Flight Manual for the *LS4-b* Sailplane

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

Registration : LN-GCM

Serial Number : 41054

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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.

## 0.1 Log of Revisions

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

| Rev. No. | Pages affected | Date of Issue | LBA-Approval Signature | Date of Approval | Date of Insertion | Signature |
|---|---|---|---|---|---|---|
| 1 | 0-1, 0-2, 4-6, 4-15 | Oct. 1999 |  | 04. 11. 99 | | |



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## 0.2 List of Effective Pages

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## Ø.3 Table of Contents





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*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 LS4-b 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 LS4-b 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 with the version name **LS4-b** has been approved by Luftfahrt-Bundesamt (LBA) Braunschweig in accordance with JAR-22, dated 15.Mar.1982 including amendments dated 15.Dec.82 of the english language original. The LBA-Type Certificate No. 345 for LS4-b Edition 1 has been issued on 31.Aug.1992.

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** 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 on any special item not directly related to safety but which is important or unusual.



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## 1.4 Descriptive Data

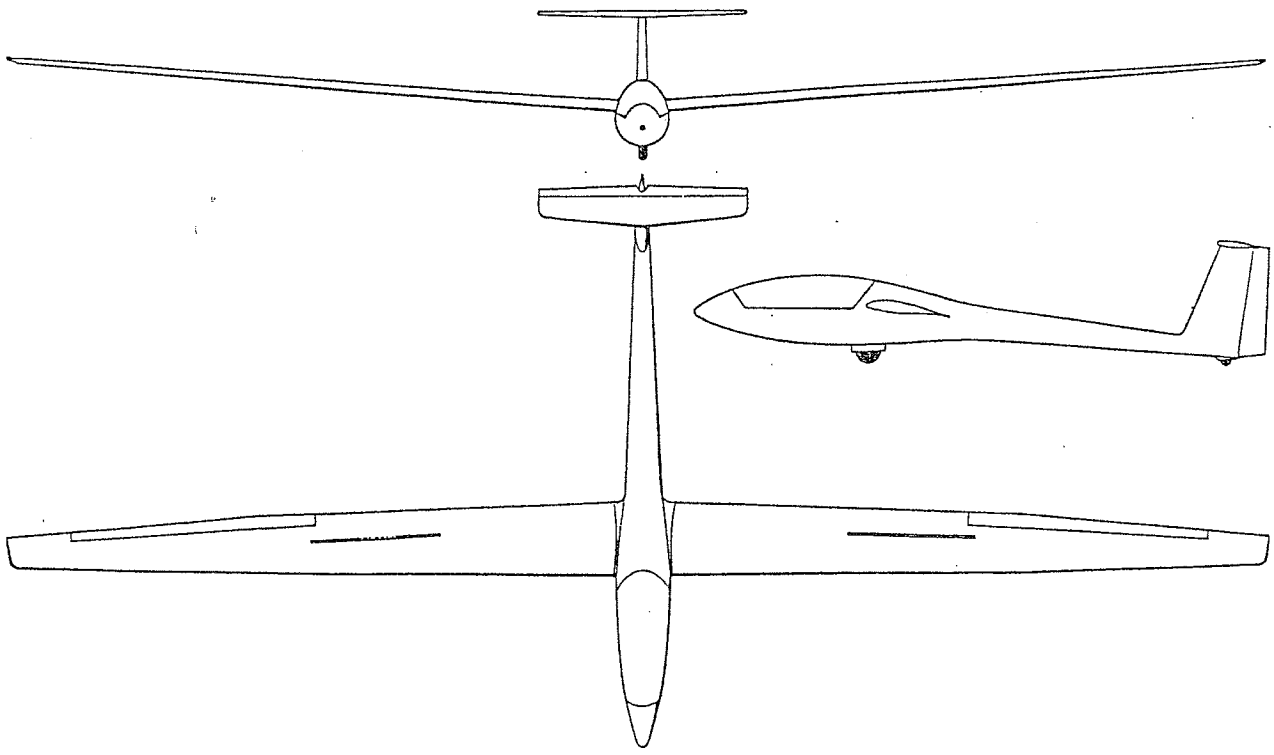
The LS4-b is a Standard Class single seater sailplane with T-tail, wing and optional vertical tail fin water ballast systems, retractable and sprung landing gear and upper wing surface air brakes.

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

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

| | | | |
|---|---|---|---|
| Wing span | 15 | m | (49.21 ft) |
| Length | 6.66 | m | (21.84 ft) |
| Height | 1.43 | m | ( 4.69 ft) |
| MAC | 0.702 | m | ( 2.30 ft) |
| Wing area | 10.5 | m² | (113.0 sq.ft) |
| Wing aspect ratio | 21.4 | | |
| Maximum gross weight | 525 | kg | (1157 lbs) |
| Maximum wing loading | 50 | kg/m² | (10.2 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 LS4-b, 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 LS4-b 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 in calm air and up to an altitude above MSL of: | | | | Do not exceed this speed in any operation.<br><br>Do not use more than one third of maximum control surface deflections at speeds above 190 km/h (103 kts, 118 MPH) |
| | 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 | |

***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. Examples of rough air are lee-wave rotor, thunderclouds etc. |
| VA | Manoeuvering speed | 190 | 103 | 118 | Do not make full or abrupt control movement above this speed, because under certain conditions the sailplane may be overstressed by full control movement. |
| VW | Maximum Winch-Launching speed | 140 | 76 | 87 | Do not exceed this speed during winch- or auto-tow-launching. |
| VT | Maximum Aerotow speed | 190 | 103 | 118 | Do not exceed this speed during aerotowing. |
| VL0 | Maximum Landing Gear operating | 280 | 151 | 174 | Landing gear operation (Extending or retracting) approved up to this speed. |
| | Air brakes | 280 | 151 | 174 | |



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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 |
|---|---|---|
| Green arc | 100 - 190 km/h<br>54 - 103 kts<br>62 - 118 MPH | Normal operating range (Air brakes retracted) |
| Yellow arc | 190 - 280 km/h<br>103 - 151 kts<br>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.<br>Manoeuvering loads, gust loads and loads due to control surface deflections should not be encountered simultaneously. |
| Red line | 280 km/h<br>151 kts<br>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<br>49 kts<br>56 MPH | Minimum recommended approach to landing speed without water ballast |



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## 2.4 Mass (Weight)

Maximum take-off mass with water ballast ..... 525 kg (1157 lbs)
without water ballast ..... 407 kg (897 lbs)

Maximum landing mass ..... 525 kg (1157 lbs)
Maximum mass of all non-lifting parts ..... 230 to 247 kg (507-545 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 and ballast bag size ..... 100 kg (220 lbs) or 160 kg (353 lbs)

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 kg (11 lbs)
When the tail fin tank is combined with a tail battery receptacle, maximum tail fin water ballast mass is 3.5 kg (7.7 lbs)

Maximum mass in Baggage Compartment ..... 5 kg (11 lbs)

Maximum mass of all instrument panel installations ..... 6.7 kg (14.8 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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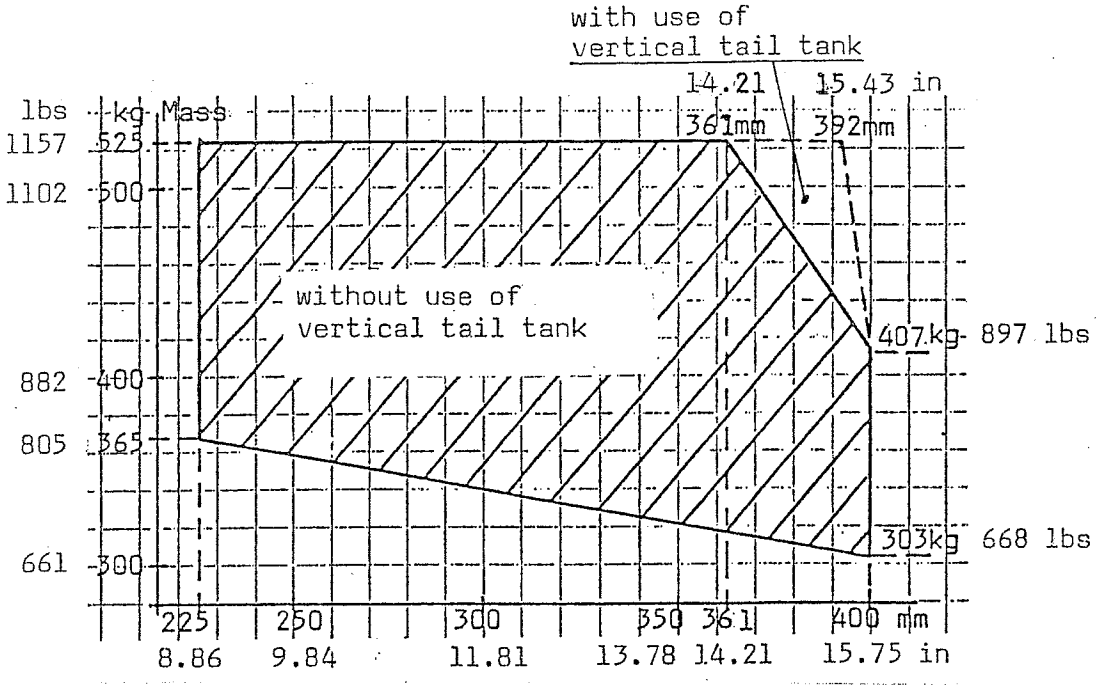
## 2.5 Center of Gravity Limits

Position of C.G. in flight
Maximum allowable:
forward C.G. position ..... 225 mm (8.86 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 4-12.**

## 2.6 Manoeuver Limits / Category of Airworthiness

The LS4-b sailplane is certified in the U (Utility) category according to JAR 22.

Aerobatic manoeuvers not approved.
**Spins and Steep Turns approved.**
Lazy Eights, Chandelles, Stall Turns and Positive Loops not approved.
Cloud flying with water ballast not approved.

For Italy: Spins not approved.

## 2.7 Manoeuvring Load Factors

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 Flight 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, 5.5 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 minimum cockpit load values with empty ballast tank as placarded in cockpit and provided on Flight Manual page 6-2, when they have positively checked (by use of the tail fin tank adaptor - removed from the filling funnel - 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

The LS4-b sailplane is approved for Day-VFR.
Minimum equipment see page 2-7.

Use of water ballast limited to non-freezing conditions.

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.

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



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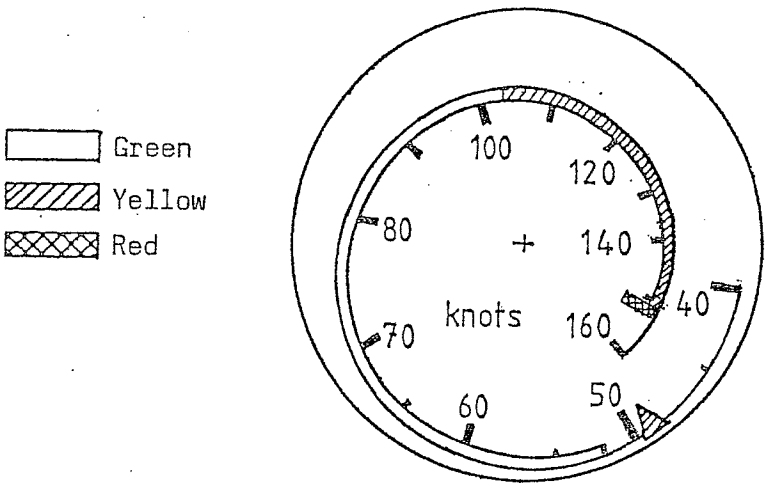
## 2.10 Minimum Equipment List

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 Maintenance Manual
3. Four piece seat belt harness
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 LS4-b.
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 adaptor, for checking of tail fin tank valve function. (One of the two filling funnel removable adaptors).

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 :**



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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: 6695 N ( appr. 670 kg (1477 lbs))
for aerotow: 6695 N ( appr. 670 kg (1477 lbs))

Recommended:
for winch-launch/auto-tow
Tost weak link No.4, colour code blue,
rated break away load 6000 N (≈600 kg, 1323 lbs)

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

**Minimum Aerotow Cable Length:** 30 m (≈100 ft)
Recommended tow cable length up to 80 m (≈260 ft)

## 2.12 Operating Placards for Limitations

For positions of placards see page 7-2. For further placards refer to Maintenance Manual chapter 10.

Rolladen-Schneider Flugzeugbau GmbH

Type: LS4-b Serial Number: 4xxx

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 |

Maximum Take-off Mass 525 kg (1157 lbs) including Water Ballast
Aerobatic manoeuvres not approved

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Weight Limitations

Battery in fin / Baggage Compartment

Maximum Cockpit Load kg. . lbs. .
***Minimum Cockpit Load*** kg. . lbs. .
Minimum Cockpit Load with tail fin tank empty kg. . lbs. .

Lighter Pilots must compensate lack of of weight as suggested in Flight Manual

on right side of cockpit >3<

**Minimum Cockpit Load kg/ lbs**
Minimum Cockpit Load with tail fin tank empty kg/ lbs

under instrument panel cover >2<

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

at main bulkhead



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*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 Jettison

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

Canopy
* Push off, 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: 84 km/h (45 kts, 52 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

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

Aileron - Opposite to spin rotation for quicker termination

Elevator - Push forward

Smooth pull-out

Altitude loss during recovery about 100 m (300 ft)

## 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, 280 km/h (151 kts, 174 MPH), see also page 2-2, inadvertently !



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## 3.7 Other Emergencies

### 3.7.1 Limitation of High Speed Flight

(a) If there are indications that the intended air speed will be exceeded, for instance
  (1) while flying under large cloudbanks
  (2) during cloud flying 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:
  - 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 retracted completely at speeds below 220 km/h (119 kts, 137 MPH): spring loaded covers stay open due to aerodynamic suction.

(c) 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
(a) expect considerable decrease of performance.
(b) increase approach to landing speed at least by 10 km/h (5 kts, 6 MPH) over normal approach speed, because
  (1) stall speed increases
  (2) effectivity of controls decreases.
(c) 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 due to safety reasons, check with built in thermometer below instrument panel.

(1) Dumping below 0° C (32° F), the rear fuselage may collect ice, resulting in dangerous rearward C.G. displacement.

(2) Additionally, the wing discharge system may freeze on one side only.

Caution: For prolonged flights below +5° C (41° 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:

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

then

(a) Avoid stalling
(b) For landing: Increase approach speed at least by 10 km/h (5 kts, 6 MPH) over normal approach speed and touch down with this increased speed.
(c) To avoid ground looping, apply aileron shortly after touchdown in the direction as noticed before.

3.7.5 Cable Failure during Winch-launch

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



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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:

(a) *steer wingtip to desired direction onto the ground*, whenever possible the windward side should be preferred.

(b) simultaneously decrease tail skid load by controlled forward stick deflection.

### 3.7.8 Emergency Landing on Water

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

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



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*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 and automatic control system connectors.
3. Position control stick centrally.
4. Insert right spar end into fuselage, aileron must be about neutral and watch for angle of dihedral.
5. Insert left spar end into fuselage, aileron must be about neutral and watch for angle of dihedral.

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!
When ailerons are deflected downward during rigging, then the automatic aileron connector strikes against the fuselage structure and rigging is impossible.

*Important Note: The aileron sandwich is pressure sensitive, handle carefully!*



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4.2 Rigging and De-Rigging continued

6. Insert main pins, when bushes are lined up correctly.
7. Secure main pins by placing handles behind spring loaded pegs.
8. Insert battery into that place, which was used during 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 tanks, (See also pages 4-7 and following ones and
   check: a) opening of wing dump valves?
   When using 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, secure against turning using tape. Install barograph.
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. When using water ballast, then according to details page 4-7 and following ones and
    check: opening of wing dump valves?
16. **Check control system functions using a helper.**
17. Perform Daily Inspection according to page 4-3.

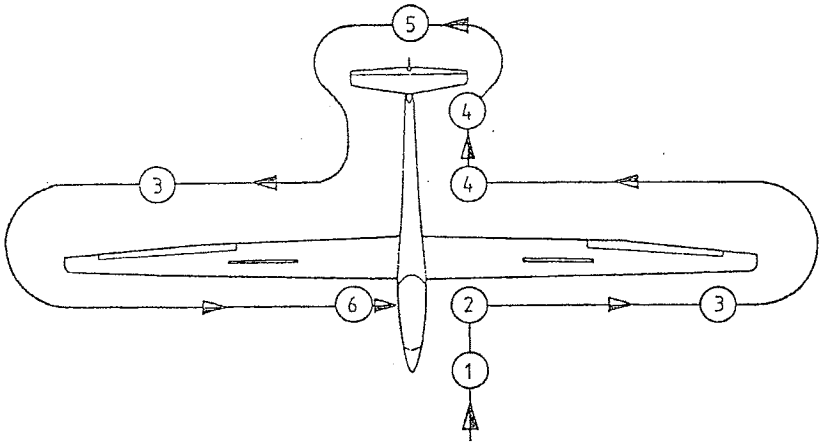
De-Rigging

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

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

## 4.3 Daily Inspection

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




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

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

3 Wings
- (a) Water drain orifices at root and at tip 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

*Important Note: The aileron sandwich is pressure sensitive, handle carefully!*

4 Fuselage
- (a) Condition, gelcoat- or structural damage, cracks, especially on lower side
- (b) Rear static ports at fuselage boom free from clogging
- (c) Recommended tail wheel pressure, if fitted, 2.5 to 3.5 bar (36 to 51 psi)
- (d) Water drain orifice in front of tail skid or tail wheel free from clogging
- (e) Tail skid, if fitted, for proper adhesion



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4.3 Daily Inspection continued

5 Tail Unit

(a) Condition, gelcoat or structural damage, cracks

(b) Total energy port at upper end of vertical tail fin leading edge free from clogging

(c) Pitot pressure port below total energy port at vertical tail fin leading edge free from clogging

(d) Charged vertical tail fin battery connected, if this battery location was fixed during the last C.G. weighing, see entry on page 6-2.

(e) Check vertical tail tank valve for proper opening:

(1) place filling tube into discharge tube

(2) open cockpit lever

(3) 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 !

(f) Amount of vertical tail fin water ballast, if fitted, in correct relation to amount of wing water ballast and cockpit load.

(g) Horizontal tail fin: no pressure marks permitted in center portion

(h) Horizontal tail properly installed and free from play

(i) Movement of tail control surfaces unobstructed and free from play

6 Cockpit

(a) Canopy cleaned, if required

(b) Check Canopy locking and emergency release function:

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

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

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

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

(c) Main pins properly secured

(d) Proper connection of aileron and air brake system:
With control stick in center position ailerons must be flush with trailing edge; air brakes must lock properly

(e) 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.

(f) Thermometer (existent with tail fin tank only) below instrument panel for function:
Indication of surrounding air temperature

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

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



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## 4.4 Preflight Check

1. Daily inspection performed
2. Control system functions checked, using a helper
3. Check water ballast system for leaks, when filled
4. Total energy tube fitted and connection properly sealed
5. Check weight and balance - especially Minimum and Maximum Cockpit Loads, trim weights and tail fin ballast amount
6. Set altimeter
7. Check other instrumentation, normally indicating zero
8. Perform radio operational check
9. Adjust backrest and check locking
10. Adjust rudder pedals
11. Papers (C of A, logbook etc.) complete and valid
12. Landing gear locking without play
13. Check wheel brake operation
14. Before take off, perform cockpit checklist procedure

## 4.5.0 Cockpit Checklist

***LS4-b 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. Test controls
4. Tail fin valve opening checked?
5. Check loading conditions
6. Check tail dolly removed
7. Fasten seat belt harness
8. Connect parachute static line
9. Lock air brakes
10. Check trim slightly nose heavy
11. Check release system
12. Lock canopy



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#### 4.5.1 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

#### 4.5.2 Adjustment of Backrest

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

Two possibilities of adjustment, both can be used on the ground only
(a) Lower adjustment allows use of various types of parachute (locating pegs and slotted screw)
(b) Upper end slope adjustment

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

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

*Warning: When the backrest is removed for huge pilots, then*
*(1) the guide tube must also be removed (it may obstruct an emergency exit)*
*(2) Additionally, an adjustable headrest according to drawing 3BR-101 must be installed.*

### 4.5.3 Automatic parachute ripcord

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

### 4.5.4 Retractable Landing Gear

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

**Important Note: During winch launch, retract gear after releasing tow cable, because C.G. hook is fitted to landing gear fork.**

**Warning: Extend or retract landing gear only, when air brakes are retracted and locked or completely extended.**

### 4.5.5 Wheel Brake

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



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### 4.5.6 Trim System

(a) Trim lever and trim locking lever are separate
(b) Trim locking lever is at control stick
(c) Pull trim locking lever to free trim knob 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 lever 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 mass

*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 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.
(b) When using wing water ballast, this balancing method may be restricted due to amount of wing water and tail fin tank version, resulting in insufficient free volume, see also table page 4-12.
(c) When discharging water ballast, this trim condition cannot be kept due to quicker discharge of tail fin water ballast.

### 4.5.9 Water Ballast

(a) increase tyre pressure to 4 bar (58 psi), when using full water ballast.
(b) wing tanks together hold about 160 liters (42.3 US gallons, 35.2 Imp. gallons).
(c) optionally tanks of about 100 liters (26.4 US Gallons, 22 Imp. gallons) may be fitted.
(d) For size of ballast tanks see entry on page 6-2.
(e) one tank and one valve per wing, operated by pushrod at root rib.
(f) use as clean water as possible to avoid damage of sealing rings by foreign matter
(f) maximum permissible water ballast depends on loading conditions, see pages 4-10 to 4-12 for water ballast loading instructions
(g) Filling sequence: always fill tail fin tank first



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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:

(1) connect tube of tail fin funnel with wire meshing to dumping tube just inside lower right rudder cut-out with rudder deflected to the left and place funnel on top of the rudder.

(2) fill tail fin tank via funnel in relation to intended wing water amount, see tables page 4-10 to 4-12.

(3) Markings on inside of translucent right rudder gap seal correspond to 0.5 Liter steps (0.13 US gallons, 0.11 Imp. gallons).

(4) use water level in funnel tube relative to markings to determine correct amount in relation to wing amount

(5) the upper red marking corresponds to maximum amount of tail fin water ballast, 5 Liters (1.32 US gallons, 1.1 Imp. gallons) or 3.5 Liters (0.92 US gal., 0.77 Imp. gal.) for the combination of tail fin tank with tail fin battery compartment

(6) close dump valves by shifting lever on right cockpit rim forward, and remove funnel from rudder

(c) open left wing valve from baggage compartment using knurled nut:

(1) turn knurled nut about 10 turns counterclockwise

(2) suck residual air from left water bag through dump orifice on under side of wing:

(a) use filling tube without funnel

(b) close left valve before terminating sucking, to avoid air entering into bag again

(c) 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

(1) connect funnel to dump orifice on under side of left wing - fill half of desired total amount of water using funnel

(2) for maximum amount of wing water ballast see pages 4-10 to 4-11

(e) when left wing and tail fin tank are filled, close dump valve of left wing by turning knurled nut in baggage compartment in clockwise direction to stop.

(f) open right wing valve from baggage compartment:

(1) turn knurled nut about 10 turns anticlockwise

(g) after sucking residual air out, use helper to hold right wing down and fill as described for left wing.

(h) close right wing valve from baggage compartment using knurled nut:

(1) turn clockwise to stop

(i) see also icing conditions in Emergency Procedures, chapter 3

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

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 together with wing system to avoid C.G. shifting backwards



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4.5.9 Water Ballast continued

Dumping:

(a) cockpit lever rearward = all tanks open
(b) discharge time approximately 4 minutes, i.e. for 160 Liters (42.3 US gallons, 35.2 Imp. gallons) about 40 Liters (10.6 US gallons, 8.8 Imp. gallons) per minute.
(c) if aileron stick force is needed to maintain level flight after about 4 minutes of dumping, this may indicate unequal dumping.
(d) 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.



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

Maximum approved capacity:
80 kg <176 lbs>, optionally 50 kg <110 lbs> per wing
= 160 kg <353 lbs> total, optionally 100 kg <220 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.

When the optional tail fin tank is fitted, see ballast loading instructions pages 4-11 to 4-12.

| Cockpit load Pilot+parachute +equipment <kg> | Empty weight <kg> 240 | 245 | 250 | 255 | 260 | 265 | 270 | 275 | 280 | 285 |
|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
| 75 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
| 80 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
| 85 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | *155* |
| 90 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | *155* | *150* |
| 95 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | *155* | *150* | *145* |
| 100 | 160 | 160 | 160 | 160 | 160 | 160 | *155* | *150* | *145* | *140* |
| 105 | 160 | 160 | 160 | 160 | 160 | *155* | *150* | *145* | *140* | *135* |
| 110 | 160 | 160 | 160 | 160 | *155* | *150* | *145* | *140* | *135* | *130* |

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>.

| Cockpit load Pilot+parachute +equipment <lbs> | Empty weight <lbs> 529 | 540 | 551 | 562 | 573 | 584 | 595 | 606 | 617 | 628 |
|---|---|---|---|---|---|---|---|---|---|---|
| 154 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 |
| 165 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 |
| 176 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 |
| 187 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | *342* |
| 198 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | *342* | *331* |
| 209 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | *342* | *331* | *320* |
| 220 | 353 | 353 | 353 | 353 | 353 | 353 | *342* | *331* | *320* | *309* |
| 231 | 353 | 353 | 353 | 353 | 353 | *342* | *331* | *320* | *309* | *298* |
| 242 | 353 | 353 | 353 | 353 | *342* | *331* | *320* | *309* | *298* | *287* |



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

Maximum approved capacity:
80 kg <176 lbs>, optionally 50 kg <110 lbs> per wing
= 160 kg <353 lbs> total, optionally 100 kg <220 lbs> total

Maximum tail fin tank capacity 5 kg <11 lbs>
Optional tail fin tank capacity 3.5 kg <7.7 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 4-11.

| Cockpit load: Pilot+parachute +equipment <kg> | Empty weight <kg> 240 | 245 | 250 | 255 | 260 | 265 | 270 | 275 | 280 | 285 |
|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
| 75 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
| 80 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | *155* |
| 85 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | *155* | *150* |
| 90 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | *155* | *150* | *145* |
| 95 | 160 | 160 | 160 | 160 | 160 | 160 | *155* | *150* | *145* | *140* |
| 100 | 160 | 160 | 160 | 160 | 160 | *155* | *150* | *145* | *140* | *135* |
| 105 | 160 | 160 | 160 | 160 | *155* | *150* | *145* | *140* | *135* | *130* |
| 110 | 160 | 160 | 160 | *155* | *150* | *145* | *140* | *135* | *130* | *125* |

Example: When empty weight is 270 kg <595 lbs> and pilot and parachute weight is 110 kg <242 lbs>, maximum permissible wing water ballast weight is 140 kg <309 lbs>.

| Cockpit load Pilot+parachute +equipment <lbs> | Empty weight <lbs> 529 | 540 | 551 | 562 | 573 | 584 | 595 | 606 | 617 | 628 |
|---|---|---|---|---|---|---|---|---|---|---|
| 154 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 |
| 165 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 |
| 176 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | *342* |
| 187 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | *342* | *331* |
| 198 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | *342* | *331* | *320* |
| 209 | 353 | 353 | 353 | 353 | 353 | 353 | *342* | *331* | *320* | *309* |
| 220 | 353 | 353 | 353 | 353 | 353 | *342* | *331* | *320* | *309* | *298* |
| 231 | 353 | 353 | 353 | 353 | *342* | *331* | *320* | *309* | *298* | *287* |
| 242 | 353 | 353 | 353 | *342* | *331* | *320* | *309* | *298* | *287* | *276* |



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## 4.5.10 Vertical Tail Fin Water Ballast Loading Instructions

(a) filling marks for the tail fin tank are on inside of translucent rudder seal

(b) Each mark = 0.5 Liter <0.132 US gal., 0.11 Imp.gal> = 0.5 kg <1.1 lbs>

(c) when water level in filling tube corresponds with filling marks, exact volume filled can be determined

(d) 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.

(e) After filling and before take off, the following must be checked:

(1) No leaks allowed in wing water ballast system

(2) Discharge of tail fin tank starting before wing tanks

**Maximum tail fin tank capacity**

- without a battery receptacle: 5.0 kg <11 lbs>
- with a battery receptacle: 3.5 kg <7.7 lbs>

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

| Filled amount of wing water water ballast mass kg / lbs | Maximum allowable tail fin water ballast mass kg / lbs | Total maximum water ballast mass kg / lbs |
|---|---|---|
| 14 / 31 | 0.5 / 1.1 | 15 / 32 |
| 28 / 62 | 1.0 / 2.2 | 29 / 64 |
| 42 / 93 | 1.5 / 3.3 | 44 / 96 |
| 56 / 123 | 2.0 / 4.4 | 58 / 128 |
| 70 / 154 | 2.5 / 5.5 | 73 / 160 |
| 84 / 185 | 3.0 / 6.6 | 87 / 192 |
| 98 / 216 | 3.5 / 7.7 | 102 / 224 |
| 112 / 247 | 4.0 / 8.8 | 116 / 256 |
| 126 / 278 | 4.5 / 9.9 | 131 / 288 |
| 140 / 309 | 5.0 / 11.0 | 145 / 320 |
| to 160/ 353 | 5.0 / 11.0 | to 165 / 364 |

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

*For 10 kg <22 lbs> of pilot mass above* ***Minimum Cockpit Load for empty 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:** See also page 3-4, Inadvertent Freezing / Icing

### 4.5.11 Winch-Launch or Auto-Tow

(a) trim slightly nose heavy: trim position indicator in front of neutral mark.

(b) adjust backrest properly (see page 4-6) 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 is the pitch up tendency.

(d) use wheel brake during tightening of tow cable to avoid rolling over tow cable.

(e) pronounced forward stick pressure is required during transition arc.

(f) **Minimum winch-launch/auto-tow speed:**
without water ballast ..... 90 km/h <49 kts, 56 MPH>
with water ballast ..... 110 km/h <59 kts, 68 MPH>

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

### 4.5.12 Aerotow

(a) trim slightly nose heavy: trim position indicator in front of neutral mark.

(b) use wheel brake during tightening of tow cable to avoid rolling over tow cable

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

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

(f) when using the C.G.hook for aerotow, retract landing gear after tow, because C.G. hook is fitted to landing gear fork.

(g) when a nose hook is fitted, this must be used for aerotow.

## 4.5.13 Free Flight

Stalling speed (IAS) for straight and level flight

| | km/h | kts | MPH |
|---|---|---|---|
| without water ballast (all-up weight 350 kg / 772 lbs) | 68 | 37 | 42 |
| with maximum water (all-up weight 525 kg / 1157 lbs) | 85 | 46 | 53 |

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): trim stick forces to zero

Best Glide Angle: between 90 and 100 km/h IAS <49-54 kts, 56-62 MPH>

High Speed Flight: reduce stick forces by trimming, avoid abrupt manoeuvers and 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>. Extend air brakes cautiously, because in this speed range air brakes are sucked out suddenly, causing short time negative acceleration and may initiate pilot induced oscillations (P.I.O.).

Warning: With tail tank fitted, 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 before tail fin valve freezes solid.



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**4.5.14 High Altitude Flight**

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

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

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

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

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

**4.5.16 Sideslip**

(1) Sideslip speed range up to VA = 190 km/h <103 Kt., 118 mph>

(2) For a straight and steady sideslip 100 % rudder and between 50% to 75% aileron deflection are necessary. During sideslip, rudder control force decreases to almost zero force.

(3) Degradation in airspeed system goes down to zero airspeed indication. Depending on airspeed indicator, negative values may be indicated.

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

**Warning: Sideslip with air brakes extended is not recommended for landing, because elevator effectiveness allows no low-speed sideslip.**

**4.5.16 Landing**

(1) Water ballast should normally be dumped prior to landing. Because of possible unequal dumping leave valves open, see also pages 3-4 and 4-7.

(2) Extend landing gear in time and lock.

***Warning: In case of late landing gear extension during final approach, do retract airbrakes and lock beforehand.***

(3) Landing with gear retracted not advisable, because pilot is much better protected by the sprung landing gear compared to the fuselage shell.

(4) Air brakes allow control of glide angle within wide limits, therefore sideslipping 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>.*** |

***Warning: 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>.*** |

***Warning: Sideslip with air brakes extended is not recommended for landing, because nose heavy moment of air brakes allows no* slow speed *sideslip.***



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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

(1) Switch off electrical instruments
(2) Remove battery and recharge, if necessary
(3) Remove insects and dust using water, sponge and 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 dumping of water ballast bags
(6) Check proper dumping of tail fin water tank
(7) Unlock wing air brake system

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.

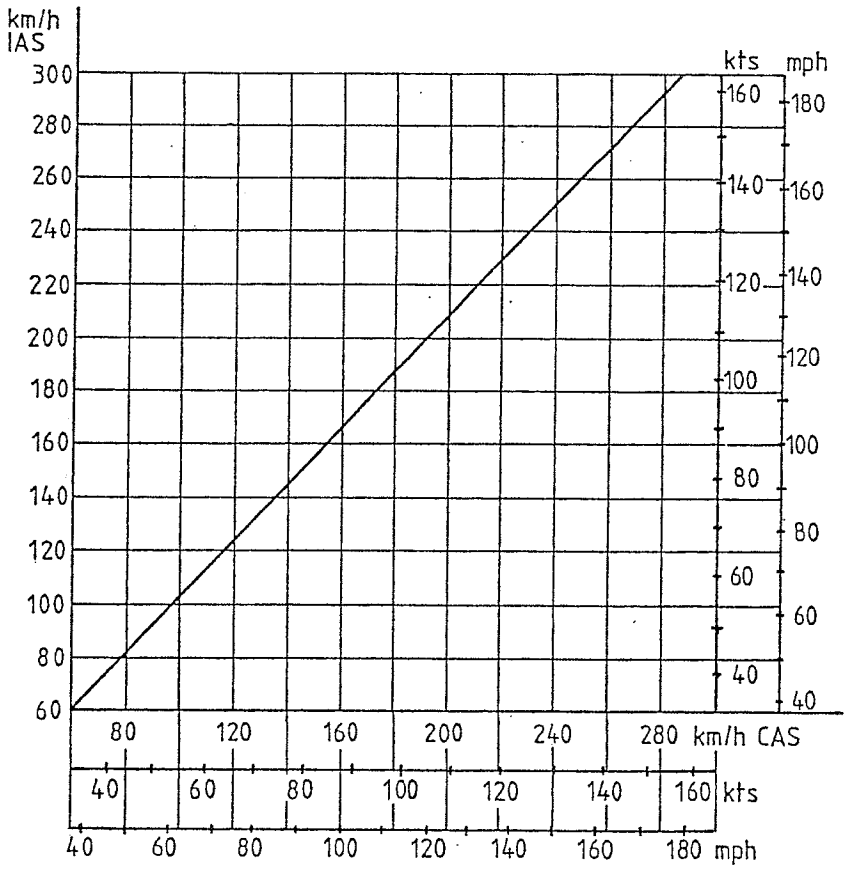
Data in the charts has been computed from actual flight tests with the sailplane in good condition and using average piloting techniques.

## 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

| | km/h | kts | MPH |
|---|---|---|---|
| **without water ballast** (all-up weight 350 kg / 772 lbs) | 68 | 37 | 42 |
| **with maximum water** (all-up weight 525 kg / 1157 lbs) | 85 | 46 | 53 |

## 5.3 Additional Information

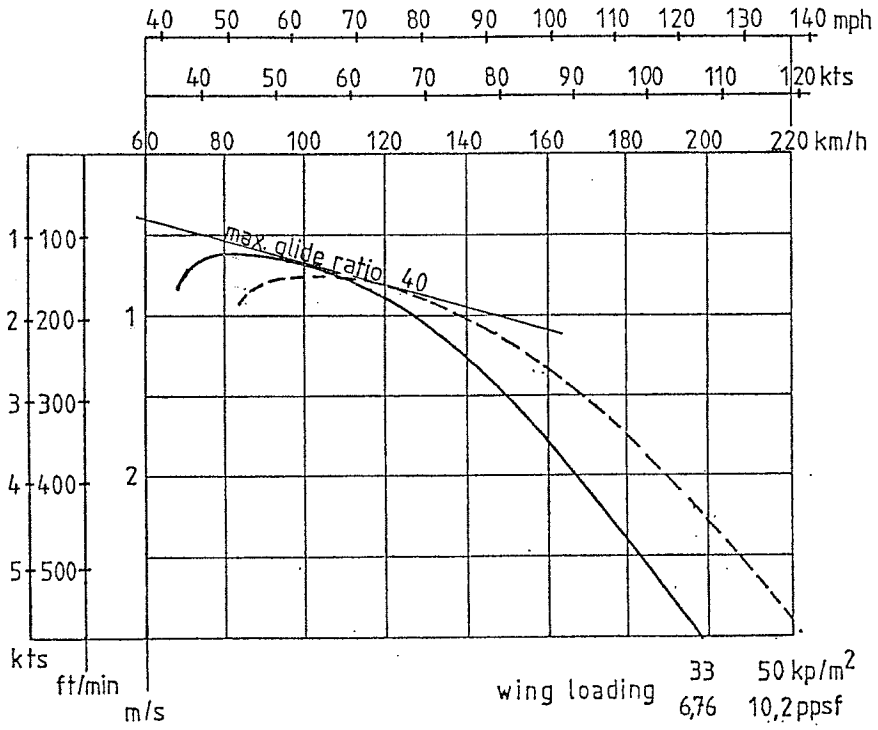
### 5.3.1 Demonstrated Crosswind Performance

Demonstrated crosswind components:
during aerotow: 20 km/h (11 kts, 12 mph)
during winch-launch: 30 km/h (16 kts, 19 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 4-15, Landing.



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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.



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## 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.

*Serial Number* .

| Empty weight <kg> | Empty weight CG.Pos <mm> | Maximum Perm. Cockpit Load <kg> | Minimum Permiss. Cockpit Load with tail fin tank full )* <kg> | Minimum Permiss. Cockpit Load with tail fin tank empty )+ <kg> | Permanently fitted Ballast forward <kg> | Permanently fitted Ballast aft <kg> | Battery in tail fin Yes/No | Tail fin tank volume <Litres> | Date / Inspector |
|---|---|---|---|---|---|---|---|---|---|
| 271. | 654 | 94 | 95 | 75 | / | / | No | 5,2 | 12.03.2003 |
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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 !



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*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.



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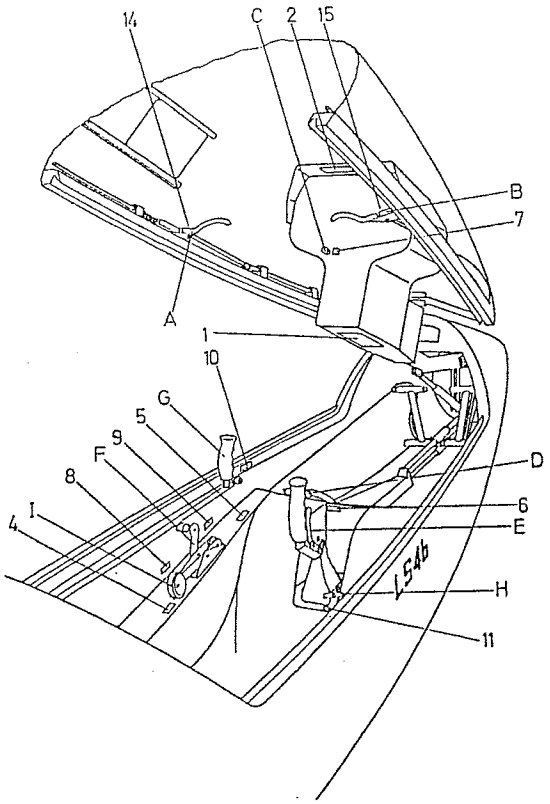
## 7.2 Cockpit Controls

Numbers refer to placards, see also Flight Manual, page 2-8/9 and Maintenance Manual chapter 10.




A Left canopy locking

B Right canopy locking and emergency canopy release

C Ventilation

D Tow cable release

E Trim locking lever

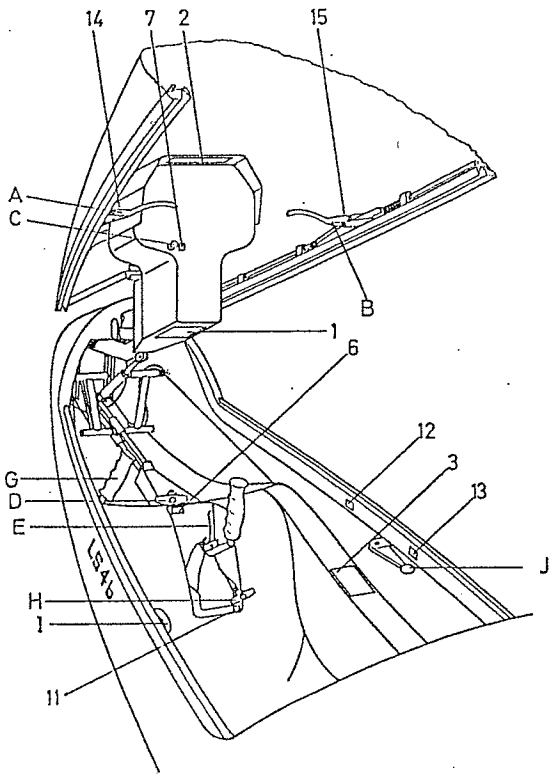
F Trim lever, also indicating trim position

G Air brake handle

H Pedal adjustment

I Landing gear

J Water ballast



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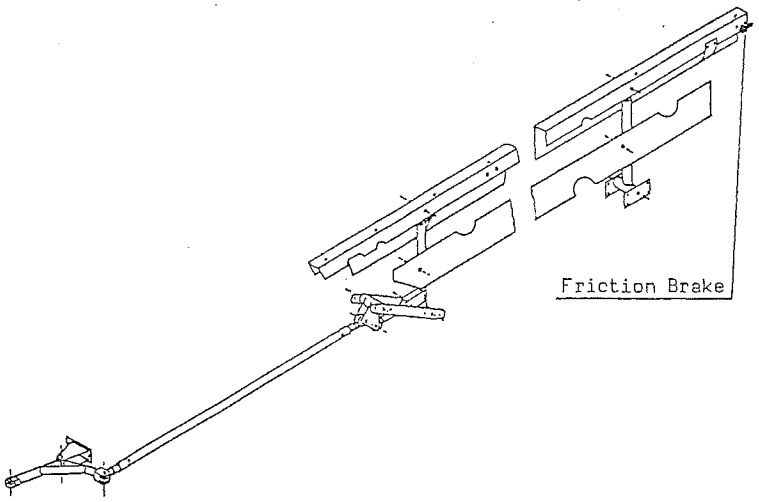
## 7.3 Air Brake System




## 7.4 Baggage Compartment

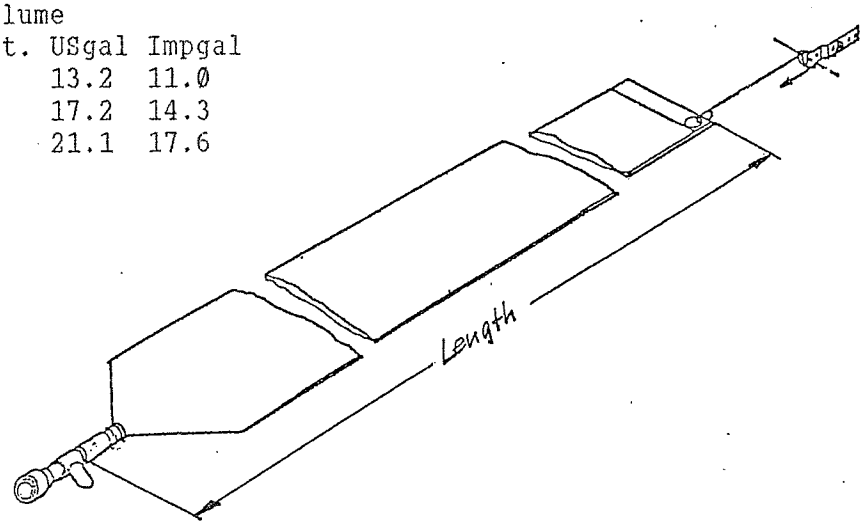
Baggage compartment is accessible only on the ground after swivelling backrest forward. Loading possible after rigging. Equipment (for instance batteries) must be installed according to Maintenance Manual, chapter 11. Not permanently fixed, soft items count for Cockpit Load.

## 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:

| Drawing No. | Length mm | in | Volume Lit. | USgal | Impgal |
|---|---|---|---|---|---|
| 3F5-81 | 2750 | 108.3 | 50 | 13.2 | 11.0 |
| 4F5-13 | 4560 | 179.5 | 65 | 17.2 | 14.3 |
| 1F5-35 | 5000 | 196.9 | 80 | 21.1 | 17.6 |



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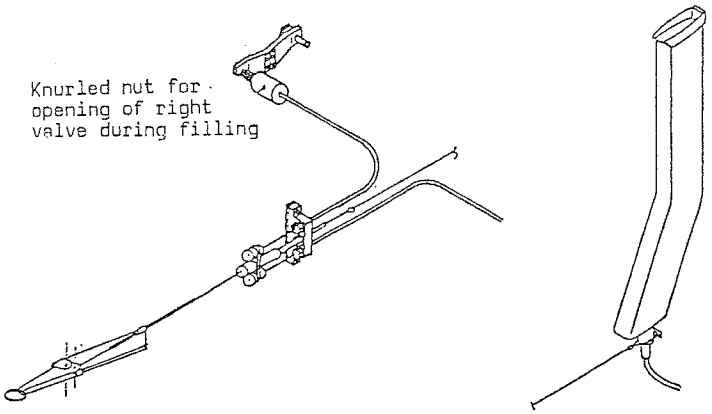
## 7.5 Water Ballast System and Operation cont.

Fuselage Water Ballast System:




## 7.6 Electrical System and Operation

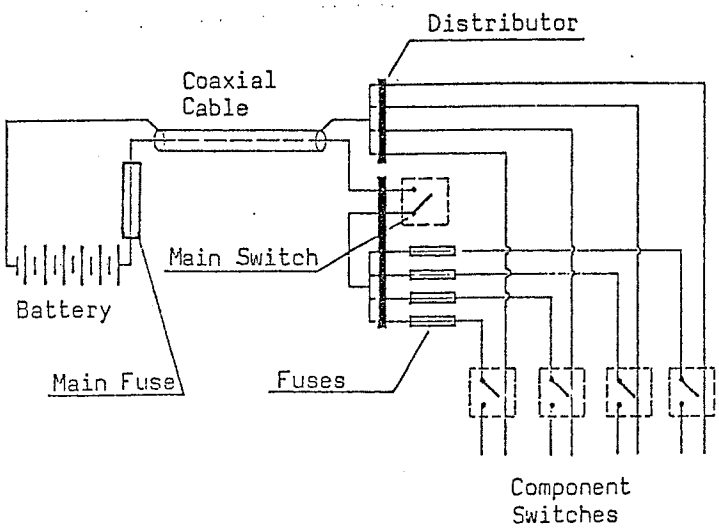
For electrical system principle see wiring diagram below. Power supply by 12V battery, for types and minimum capacity see Master Equipment List in Maintenance Manual, chapter 12.

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
(corresponds to AN 20 cable)



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## 7.7 Pneumatic System (Static and total pressure)

Pressure ports:

Vertical tail fin pitot below TE port

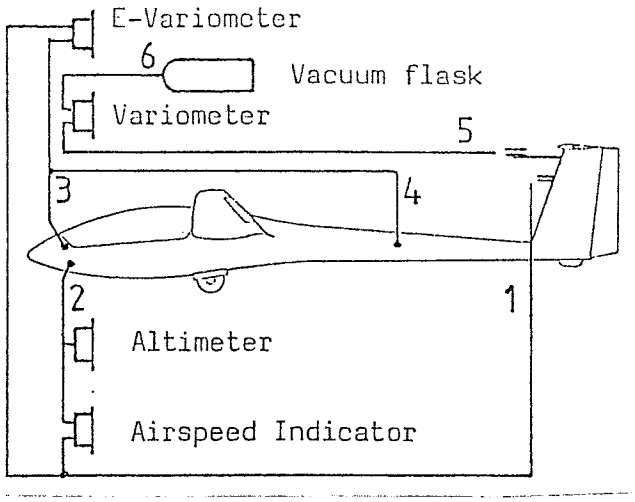
Statics: For airspeed indicator and altimeter :
Lower forward fuselage side statics

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 ø**
4 Boom statics **yellow**
5 T.E.port **green**
6 Vacuum bottles for variometers **clear 8 mm Ø.32 in ø**




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 14, 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.



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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, as 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 !



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## 8.4 Ground Handling / Road Transport

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

a) Ground Towing
(1) tow at walking speed only
(2) use elastic cable from tow release and helper at wingtip
or
(3) use tail dolly with tow bar and sprung wheel at one outer wing

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

c) Tie-down
***Tie-down out in the open as a substitute for a hangar place should never be considered***: weathering marks due to changes of temperature, ultra violet radiation and humidity can result in rapid gelcoat deterioration; resulting cracks can cause eventual structural damage.
When permanent supervision cannot be guaranteed, tie down as follows:
(1) Place tail unit about 45° into main wind direction
(2) lay windward wingtip down
(3) place ground anchors to both sides of rear fuselage boom and wingtip
(4) strap rear fuselage and wingtip down using rope and foam to avoid scratching

d) Supporting Area to lift whole Sailplane
(1) under wing spar near fuselage, never under nose section
(2) under fuselage shell in front of wing (main bulkhead)
(3) fuselage shell at tail skid

e) Supporting Area for Road Transport

Fuselage:
(1) tail skid or tail wheel
(2) main wheel
(3) shell in front of landing gear, minimum width of support 300 mm <11.8 in>

Wing:
(1) right spar at inner or outer main pin hole
(2) left forked spar at inner main pin hole. At outer main pin hole only, if both fork ends are supported.
(3) shell at root, minimum width of support 150 mm <5.9 in>
(4) shell at outer air brake end, minimum width of support 250 mm <10 in>

Horizontal Tail Unit:
(1) at any place, minimum width of support 80 mm <3.2 in>

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



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## 8.5 Cleaning and Care

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

Humidity enters resin structure after prolonged application and causes swelling up. High temperatures at the same time speed this process up. Conserving gelcoat with wax decelerates this process, but is unable to stop it completely.
Therefore, try to remove water whenever it enters interior as far as possible using a sponge.
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 to become yellow. Therefore, avoid unnecessary exposure to sunlight (for instance outside parking instead of packing into the trailer).

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<br>- car polish with or without silicone<br>- car hardwax |
| **Suitable with reservations** | - tar remover for cars based on petrol or white gasoline<br>- alcohol, like spirit or isopropyl alcohol<br>‖ Reservations are, that these liquids should only be used for wiping off, not for soaking with rags. |
| **Unsuitable** | - strong solvents and thinners (acetone)<br>‖ These items may decompose gelcoat and cause local shrinking. |
| **Completely unsuitable** | - trichlorethylene<br>- carbon tetrachloride or similar hydrocarbon chlorides<br>‖ These liquids destroy the gelcoat |

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



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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 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.

**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

(a) remove instrumentation and store separately
(b) close external pressure ports (See page 7-5) and inner tube ends
(c) protect all metal parts using acidless spray oil or non-corrosive grease (vaseline)
(d) close all orifices without preventing air circulation using wire cloth or similar means to prevent entry of small animals (**keep wing discharge valves opened for ventilation**)
(e) store in as dry as possible environment

Return to service

(a) Inspection according to Annual Inspection (See Maintenance Manual page 3-1 and blank inspection forms chapter 14 as well as Flight Manual chapter 8).
(b) inspect inside of wings and fuselage for small animals (mice, birds etc.) and/or nests.

*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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