Flight Manual for the *LS6-18w* Sailplane

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

Registration : D-8817

Serial Number : 6374

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Owner AAVA

Published: Mar. 30, 1994

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

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

Annexe 1

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

Cet intercalaire doit obligatoirement être inséré devant la page de garde d'un manuel de vol en langue anglaise

AVERTISSEMENT

Le présent document en langue anglaise est le manuel de vol approuvé par l'Agence européenne de la sécurité aérienne.

En application des dispositions de l'arrêté du 24 juillet 1991 relatif aux conditions d'utilisation des aéronefs civils en aviation générale (« Un vol ne peut être entrepris que si, d'une part les membres d'équipage sont familiarisés avec l'aéronef et son équipement de bord, notamment le matériel de sécurité-sauvetage et les systèmes spéciaux, et d'autre part ont une connaissance pratique de son manuel de vol ou des documents acceptés comme équivalents. »),

Nul ne peut utiliser l'aéronef avec ce seul document s'il n'a pas une connaissance suffisante de la langue anglaise.

A défaut, il appartient au propriétaire ou à l'exploitant de l'aéronef de se procurer une traduction de ce document sous sa responsabilité.

Référence : Instruction du 13/11/2009 relative à la langue des manuels de vol

0.1 Log of Revisions

Any revision of the present manual, except actual weighing data, must be recorded in the following table and in case of approved sections endorsed by the responsible airworthiness authority.
The new or amended text in the revised page will be indicated by a black vertical line in the left hand margin, and the revision No. and the date will be shown on the bottom left hand of the page.

Rev. No.	Pages affected	Description	Date of issue	Approval	Date of approval
1	0-1, 0-2, 4-1, 4-2	15m Dillinger Winglets TN 6041	Dec. 2016	EASA	Feb. 1st, 2017
2	0-1, 0-2, 4-3	Small tailwheel TN 6044	August 2022	Approved under privilege DOA Ref. EASA.21J.780	10. August 2022

LS6-18w manuals can be ordered from:

DG Aviation GmbH
Otto-Lilienthal-Weg 2
76646 Bruchsal
Germany

0.2 List of effective pages

Page		Issue Date
0-1	LBA-appr.	Dec.2016 / 6041
0-2	LBA-appr.	Dec.2016 / 6041
0-3	LBA-appr.	March 30,1994
1-1		March 30,1994
1-2		March 30,1994
2-1	LBA-appr.	March 30,1994
2-2	LBA-appr.	March 30,1994
2-3	LBA-appr.	March 30,1994
2-4	LBA-appr.	March 30,1994
2-5	LBA-appr.	March 30,1994
2-6	LBA-appr.	March 30,1994
2-7	LBA-appr.	March 30,1994
2-8	LBA-appr.	March 30,1994
2-9	LBA-appr.	March 30,1994
3-1	LBA-appr.	March 30,1994
3-2	LBA-appr.	March 30,1994
3-3	LBA-appr.	March 30,1994
3-4	LBA-appr.	March 30,1994
3-5	LBA-appr.	March 30,1994
4-1	LBA-appr.	Dec.2016 / 6041
4-2	LBA-appr.	Dec.2016 / 6041
4-3	LBA-appr.	Aug.2022/6044
4-4	LBA-appr.	March 30,1994
4-5	LBA-appr.	March 30,1994
4-6	LBA-appr.	March 30,1994
4-7	LBA-appr.	March 30,1994
4-8	LBA-appr.	March 30,1994
4-9	LBA-appr.	March 30,1994
4-10	LBA-appr.	March 30,1994
4-11	LBA-appr.	March 30,1994
4-12	LBA-appr.	March 30,1994
4-13	LBA-appr.	March 30,1994
4-14	LBA-appr.	March 30,1994
4-14	LBA-appr.	March 30,1994
4-15	LBA-appr.	March 30,1994
4-16	LBA-appr.	March 30,1994
4-17	LBA-appr.	March 30,1994
5-1	LBA-appr.	March 30,1994
5-2	LBA-appr.	March 30,1994
6-1		March 30,1994
6-2		March 30,1994
7-1		March 30,1994
7-2		March 30,1994
7-2		March 30,1994
7-3		March 30,1994
7-4		March 30,1994
7-5		March 30,1994
8-1		March 30,1994
8-2		March 30,1994
8-3		March 30,1994
8-4		March 30,1994
8-5		March 30,1994
8-6		March 30,1994
9-1		March 30,1994

0.3 Table of Contents

Section 1

1.1 Introduction

This sailplane Flight Manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of the LS6-18w sailplane.

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

The LS6-18w 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

This type of sailplane has been approved by Luftfahrt-Bundesamt (LBA) Braunschweig in accordance with JAR-22 including amendments Change 4, Amend. 22/86/1, Eff. 22.10.86 plus § 22.375 Amend. 22/90/1, Eff. June 90 of the english language original. The LBA-Type Certificate No. 357 for LS6-18w has been issued on 31.Jan.1995.

Category of Airworthiness: Utility

1.3 Warnings, Cautions and Notes

The following definitions apply to warnings, cautions and notes used in the flight manual.

Warning Any operating procedure, practice or condition which, if not strictly complied with, may result in personal injury or loss of life.

Caution Any operating procedure, practice or condition which, if not strictly complied with, may result in damage to the aircraft or equipment.

Note Any operating procedure, practice or condition which is essential to emphasize.

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1.4 Descriptive Data

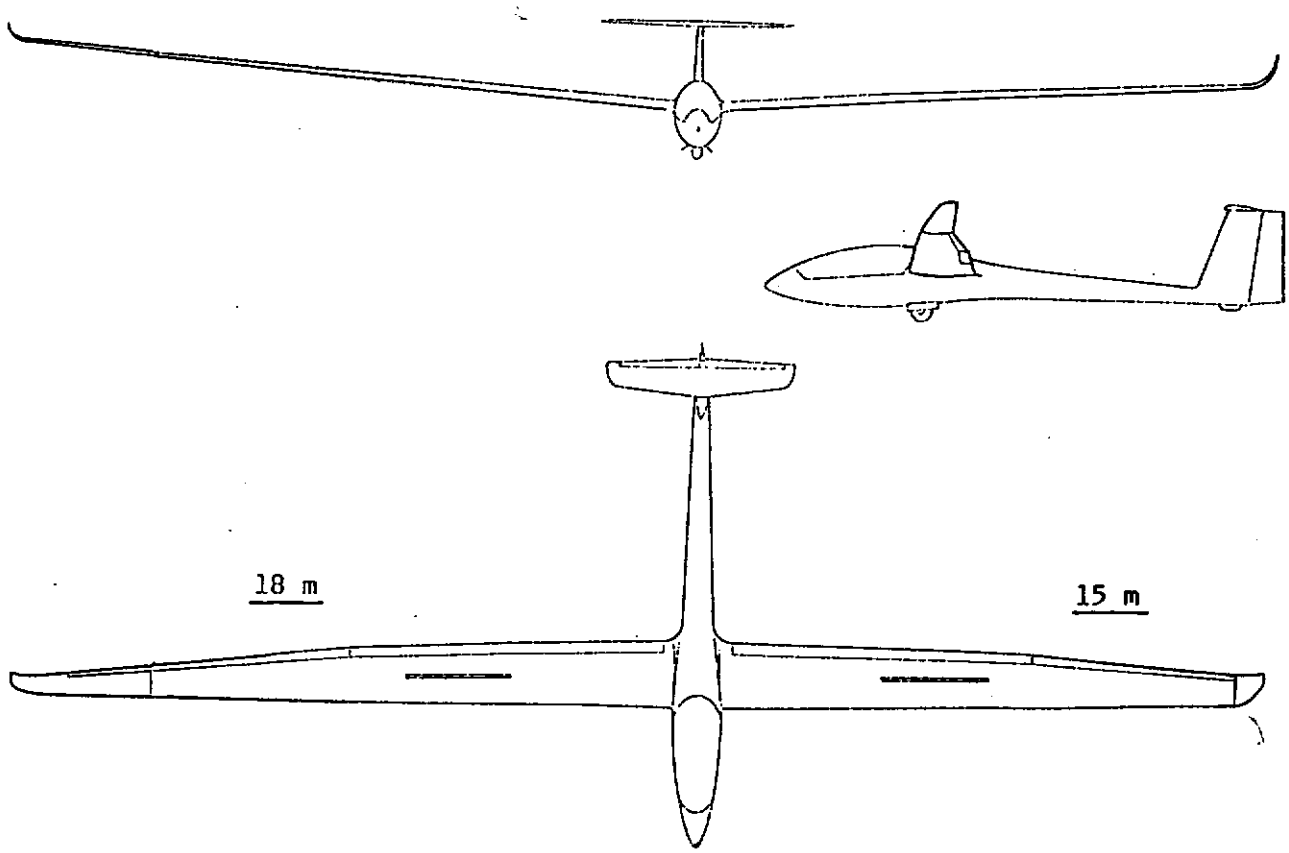
The LS6-18w is a single seater sailplane with carbon fibre wing shell, wing flaps, T-tail, wing and optional vertical tail fin water ballast systems, retractable and sprung landing gear and upper wing surface air brakes; the LS6-18w may be operated with 15 m or 18 m span and winglets in both versions.

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

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

Wing span	15	m	(49.21 ft)	or	18	m (59.06 ft)
Length	6.66	m	(21.84 ft)		6.66	m (21.84 ft)
Height	1.33	m	(4.36 ft)		1.33	m (4.36 ft)
MAC	0.702	m	(2.30 ft)		0.634	m (2.08 ft)
Wing area	10.5	m²	(113.0 sq.ft)		11.417	m² (122.9 sq.ft)
Wing aspect ratio	21.4				28.379	
Maximum gross weight	525	kg	(1157 lbs)		525	kg (1157 lbs)
Maximum wing loading	50	kg/m²	(10.2 lbs/sq.ft)		45.99	kg/m² (9.4 lbs/sq.ft)

1.5 Three View Drawing



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Section 2

2.1 Introduction

Section 2 includes operating limitations, instrument markings, and basic placards necessary for safe operation of the sailplane LS6-18w, its standard systems and standard equipment.
The limitations included in this section and in section 9 have been approved by LBA (Luftfahrt-Bundesamt Braunschweig).

The LS6-18w sailplane has been designed and approved according to JAR 22 requirements. Factors of safety (relation of ultimate loads to permissible maximum loads occurring during operation) are 1.5 only. Thus, ultimate loads will be reached, when exceeding permissible load factors by 50%. When exceeding permissible speeds, the safety reserve is much lower (ca 1.22).

Maximum loads should never be caused by the pilot's 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 turbulences when crossing mountain ridges in strong winds.

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2.2 Airspeed

Airspeed limitations and their operational significance are shown below:

	Speed	IAS km/h	IAS kts	IAS MPH	Remarks
VNE	Never Exceed speed				Do not exceed this speed in any operation and do not use more than one third of control deflections.
		280	151	174	from sea level to 2000 m (6500 ft) MSL
		266	144	165	from 2000 m(6500 ft) to 3000 m(9800 ft) MSL
		253	137	157	from 3000 m(9800 ft) to 4000 m(13100 ft) MSL
		227	122	141	from 4000 m(13100 ft) to 6000 m(19700 ft) MSL
		202	109	126	from 6000 m(19700 ft) to 8000 m(26200 ft) MSL
		179	97	111	from 8000 m(26200 ft) to 10000 m(32800 ft) MSL

Warning: When flying at altitude, the lower limit IAS is always authoritative.

VRA	Rough air speed	190	103	118	Do not exceed this speed except in smooth air and then only with caution. Air movements in lee-wave rotors, thunderclouds, visible whirlwinds, or over mountain crests are to be understood as rough air.
VA	Manoeuvering speed	190	103	118	Do not make full or abrupt control movement above this speed, because under certain circumstances loads due to manoeuvering, gusts and control surface deflections may exceed design limits.
VFE	Max. flap extended speed, flap setting				Do not exceed these speeds with the given flap settings.
	-5° up to 0°	280	151	174	
	0° up to 10°	190	103	118	
	10° up to L (+15°)	150	81	93	
VW	Maximum Winch-Launching speed	140	76	87	Do not exceed during winch- or auto-tow-launching.
VT	Maximum Aerotow speed	190	103	118	Do not exceed during aerotow.
VLO	Maximum Landing Gear operating	280	151	174	Landing gear operation (Extending or retracting) approved up to this speed.
	Air brakes	280	151	174	With flaps to detent between +2° and +5° possible air brake extension approx. 3/4 of possible travel due to coupling with flap operation.
		190	103	118	approx. 95% extended with flaps to +10°
		150	81	93	Full extension at flap position "L" (+15°)

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2.3 Airspeed Indicator Markings

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

Marking	IAS value / range	Significance
White arc	86 - 190 km/h 46 - 103 kts 53 - 118 MPH	Positive flap operating range. 86 km/h is minimum speed in steady straight flight with flaps at "L" (+15) position, air brakes fully extended and at maximum all-up weight (525 kg, 1157 lbs) 190 km/h is maximum speed permissible with flaps extended up to +10°.
Green arc	90 - 190 km/h 49 - 103 kts 56 - 118 MPH	Normal operating range (Air brakes retracted)
Yellow arc	190 - 280 km/h 103 - 151 kts 118 - 174 MPH	Within this speed range "Severe turbulence" or control surface deflections of more than 1/3 of possible travel may exceed the design limit and must be avoided. Manoeuvering loads, gust loads and loads due to control surface deflections should not be encountered simultaneously.
Red line	280 km/h 151 kts 174 MPH	Maximum speed from MSL up to 2000 m / 6500 ft above MSL flying altitude for all not otherwise restricted operations
Yellow triangle	90 km/h 49 kts 56 MPH	Minimum recommended approach to landing speed without water ballast
White "L"	150 km/h 81 kts 93 MPH	Maximum speed with flap position above 10° up to and inclusive 15° (Landing configuration)
White "5°, 10°"	190 km/h 103 kts 118 MPH	Maximum speed with flap position above 5° up to and inclusive 10°

For an example of airspeed indicator marking see page 2-7.

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2.4 Mass (Weight)

Maximum take-off mass with water ballast ..... 525 kg (1157 lbs)
without water ballast ..... 422 kg (930 lbs)

Maximum landing mass ..... 525 kg (1157 lbs)
Maximum mass of all non-lifting parts ..... 240 to 256 kg (529-564 lbs)

Value must be determined according to table in Maintenance Manual, chapter 2, related to empty weight and empty weight C.G. position.
The term "non-lifting parts" includes the following: fuselage inclusive permanently fitted equipment, canopy and main pins plus maximum cockpit load. Tail fin water ballast, if system is installed, is not counted for non-lifting parts, but for maximum weight.

Maximum wing water ballast mass, depending on loading conditions ..... 150 kg (331 lbs)
Loading instructions see pages 4-9 to 4-12.

If vertical tail fin water ballast system installed:
Vertical tail fin water ballast mass, depending on wing water ballast loading and/or pilot weight .. maximum 5.5 kg (12 lbs)
Loading instructions see page 4-13.
When the tail fin tank is combined with a tail battery receptacle, maximum tail fin water ballast mass is ..... 4.1 kg (9 lbs)

Maximum mass in Baggage Compartment ..... 5 kg (11 lbs)
Loading instructions see page 4-7.

Maximum mass of all instrument panel installations ..... 6.7 kg (14.7 lbs)

Warning: If C.G. weighing had been performed with a vertical tail fin battery, see entry on page 6-2, then the battery must always be carried in the vertical tail fin.

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2.5 Center of Gravity Limits

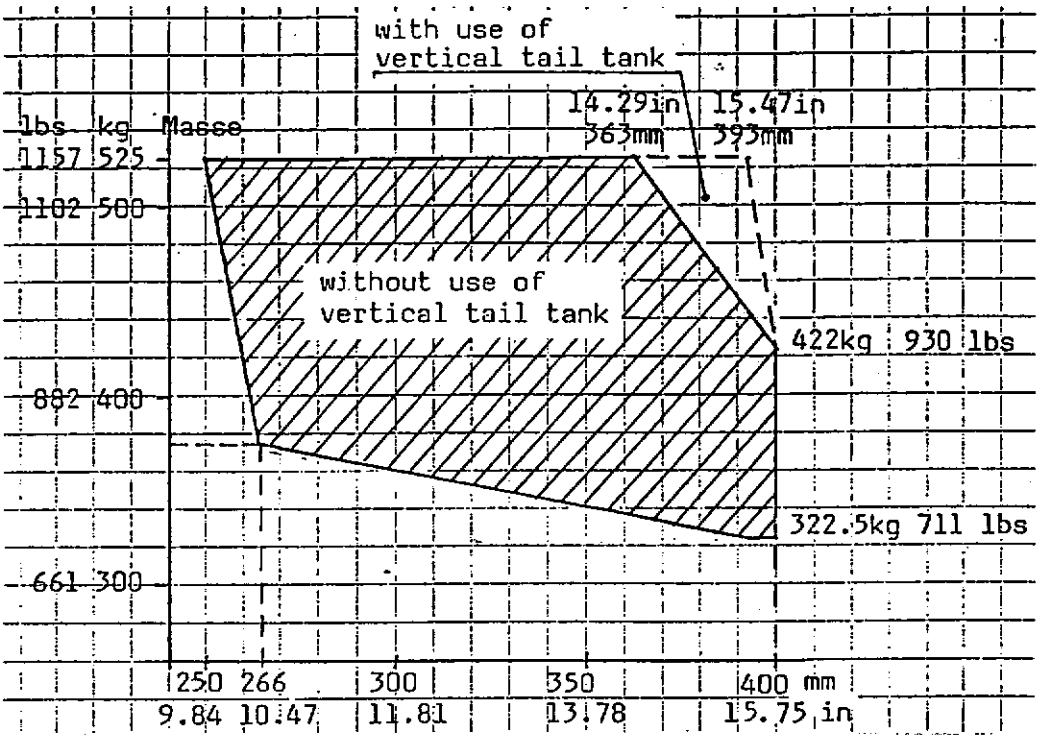
Position of C.G. in flight

Maximum allowable:

forward C.G. position ..... 250 mm (9.84 in) aft of DP

rearward C.G. position ..... 400 mm (15.75 in) aft of DP

Datum point (DP): leading edge of wing at root, when under side of fuselage boom placed horizontal.



Warning: Vertical tail fin water ballast (if fitted) may be used to compensate C.G. displacement due to wing water ballast mass, pilot mass or both. Possible amounts see table page 4-13.

2.6 Manoeuver Limits / Category of Airworthiness

The LS6-18w sailplane is certified in the U (Utility) category according to JAR 22.

Aerobatic manoeuvers not approved.

Spins and Steep Turns approved with all flap positions.

Lazy Eights, Chandelles, Stall Turns and Positive Loops not approved.

Cloud flying with water ballast not approved.

For Italy: Spins not approved.

2.7 Flight Load Factor Limits

At 190 km/h (103 kts, 118 MPH) 5.3 G positive and 2.65 G negative.

At 280 km/h (151 kts, 174 MPH) 4.0 G positive and 1.5 G negative.

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2.8 Crew

Maximum Cockpit Load ..... maximum 110 kg (242 lbs)
The term "Cockpit Load" includes the following:
Pilot, parachute, baggage and temporary equipment.
Maximum cockpit load may be limited by maximum mass of non-lifting parts.
See entry on page 6-2.

Minimum Cockpit Load for club use and without tail fin water tank:
Pilot and parachute ..... 70 kg (154 lbs)
No baggage, no temporary equipment, no trim ballast

Pilot and parachute ..... 55 kg (121 lbs)
3 trim weights fitted in front of rudder pedals,
no baggage, no temporary equipment
One trim weight (2.5 kg, 6 lbs) corresponds to 5 kg (11 lbs) of pilot mass.

If the sailplane does not fly in a club, it may be trimmed for higher minimum cockpit load. See instructions in chapter 11 of Maintenance Manual.
For minimum cockpit load see entry on page 6-2 and placards.

When equipped with a tail fin water ballast tank, for reasons of safety, the cockpit placarded minimum cockpit load includes the full ballast tank weight. Lighter pilots may only use the lower values from Flight Manual page 6-2, when they have positively checked (by use of tubing and blowing through valve), that in discharge valve lever open position the valve is really open, i.e. unintentional use of tail fin water ballast can be excluded.

2.9 Kinds of Operation Limits

The LS6-18w sailplane is approved for Day-VFR.
Minimum equipment see page 2-7.

Cloud flying only approved without water ballast (Applicable only for countries which permit cloud flying and when Minimum Equipment is approved for cloud flying, see inspector's entry in inspection certificate). Minimum equipment see page 2-7.

Additives to water ballast not approved.

For USA only:
Night-VFR, IFR and Flight into known icing conditions are not approved.
Use of water ballast limited to non-freezing conditions.

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2.10 Minimum Equipment List

1. Airspeed Indicator, scale 50-300 km/h (27-162 kts, 31-186 MPH)
   Colour marking see page 2-3 and example below.
   Approved types see Master Equipment List.
   Pressure pick-ups: Vertical tail fin pitot and **lower forward fuselage side statics**.

2. Altimeter in m (For Italy) or ft — See Master Equipment List in
3. Four piece seat belt harness — Maintenance Manual
4. Magnetic compass *(For USA and Canada)*

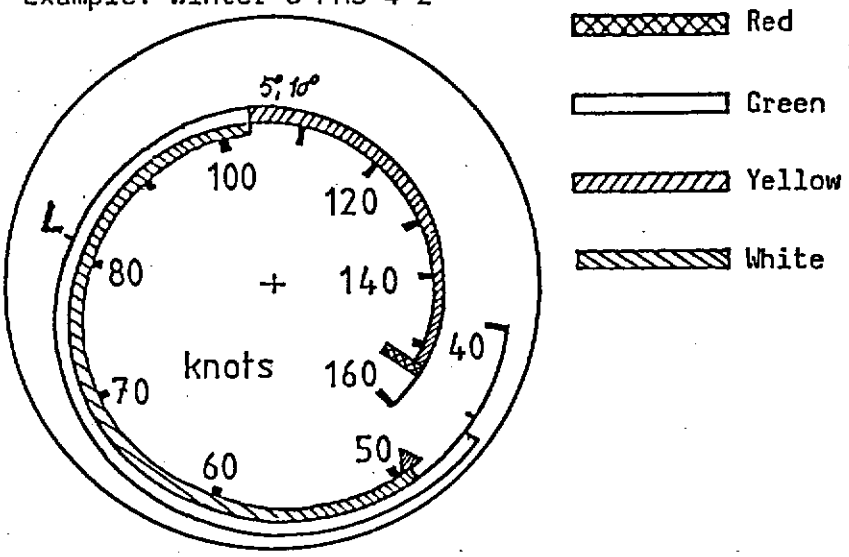
5. Back cushion or parachute in compressed form should not be thinner than 80 mm to 100 mm (3 to 4 in).
6. Checklist, type placard, data and loading placard, operating placards.
   For placards see pages 2-8 and Maintenance Manual chapter 10.
7. Flight Manual LS6-18w.
8. **When tail fin water ballast system is fitted:**
   Remote indicating thermometer, approved types see Master Equipment List in Maintenance Manual.
   Vertical tail filling tube, for checking of tail fin tank valve function.

Additionally for cloud flying:

Airspeed indicator **scale with 1 turn only**,
scale 50-300 km/h (27-162 kts, 31-186 MPH)
Turn and Bank indicator
Compass, compensated in sailplane (Not for USA and Canada)
Variometer, range at least ±10 m/s (1970 ft/min, 19.4 kts)

Example of airspeed indicator colour marking :

Example: Winter 6 FMS 4-2



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2.11 Break Away Links for Aerotow, Winch Launch and Auto Tow

Maximum winch-launch / auto-tow speed 140 km/h (76 kts, 87 MPH)
Maximum aerotow speed 190 km/h (103 kts, 118 MPH)

Maximum break away link in tow cable
for winch-launch and auto-tow: 8250 N (appr. 825 kg (1819 lbs))
for aerotow: 6695 N (appr. 670 kg (1477 lbs))

Recommended:
for winch-launch/auto-tow
Tost weak link No.3, colour code red,
rated break away load 7500 N (≈750 kg, 1653 lbs)

for aerotow Tost weak link No.4, colour code blue,
rated break away load 6000 N (≈600 kg, 1323 lbs)

Minimum Aerotow Cable Lenght: 30 m (98 ft)
Recommended tow cable length up to 80 m (262 ft)

2.12 Operating Placards for Limitations

For positions of placards see page 7-2.

Rolladen-Schneider Flugzeugbau GmbH

Type: LS6-18w Serial Number: xxxx

Data Placard

Airspeed Limits (IAS)		km/h	MPH	kts
Winch-launch / Auto-tow		140	87	76
Aerotow		190	118	103
In Rough Air		190	118	103
Never Exceed (VNE)		280	174	151
Flap	"L" "10"	150	93	81
Position from "10" to "0"		190	118	103
	"0" "-5"	280	174	151

Maximum Weight 525 kg (1157 lbs)
including Water Ballast
Aerobatic manoeuvres not approved

Weight Limitations

Maximum Cockpit Load kg. . lbs. .
Minimum Cockpit Load kg. . lbs. .
For lower Minimum Cockpit Loads see
Flight Manual pages 2-6 and 6-2

Battery in fin / Baggage Compartment
Lighter Pilots must compensate lack of
of weight as suggested in Flight Manual

on right side of cockpit >3<

Minimum Cockpit Load kg/ lbs
For use of lower Minimum Cockpit Load
see Flight Manual pages 2-6 and 6-2

under instrument panel cover >2<

Maximum Baggage Weight 5 kg/11 lbs
(Soft items only)

at main bulkhead

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2.12 Operating Placards for Limitations continued

For positions of placards see page 7-2.

Altitude related Never Exceed Speed	km/h	kts	MPH
up to 6500 ft MSL:	280	151	174
up to 9800 ft MSL:	266	144	165
up to 13100 ft MSL:	253	137	157
up to 19700 ft MSL:	227	122	141
up to 26200 ft MSL:	202	109	126
up to 32800 ft MSL:	179	97	111

on instrument panel near air speed indicator

Altitude related Never Exceed Speed	km/h
up to 2000 m MSL:	280
up to 3000 m MSL:	266
up to 4000 m MSL:	253
up to 6000 m MSL:	227
up to 8000 m MSL:	202
up to 10000 m MSL:	179

(for countries operating with metric units only)

2.13 Approved Gelcoat Colours for exterior surfaces

All external portions of the glider must be painted white except of wingtips, nose of fuselage and rudder.

Approved gelcoat: UP-Gelcoat Scheufler T35 white, tone similar to RAL 9010

2.14 Use of Water for Ballast

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

Section 3

3.1 Introduction

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur. Emergencies caused by sailplane malfunction are extremely rare if proper preflight inspections and maintenance are practised.
However, should an emergency arise, the basic guidelines described in this section should be considered and applied as necessary to correct the problem.

3.2 Emergency Canopy Release and Exit

Canopy locks
* Pull both handles open to stops.
  - Right handle operates emergency release, therefore longer travel as on left handle
  - Hand force increases for emergency release travel to avoid unintentional jettison during normal operation

Canopy
* Push off, assisted by lifting panel
* Spring-loaded peg at canopy frame rear edge acts as temporary hinge for clean separation from fuselage.

3.3 Emergency Exit

Canopy
* Jettison

Seat harness
* Open

Exit
* Lift with arms over cockpit rim and push yourself away from the sailplane to avoid the tail
* preferably dive under wing to avoid the tail unit

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3.4 Stall Recovery

Warning - Slight tail shudder prior to entry
Aileron - Effectiveness reduced by about 50%
Sink rate - Increases considerably
Termination - Stick forward to neutral

Stalling speed at maximum weight (525 kg, 1157 lbs), straight flight, air brakes retracted, related to flap position:

"L" (+15)	78 km/h	42 kts	48 MPH
"+10"	81 km/h	44 kts	50 MPH
"0"	84 km/h	45 kts	52 MPH
"-5"	88 km/h	48 kts	55 MPH

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

3.5 Spin Recovery

Simultaneously:

Rudder - Opposite to spin rotation until rotation stops
Elevator - Push forward

Then:

Flaps - move to "+10" during dive-out
* when in position "L" (+15°),

Aileron - Neutral

Smooth pull-out

Altitude loss during recovery about 100 m (300 ft)

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

3.6 Spiral Dive Recovery

Spiral dive may occur when the sailplane terminates spinning on its own and not by pilot's action

Rudder - Opposite to dive rotation
Aileron - Opposite to angle of bank
Elevator - Pull cautiously

Warning: During dive-out be alert not to exceed maximum permissible speed VNE, see page 2-2, inadvertently !

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3.7 Other Emergencies

3.7.1 Limitation of High Speed Flight

If there are indications that the intended air speed will be exceeded, for instance

- while flying under large cloudbanks
- during cloud flying at heavy turbulences

then air brakes should be extended carefully before 190 km/h (103 kts, 118 MPH) is reached.

Warning:

* In emergencies, air brakes can also be extended up to a speed of 280 km/h (151 kts, 174 MPH).
* However, pay attention to the following:
  - flaps should be in the -5° position
  - extend airbrakes with care

Warning: in this speed range air brakes are sucked open suddenly during unlocking, resulting in short time negative acceleration.

- this may support pilot induced oscillations (P.I.O.)
- this effect is smallest with negative flap position

* Once extended, the air brakes can only be retracted completely at speeds below 220 km/h (119 kts, 137 MPH): spring loaded covers stay open due to aerodynamic suction.

* When air brakes are extended during descent after high altitude wave flights, a speed of 190 km/h (103 kts, 118 MPH) -green ASI range upper end- should not be exceeded because of possible severe turbulence.

3.7.2 Rain

During rain

* expect considerable decrease of performance.
* increase approach to landing speed at least by 10 km/h (5 kts, 6MPH) over normal approach speed, because
  - stall speed increases
  - effectivity of controls decreases.
* Open canopy window to increase visibility.

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3.7 Other Emergencies continued

3.7.3 Inadvertent Freezing / Icing

Water ballast in wings and tail fin

* Water ballast must be dumped above +5° C (41° F) outside temperature, see built in thermometer below instrument panel.

Water ballast in wings only

* Do not dump below +5° C (41° F) outside temperature.

In both cases

- the rear fuselage may collect ice
- the vertical tail fin valve may freeze solid.

* Both cases can result in very dangerous rearward C.G. displacement.
* Additionally, one wing valve may freeze solid.

Caution: For prolonged flights below 0° C (32° F) use no water ballast.

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

3.7.4 Flight with asymmetric Water Ballast Loading

* Uneven water ballast dumping may be recognized as follows:
  - with free aileron, one wing tends downward.
  - for straight flight at low speeds considerable aileron deflection is necessary.
* Avoid stalling
* Increase approach to landing speed at least by 10 km/h (5 kts, 6MPH) over normal approach speed and touch down with this increased speed.
* To avoid ground looping, apply aileron shortly after touchdown in the direction as noticed before.

3.7.5 Cable Failure during Winch-launch

* Immediately push stick fully forward until air speed indication is within green range.
* Release cable
* according to altitude:
  - use short traffic pattern and make safety landing on airfield
  - extend air brakes immediately and land in front of winch

Erstellt: 28.Sep.95 Geprüft:

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3.7 Other Emergencies continued

3.7.6 Emergency Landing with Landing Gear Retracted

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

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

3.7.7 Ground Loop

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

* lay the windward wingtip onto the ground.
* simultaneously decrease tail skid load by controlled forward stick deflection.

3.7.8 Emergency Landing on Water

During a water landing test with landing gear retracted, the sailplane used submarined completely.

As submarining may be possible also with gear extended, the following procedure is recommended:

* In the downwind leg of your landing pattern
  - extend landing gear
  - open parachute harness
* Touch down with gear extended and speed as low as possible.
* At touch down point use left arm to protect face against possible canopy fracture.
* After touch-down undo parachute and seat belt harnesses.
* 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.

SECTION 4

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 extending landing gear check for adequate ground clearance.
2. Clean and grease all pins and matching bushes including main pins.
3. Position flap handle to flap position 0° or 5°.

IMPORTANT NOTE: Rig wings in 15 m <49 ft> version always without winglets; for winglet installation see Normal Procedures on page 4.2.

4. Insert right spar end into fuselage, flaperon must be about neutral and watch for angle of dihedral.
5. Insert left spar end into fuselage, flaperon must be about neutral and watch for angle of dihedral.

WARNING: **When flaperons are deflected downward during rigging, then the automatic flaperon connector prevents rigging. Do not use brute force!**

IMPORTANT NOTE: The flaperon sandwich is pressure sensitive, handle carefully!

6. Insert main pins, when bushes are lined up correctly.

4.2 RIGGING AND DE-RIGGING continued

7. Secure main pins by placing handles behind spring loaded pegs.
8. Insert battery into the place, which was used during the last weighing and calculation of load range (see Data Placard in cockpit or page 6-2), connect to system and check operation.
   The battery must be equipped with an appropriate main fuse!
9. Fill water ballast system (for loading instructions see also pages 4-7) and
   check: a) opening of wing dump valves?
   Only when using the tail fin tank:
   Check a) if tail fin valve really opens.
   b) wing system completely water tight?
10. Check forward horizontal tail attachment for ball being fixed.
    WARNING: When ball is loose refer to page 8-3
11. Install horizontal tail, secure with slotted nut against tapered pins (using supplied key or suitable coin) until free from play and red marking on attachment bracket is invisible.
12. Install total energy tube and temporary equipment (barograph etc.).
13. Connect automatic parachute ripcord to red marked portion at main bulkhead using special loop only.
14. Seal wing fuselage intersection by taping upper and lower sides and cutout on upper horizontal tail fin.
15. **Check control system functions using a helper.**

IMPORTANT NOTE: The aileron sandwich is pressure sensitive, handle carefully!
Sufficient strength for handling around drive brackets.

16. Perform Daily Inspection according to page 4-3.

IMPORTANT NOTE: When parking with canopy open, according to position relative to sun, this may result in cockpit region fire hazard due to convex lens effect induced by its curvature.

CONVERSION FROM 15 m to 18 m Wing Span or vice versa

1. Remove sealing tape from wing tip intersection.
2. Turn locking nut in such direction that wing-side nut pushes tip outward. Additionally, move tip fore and aft to ease sliding out.
3. Remove 15 m tip and insert 18 m tip until locking nut starts catching. Unless outer flaperon connection pins are positioned correctly, installation is not possible.
4. Turn nut in direction that it pulls tip into position.
5. Lock nut until tip is free from play: play is zero, when force increases remarkably during turning of nut with supplied key. Turn not further than next notch catching ratchet.
6. Tape wing tip intersection.

IMPORTANT NOTE: Due to flutter considerations it is not allowed to mount additional masses (e.g. cameras) on the winglets!

DE-RIGGING

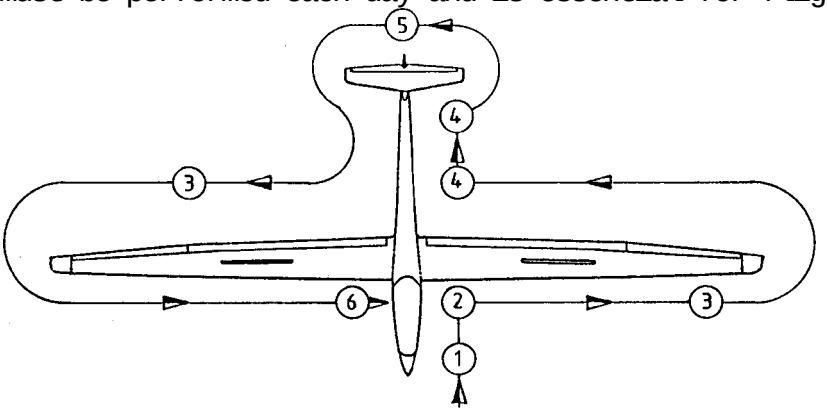
* Reverse assembly sequence.
* Air brake system should be unlocked to avoid permanent pressure on flexible covers and resulting possible deformations (over-center in wing).

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

WARNING: When de-rigging with water ballast bags filled, 18 m wing tip must be removed beforehand!

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
- Forward static pressure ports for clogging
- Function of nose hook, if fitted

2 Landing gear
- Recommended tyre pressure 3 to 3.5 bar (44 to 51 psi)
  When using water ballast increase up to 4 bar (58 psi)
- Slip mark and tyre condition
- C.G. hook manual and automatic operation working properly
- Water drain orifices in front and behind of landing gear box free from clogging

3 Wings
- Water drain orifices at root and tip free from clogging
- Condition, gelcoat- or structural damage, pressure marks, cracks.
- Air brakes for proper function and locking
- 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 airbrakes

- Flaperons for unobstructed movement and free from play

IMPORTANT NOTE: The aileron sandwich is pressure sensitive, handle carefully!

- Wing-tip installation free from play

4 Fuselage
- Condition, gelcoat- or structural damage, cracks, especially an lower side
- Rear static ports at fuselage boom free from clogging
- Recommended tyre pressure tail wheel 210x65, if installed: 2.5 to 3.5 bar (36 to 51 psi)
- Tyre pressure small tail wheel according to TN 6044, if installed: 6,2bar/90 psi
- Water drain orifice in front of tail skid or tail wheel free from clogging
- Tail skid, if fitted, for proper adhesion

4.3 Daily Inspection continued

5 Tail Unit
- Condition, gelcoat or structural damage, cracks
- Total energy port at upper end of vertical tail fin leading edge free from clogging
- Pitot pressure port below total energy port at vertical tail fin leading edge free from clogging
- Charged vertical tail fin battery connected, if this battery location was fixed during the last C.G. weighing, see entry on page 6-2.
- Check vertical tail tank valve for proper opening:
  - place filling tube 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 fractured). **Take off permitted only, when unintentional use of tail fin water ballast can be positively excluded !**
- Amount of vertical tail fin water ballast, if fitted, in correct relation to amount of wing water ballast and cockpit load.
- Horizontal tail fin: no pressure marks permitted in center portion
- Horizontal tail properly installed and free from play
- Movement of tail control surfaces unobstructed and free from play

6 Cockpit
- Canopy cleaned, if required
- Check Canopy locking and emergency release function:
  * "Pilot" in seat, both canopy locking levers opened
  * Helper at front canopy end to avoid lifting of canopy by gas spring, because this would unduly deform the spring of the temporary rear end hinge
  * After opening emergency release, the pilot pushes the rear end temporary hinge bolt free and lifts the canopy at opening levers, the helper holds the front end on the opener
  * With canopy fully open, the helper pushes the connecting pin upward and engages canopy to opener by turning driving lug anti-clockwise
- Main pins properly secured
- Proper connection of flaperon and air brake system:
  With control stick in center position and flap handle in -5° position, flaperons must be flush with trailing edge; air brakes must lock properly
- Charged battery fixed in baggage compartment and connected, if this battery location was fixed during the last C.G. weighing, see entry on page 6-2.
- Thermometer below instrument panel for function (only existent when a vertical tail fin tank is fitted):
  Indication of surrounding air temperature

- ***check for non-existence of foreign matter***

Erstellt: 06.Jun.95 Heuck	Geprüft: Schepka

4.4 Preflight Check

Daily inspection	- performed
Control systems	- check functions using a helper
Vertical tail fin tank	- valve opening positively checked (See page 4-4)
Water ballast system	- check for leaks, if filled
	- no leaks in wing system allowed, when using tail fin ballast also, to avoid unintentional rearward C.G. displacement
	- check proper dumping: tail fin system starts dumping before wing system
Total energy tube	- fitted and connection properly sealed
Weight and Balance	- especially Minimum and Maximum Cockpit Loads, trim weights and tail fin ballast amount checked
Altimeter	- set
Other instrumentation	- checked, normally indicating zero
Radio	- operational check
Backrest	- adjusted and locking checked
Rudder pedals	- adjusted
Papers (C of A, logbook etc.)	- complete and valid
Landing gear locking	- without play
Wheel brake	- check operation
Before take off	- perform cockpit checklist procedure

4.5.0 Cockpit Checklist

LS6-18w Checklist

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

1. Main pins secured ?
2. Horizontal tail secured ?
3. Wingtips secured ?
4. Test controls
5. Tail fin valve opening checked?
6. Check loading conditions
7. Check tail dolly removed
8. Fasten seat belt harness
9. Connect parachute static line
10. Lock airbrakes
11. Trim neutral
12. Flap position +5° ?
13. Check release system
14. Lock canopy

4.5.1 Adjustment of Rudder Pedals

- Possible in flight or on the ground
- Release pressure on pedals
- Unlock pawl by pulling black pedal release handle
- Forward adjustment: push pedals forward with feet into desired position and lock
- Rearward adjustment: pull pedals with release handle into desired position and lock

4.5.2 Adjustment of Backrest

Warning: **Adjust backrest in such way that lower spine end 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

- Lower bracket adjustment allows use of various types of parachutes (Locating pegs and screw)
- Upper end slope adjustment

During adjustment, pay attention to the following:

- Remember colour code at backrest support to allow for easy position identification of personal adjustment
- position head as high as possible for good visibility
- tow hook handle must be within easy reach

Warning: Check locking pin in baggage compartment fully home.

Warning: When the backrest is removed for huge pilots, then the guide tube must also be removed. Otherwise it may obstruct an emergency exit.

4.5.3 Automatic Parachute Ripcord

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

4.5.4 Landing Gear

- Extension or retraction permitted over whole approved speed range
- rapid operation eases retraction
- Handle locked in forward position - gear up
- Handle locked in rearward position - gear down

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

4.5.5 Wheel Brake

- Press rudder pedals with both feet to activate wheel brake
- Wheel brake is an emergency brake, therefore it should be used sparingly because of high wear rate of linings

4.5.6 Trim System

Trim locking lever at control stick - pull to free trim knob
Trim knob at left cockpit side - forward for nose down
- rearward for nose up
Use trim knob - to trim elevator stick force to zero
- to trim for desired speed
Fix trim setting - release locking lever
Indication of trim setting - shown by trim position indicator relative to neutral mark

4.5.7 Baggage Compartment

Baggage compartment should be used for soft and light materials which would not obstruct the pilot after deceleration or injure the pilot in crash landings. Maximum baggage 5 kg (11 lbs). Baggage compartment load counts for useful load and must therefore be included, when checking loading conditions.

For permanent installation of equipment (Battery, Barograph, ELT) see Maintenance Manual, chapter 11.

4.5.8 Balancing of Pilots 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.

One trim weight of 2.5 kg (5.5 lbs)
corresponds to 5 kg (11 lbs) of pilot weight

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

- for 10 kg <22 lbs> of pilot weight above Minimum Cockpit Load without water ballast in tail fin tank, 1 Liter <0.264 US gal, 0.22 IMP gal> of water may be filled into the tail fin tank.
- When using wing water ballast, this balancing method may be restricted due to insufficient free volume, see also table page 4-13.
- When discharging water ballast, this trim condition cannot be kept due to quicker discharge of tail fin water ballast.

4.5.9 Water Ballast

- use clear water without any additives
- increase tyre pressure to 4 bar (58 psi), when using full water ballast.
- both wings together hold about 150 liters (39.6 US gallons, 33 Imp. gallons).
- one double-tank and one double-valve per wing, operated by pushrod at root rib simultaneously
- use as clean water as possible to avoid damage of sealing rings by foreign matter
- maximum permissible water ballast depends on loading conditions, see pages 4-9 to 4-12 for water ballast loading instructions

4.5.9 Water Ballast continued

Filling Sequence:

a. open dump valve by shifting lever on right cockpit rim backwards

b. when the tail fin tank is going to be used,
fill tail fin tank first:
- place tail fin funnel with wire meshing on top of the rudder.
- connect tube of funnel to dumping tube just inside lower right rudder cut-out with rudder deflected to the left.
- fill tail fin tank via funnel in relation to intended wing water amount, see table page 4-13.
- markings on inside of translucent right rudder gap seal correspond to 0.5 Liter steps (0.13 US gallons, 0.11 Imp. gallons).
- use water level in funnel tube relative to markings to determine correct amount in relation to wing amount
- the upper red marking corresponds to maximum amount of tail fin water ballast, 5.5 Liters (1.45 US gallons, 1.21 Imp. gallons) or 4.1 Liters (1.08 US gal., 0.90 Imp. gal.) for the combination of tail fin tank with tail fin battery compartment
- close dump valves by shifting lever on right cockpit rim forward and remove funnel from rudder

c. open left wing valve through baggage compartment using knurled nut:
turn 10 turns counterclockwise
- suck residual air from left water bag:
  - use connection hose through dump orifice on under side of wing
  - close dump valve before terminating sucking, to avoid air entering into bags again
  - residual air may reduce amount of water

Warning: residual air may create undue pressure during high altitude flights above 3000 m (10000 ft)

Warning: **never use more than 0.1 bar of water pressure (funnel max. 1 m (3.3 ft) above wing) because of possible damage of structure**

d. lay left wing down for filling:
- connect funnel filled with water to dump orifice on under side of left wing and and open valve again, to avoid entry of unwanted air
- fill half of desired total amount of water into wing using funnel
- for maximum amount of wing water ballast see pages 4-9 to 4-12

e. with left wing filled, close valve by turning knurled nut through baggage compartment clockwise to stop

f. to open right wing valve through baggage compartment use knurled nut:
- turn 10 turns counterclockwise

g. after sucking residual air out of bag let a helper keep the wing tip on the ground and fill the same amount as in left wing

h. close right wing valve through baggage compartment with knurled nut:
- turn clockwise against stop

- see also icing conditions in Emergency Procedures, Chapter 3

Warning: To avoid incorrect water displacement - always lay wingtip down during filling !

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

Warning: Check proper dumping - tail fin system must start dumping before wing system to avoid C.G. shifting backwards

- use of water ballast limited to non-freezing conditions, see also Flight Manual page 2-6.

Erstellt: 06.Jun.95 Heuck	Geprüft: Schaplin

4.5.9 Water Ballast continued

Dumping:

- open valve by shifting lever backwards
- 10 liters (2.6 US gallons, 2.2 Imp. gallons) will be dumped in approx. 6 to 7 seconds
- if aileron stick force is needed to maintain level flight after dumping, this may indicate unequal dumping
- to avoid ground looping in case of unequal dumping apply aileron in the direction as noticed before shortly after touchdown

Warning Check thermometer (if tail fin tank is fitted) regularly during flight. Dump water at 5° Centigrade (41° F) to ensure proper dumping before tail fin valve freezes solid.

4.5.9a Maximum Water Ballast (wing tank only, no tail tank)

Maximum approved capacity per wing 75 kg ‹165 lbs› = 150 kg ‹331 lbs› total

Table provides maximum total water ballast weight in relation to empty weight and cockpit load. Baggage and temporary equipment reduce maximum water ballast weight accordingly.

For values in lbs see following page !

Cockpit load Pilot+parachute +equipment ‹kg›	Empty weight ‹kg› 250	255	260	265	270	275	280	285	290	295
70	150	150	150	150	150	150	150	150	150	150
75	150	150	150	150	150	150	150	150	150	150
80	150	150	150	150	150	150	150	150	150	150
85	150	150	150	150	150	150	150	150	150	**145**
90	150	150	150	150	150	150	150	150	**145**	**140**
95	150	150	150	150	150	150	150	**145**	**140**	**135**
100	150	150	150	150	150	150	**145**	**140**	**135**	**130**
105	150	150	150	150	150	**145**	**140**	**135**	**130**	**125**
110	150	150	150	150	**145**	**140**	**135**	**130**	**125**	**120**

Example: When empty weight is 270 kg ‹595 lbs› and pilot and parachute weight is 110 kg ‹242 lbs›, maximum permissible total water ballast weight is 145 kg ‹320 lbs›.

When the optional tail fin tank is fitted, see ballast loading instructions pages 4-11 to 4-13.

4.5.9a Maximum Water Ballast (wing tank only, no tail tank)

Maximum approved capacity per wing 75 kg (165 lbs) = 150 kg (331 lbs) total

Table provides maximum total water ballast weight in relation to empty weight and cockpit load. Baggage and temporary equipment reduce maximum water ballast weight accordingly.

For values in kg see preceding page !

Cockpit load Pilot+parachute +equipment (lbs)	Empty weight (lbs) 551	562	573	584	595	606	617	628	639	650
154	331	331	331	331	331	331	331	331	331	331
165	331	331	331	331	331	331	331	331	331	331
176	331	331	331	331	331	331	331	331	331	331
187	331	331	331	331	331	331	331	331	331	**320**
198	331	331	331	331	331	331	331	331	**320**	**309**
209	331	331	331	331	331	331	331	**320**	**309**	**298**
220	331	331	331	331	331	331	**320**	**309**	**298**	**287**
231	331	331	331	331	331	**320**	**309**	**298**	**287**	**276**
242	331	331	331	331	**320**	**309**	**298**	**287**	**276**	**265**

Example: When empty weight is 270 kg (595 lbs) and pilot and parachute weight is 110 kg (242 lbs), maximum permissible total water ballast weight is 145 kg (320 lbs).

When the optional tail fin tank is fitted, see ballast loading instructions pages 4-11 to 4-13.

4.5.9b Maximum Water Ballast (Loading Instructions for wing and tail fin tank in use)

Maximum approved capacity per wing 75 kg <165 lbs> = 150 kg <331 lbs> total

Maximum tail fin tank capacity 5.5 kg <12 lbs>

Optional tail fin tank capacity 4.1 kg <9 lbs>, when the tail fin tank is combined with a tail fin battery receptacle

Table provides maximum water ballast weight in wing (when using wing and tail fin tanks) related to empty weight and cockpit load (Pilot + parachute + temporary equipment + baggage). For permissible tail fin ballast amount see table page 4-13.

4.5.9c Maximum Water Ballast (Loading plan for wing and tail fin tank in use)

For values in lbs see following page !

Cockpit load: Pilot+parachute +equipment <kg>	Empty weight <kg> 250	255	260	265	270	275	280	285	290	295
70	150	150	150	150	150	150	150	150	150	150
75	150	150	150	150	150	150	150	150	150	150
80	150	150	150	150	150	150	150	150	150	145
85	150	150	150	150	150	150	150	150	145	140
90	150	150	150	150	150	150	150	145	140	135
95	150	150	150	150	150	150	145	140	135	130
100	150	150	150	150	150	145	140	135	130	125
105	150	150	150	150	145	140	135	130	125	120
110	150	150	150	145	140	135	130	125	120	115

Example: When empty weight is 265 kg <584 lbs> and pilot and parachute weight is 110 kg <242 lbs>, maximum permissible total water ballast weight is 145 kg <320 lbs>.

4.5.9c Maximum Water Ballast
(Loading Instructions for wing and tail fin tank in use) continued

For values in kg see preceding page !

Cockpit load Pilot+parachute +equipment <lbs>	Empty weight <lbs> 551	562	573	584	595	606	617	628	639	650
154	331	331	331	331	331	331	331	331	331	331
165	331	331	331	331	331	331	331	331	331	331
176	331	331	331	331	331	331	331	331	331	320
187	331	331	331	331	331	331	331	331	320	309
198	331	331	331	331	331	331	331	320	309	298
209	331	331	331	331	331	331	320	309	298	287
220	331	331	331	331	331	320	309	298	287	276
231	331	331	331	331	320	309	298	287	276	265
242	331	331	331	320	309	298	287	276	265	254

Example: When empty weight is 265 kg <584 lbs> and pilot and parachute weight is 110 kg <242 lbs>, maximum permissible total water ballast weight is 145 kg <320 lbs>.

Erstellt: 29.Sep.95 Geprüft:

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4.5.10 Vertical Tail Fin Water Ballast Loading Instructions

- filling marks for the tail fin tank are on inside of translucent rudder seal
- Each mark = 0.5 Liter ‹0.132 US gal., 0.11 Imp.gal› = 0.5 kg ‹1.1 lbs›
- when water level in filling tube corresponds with filling marks, exact volume filled can be determined
- the combination of battery and/or water cannot be chosen independently, as position of battery was fixed during last weighing of C.G., see also entry on page 6-2.

Warning: Filling ballast into the vertical tail fin must be **exactly** according to marks on inside of the translucent rudder seal and corresponding water level in filling tube **in relation** to wing water amount, otherwise C.G. position may be outside approved range. See table below.

Warning: Filling funnel must be equipped with wire meshing to guarantee proper function of valve.

- After filling and before take off, the following must be checked:
  a) No leaks allowed in wing water ballast system
  b) Discharge of tail fin tank starting before wing tanks

Maximum tail fin tank capacity 5.5 kg ‹12 lbs›.
When the tail fin tank is combined with a battery receptacle, the maximum capacity is 4.1 kg ‹9 lbs›

Table provides maximum tail fin water ballast weight in relation to wing water ballast weight.

Filled amount of wing water water ballast weight kg / lbs	Maximum allowable tail fin water ballast weight kg / lbs	Total maximum water ballast weight kg / lbs	Amount of tail fin tank water available for trimming of heavy pilots ‹kg/lbs›, for tank volume of 5.5 Liter 1.45/1.21 US./Imp.gal kg/lbs	4.1 Liter 1.08/0.90 US./Imp.gal kg/lbs
26 / 57	1.0 / 2.2	27 / 59	4.5/9.9	3.0/6.6
39 / 86	1.5 / 3.3	41 / 89	4.0/8.8	2.5/5.5
52 / 114	2.0 / 4.4	54 / 119	3.5/7.7	2.0/4.4
65 / 143	2.5 / 5.5	68 / 149	3.0/6.6	1.5/3.3
78 / 172	3.0 / 6.6	81 / 178	2.5/5.5	1.0/2.2
91 / 201	3.5 / 7.7	95 / 208	2.0/4.4	0.5/1.1
104 / 229	4.0 / 8.8	108 / 238	1.5/3.3	0
117 / 258	)* 4.5 / 9.9	122 / 268	1.0/2.2	---
130 / 287	)* 5.0 / 11.0	135 / 298	0.5/1.1	---
143 / 315	)* 5.5 / 12.0 (max.)	149 / 327	0	---
150 / 331	)* 5.5 / 12.0 (max.)	156 / 344	0	---

)* not usable for tail fin tank combined with battery receptacle
For 10 kg ‹22 lbs› of pilot weight above Minimum Cockpit Load without water ballast in tail fin tank, 1 Liter ‹0.264 US gal, 0.22 IMP gal› of water may be filled into the tail fin tank. See also further hints on page 4-7.

Warning: For the combination of tail fin tank with battery receptacle, filling marks between 4 Liters ‹1.057 US gal., 0.80 Imp. gal› and full are not in even distance due to receptacle

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

Erstellt: 08.Jun.95	Geprüft:

(FHE_618W)

4.5.11 Winch-Launch or Auto-Tow

- set flaps to +5° position and trim system to neutral

- adjust backrest properly (see page 4-6) to avoid sliding backwards
- tighten seat belt harness during acceleration and steep climb

- break away link in tow cable max. 825 kg (1819 lbs)

- ask winch operator to avoid too high acceleration. The higher the initial acceleration, the higher is the pitch up tendency

- use wheel brake during tightening of tow cable to avoid rolling over tow cable
- pronounced forward stick pressure is required during transition arc

- Minimum winch-launch/auto-tow speed:
  without water ballast ..... 90 km/h <49 kts, 56 MPH>
  with water ballast ..... 100 km/h <54 kts, 62 MPH>

- retract landing gear after tow, because C.G. hook is fitted to landing gear fork

4.5.12 Aerotow

- set flaps to +5° position during initial take off roll, then to +10° for better visibility to towplane

- set trim system to neutral position

- break away link in tow cable max. 670 kg (1477 lbs)

- use wheel brake during tightening of tow cable to avoid rolling over tow cable

- Minimum tow speed:
  without water ballast ..... 100 km/h <54 kts, 62 MPH>
  with water ballast ..... 120 km/h <65 kts, 75 MPH>

- recommended tow cable length: 30 - 80 m <100 - 260 ft>

- when the C.G. hook is being used, retract landing gear after tow, because C.G. hook is fitted to landing gear fork

- when a nose hook is fitted, this must be used for aero tow

4.5.13 Free Flight

- stalling speed (IAS) for straight and level flight

flap position	without water ballast (all-up weight 360 kg) (794 lbs)			with maximum water (all-up weight 525 kg) (1157 lbs)		
	km/h	kts	MPH	km/h	kts	MPH
"L" (+15°)	67-75	36-41	42-47	78-82	42-44	48-51
+10°	69-76	37-41	43-47	80-85	43-46	50-53
0°	71-78	38-42	44-48	82-88	44-48	51-55
-5°	75-80	41-43	47-50	85-93	46-50	53-58

Warning: when flying with empty water tanks, leave dump valve in **"Open"** position to avoid pressure built up inside tanks at altitude

Circling Flight (thermalling):
- flap position +5° or +10° according to turbulence, trim stick forces to zero

Best Glide Angle: between 95 and 105 km/h <51-57 kts, 59-65 MPH> with flap position 0° to -5°

High Speed Flight up to 190 km/h <103 kts, 118 MPH>:
- set flaps to 0° or -5° according to desired speed
- when trimmed for circling flight, normally no change of trim required, due to automatic change of trim with flap position change
- flap control forces prevent setting of position +10° above 150 km/h <81 kts, 93 MPH>

High Speed Flight between 190-280 km/h <103-151 kts, 118-174 MPH>:
- flap position -5°, reduce stick forces by trimming
- avoid abrupt manoeuvers
- check speed indication regularly to avoid exceeding limit values

Warning: observe airspeed limits versus altitude (see page 2-2)

Warning: In emergencies, air bakes can be extended up to VNE=280 km/h <151 kts, 174 MPH>. Make sure that flaps are positioned to -5° position. Extend air brakes cautiously.

Warning: In this speed range air brakes are sucked out suddenly. With other flap positions this may cause uncomfortable negative accelerations and initiate pilot induced oscillations. This effect is smallest with full negative flap position.

Warning: Check thermometer (if tail fin tank is fitted) regularly during flight. Dump water at 5° Centigrade (41° F) to ensure proper dumping before tail fin valve freezes solid.

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4.5.14 High Altitude Flights

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 should never be above 280 km/h IAS (151 kts, 174 mph) up to 2000 m (6500 ft) above MSL.

Using the table on page 2-2, maximum permissible airspeeds depending on altitude, the pilot is able to avoid flying faster than true airspeed of 280 km/h CAS (151 kts, 174 mph).

Example: Indicated airspeed of 227 km/h (122 kts, 141 mph) at 6000 m (19700 ft) altitude corresponds to 280 km/h (151 kts, 174 mph) true airspeed.

4.5.15 Sideslip

- Sideslip speed range: up to VA= 190 km/h (103 kts, 118 mph)
- During sideslip, rudder control force decreases to almost zero force.
- For a straight and steady sideslip 100% rudder and between 50 to 75% aileron deflection are necessary.
- Degradation in airspeed system goes down to zero airspeed indication. Depending on airspeed indicator, negative values may be indicated. (Vertical tail fin pitot and forward fuselage side statics used).

Warning: Sideslip with air brakes extended is not recommended for landing, because nose heavy moment of airbrakes allows no low-speed side slip.

4.5.16 Landing

- approach for landing always with flap position "L" (+15°). Due to high forces, flaps can be extended to position "L" (+15) only below 130 km/h <70 kts, 81 MPH)
- water ballast should normally be dumped prior to landing (For possible unequal dumping see pages 3-4 and 4-9)
- extend landing gear in time and lock (right hand gear handle)
- always extend landing gear, especially in case of an emergency outlanding
- only the sprung landing gear absorbs much landing impact energy.

Warning: minimum approach speed with air brakes fully extended:

without water ballast	not below 90 km/h (49 kts, 56 mph)
with water ballast	not below 100 km/h (54 kts, 62 mph)

- air brakes allow control of glide angle within wide limits

Warning: minimum speed increases:
with airbrakes extended by about 10km/h, < 5 kts, 6 mph>
with rain and airbrakes extended by about 20 km/h <10 kts, 12 mph>

- side slipping is not necessary to control glidepath.

Warning: Sideslip with air brakes extended is not recommended for landing, because nose heavy moment of airbrakes allows no low-speed side slip

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4.5.17 Flight in Rain

Warning: During rain expect considerable decrease of performance. Increase approach to landing speed at least by 10 km/h (5 kts, 6 mph) over normal approach speed, because stall speed increases and effectivity of controls decreases.

Open canopy window to increase visibility.

4.6 Postflight Check

Electrical instruments	- switch off
Battery	- recharge, if necessary
Insects and dust	- remove using water, sponge and chamois leather (See also chapter 8, Cleaning and Care)
Air brake boxes	- check if moisture has accumulated and remove with sponge
Water ballast system	- check proper dumping
Tail fin water tank	- check proper dumping

For Cleaning and Care see Chapter 8.

Section 5

5.1 Introduction

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

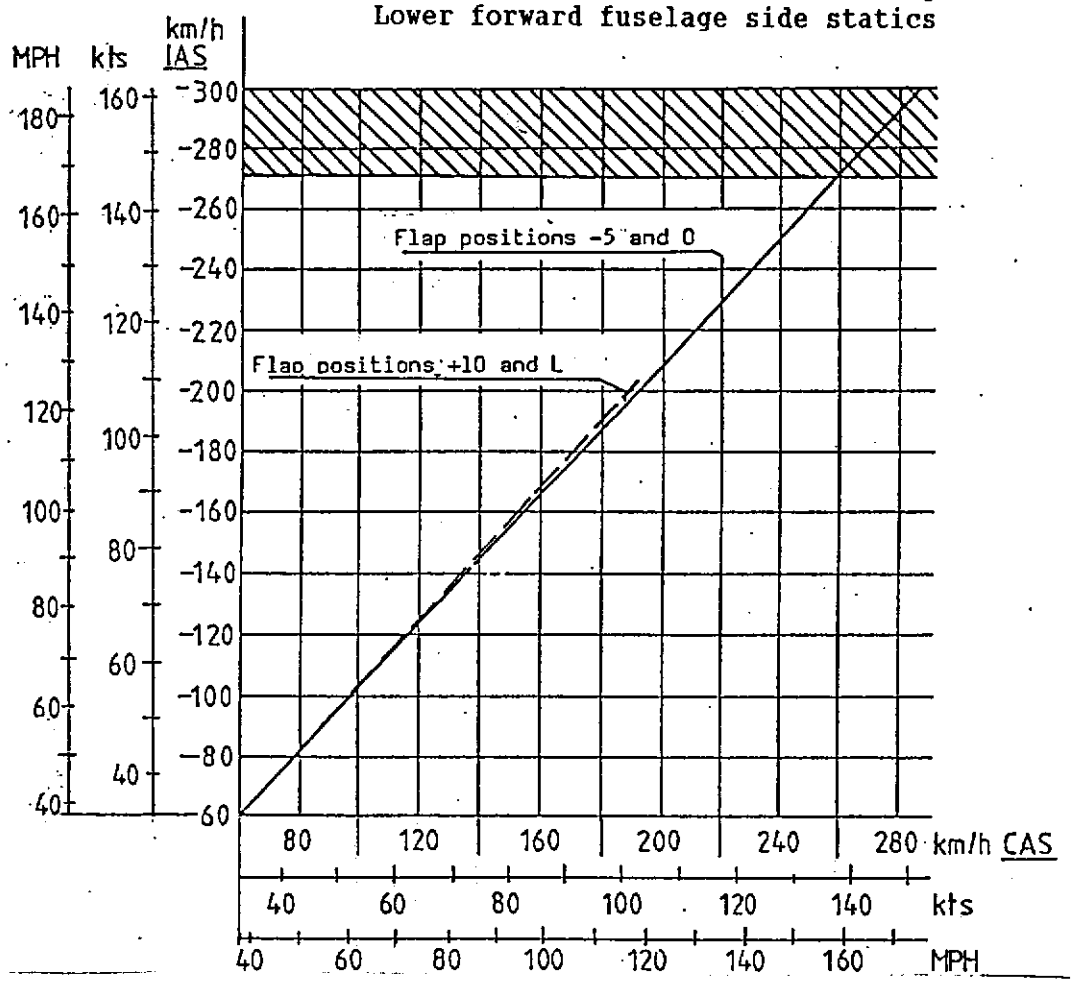
Data in the charts has been computed from actual flight tests with the sailplane in good condition and using average piloting techniques.

5.2 Approved Data

5.2.1 Airspeed Indicator System Calibration

This diagram shows airspeed indicator error due to position of pressure ports.

Pressure ports: Vertical tail fin pitot at 3/4 height
Lower forward fuselage side statics



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5.2.2 Stalling Speeds

- stalling speeds (IAS) for straight and level flight

flap position	without water ballast (all-up weight 360 kg) (794 lbs)			with maximum water (all-up weight 525 kg) (1157 lbs)		
	km/h	kts	MPH	km/h	kts	MPH
"L" (+15°)	67-75	36-41	42-47	78-82	42-44	48-51
+10°	69-76	37-41	43-47	80-85	43-46	50-53
0°	71-78	38-42	44-48	82-88	44-48	51-55
-5°	75-80	41-43	47-50	85-93	46-50	53-58

5.3 Additional Information

5.3.1 Demonstrated Crosswind Performance

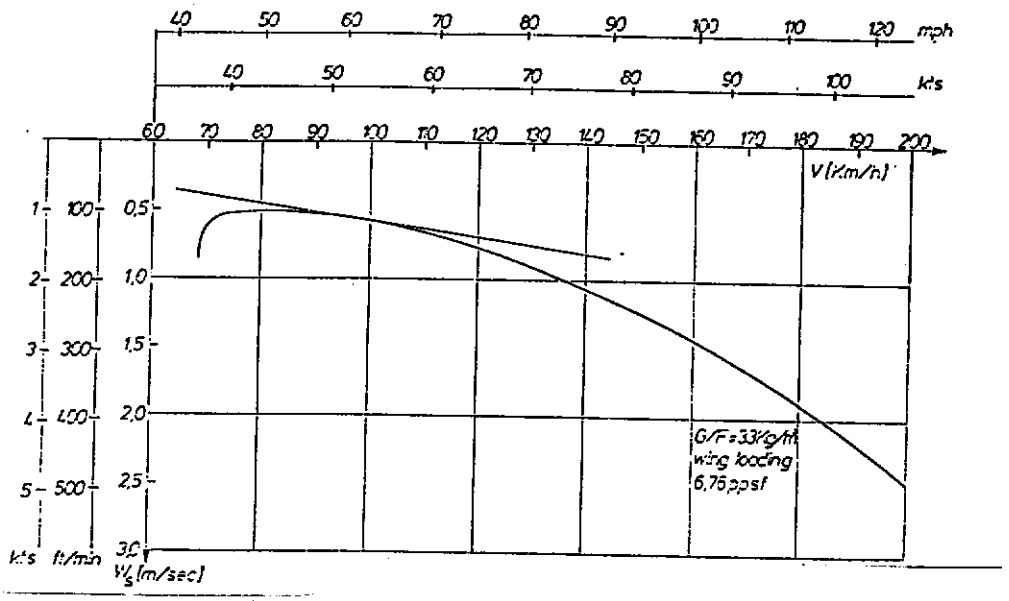
Demonstrated crosswind components:

during aero tow:	20 km/h (11 kts, 12 mph)
during winch launch:	25 km/h (13 kts, 16 mph)

5.3.2 Flight Polar

The flight polar gives forward speed versus sinking speed.

It is valid for "clean" wing. Insects and raindrops on wing decrease performance and handling, see also page 4-16, Landing.



Erstellt: 08.Jun.95	Geprüft:

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Section 6

6.1 Introduction

This section gives details about permissible Cockpit Loading and approved mass limitations of this sailplane.

Complying with these procedures, the pilot is able to load the sailplane properly without any additional calculations due to loading limits placarded in the cockpit and provided in this manual on page 6-2.

The procedures for establishing the basic empty mass, mass of non-lifting parts, center of gravity and loading limits is given in Maintenance Manual chapter 2.

Erstellt: 06.Jun.95	Geprüft:

6.2 Cockpit Loading Plan ‹Pilot and parachute›

Warning: New entry with each annual inspection and when changing equipment. Entry should be calculated in accordance with chapter 2 of Maintenance Manual.

State dimensions used!
State amount of permanently fitted ballast in appropriate position or None.

Empty weight 15 m 18 m ‹ ›	Empty weight CG.Pos 15m ‹ ›	Maximum Perm. Cockpit Load ‹ ›	Minimum Permiss. Cockpit Load with tail fin tank full)* ‹ ›	tail fin tank empty)+ ‹ ›	Permanently fitted Ballast forward ‹ ›	aft ‹ ›	Battery in tail fin Yes/No	Wing ballast volume ‹ ›	Date / Inspector
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)* If not fitted, enter "NONE" in this column
)+ This Minimum Cockpit Load value may only be used, when the pilot can positively exclude unintentional use of tail fin water ballast, i.e. he has checked proper valve opening by use of tubing and blowing through valve !

Erstellt: 06.Jun.95 Schenk	Geprüft: Schaefer

(FHE_618W)

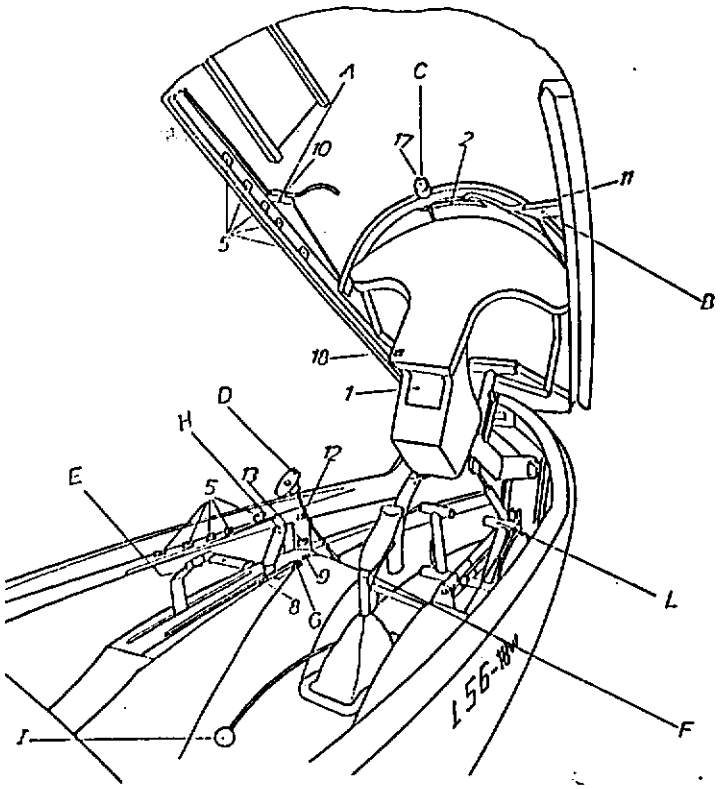
Section 7

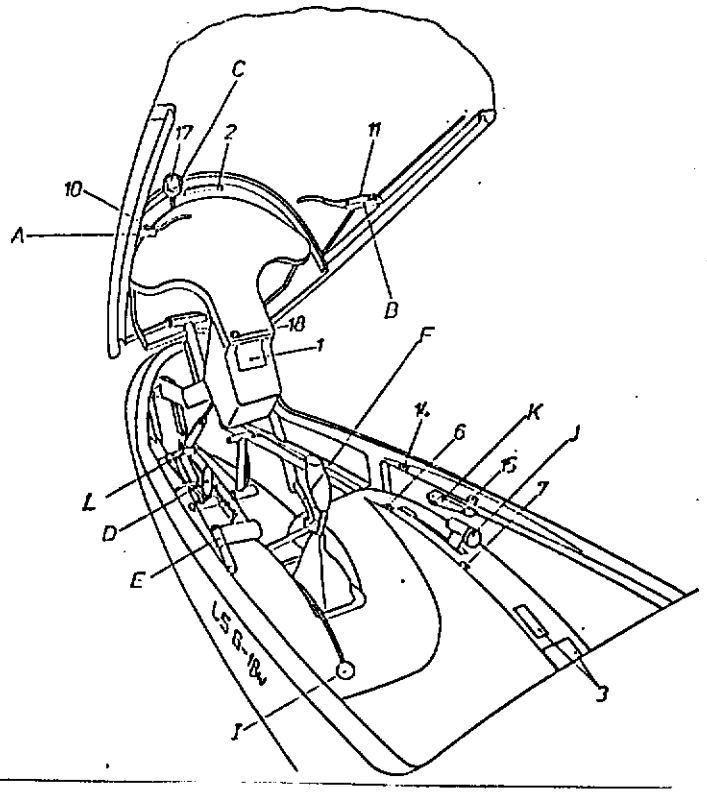
7.1 Introduction

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

7.2 Cockpit Controls

Numbers refer to placards, see also Flight Manual, page 2-8 and Maintenance Manual chapter 10.





A Left canopy locking

B Right canopy locking and emergency canopy release

C Ventilation

D Tow cable release

E Flap handle

F Trim locking lever

G Trim lever, nearby trim position indicator

H Air brake handle

I Pedal adjustment

J Landing gear

K Water ballast valve

L Wheel brake, foot operated

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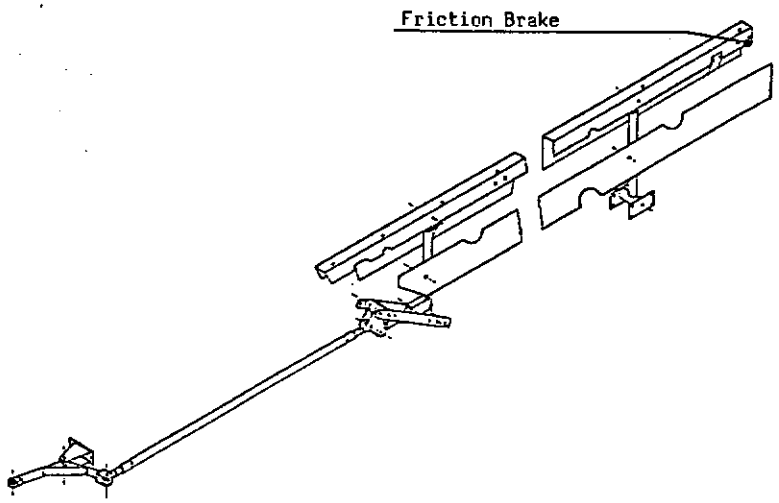
7.3 Air Brake System



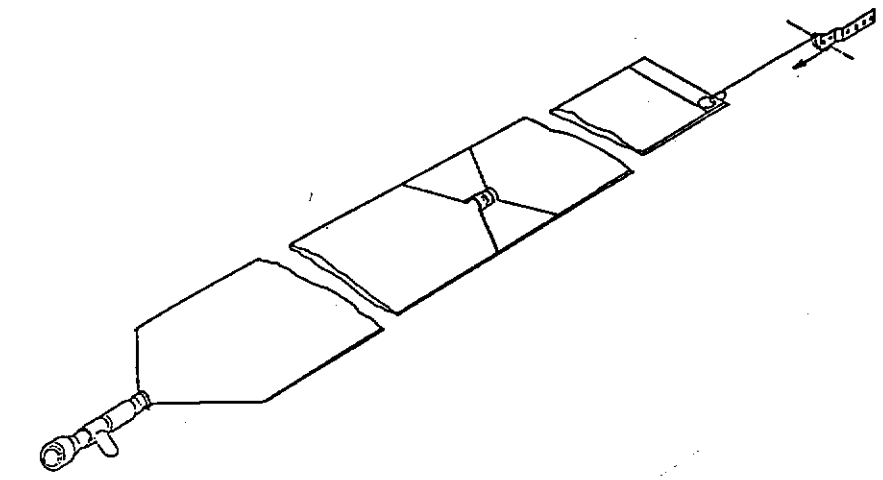
7.4 Baggage Compartment

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

7.5 Water Ballast System and Operation

Lever at right cockpit rim operates total water ballast system (Wing tanks and optional tail fin tank). Wing operating system couples automatically during rigging. Use as clean water as possible to avoid damage of seals due to foreign matter.

Wing Water Ballast System:



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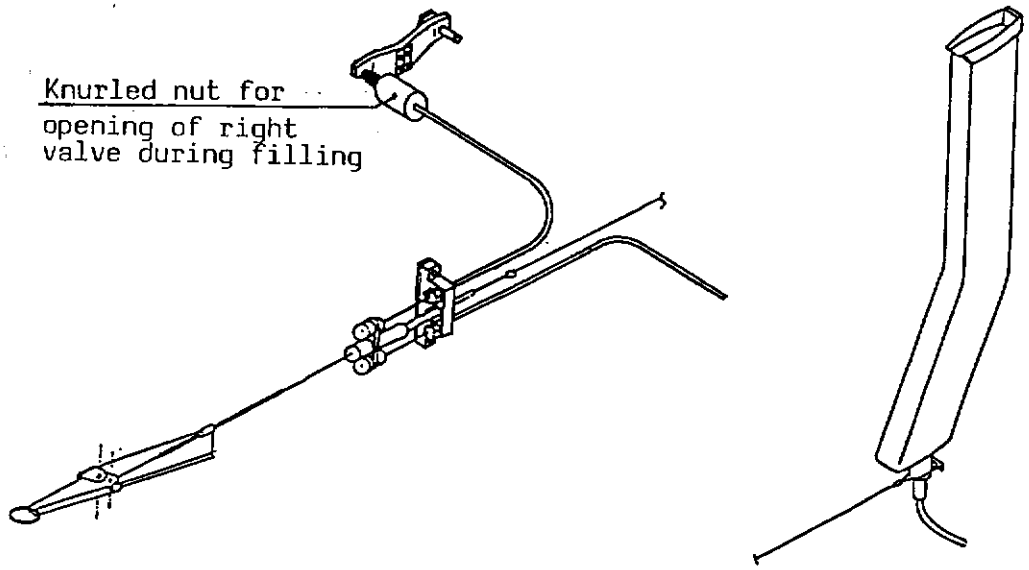
7.5 Water Ballast System and Operation continued

Fuselage Water Ballast System:



7.6 Electrical System and Operation

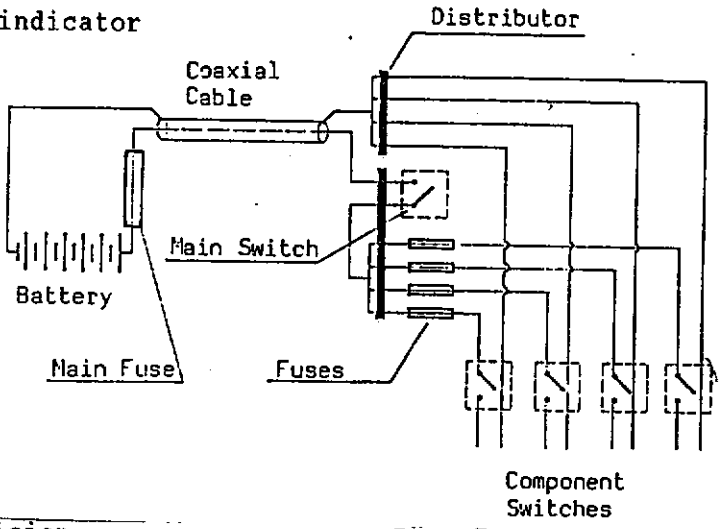
For electrical system principle see wiring diagram below. Power supply by 12V battery, for types and minimum capacity see Master Equipment List in Maintenance Manual, chapter 12.

In case of two batteries, a three-position switch may be used as main switch. A current limiting device must be provided for each electrical user (microfuses or circuitbreakers, details see Master Equipment List). When using circuitbreakers, a separate main switch is not necessary.

Position of fuses: Main fuse at battery
Single component fuses at lower instrument panel area

Fuse ratings:
5 A (quick acting) for main fuse at battery
2 A quick acting: Radio (Becker/Dittel types)
1 A quick acting: Electrical variometers
Turn and bank indicator

Cross section of cables:
Battery cable at least 1 mm²



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7.7 Pneumatic System (Static and total pressure)

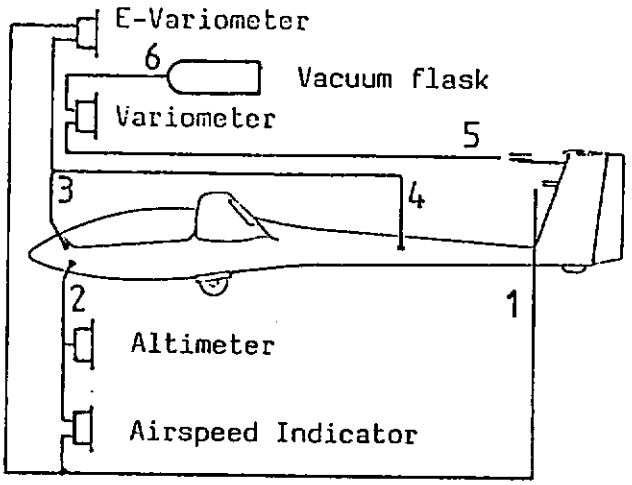
Pressure ports: Vertical tail fin pitot below TE port

Statics: For airspeed indicator and altimeter :
Lower forward fuselage side statics
For Variometers: Upper forward fuselage side statics
Fuselage boom

Total energy port at upper vertical tail fin

Tubing colour code:

1 Fin pitot red
2 Lower side statics blue
for airspeed and altimeter only !
3 Upper side statics clear 6 mm Ø.24 in ⌀
4 Boom statics yellow
5 T.E.port green
6 Vacuum bottles for variometers clear 8 mm Ø.32 in ⌀



When connecting an electrical variometer (E.V.) additionally to the boom static ports (tube No. 4), a blowing circuit must be switched operative to avoid water entering system during water ballast discharge. Thus the electrical variometer is inoperative during water discharge.
Important Note: Manual operation of blowing circuit during water discharge

7.8 Various Equipment

7.8.1 Expendable Ballast (Trim Weights)

Expendable ballast to compensate pilot weight below Minimum Cockpit Load may be fitted on threaded rod in front of rudder pedals and secured with knurled nut (12 mm thread).

7.8.2 Oxygen System

Fiberglass receptacle at left main bulkhead for 3 or 4 Liter oxygen bottles of 100 mm ‹3.94 in› in diameter.
After permanent installation of an oxygen system according to it's 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, it's weight must be counted as useful load.

7.8.3 Emergency Locator Transmitter

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

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Section 8

8.1 Introduction

This section contains manufacturer's 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.

a) For service and information not contained within this manual, it is recommended to contact agent or manufacturer.

b) All correspondence regarding the sailplane should carry its serial number.

c) The serial number can be found on the type placard, on the right side of the main bulkhead.

d) A Maintenance Manual is issued with each sailplane.

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8.2 Sailplane Inspection Periods

a) Annual Inspection according to checklist and inspection forms provided in Maintenance Manual, chapter 2, after performance of annual maintenance procedure (Maintenance Manual, chapter 3).

b) Manufacturer recommended daily inspection, preflight check and cockpit checklist procedure according to checklists, chapter 4.

c) Manufacturer recommended extraordinary inspection, depending on circumstances (rough landings, ground loops etc.) as provided in Maintenance Manual, chapter 3.

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

It is the responsibility of the owner/operator to determine that all applicable airworthiness directives are complied with.

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

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

Agency or personnel accomplishing the required inspections and most of the manufacturer recommended inspections must be properly certificated.
In case of doubt, consult agent, manufacturer or responsible local certification authority.

8.3 Preventive Maintenance that may be accomplished by a certificated pilot *FOR USA ONLY !*

a) A certificated pilot who owns or operates an airplane not used as an air carrier is authorized by FAR Part 43 to perform limited preventive maintenance on his airplane. Refer to FAR Part 43 for appropriate list.

b) All other maintenance required is to be accomplished by appropriately licensed personnel.

c) Preventive maintenance should be accomplished in accordance with the appropriate airplane Maintenance Manual, to be sure that proper procedures are followed. A Maintenance Manual is delivered with each sailplane, carrying the serial number.

8.3.1 Alterations or Repairs

a) Alterations or repairs must be accomplished by licensed personnel.

b) Prior to any alteration the FAA should be contacted to make sure that airworthiness of the airplane is not violated.

Erstellt: 06.Jun.95	Geprüft:

8.3.1 Alterations or Repairs continued

c) For alterations or repairs a written approval from the manufacturer is required. (Special advice, drawings, etc.)

Repair damage prior to next flight

When in doubt whether a "small repair" or a "major repair" is necessary, contact the manufacturer.

Major repairs must be accomplished at national authority-certified repair stations rated for composite aircraft structure work in accordance with Rolladen-Schneider repair methods.

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

Longitudinal Motion Pushrod Bearings

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

Important Note Longitudinal motion pushrod bearings should never be greased or oiled.

Forward Horizontal Tail Attachment

The forward horizontal tail attachment on the vertical tail fin consists of a special rod end bearing, which is cemented in the correctly aligned position. (See also placards pages 10-1 and 10-2 of Maintenance Manual).
When the ball becomes loose (by deliberate action or inadvertently), the attachment may be damaged during horizontal tail assembly due to nonalignment of ball and corresponding pin.

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

8.4 Ground Handling / Road Transport

For assembly and disassembly procedures see Normal Procedures, chapter 4.

Ground Moving

- with 18 m wing span do not push/pull at wingtips !

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

Supporting Area for Road Transport

Fuselage:	- tail skid or tail wheel - main wheel - shell in front of landing gear, minimum width of support 300 mm (11.8 in)
Wing:	- right spar at inner or outer main pin hole - left forked spar at inner main pin hole. At outer main pin hole only, if both fork ends are supported. - shell at root, minimum width of support 150 mm (5.9 in) - shell at half span of wing half, minimum width of support 250 mm (10 in)

Important Note: The aileron sandwich is pressure sensitive, handle carefully! Sufficient strength for handling around drive brackets.

Horizontal Tail Unit	- at any place, minimum width of support 80 mm (3.2 in)

Supporting Area to lift whole Sailplane

- under wing spar, never under nose section
- under fuselage shell in front of wing
- under fuselage shell behind wing

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.

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. If need be, store in dry environment for drying.

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

8.5 Cleaning and Care continued

Self-adhesive tape residues should only be wiped off with white gasoline. (See also following recommendations from paint manufacturers)

For 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 afterwards (for instance Plexiklar).

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) ‖ 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 !

Pins, bushes and control system connectors

Due to required tolerances not all these items can be protected against corrosion. Therefore cover regularly with noncorrosive 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 manufacturer's maintenance instructions, accompanying this manual)

Control surface gap sealing

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

Tow release

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

8.5 Cleaning and Care continued

Longitudinal Motion Pushrod Bearings

These bearings should never be greased or oiled, their plastic balls and bearing surfaces will soon be destroyed due to collection of small foreign matter.
These bearings are being used throughout the wing control systems, in the fuselage for elevator-, aileron- and landing gear drive systems.

Long Term Storage

Preparation for long term storage

- remove instrumentation and store separately
- close external pressure ports (See page 7-5) and inner tube ends
- protect all metal parts using spray oil and vaseline
- close all orifices without preventing air circulation using wire cloth or similar means to prevent entry of small animals
- store in as dry as possible environment

Return to service

- Inspection according to Annual Inspection (See Maintenance Manual page 2-1 and blank inspection forms chapter 14 as well as Flight Manual chapter 8.
- inspect inside of wings and fuselage for small animals (mice, birds etc.) and/or nests.

Erstellt: 06.Jun.95	Geprüft:

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 Inserted Supplements

Date of Insertion	Document No.	Title of the inserted Supplement
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Erstellt: 06.Jun.95	Geprüft: