilot, to enable proper foot brake operation.

With TN8019 executed: No pedal adjustment is required for landing.

(d) Landing with gear retracted not advisable, because pilot is much better protected by the sprung landing gear compared to the fuselage shell. Check fuselage underside shell after wheel-up landings for damage.

(e) 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:***
Without water ballast not below 90 km/h <49 Kt., 56 mph>.
With water ballast not below 105 km/h <57 Kt., 65 mph>.

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

Warnung: ***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

Warnung: ***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.***

Open canopy window completely 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 LS8-s and LS8-sb sailplanes.***

4.5.19 CLOUD FLYING

Cloud flying only approved without water ballast. Especially try to fly with string centered. Spinning not to be used as an emergency measure. Use air brake in an emergency before reaching 195 km/h <105 Kt., 121 mph> and leave cloud with max. speed of 195 km/h <105 Kt., 121 mph>.

Warning: ***Flying in the vicinity of or in thunderstorms prohibited!***

4.6 POSTFLIGHT CHECKS

1. Switch off electrical instruments

2. Remove batteries 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.

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 8.5

5 PERFORMANCE

Contents of **Section 5**:

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.

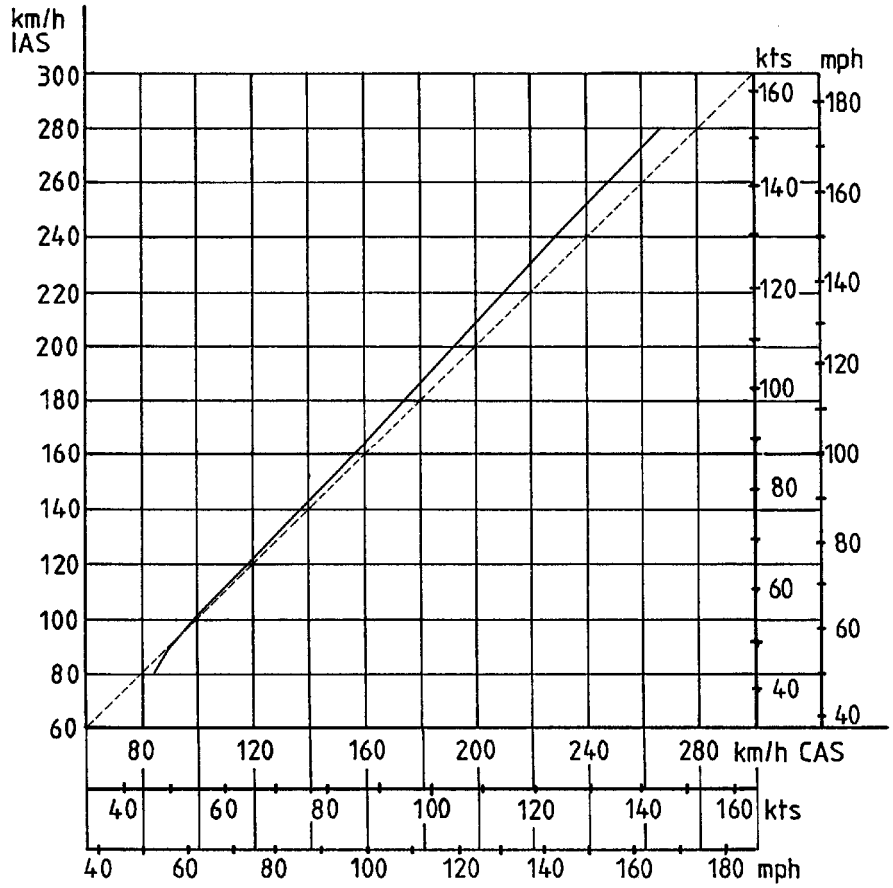
5.2 EASA-APPROVED DATA

5.2.1 AIRSPEED INDICATOR SYSTEM CALIBRATION

Diagram shows airspeed indicator error due to position of pressure ports:

LS8-s: Pitot pressure .....at vertical tail fin about 3/4 up
Static pressure.....at lower forward fuselage sides

LS8-sb: Pitot pressure .....above nose hook opening
As well as optionally:
.....at vertical tail fin about 3/4 up
Static pressure.....at lower forward fuselage sides



IAS = indicated airspeed
CAS = calibrated airspeed

5.2.2 STALLING SPEEDS

Stalling speeds (IAS) for straight and level flight:

15m wingspan

		Mass [kg] / [lbs]						
		375	400	425	450	475	500	525
Air Brakes		827	882	937	992	1047	1102	1157
	km/h	73	76	78	80	82	85	87
retracted	Kt.	39	41	42	43	44	46	47
	MPH	45	47	48	50	51	53	54
	km/h	80	83	85	88	90	92	95
extended	Kt.	43	45	46	48	49	50	51
	MPH	50	52	53	55	56	57	59

18m wingspan

		Mass [kg] / [lbs]								
		375	400	425	450	475	500	525	550	575
air brakes		827	882	937	992	1047	1102	1157	1212	1267
	km/h	70	72	74	76	79	81	83	85	86
retracted	Kt.	38	39	40	41	43	44	45	46	46
	MPH	43	45	46	47	49	50	52	53	53
	km/h	76	79	81	84	86	88	90	93	95
extended	Kt.	41	43	44	45	46	48	49	50	51
	MPH	47	49	50	52	53	55	56	58	59

5.3 ADDITIONAL INFORMATION

5.3.1 DEMONSTRATED CROSSWIND PERFORMANCE

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

Winch Launch: ..25 km/h <13 Kt., 15 mph>

5.3 ADDITIONAL INFORMATION (continued)

5.3.2 GLIDING PERFORMANCE

All values in the following table for:

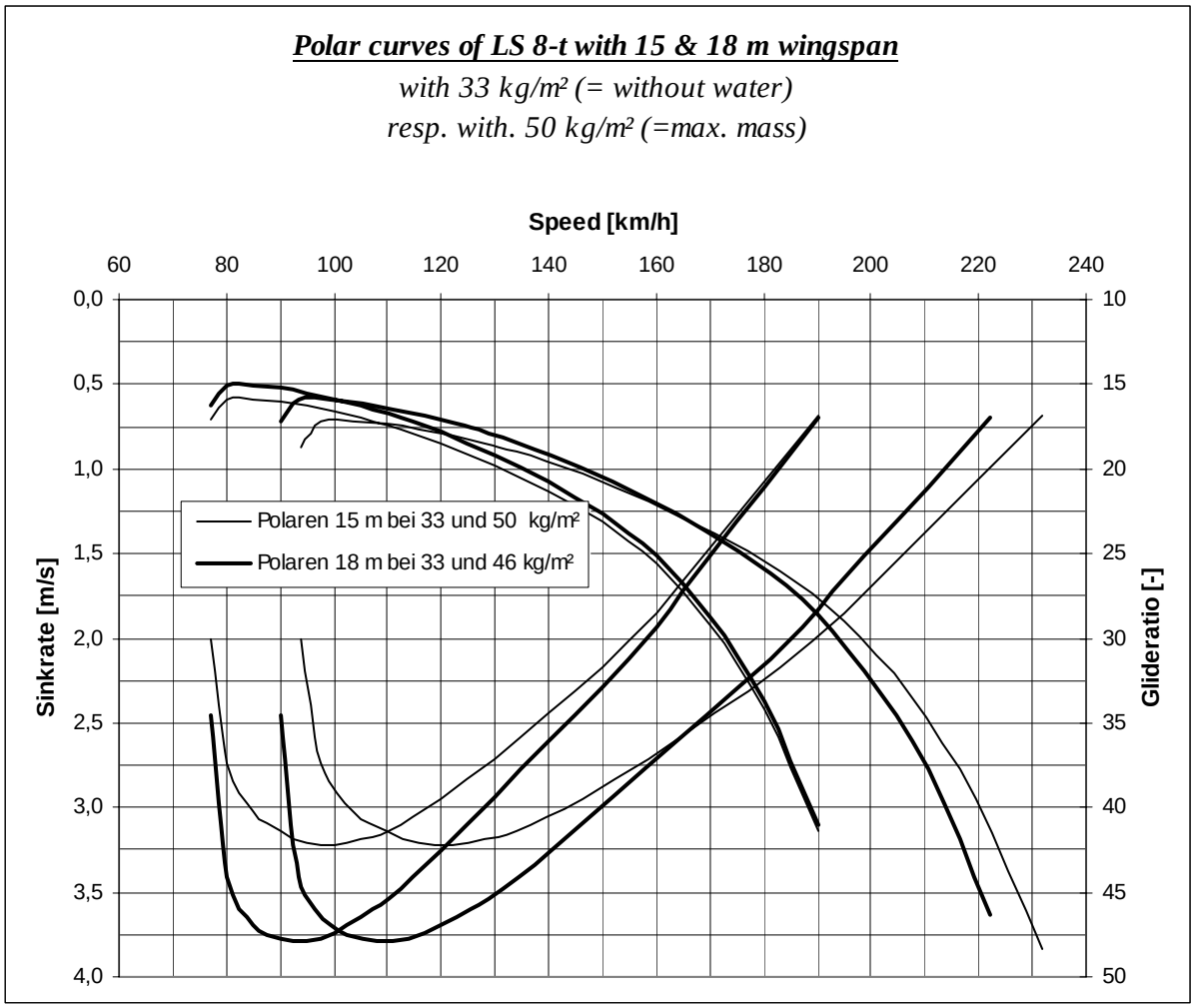
Mass 390 kg <860 lbs>
Altitude 0 m <0 ft> MSL

	15 m wing span	**18 m wing span**
Minimum sink rate	appr. 0,59 m/s at 85 km/h 1.1 Kt. @ 46 Kt. 116 ft/min @ 53 mph	appr. 0,51 m/s at 85 km/h 1.0 Kt. @ 46 Kt. 100 ft/min @ 53 mph
Best Glide ratio	appr. 43 at 100 km/h @ 54 Kt. @ 62 mph	appr. 48 at 100 km/h @ 54 Kt. @ 62 mph

For gliding speed polar see following page.

5.3 ADDITIONAL INFORMATION (continued)

5.3.2 FLIGHT POLAR



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		
Ft/min	98	197	295	394	492	591	689	787		

6 WEIGHT AND BALANCE

Contents of chapter **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 under 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 5.

In addition, section 6.3 lists guiding values for modification of Minimum Cockpit Load, as well as data for exact C.G. calculation.

6.2 Weighing Record and Loading Limits

Warning: New entry with each new weighing or when changing equipment. Entry should be calculated in accordance with chapter 5 of Maintenance Manual. **Mark dimensions used**. State amount of permanently fitted ballast in appropriate position or none.

Serial Number: .

		Wing span	[m]	15	18	15	18	15	18	15	18
		Empty mass	[kg] / [lbs]								
		C.G. position	[mm] / [in]								
	Max. Cockpit Load		[kg] / [lbs]								
Minimum Cockpit Load	**with** tail battery	Tail tank **full**	[kg] / [lbs]								
		Tail tank empty ***(+)***	[kg] / [lbs]								
	without tail battery .	Tail tank full ***(+)***	[kg] / [lbs]								
		Tail tank empty ***(+)***	[kg] / [lbs]								
	Perm. fixed Trim mass	front	[kg] / [lbs]								
		rear	[kg] / [lbs]								
	installed batteries	Seat front	[No.]								
		Baggage comp.	[No.]								
		Vertical tail fin	[No.]								
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.

6.2 Weighing Record and Loading Limits **(**continued**)**

Warning: New entry with each new weighing or when changing equipment. Entry should be calculated in accordance with chapter 5 of Maintenance Manual. **Mark dimensions used**. State amount of permanently fitted ballast in appropriate position or none.

Serial Number: .

		Wing span	[m]	15	18	15	18	15	18	15	18
		Empty mass	[kg] / [lbs]								
		C.G. position	[mm] / [in]								
	Max. Cockpit Load		[kg] / [lbs]								
Minimum Cockpit Load	**with** tail battery	Tail tank **full**	[kg] / [lbs]								
		Tail tank empty ***(+)***	[kg] / [lbs]								
	without tail battery .	Tail tank full ***(+)***	[kg] / [lbs]								
		Tail tank empty ***(+)***	[kg] / [lbs]								
	Perm. fixed Trim mass	front	[kg] / [lbs]								
		rear	[kg] / [lbs]								
	installed batteries	Seat front	[No.]								
		Baggage comp.	[No.]								
		Vertical tail fin	[No.]								
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.

6.3 Inflight C.G. calculation

Table of C.G. positions of various items of equipment:

Component	Mass	lever related to Datum
Battery at seat front end	**2.5 –2.7 kg 5.5 –6.0 lbs**	**-1060 mm -41,732 in**
Battery in Baggage Comp.	**2.5 –3.0 kg 5.5 –6.6 lbs**	**+150 mm +5,906 in**
Battery in vertical tail fin	**2.5 –2.7 kg 5.5 –6.0 lbs**	**+4430 mm +174,409 in**
Water in tail tank	LS8-s: up to 12 kg up to 26.5 lbs LS8-sb: up to 7.5 kg up to 16.5 lbs	+4230 mm +166,535 in
Trim weight at vertical tail fin web 4R8-109	up to 2,5 kg up to 5.5 lbs	+4550 mm +179.134 in
Trim weight in front holder	2.4 – 2.5 kg 5.3 –5.5 lbs	- 1650 mm - 64,961 in

Simplified variation of Minimum Cockpit Load possible by use of the following values:

Installation of 1 trim ballast weight (2.5 kg, 5.5 lbs) in front holder..... ..... **reduces** Minimum Cockpit Load by **5 kg / 11 lbs**

Installation of 1 Battery (2.5 kg, 5.5 lbs) at the seat front end..... ..... **reduces** Minimum Cockpit Load by **4 kg / 8.8 lbs**

Removal of tail fin battery (2.5 -2.7 kg, 5.5 –6.0 lbs)..... ..... **reduces** Minimum Cockpit Load by **10 kg / 22 lbs**

Filling of 1.5 Litres of water (1.5 kg, 3.3 lbs) additionally into the tail tank ....**increases** Minimum Cockpit Load by **10 kg / 22 lbs**

Warning: ***Values for simplified variation of Minimum Cockpit Load are related to the equipment conditions during the last C.G. weighing. Entries in section 6-2 refer to this basic condition.***

Caution: **Simplified variation values are always on the safe (nose heavy) side. For more exact calculation use provided real lever arms.**

7 Description of SYSTEMS

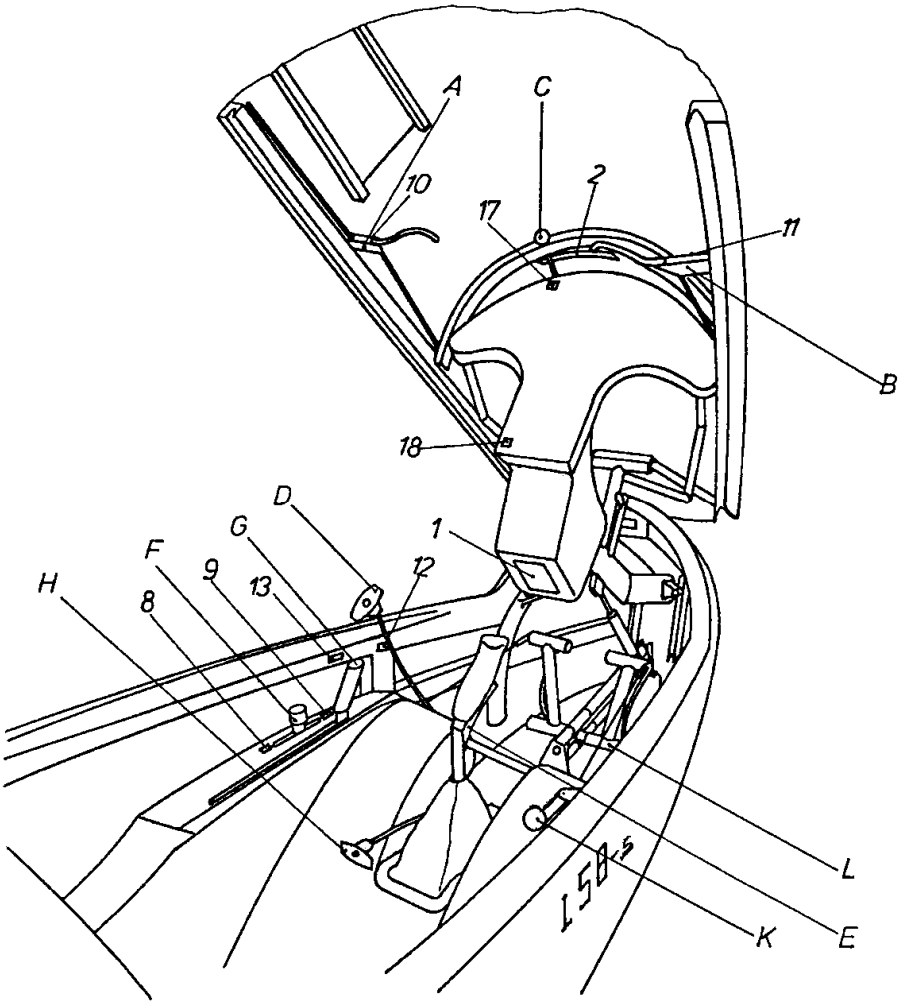
Contents of **Chapter 7**:

7.1 INTRODUCTION

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

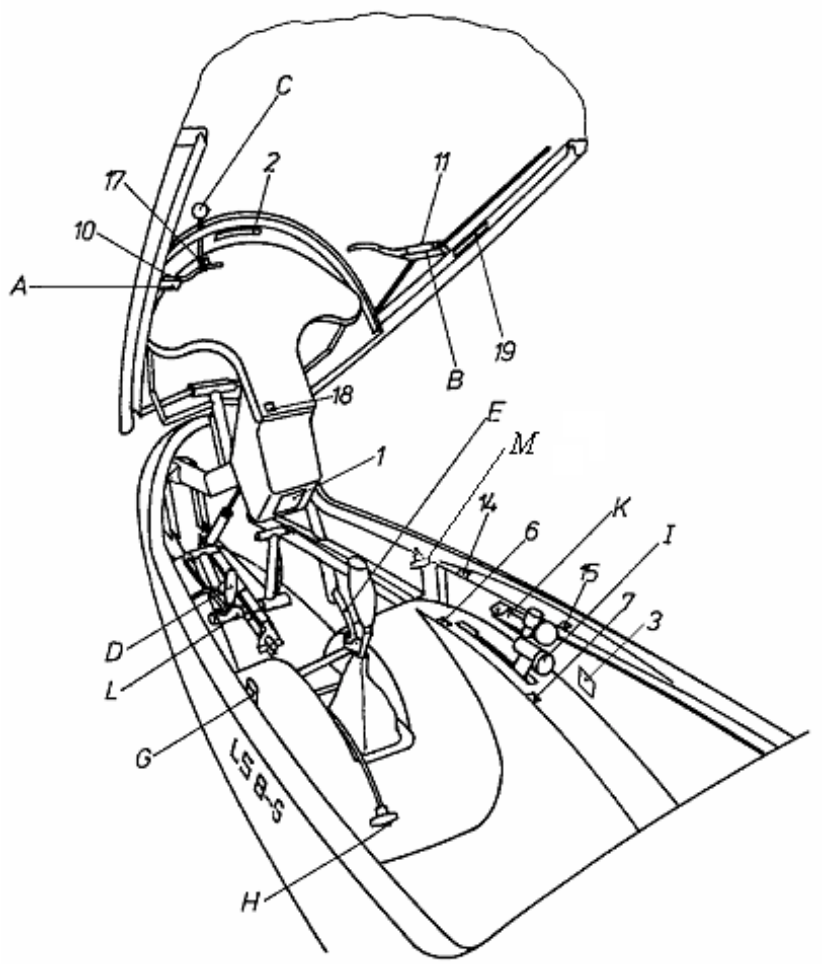
Refer to Chapter 9, Supplements, for details of optional systems and equipment.

7.2 COCKPIT CONTROLS



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
G - **From ser.no. 8527 on (ÄM LS8-1):** Airbrake handle with Piggott-hook and wheel brake with parking brake, see section 7.4.
H - Pedal adjustment
K – Water ballast
L - Rudder pedals and wheel brake (feet operated)
L with TN8019 executed:
Only rudder pedals

7.2 COCKPIT CONTROLS (continued)



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
G - **From ser.no. 8527 on (ÄM LS8-1):** Airbrake handle with Piggott-hook and wheel brake with parking brake, see section 7.4.
H - Pedal adjustment
I - Landing gear lever
K – Water ballast
L - Rudder pedals and wheel brake (feet operated)
L with TN8019 executed:
Only rudder pedals
M – Handle for NOAH Emergency Exit System (Option)

7.3 CONTROL SYSTEM

Rudder Control:
Cable controlled from adjustable pedals.
See Diagram in Maintenance Manual chapter 1.

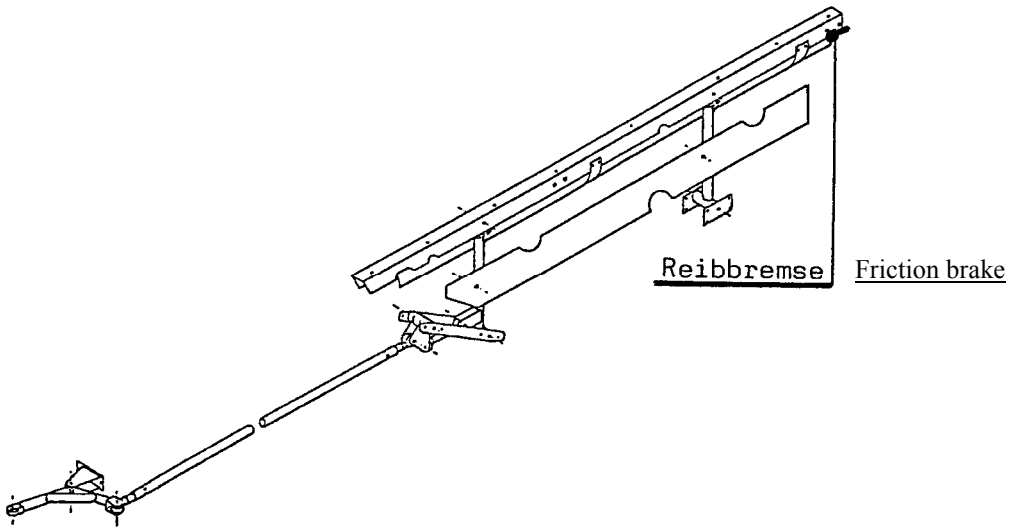
Elevator Control:
Pushrods guided in maintenance-free longitudinal motion ball bearings. Elevator 100% mass balanced by pushrod in vertical tail fin. Automatic connection during rigging.
See Diagram in Maintenance Manual chapter 1.

Trim Control:
Longitudinal trim system by springs, locking lever at control stick, trim position indicator on left cockpit frame.
For trim operation, the control stick locking lever must be pulled and the stick placed to a speed related position. Should this positioning not suffice, the indicator lever can additionally be moved by hand as long as the locking is open.
See Diagram in Maintenance Manual chapter 1.

Aileron Control
Aileron system activated via pushrods guided in longitudinal motion ball bearings, connection of system by automatic coupling during rigging. Dynamic aileron mass balance in wing, aileron with 18m wingspan in two parts.
See Diagram in Maintenance Manual chapter 1.

7.4 Air Brake Control

Upper surface double height air brakes with spring loaded cover blades. Activated via pushrods, guided in longitudinal motion ball bearings. Automatic connection of system during rigging. Locking mechanism in wings. Wing boxes sealed against wing structure. Friction damper in box to prevent oscillations during extension.
See Diagram in Maintenance Manual chapter 1.



From ser.no. 8527 on (ÄM LS8-1):
The airbrake control is combined with an airbrake securing device (Piggott-hook) and a parking brake:
Pull the airbrake handle back to actuate the wheelbrake and rotate the handle to the cockpit wall. The handle will engage in a notch to hold the system in this position.
In case the airbrakes mistakenly haven't been locked, the handle will engage in a notch to avoid inadvertent deployment of the airbrakes. To open and to close the airbrakes the operating handle must be rotated into the cockpit until the handle passes the notches.

7.5 Landing Gear

a) Main wheel: Sprung retractable landing gear, housed in closed and sealed box.

- 5“-landing gear:
  Tyre 5.00-5 6 PR
  Tyre pressure 3,5 bar <51 psi>
  Drum brake

See Diagram in Maintenance Manual chapter 1.

b) Tail:

Tail wheel:
Tyre 210 x 65 2 PR, diameter 210 mm <8.268 in>,
Tyre pressure 2,5 - 3,5 bar <36 – 51 psi>

or:

Tail skid including cable deflector at front end.

7.6 Baggage Compartment

Baggage compartment behind pilot's shoulders, accessible on ground after swivelling backrest forward. Loading possible after rigging only. Permanent installation (for instance batteries) or other equipment possible according to details provided in Maintenance Manual section 4.8. Not permanently fixed light and soft materials count for cockpit load.

7.7 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.

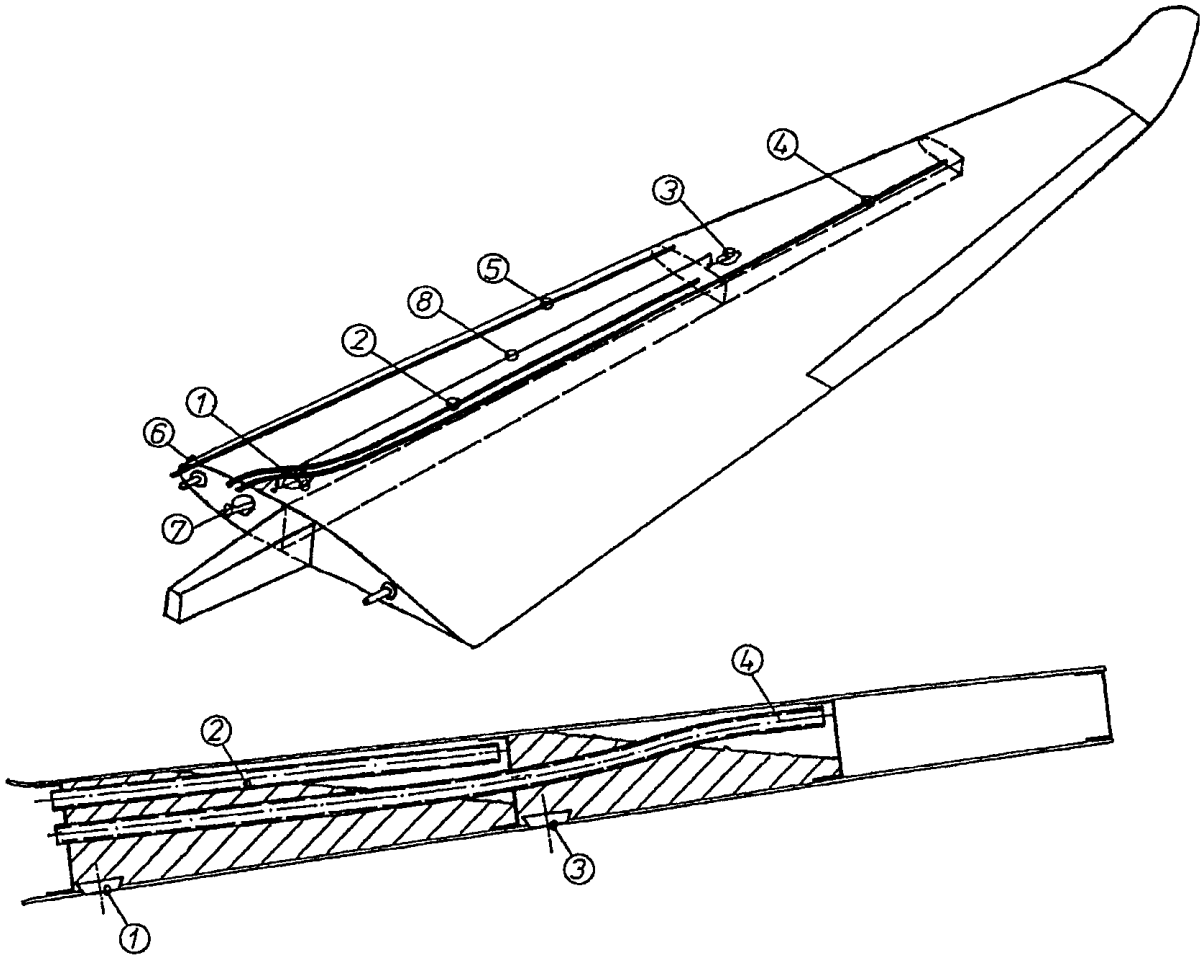
A single lever at right cockpit rim operates **total** water ballast system (wing tanks and tail tank).

Operating system for the wing integral tanks couples automatically during rigging. Use as clean water as possible **without any additives** to avoid damage of inner tank surfaces and seals due to chemical reaction and foreign matter or clogging of discharge valves or ventilation.

7.7.1 WING-WATER BALLAST SYSTEM

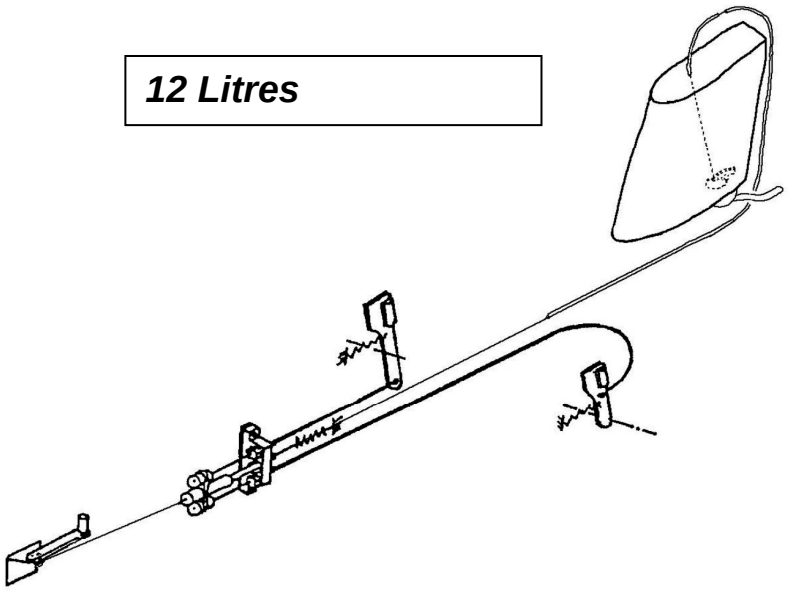
(1) Valve of inner tank
(2) Ventilation tube of inner tank
(3) Valve of outer tank
(4) Ventilation tube of outer tank
(5) Drain tube of outer tank (only up to S/N 8500)
(6) Drain valve for both tanks (only up to S/N 8500)
(7) Drive lever
(8) Cable to valve of outer tank

See Diagram in Maintenance Manual chapter 1.

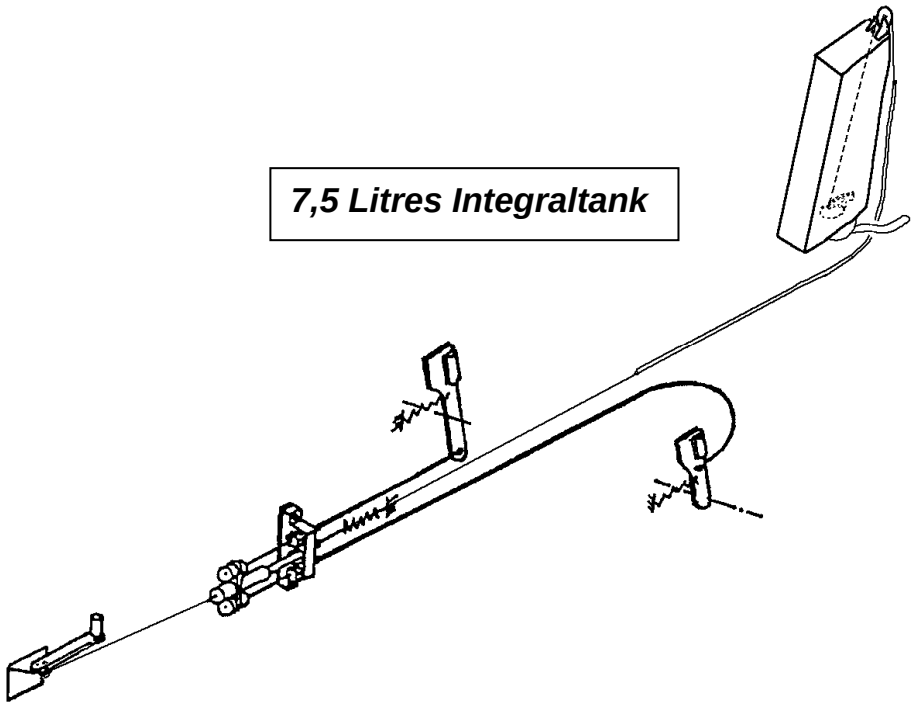


7.7.2 FUSELAGE WATER BALLAST SYSTEM

LS8-s: 12 Litres Integral tank

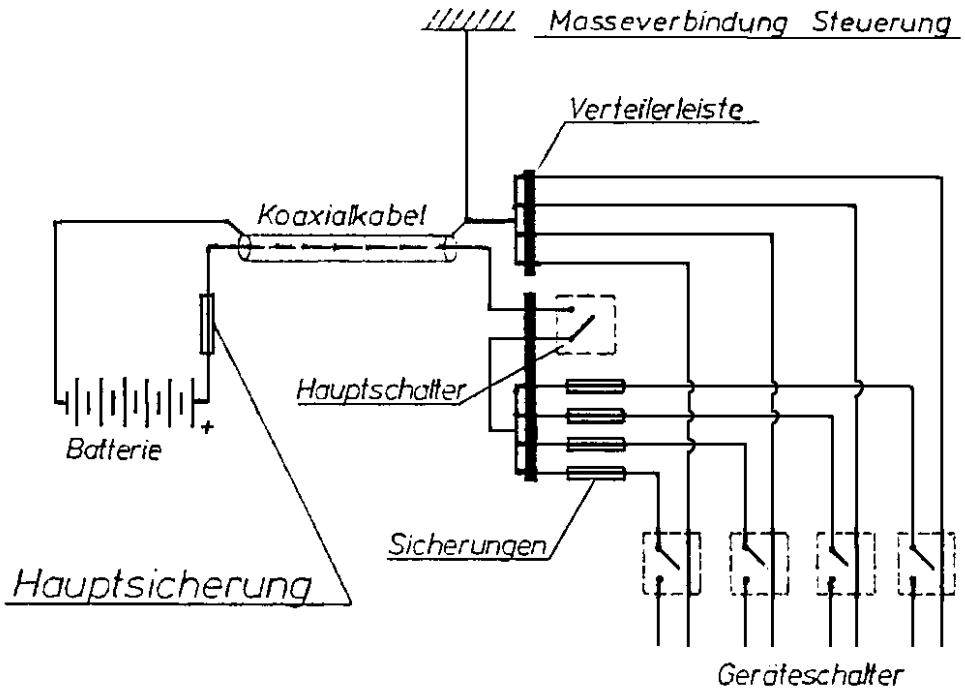


LS8-sb: 7,5 Litres Integral tank



7.8 ELECTRICAL SYSTEM AND OPERATION

For electrical system, see wiring diagram below. Electrical supply by sealed and maintenance free 12V/7,2 Ah gel-cell battery. When installing an additional battery, a switch can be used as main switch. For each electrical appliance a current limiting device should be used. (normally microfuses, but automatic cut-outs can also be used).



Position of fuses:

Main fuse at battery.
Single fuses at lower end of instrument panel.

Denomination:

Micro fuse 20*5 (DIN 41571).
Circuit breaker Klixon 7277-2, 7274-2 or similar ones.

Fuse ratings:

max. **15** A ..... for battery main fuse (Battery drawing 3BR-253).
max. **3** A quick acting ..... for VHF radio.
max. **2** A quick acting ..... for electrical variometer and turn and bank.

Cross section of cables:

See Maintenance Manual section 1.9

7.9 PNEUMATIC SYSTEM (Static- and Pitot-Pressure)

7.9.1 LS8-s

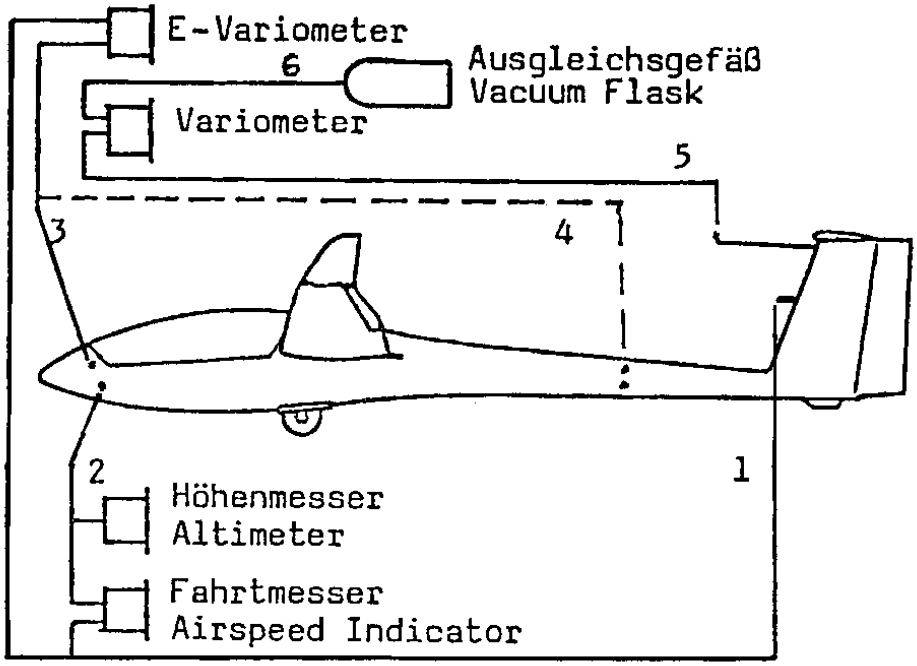


Diagram:

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

Colours of pressure lines:

1	Total pressure	**red**
2	Front lower static pressure	**blue (for ASI and altimeter only!)**
3	Front upper static pressure	**transparent Ø6 mm <0,236 in>**
4	Rear static pressure	**yellow**
5	TE pressure	**green**
6	Vacuum bottles	**transparent Ø8 mm <0,315 in>**

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

7.9 PNEUMATIC SYSTEM (Static- and Pitot-Pressure)

7.9.2 LS8-sb

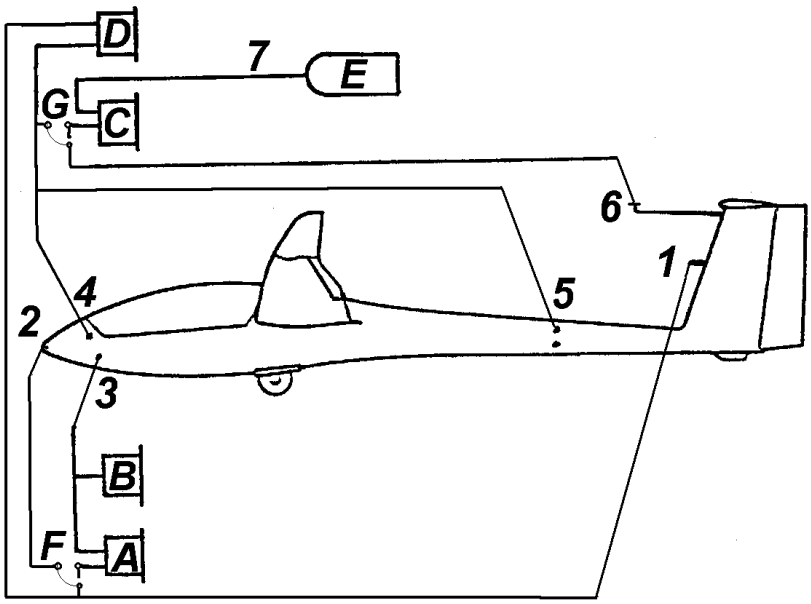


Diagram:

1 Pitot pressure port at vertical tail fin (Option) below TE port.
2 Pitot pressure port at fuselage nose.
3 Static pressure port for airspeed indicator and altimeter – lower forward fuselage side statics.
4, 5 Static pressure ports for variometers – upper forward fuselage side statics and at tail boom.
6 TE port at upper vertical tail fin end.

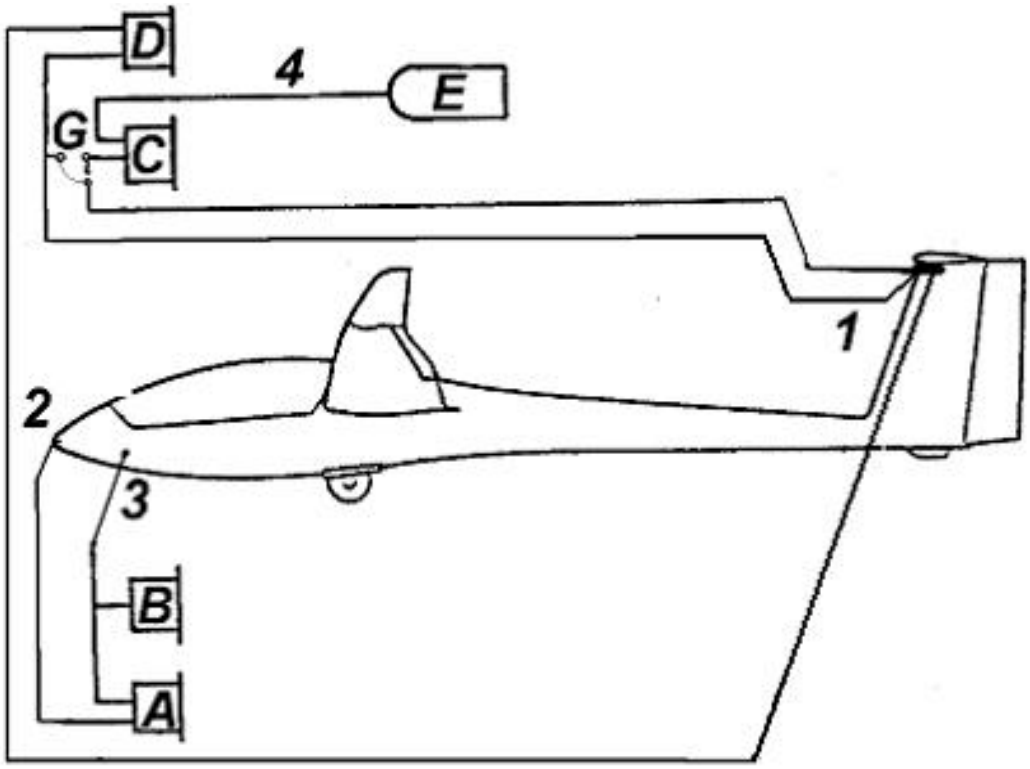
A ASI
B altimeter
C Variometer
D Electrical Variometer (Do not use flow measuring instruments)
E Vacuum bottles for variometers
F ASI-switch: „Engine / Soaring“
G Variometer switch: „Engine / Soaring“ (Both switches drawn in „SOARING“ position

Colours of pressure lines:

7	Rear total pressure	**red**
8	Front total pressure	**red**
9	Front lower static pressure	**blue (<u>for ASI and altimeter only!</u>)**
10	Front upper static pressure	**transparent Ø6 mm <0,236 in>**
11	Rear static pressure	**yellow**
12	TE pressure	**green**
13	Vacuum bottles	**transparent Ø8 mm <0,315 in>**

7.9.2 Pressure Ports cont.

From ser.no. 8527 on (ÄM LS8-1) the following system is installed:



1 Multi Probe : Pitot-/Static-/TE pressure port
2 Pitot pressure port at fuselage nose.
3 Static pressure port for airspeed indicator and altimeter – forward fuselage sides.
4, Vacuum Bottles.

A	ASI	**E**	Capacity bottles for variometers
B	Altimeter	**G**	Variometer switch (Option):
C	Variometer		TE (Soaring) / static (Engine operstion)
D	Electrical Variometer		(switch shown in „SOARING“ position

Colours of instrument lines:

14	Multi Probe:	
	Pitot	**clear**
	Static	**red**
	TE	**green**
15	Front total pressure	**yellow**
16	Static pressure front	**blue (<u>for ASI and altimeter only!</u>)**
17	Variometer capacity bottles	**clear dia. 8 mm (0,315 in)**

Note: To preserve the sealing-rings inside the holder for the Multi Probe, the end of the probe should be greased with e.g. Vaseline from time to time.

7.10 VARIOUS EQUIPMENT

7.10.1 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.

7.10.2 ADDITIONAL BATTERIES

Vertical Tail Fin Battery

Optional. The tail fin battery must be equipped with a main fuse according to drawing 3BR-199. Measurements L 155mm * B 35mm * H 100mm (over terminals), 6V 7.2Ah, 2 cells required.

From ser.no. 8527 on (ÄM LS8-1): If an optionally battery will be installed in the fin the locking bow (part 10L35 made from piano wire) must be removed. The locking bow prevents the installation of a battery and serves as indicator if a battery is installed, as its ends are visible from the outside.

Battery in Baggage Compartment

Optional. Installation on landing gear box, see Maintenance Manual section 4.8. The battery must be equipped with an appropriate main fuse! Measurements identical to forward seat battery with identical holder or for instance Dittel ZT 092, 12V 6.5Ah complete with holder.

7.10.3 OXYGEN SYSTEM

Fiberglas 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 licensed 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.

7.10.4 EMERGENCY LOCATOR TRANSMITTER (ELT)

Permanent installation according to Maintenance Manual chapter 11 and to manufacturers instructions. Possible installation location in rear portion of the baggage compartment, remote control from instrument panel necessary. After installation, cockpit loading limit values must be checked according to Maintenance Manual chapter 5.

8 HANDLING, SERVICING AND MAINTENANCE

Contents of **Chapter 8**:

8.1 INTRODUCTION

This section contains manufacturer 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 - AND MAINTENANCE INTERVALS

(a) Annual Inspection according to checklist and inspection forms provided in Maintenance Manual, chapter 12, after performance of annual maintenance procedure (Maintenance Manual chapter 2).

(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 2.

(d) Other inspections may be required by the issuance of airworthiness directives applicable to the aircraft or components.

(e) Life limited parts, such as tow release system components or seat belt harness may require other inspections. See Maintenance Manual chapter◦0.4.
Agency or personnel accomplishing the required inspections and most of the manufacturer recommended inspections must be properly certificated.

8.2.1 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 carrier is 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 MODIFICATIONS 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, weather 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 manufacturer approved 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 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!

8.3 MODIFICATIONS OR REPAIRS (continued)

8.3.2 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 chapter 10 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

8.4.1 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.***

8.4.2 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..

8.4 GROUND HANDLING / ROAD TRANSPORT (continued)

8.4.3 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.

8.4.4 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

8.4 GROUND HANDLING / ROAD TRANSPORT (continued)

8.4.5 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 bushings.

Left forked spar at outer main pin bushing only, when both fork ends are supported. Otherwise use inner fork end only.

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 and drain orifices open for ventilation during trailer storage. Keep trailer vented to avoid corrosion due to condensation. Wing leading edge drainage applies only up to S/N 8500.

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 every 6 months!).

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 manufacturers).

8.5 CLEANING AND CARE (continued)

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 Plexi-klar) 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.
  Reservations are, that these liquids should only be used for wiping off, not for soaking with rags.

Unsuitable:
- Strong solvents and thinners (Acetone, the whole Ester and Ketone groups)
  These items may decompose gelcoat and cause local shrinking.

Completely unsuitable:
- Trichlorethylene
- Carbon tetrachloride or similar hydrocarbon chlorides
  These liquids destroy the gelcoat.

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

For polyurethane (PU)-paint system care take note of DG-Flugzeugbau recommendations.

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.

8.6 LONG TERM STORAGE

Preparation and Storage

(a) Remove instrumentation and store separately.
(b) Close external pressure ports (see Maintenance Manual chapter 1.16) 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.
ATTENTION: Storing in aggressive surroundings (for instance acetic acids [silicone sealing in trailer], uric acid [urine contamination at structure], various salts [sea air, drying agents] can result in extreme corrosion, even at corrosion protected items.

Return to Service

(a) Inspection according to annual inspection, See Maintenance Manual chapter 2 and blank inspection forms in chapter 11.
(b) Inspect inside of fuselage for small animals (Mice, birds etc.) and/or nests.
(c) Check compass deviation and update deviation table.

9 SUPPLEMENTS

Contents of **Section 9**:

9.1 INTRODUCTION

This section contains the appropriate supplements necessary to safely and efficiently operate the sailplane when equipped with various optional systems and equipment not provided with the standard sailplane.

9.2 LIST OF SUPPLEMENTS INCLUDED

Date	Section	Denomination of added Supplement

9.3 Emergency Exit Assist System NOAH (Optional)

Chapter 1

Introduction

In the following pages modifications to variuos Flight Manual chapters related to the emergency assist system NOAH are provided.

Abstract

The NOAH system is designed to make the emergency exit of the pilot easier, it is a supplement to the emergency parachute.
NOAH consists of an air cushion similar to a car airbag. The propellant gas is contained in a small pressure cylinder. System activation is purely mechanic via a right cockpit side handle.

To release NOAH, the canopy must either be opened or jettisoned. Locking of NOAH system by activator lever against canopy frame when canopy is closed.

When NOAH is activated, first of all the seat belt harness becomes opened, thereafter the pressure cylinder. The filled air cushion lifts the pilot above the canopy rim and he is able to roll out unless he is catapulted out due to the plane's movements.
When NOAH is being used together with an automatic parachute, the emergency exit after NOAH activation is more or less fully automatic and without further pilot action required.

Note: The NOAH cushion is penetrable by air allowing pressure reduction after filling in case of unintended filling. This avoids pilot injury in case of a not opening harness.

Technical Data:
Total mass system: about 4,5 kg <9,9 lbs>.
Pressurization: Nitrogen, about 200 bar <2900 psi>.
Inflation in about 2 Seconds.
Layout range: Pilot weight 110 kg <242 lbs> up to at least 4 g.

9.3 Emergency Exit Assist System NOAH (Optional)

Chapter 3

Use of NOAH in an emergency exit:

Caution: Use of an automatic parachute is strongly recommended. Only then the emergency exit including parachute activation is more or less automatic and saves valuable time and altitude.

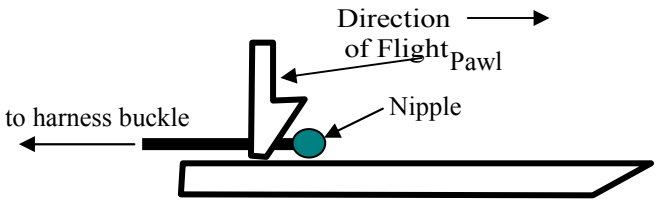
First of all, jettison canopy by pulling both red handles **to stops** and push off when required at **both** red handles.

Then pull NOAH activator lever strongly and swiftly against stop (yellow-black marked handle at right side of cockpit frame). After cushion inflated, roll out of cockpit.

Caution: Avoid activator lever operation on ground with canopy open – NOAH becomes activated.

Chapter 4

a) Pre-flight inspection
Check NOAH cushion, high pressure hose and operating cables for proper positioning and for damage.
Check especially wether the nipple of the cable opening the harness buckle is **behind** the activator lever pawl, see sketch.



Detail of activator unit (at left canopy frame adjacent to instrument panel)

b) Normal OPENING of harness buckle by turning clockwise only.

9.3 Emergency Exit Assist System NOAH (Optional)

Chapter 7

NOAH activator lever placed on right side cockpit frame adjacent to control stick and marked black-yellow.
A sticker is wrapped around the handle and onto the cable guide-tube and acts as an aid against unintentional operation.

Chapter 8

For inspection and maintenance see details in ”Manual for Emergency Exit Assist NOAH”.