

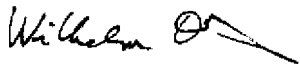
Maintenance Manual LS4

Recommendations to order spare parts

Please try to determine the exact designations of the spare parts for your order using the maintenance manual. This is to guarantee a fast and correct delivery of the parts.

The designations are to find in the sections system description, instructions for assembly and servicing work and especially in the diagrams of the maintenance manual.

Yours sincerely
DG FLUGZEUGBAU GMBH



Dipl.- Ing. W. Dirks

Maintenance Manual LS4

0 General

0.1 Manual amendments

No.	Page	Description	Date
0.1	all	Combination of the initial Maintenance Manuals of the Variants LS4, LS4-a and LS4-b, new standardized format	May 2011
0.2	0-11, 1-1 ÷ 1-7, 1-10 ÷ 1-15, 2-1 ÷ 2-6, 2-15, 2-17, 2-20, 2-21, 2-23, 3-1 ÷ 3-4, 3-6, 3-7, 4-1, 4-5 ÷ 4-7, 4-9, 4-16, 4-18 ÷ 4-20, 5-1 ÷ 5-3, 6-1, 7-6, 8-1, 9--1 ÷ 9-4, 10-1 ÷ 10-3, 11-1 ÷ 11-10 12-1, 12-2, 13-1, 14-3 ÷ 14-7	Miscellaneous changes to the contents of the latest amendments of the initial maintenance manuals	May 2011

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0.2 List of effective pages

Section	page	issued	replaced	replaced	replaced
0	0-0	May 2011			
	0-1	See list of amendments			
	0-2	"			
	0-3	"			
	0-4	"			
	0-5	"			
	0-6	May 2011			
	0-7	"			
	0-8	"			
	0-9	"			
	0-10	"			
	0-11	"			
1	1-1	May 2011			
	1-2	"			
	1-3	"			
	1-4	"			
	1-5	"			
	1-6	"			
	1-7	"			
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2	2-1	May 2011			
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4	4-1	May 2011			
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5	5-1	May 2011			
	5-2	"			
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8	8-1	May 2011			
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13	13-1	May 2011			
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0.4 Airworthiness Limitations

0.4.1 Repairs

Repair or replace damaged parts prior to next flight. Follow the instructions of section 11 of this manual for repairs of the airframe. Major repairs must be accomplished at an approved repair station or by an approved mechanic rated for composite aircraft structure work in accordance with DG repair methods.

Use only genuine spare parts.

For all aircraft under EASA regulations the following applies: According to part 21, subpart M to accomplish major repairs an approved repair instruction is required, see also TN DG-G-01 “Approved repair methods according to EU Commission Regulation 1702/2003 part 21, subpart M”

0.4.2 Life time of the airframe

The maximum allowable operating time for the Variants LS4, LS4-a and LS4-b is 12000 flight hours. Therefore inspections according to section 3.3 of this manual have to be executed at 3000 h, 6000 h, 9000 h and every 1000 hours following thereafter.

0.4.3 Life time of equipment and components

- a) The **fabric straps of the safety harness** have to be exchanged according to the instructions of the respective manufacturer. If no limitations are given, exchange after 12 years.
- b) **Other components:**
All other components like tow hooks, wheels, gas struts, control system parts, bolts, pins etc. have no life time limitation, but should be replaced when worn, damaged or disqualified by excessive corrosion.

0.4.4 Service time, maintenance documents of equipment and components

Follow the instructions of the respective manufacturer:

- a) Operating Manual for Safety Tow Releases
Series: Europa G 72 or Europa G 73 or Europa G 88 Safety Tow Release latest approved version
And if installed:
Operating Manual for Tow Releases Series: E72 or E75 or E 85 Nose Tow Release latest approved version
- b) Safety harness: instructions of the manufacturer.
- c) Minimum instrumentation: instructions of the manufacturer.

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1 Description of systems

1.1 Wings

GFRP wing, wing span 15 m.

With TN4045 performed: removable 15 m wingtips which may be replaced by wingtips with Winglets.

Caution: For operation with Winglets (TN4045) the max. payload must be reduced by 10 kg (22 lbs.).

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1.2 Aileron control

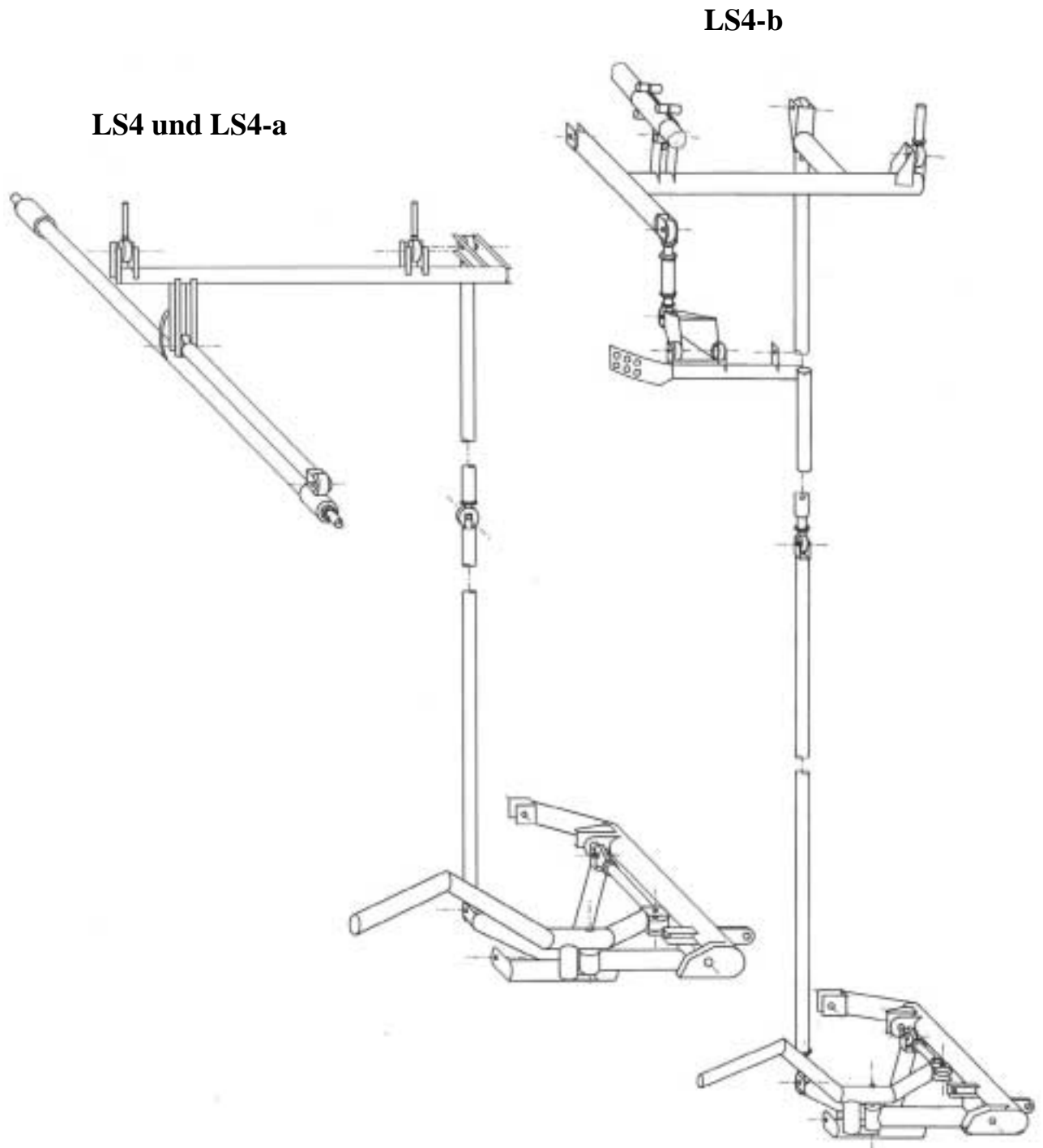
1.2.1 Aileron control LS4 and LS4-a

Activation via pushrods, with ball and swivel joints in fuselage and LS-securing sleeves at wings side. Ailerons partly massbalanced.

1.2.2 Aileron control LS4-b

Activation via pushrods, with automatic hookup (system Hänle). Ailerons partly massbalanced.

Note: The sketches for the control systems in the wings are to be found in section 1.7.



1.3 Elevator Controls and Trim-System:

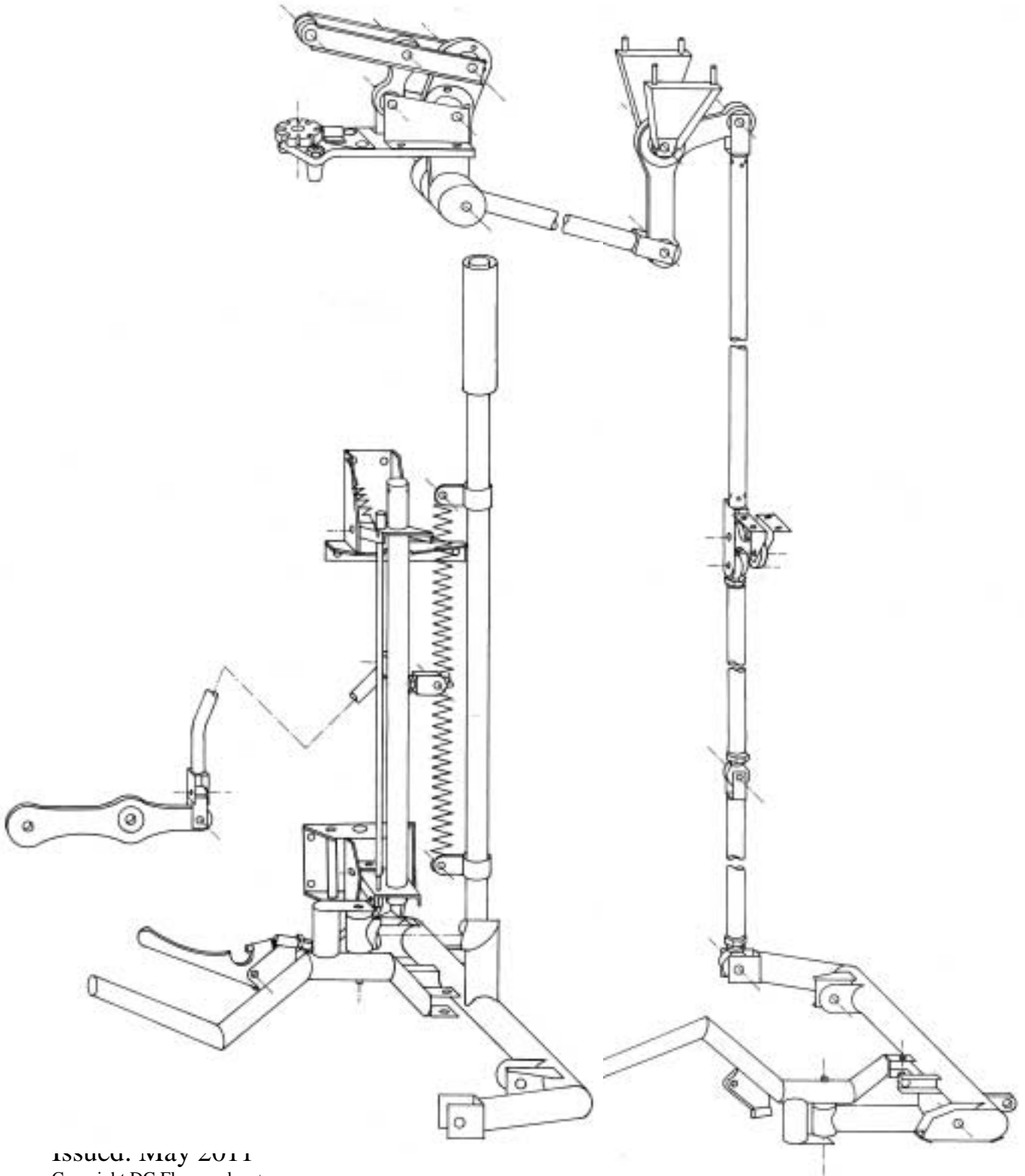
1.3.1 Elevator Controls

Elevator system activated via pushrods. Automatic coupling during assembly of horizontal tail unit.

100% mass balance in vertical tail fin pushrod.

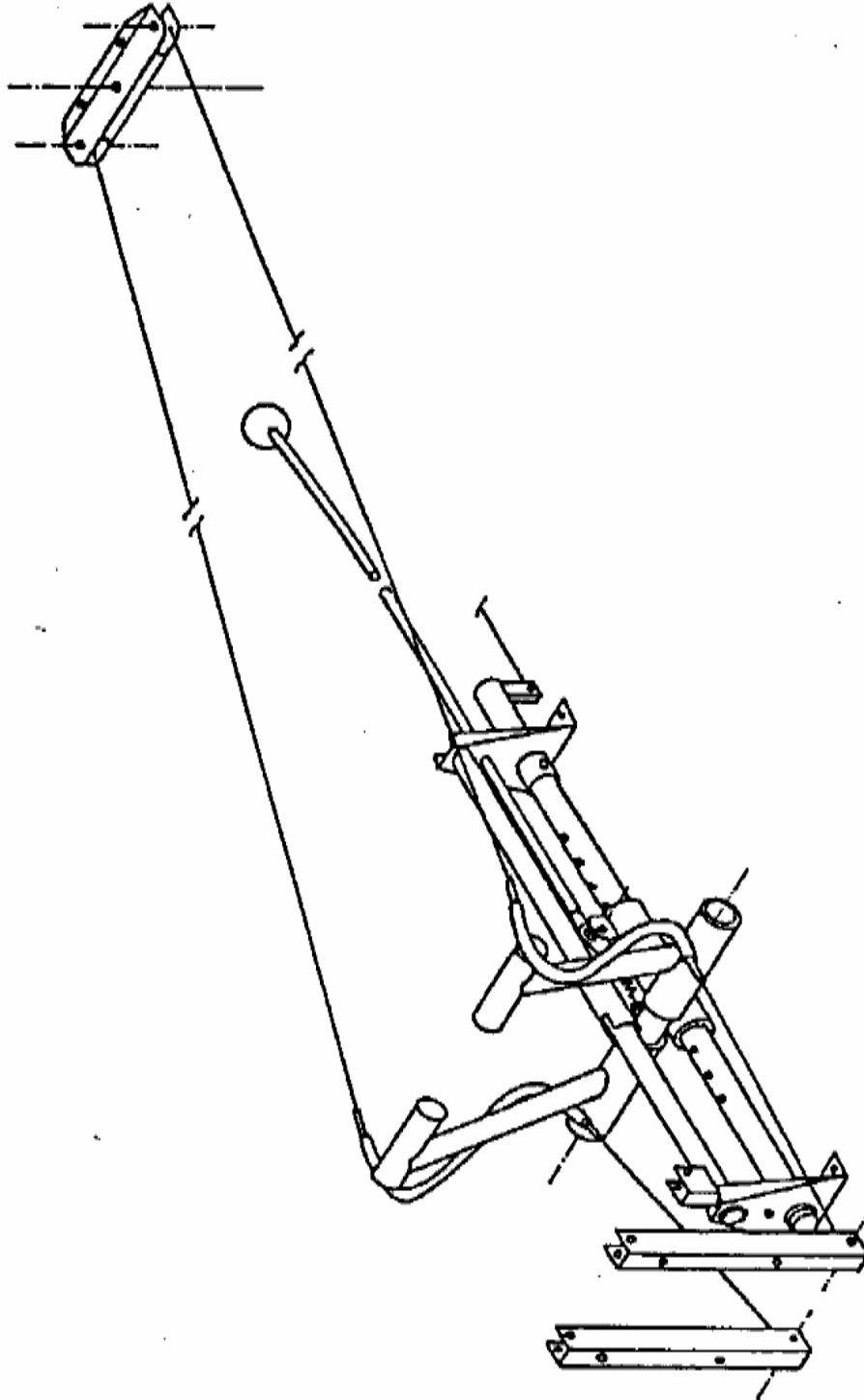
1.3.2 Trim Controls

Trim handle at left hand cockpit wall behind landing gear handle-



1.4 Rudder control system

Rudder activated via steel cables guided in polyamide tubing,. 100% mass balance at rudder.



1.5 Wheel brake

Feet operated, activated by bowden cable from rudder pedals.

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1.6 Air brake controls

1.6.1 Air brake controls LS4 and LS4-a

Activation via pushrods, with L'Hotellier connectors in fuselage and LS-securing sleeves wingside.

Upper surface double storey airbrakes with spring loaded caps.

1.6.2 Air brake controls LS4-b

Activated via pushrods. Automatic connection of system during rigging (Hänle system). Air brake locking in wings.

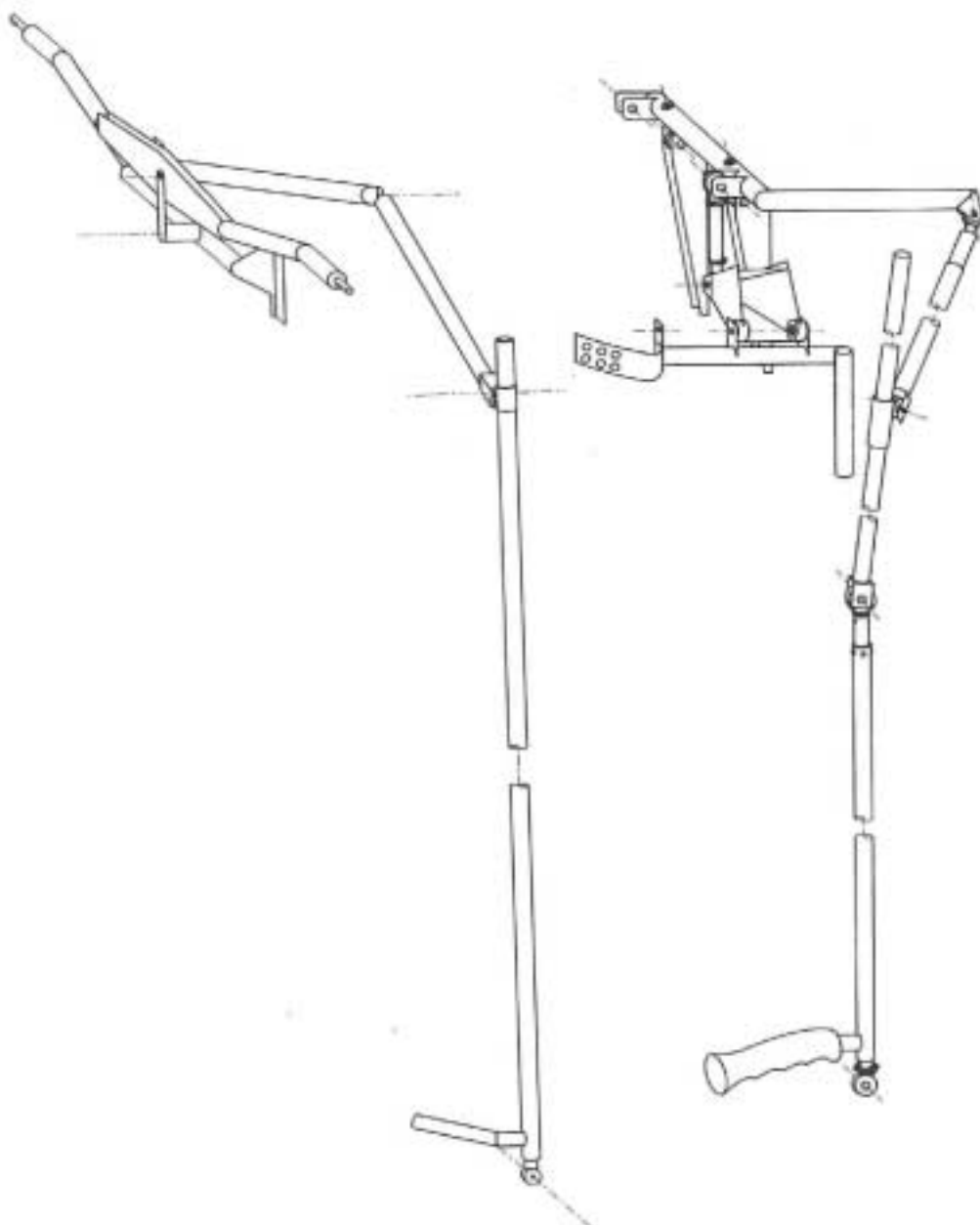
Upper surface double storey air brakes with spring loaded caps.

Friction damper in airbrake box to prevent oscillations during extension.

Note: The sketches for the control systems in the wings are to be found in section 1.7.3 and 1.7.4.

LS4 und LS4-a

LS4-b



1.7 Water ballast system and sketches for wing control systems

1.7.1 Water Ballast System LS4 and LS4-a

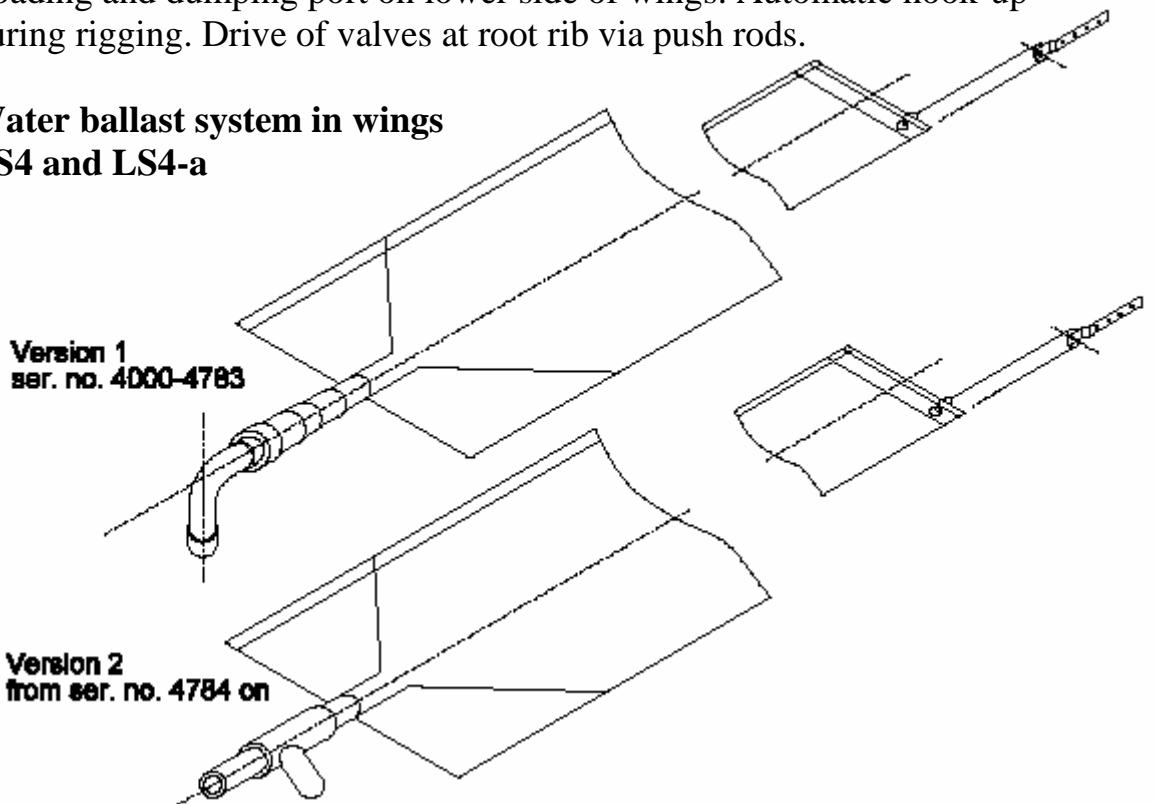
LS4 and LS4-a : Waterbags 4F5-13 (approx. 70 Liter <18.5 US gallons> per wing) or

LS4-a optionally: 3F5-25 (approx. 85 Liter <22.45 US gallons> per wing), retrofit for LS4 see TN 4014.

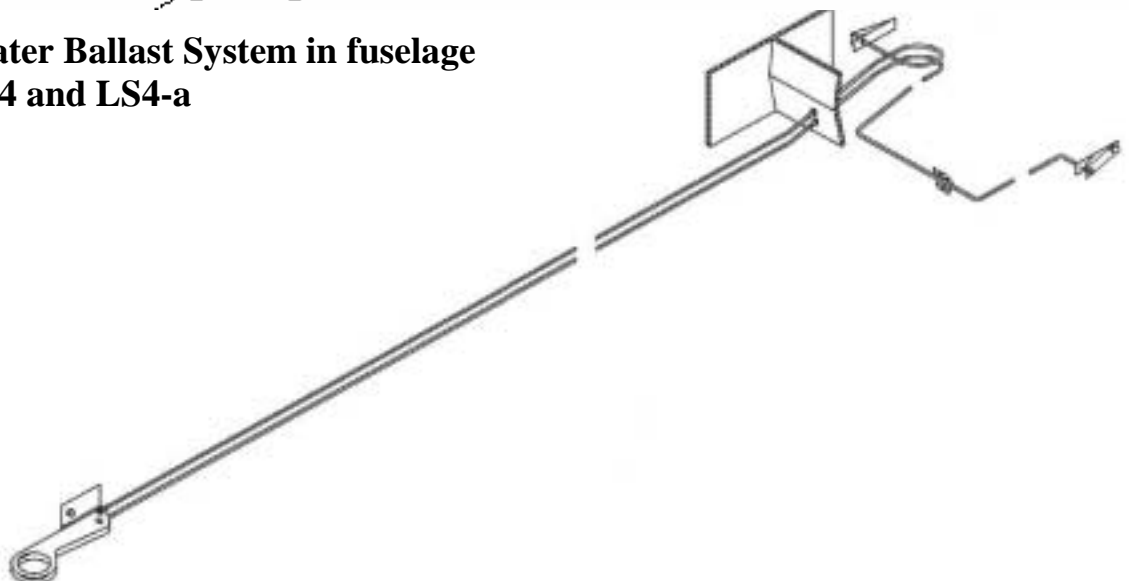
The bags 3F5-25 consist of 2 bags per wing which are connected via a tube running from the valve at the root through the inner bag to the outboard bag. The valve is constructed as a double valve.

Loading and dumping port on lower side of wings. Automatic hook-up during rigging. Drive of valves at root rib via push rods.

Water ballast system in wings LS4 and LS4-a



Water Ballast System in fuselage LS4 and LS4-a



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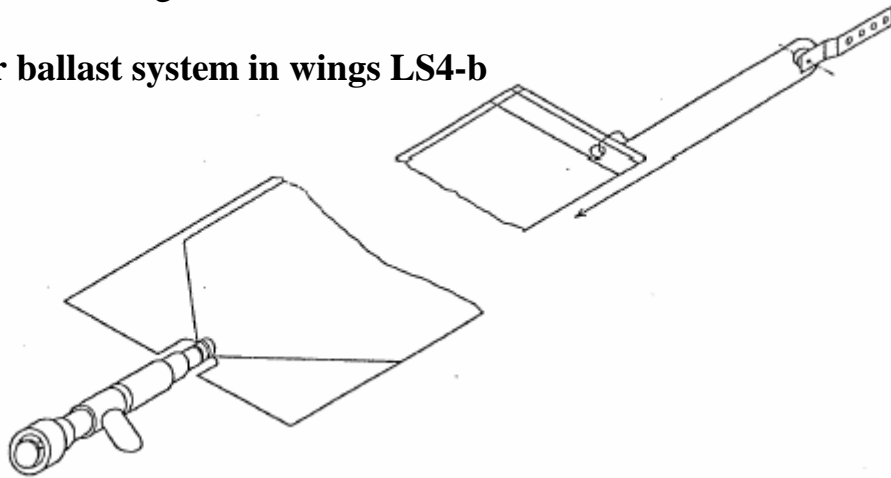
1.7.2 Water Ballast System LS4-b

Waterbag 4F5-35 (approx. 85 Liters <22.45 US gallons > per wing), optionally 4F5-13 (approx. 70 Liter <18.5 US gallons> per wing) or waterbag 4F5-81 (50 Liters <13.2 US gallons> per wing).

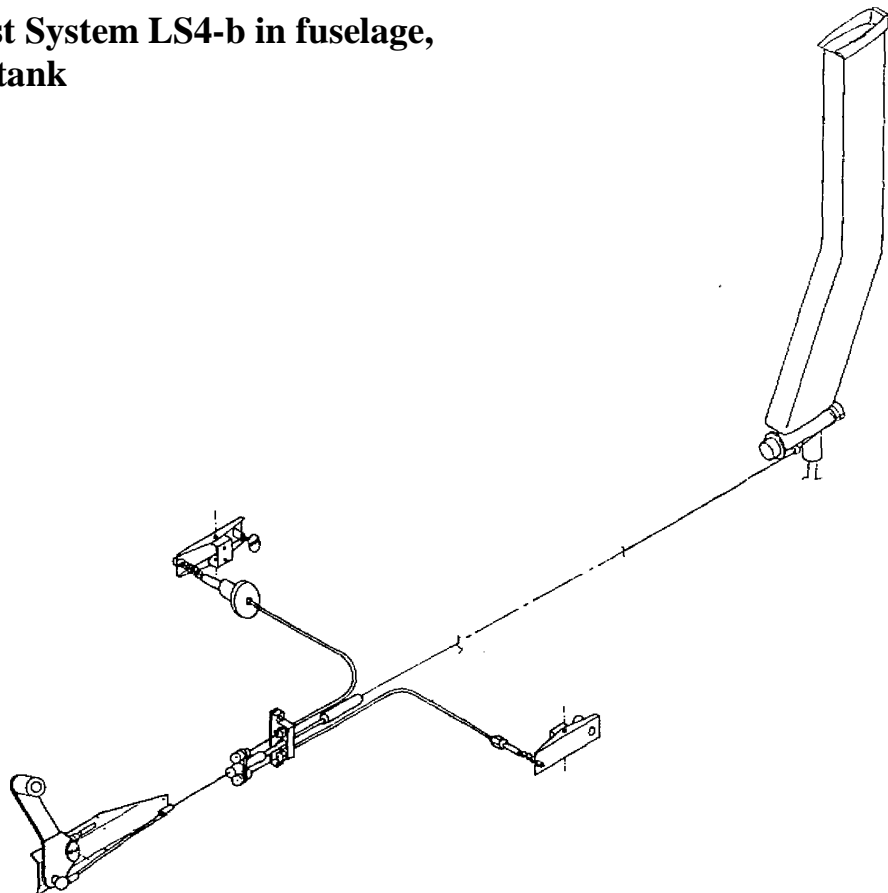
Valves / loading and dumping port on lower side of wings. Automatic hook-up during rigging. Drive of valves at root rib via push rods.

If installed: In the vertical tail fin either battery receptacle or ballast tank allowing to compensate C.G. shift due to wing water ballast or mass of heavy pilots, maximum capacity 5 Liters <1.32 US gallons>. When the tail fin tank is combined with a battery receptacle, the maximum capacity is 3.5 Liters <0.92 US gal.>

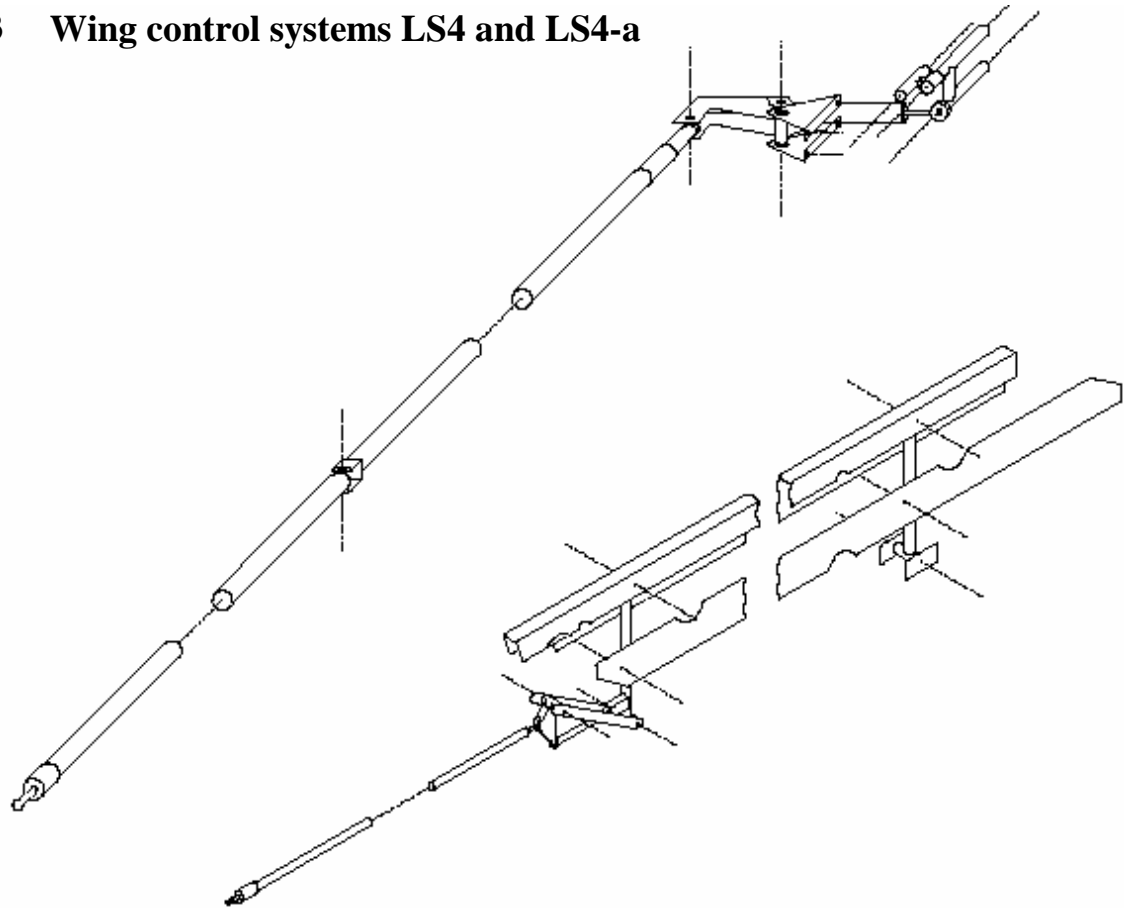
Water ballast system in wings LS4-b



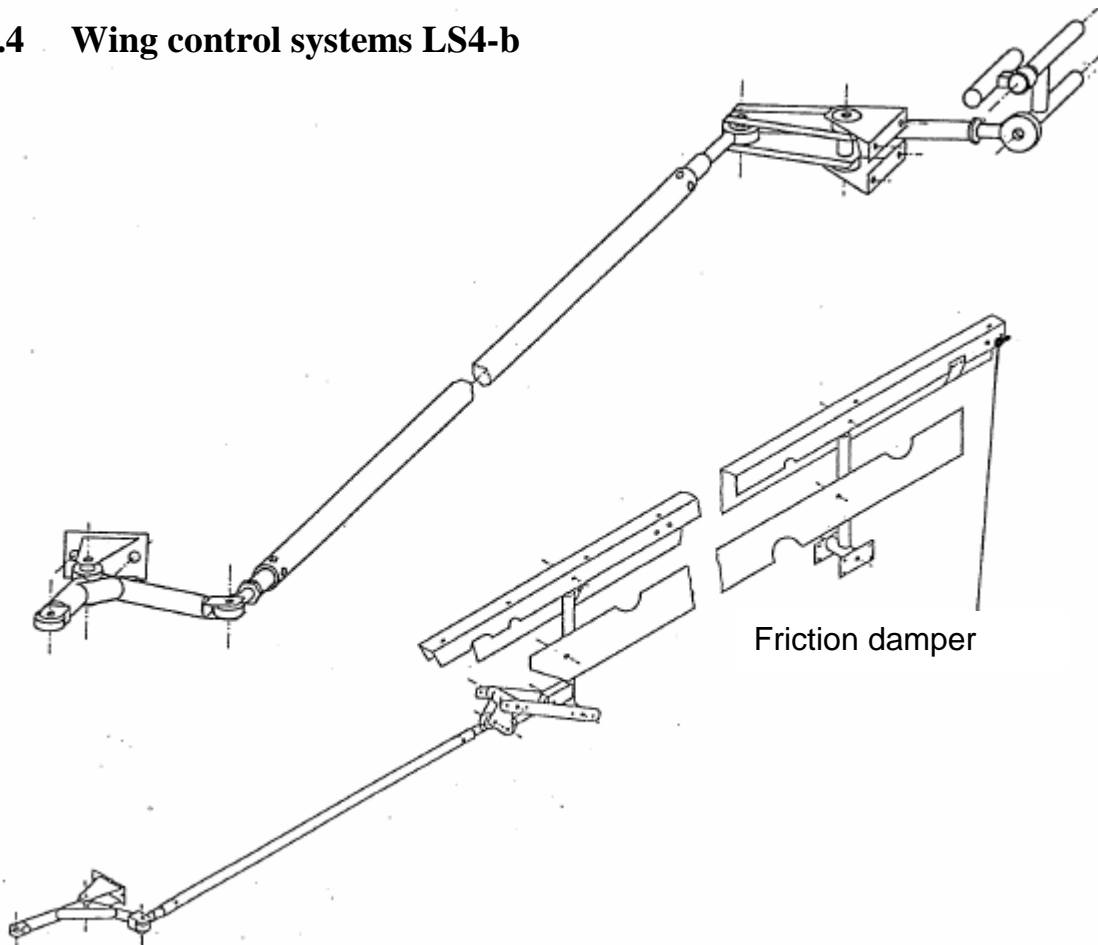
Water ballast System LS4-b in fuselage, optional fin tank



1.7.3 Wing control systems LS4 and LS4-a



1.7.4 Wing control systems LS4-b



1.8 Cockpit

1.8.1 Cockpit LS4 and LS4-a

Double fiberglass shell.

Controls for airbrakes, landing gear on left cockpit side.

Control for longitudinal trim (acting as trim position indicator also) located on left cockpit side behind landing gear handle, trim locking lever at control stick.

Control for tow cable release (operating C.G. hook and optional nose hook), for pedal adjustment, canopy emergency release and for ventilation on instrument panel.

Handle for water ballast valve and for adjustment of the back rest inclination on right hand side of cockpit.

Handles for canopy opening on both sides.

1.8.2 Cockpit LS4-b

Double fiberglass shell.

Controls for airbrakes, landing gear, tow cable release (operating C.G. hook and optional nose hook) on left cockpit side.

Control for longitudinal trim (acting as trim position indicator also) located on left cockpit side behind landing gear handle, trim locking lever at control stick.

Handle for pedal adjustment left near centre of seat shell.

Handle for ventilation on instrument panel cover.

Handle for water ballast on right hand side of cockpit,

Handles for canopy opening on both sides.

When operating right canopy lever over full possible travel, the forward canopy mount becomes disengaged (emergency canopy release).

Adjustment of the back rest inclination only on the ground via latching device in the baggage compartment.

1.9 Canopy

One piece front hinged canopy. 2 threads at left and right hand sides of the canopy frame for installation of cameras or other equipment are standard equipment.

1.9.1 Canopy LS4 and LS4-a

Instrument panel cover fixed to canopy.

With TN4032 executed: A spring at the canopy hinge lifts the canopy in case of canopy emergency release.

1.9.2 Canopy LS4-b

After operating the canopy emergency release the canopy will be lifted at the front by the instrument panel, which is lifted by a gas strut.

1.9.3 Canopy LS4-b standard, LS4 and LS4-a with TN4032 executed

In case of an emergency exit, a spring loaded latch (LS-latch (Röger hook) for canopy emergency release) at the rear canopy edge acts as a temporary hinge for clean separation of the canopy from the fuselage.

1.10 Instrument panel

1.10.1 LS4 and LS4-a instrument panel

Instrument panel fixed to cockpit floor. Lower sides chamfered for easy boarding and exit. Depending on version allows for installation of up to 8 instruments plus radio. Weight limitation for instruments installed in upper portion of panel 4 kg (8.8 lbs.).

1.10.2 LS4-b instrument panel

Panel lifting together with canopy allowing unobstructed entry and exit. Depending on version, allows for installation of up to 10 instruments including radio. Maximum mass of all instrument panel installations 6,7 kg (14,8 lbs).

1.11 Baggage compartment

Baggage compartment behind pilot's shoulders is for light and soft materials only, max. mass 5 kg (11 lbs.).

Permanent installation of batteries or other equipment is possible, see section 8.3.

1.12 Oxygen system

1.12.1 LS4 and LS4-a Oxygen system

Receptacle for oxygen bottles provided, size of bottles 3 or 4 liters, diameter 100 mm (3.94 in).

1.12.2 LS4-b Oxygen system

Receptacle for oxygen bottles provided, size of bottles 3 or 4 liters, diameter 100 mm (3.94 in).

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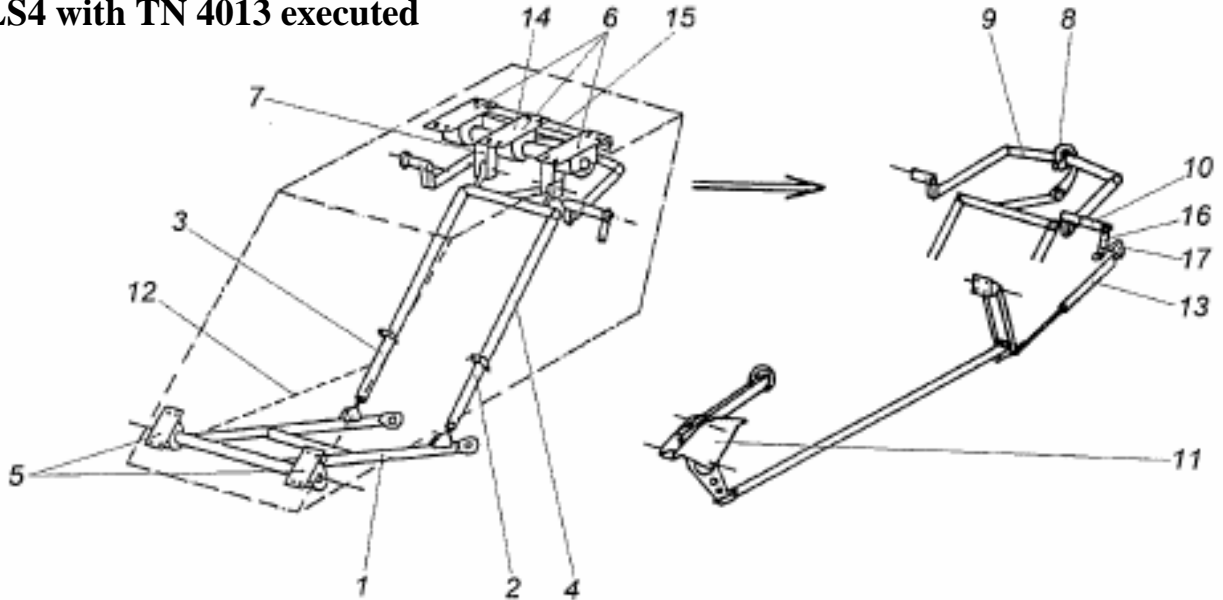
1.13 Landing gear

Sprung and retractable, housed in a closed box, left hand operation. A gas strut in the LG operation system provides a constant pressure on the system to prevent from damage during failures when rigging the glider.

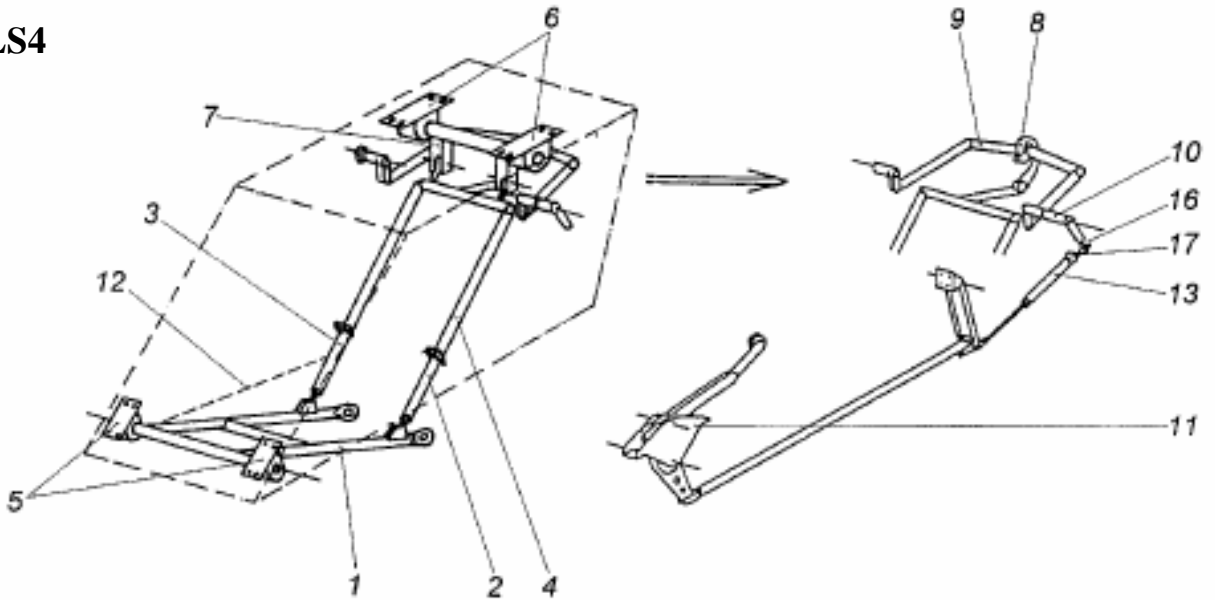
Tail skid including cable deflector at front end or tail wheel optional.

LS4-a, LS4-b

LS4 with TN 4013 executed



LS4



Parts list see next page

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Parts list landing gears

No.	Description	LS4	LS4-a and LS4 TN4013	LS4-b
1	front fork	1R2-1		
2	left strut	1R2-24	4R2-2e	
3	right strut	1R2-2	4R2-62a	
4	rear fork	1R2-3	1R2-3e	
5	small rubber mounts	2 x 31500 SM 550		
6	large rubber mounts	2 x 31700 SM 650	3 x 31700 SM 650	
7	swinging arm	1R2-4	3R2-64e	
8	drive lever	3 x 4R2-6		
9	inner drive	1R2-5a		
10	outer drive (drilled together with inner drive)	4R2-15		4R2-120
11	cockpit handle unit			
12	shock absorber	x		
13	gas strut 400 N	x		
14	bracket for rubber mount	/	3R2-67	
15	spring unit support	/	2 x 3R2-66b	
16	upper adjustment screw	4R2-17		4R2-119a
17	lower adjustment screw	4R2-8		4R2-124a

1.14 Wheel Brake

Feet operated; activated by Bowden cable from rudder pedals.

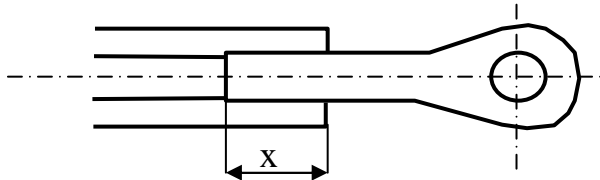
1.15 Hint for working at the control systems

Caution: When working on control systems:

Protection against corrosion (humidity entering pushrods) required for previously used inspection openings to check minimum reach of thread to be dropped.

Used rod end bearings may have different thread lengths with identical heads. Therefore, before adjusting rod end bearings, remaining thread reach must be checked by dismantling.

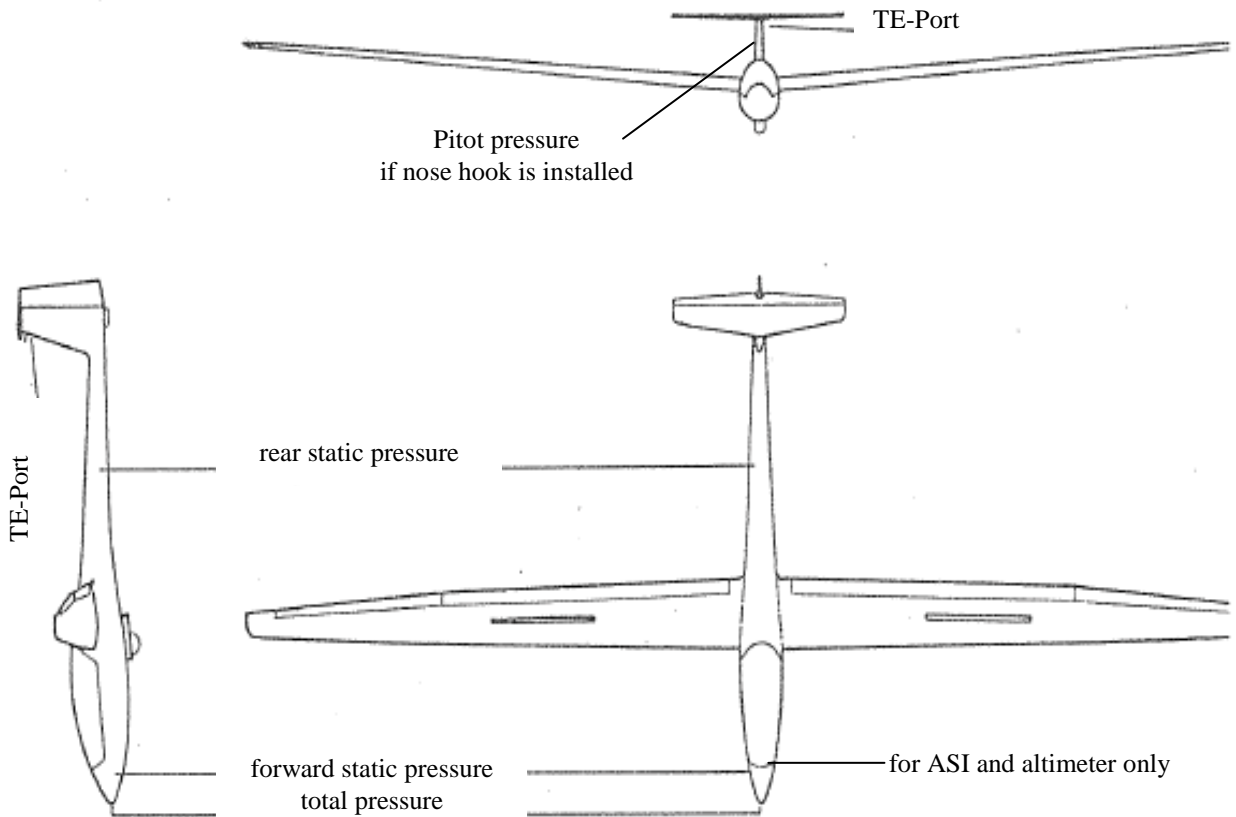
Thread diameter	Minimum reach x	Rod end designation
M6 x 1 (Standard)	17 mm / 0.67 in	EM 6 R (used in single cases only)
M8 x 1,25 (Standard)	17 mm / 0.67 in	various versions possible
M10 x 1 (Fine thread)	17 mm / 0.67 in	PM 6 long



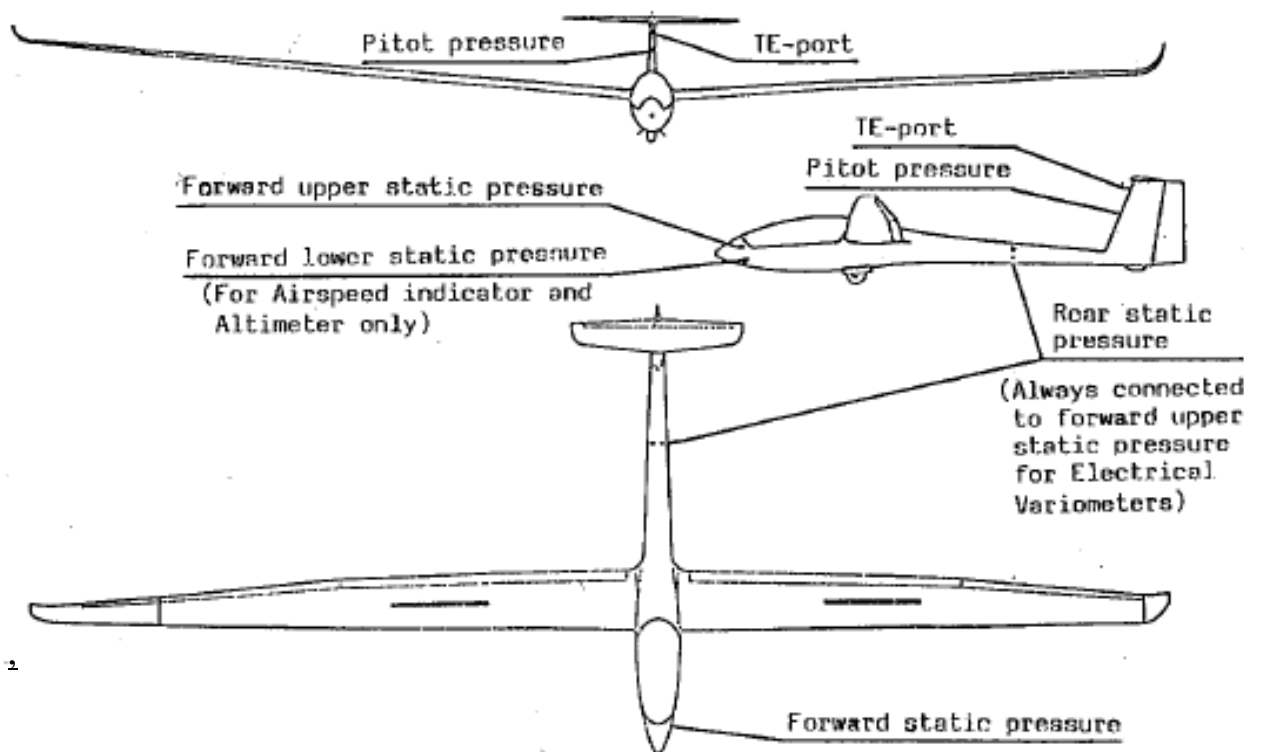
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1.16 Pressure ports

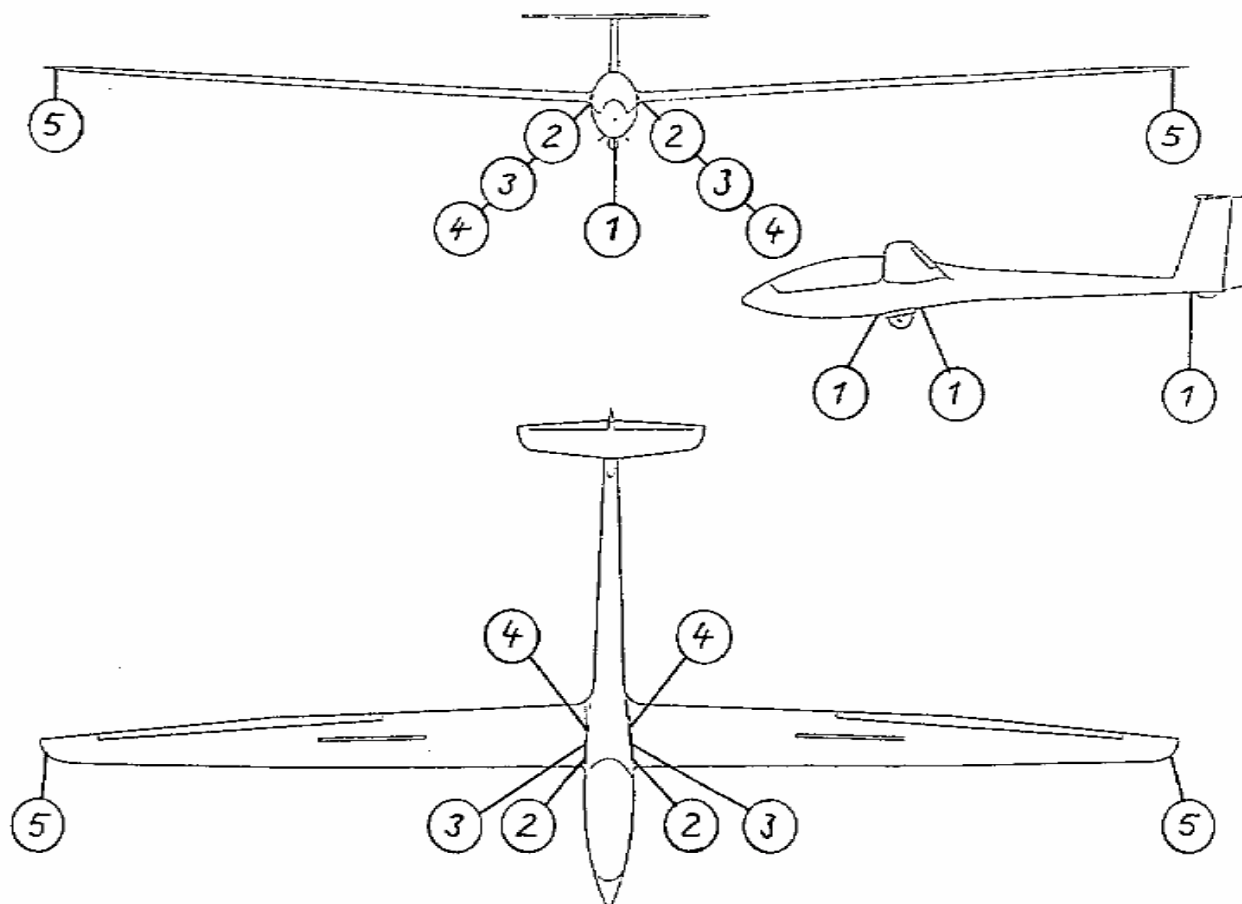
1.16.1 Pressure ports LS4, LS4-a:



1.16.2 Pressure ports LS4-b:



1.17 Drain orifices



In case of TN 4045 (Winglets) executed there must be drain holes at the parting at the inboard wing and at the wing tips (with winglets and conventional tips).

1.18 Colour coding of instrument lines

The following colour code is used for the lines:

Hoses are dia. 8x1,5 mm

Red = pitot pressure

Blue = lower static pressure forward (Airspeed indicator and altimeter)

Yellow = static pressure aft

Green = pressure port for TE probe (total energy probe).

Additionally 3 clear tubes without colour marking are installed from the vacuum bottle stowage compartment.

Only LS4-b: Transparent dia. 6x1: upper front static pressure ports for very sensitive variometers or connected together with yellow line for electric variometers

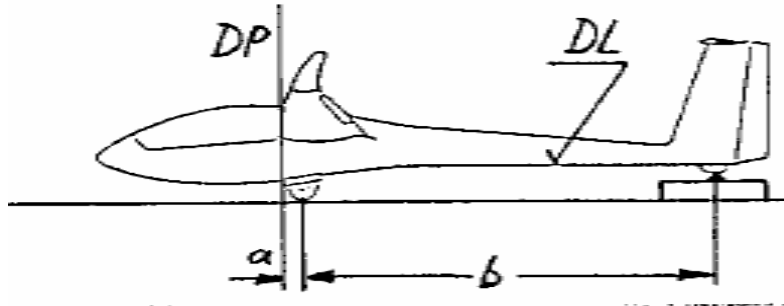
2 Mass and balance

2.1 Weighing procedure

Datum Line (DL): Under side of fuselage boom placed horizontal
Datum Point (DP): Leading edge of wing at root

1. Determine total mass by weighing all parts and adding together. For inflight C.G. position, the pilot's mass must also be taken into account.
2. Assemble sailplane. For inflight C.G., the pilot must be seated in the sailplane.
3. Raise tail on weighing machine until datum line is level using wooden blocks or adjustable jack. (Check with leveling gauge)
4. Measure distance (b) from tail support to centre of landing gear axis.
5. Using plumb lead, determine points on floor perpendicular to left and right datum points, and points on floor perpendicular to centre of landing gear axis. Measure distance (a) from wheel axis to datum point.

Caution: The distances a and b may change with different masses due to deflection of the landing gear and by setting of the rubber spring elements.



6. Determine tail load and deduct mass of additional auxiliary supports to get net tail load.
7. If a battery may be fitted in the vertical fin the weighing must be done in this configuration. Determine the mass of the battery separately by weighing (max. 2.6 kg, 5.7 lbs.).
8. Weight and balance must be carried out at least every 4 years.
9. Calculate empty mass C.G. position for empty or non-existent vertical tail fin tank:

$$X_{cg} = \frac{\text{net tail load} * b}{\text{empty mass}} + a$$

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Mass and balance continued

10. **Only LS4-b optional:** Calculate C.G. position for full vertical tail fin tank:
(net tail load+ tail fin water mass) * b

$$X_{cg} = \frac{\text{(net tail load+ tail fin water mass) * b}}{\text{empty mass + tail fin water mass}} + a$$

11. Loading limits

<u>max. flight mass:</u>	LS4: 472 kg <1041 lbs.> (max. 140kg <309 lbs.> water ballast)
	LS4-a: 525 kg <1157 lbs.> (max. 170kg <375 lbs.> water ballast)
	LS4-b: 525 kg <1157 lbs.> (max. 170 kg <375 lbs.> water ballast)

max. flight mass without waterballast: $W_{max} = W_{nlp} + W_{wings}$

max. of non lifting parts W_{nlp} : 230 kg up to 244kg
250 kg up to 264 kg (TN 4046/4047)
depending on empty-mass C.G. position

Caution: With TN4045 (winglets) executed, the max. mass and the max. mass of the non lifting parts are reduced by 10 kg (22 lbs.). The max. amount of waterballast is limited to 100 kg (220 lbs.)

Note: TN 4046 (manual revisions) and TN 4047 (increase of mass of non lifting parts) don't apply for LS4-b only, but also for LS4 and LS4-a (TN LS-S-01).

12. Calculate loading limits according to next page.

2.2 Calculation of loading limits, example

2.2.1 Calculation of loading limits

1. Determine Minimum Cockpit Load from table "Empty mass C.G. Position" in section 2.3 with the empty mass determined according to section 2.1. If a fin tank is installed, determine Minimum Cockpit Load with **empty and full fin tank**.

When being used in a club, Minimum Cockpit Load should be 70 kg (154 lbs) for empty or non-existent tail fin tank.

If it is higher, permanent ballast may be fitted under the forward seat portion, see section 8.1.

Finally, resulting Minimum Cockpit Load (for full **and** empty fin tank if existent) should be entered in the following places:

- in weighing report of inspection
- under instrument panel cover
- on Data Placard in cockpit
- in Flight Manual on page
LS4 and LS4-a: 1-6
LS4-b: 6-2 and 6/3

2. Maximum mass of non-lifting parts

Note: With TN LS-S-01 the procedure to determine the max. mass of the non-lifting parts used for the LS4-b will also be allowed for the LS4 and LS4-a.

Maximum mass of non-lifting parts may vary between 230 and 244 kg (507 and 538 lbs) or with (TN 4046/4047, with TN LS-S-01 also valid for LS4 and LS4-a) between 250 and 264 kg (551 and 582 lbs)

In contrast to methods used up to now the maximum mass of non-lifting parts can be determined in relation to empty mass and empty mass C.G. position according to tables in section 2.3, see also example in section 2.2.2. Maximum mass of non-lifting parts should be entered into Weighing Report.

Calculation of loading limits cont.

3. The maximum permissible Cockpit Load is usually 110 kg <242 lbs> as from table "Empty mass C.G. Position", see section 2.3.
It may be lower due to excessive equipment or repairs as otherwise the max. mass of the non lifting parts will be exceeded..
Calculate the max. payload in the fuselage by deductiong the mass of the fuselage and tailplane from the max. mass of the non lifting parts. If this value is lower than 110 kg, the lower value must be taken for the maximum permissible Cockpit Load; see also example section 2.2.2.

Resulting Maximum Cockpit Load should be entered in the following places:

- in weighing report of inspection
- on Data Placard in cockpit
- in Flight Manual on page
LS4 and LS4-a: 1-6
LS4-b: 6-2 and 6-3

If waterbags V-112 according to TN 4047 are installed, the entry "V-112" must be noted in the column "wing tank volume"

4. Empty mass (perhaps increased by mass of permanently fitted trim ballast) should be entered in the following places:
- in weighing report of inspection
 - in Flight Manual for calculation of maximum permissible water ballast mass on page
LS4 and LS4-a: 1-6
LS4-b: 6-2 and 6-3

5. Battery positions during weighing should be entered in the following places:
- in equipment list and weighing report of inspection
 - on Data Placard in cockpit
 - in Flight Manual LS4-b, page 6-3, if fitted in tail fin

Note for LS4 und LS4-a: If a fin battery may be installed, make a note on page 1-6.

6. For permanent installation of trim ballast mass see section 8.

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2.2.2 Examples for calculation of loading limits

This sample is for an LS4-b, procede similar for the other variants.

1) Min. cockpit load (fin tank empty)

With empty mass 255 kg/ 562 lbs and empty mass C.G. 665 mm/26,181 in

The min. cockpit load according to table section 2.3 is **75 kg/ 165 lbs**

(limit values 586 mm/ 23,071 in up to 680 mm/ 26,772 in

> actual value 665 mm/ 26,181 in)

Min. cockpit load (fin tank 3,5 kg/ 7,7 lbs full)

With empty mass 258,5 kg/570 lbs and empty mass C.G. 711 mm/ 28,000 in

The min. cockpit load according to table section 2.3 is **85 kg/ 187 lbs**

(limit values 580 mm/22,835 in up to 712 mm/28,031 in

> actual value 711 mm/ 28,000 in)

Min. cockpit load (fin tank 5,6 kg/12,3 lbs full)

With empty mass 260,6 kg/575 lbs and empty mass C.G. 739 mm/ 29,094 in

The min. cockpit load according to table section 2.3 is **95 kg/ 209 lbs**

(limit values 577 mm/ 22,717 in up to 748 mm/29,449 in

> actual value 739 mm/ 29,094 in)

2) Max. mass of the non lifting parts

With empty mass 255 kg/ 562 lbs and empty mass C.G. 665 mm/ 26,181 in

The max. mass of the non lifting parts according to table section 2.4.1

(normal water bags) is

234 kg/ 516 lbs

and according to table section 2.4.2 (TN 4047 “V 112”) **254 kg/ 560 lbs**

3) Max. cockpit load

a) Max. cockpit load with normal waterbags

Max. mass of the non lifting parts

234,0 kg/ 516 lbs

deduct:

fuselage with complete equipment, battery in baggage compartment, canopy,

main pins, 130,6 kg/ 288 lbs

horizontal tailplane

6,3 kg/ 14 lbs

Payload in fuselage

97,1 kg/ 214 lbs

Max. cockpit load (max. 110 kg/242 lbs.)

97 kg/ 214 lbs

4) Max. take-off mass

525 kg/ 1157 lbs

Entry in flight Manual page 6-2/3 for example above

Empty mass kg/ lbs	C.G. position mm/in.	Max. loading kg/lbs.	Min. loading for vertical fin tank		Permanently fitted mass balance		Vertical tail fin battery	Wing tank volume	Date/ Inspector
			Full kg/lbs.	Empty kg/lbs.	Frontk g/lbs.	Rear kg/lbs.			
255 / 562	665 / 26,181	97 / 214	95 / 209	75 / 165	--- / ---	--- / ---	No	160 / 42,3	Dez. 2009 / Dö.

Examples for calculation of loading limits cont.

- b) Max. cockpit load for with waterbags “V-112” according to TN 4047
 Max. mass of the non lifting parts 254,0 kg/560 lbs.
 deduct:
 fuselage with complete equipment, battery in baggage compartment, 130,6 kg/288 lbs.
 canopy, main pins, 6,3 kg/ 14 lbs.
 horizontal tailplane
 Payload in fuselage 117,1 kg/258 lbs.
- Max. cockpit load (max. 110 kg/242 lbs.) 110 kg/242 lbs.
- 4) Max. take-off mass 525 kg/1157 lbs.

Entry in flight Manual page 6-2/3 for example above

Empty mass kg/lbs	C.G. position mm/in	Max. loading kg/lbs	Min. loading for vertical fin tank		Permanently fitted mass balance		Vertical tail fin battery Yes / No	Wing tank volume Ltr./Gal	Date/ Inspector
			Full kg/lbs	Empty kg/lbs	Front kg/lbs	rear kg/lbs			
255 / 562	665 / 26,181	110 / 242	95 / 209	75 / 165	---	---	No	V112 / 29,6	Dez. 2009/ Dö

Note for both examples: The small margin between maximum load (97 kg <214 lbs>) and minimum cockpit load with vertical fin tank full (95 kg < 209 lbs>, here entered for 5.5 Liter tank) indicates a pre-flight check of the fin tank valve before every take-off is required. If passage can't be verified while blowing air through the valve, water is most likely remaining in the tank and therefore the tank requires such a high minimum cockpit load.

Note for both examples: The mass of a battery in the fin and of waterballast in the fin tank don't count to the mass of the non-lifting parts, but must be counted when determining the max. total waterballast for not exceeding the max. TOW.

2.3 Empty mass C.G. range

Note: With TN LS-S-01 the same in-flight C.G. limits as for LS4-a and LS4-b have been approved for variant LS4 too. So you will find only 1 set of tables valid for all variants in this manual.

Maintenance Manual LS4

Empty mass C.G. range tables

(empty mass up to 272 kg, min. cockpit load 60 – 90 kg) **Table for <kg> and <mm>**
 Calculated C.G. positions for weighed empty weight must be within limit values. Related cockpit loads are permissible minimum and maximum cockpit loads. For in and lbs values see page 2-11.

Empty mass <kg>	Cockpit load <kg> / Empty mass C.G. range <mm>						
	110-60	110-65	110-70	110-75	110-80	110-85	110-90
235	616 -645	616 -664	616 -684	616 -704	616 -724	616 -744	616 -765
236	615 -644	615 -663	615 -683	615 -703	615 -723	615 -743	615 -763
237	613 -643	613 -662	613 -682	613 -701	613 -721	613 -741	613 -762
238	611 -642	611 -661	611 -681	611 -700	611 -720	611 -740	611 -760
239	610 -641	610 -660	610 -679	610 -699	610 -719	610 -739	610 -759
240	608 -640	608 -659	608 -678	608 -698	608 -717	608 -737	608 -757
241	607 -639	607 -658	607 -677	607 -696	607 -716	607 -736	607 -756
242	605 -638	605 -657	605 -676	605 -695	605 -715	605 -734	605 -754
243	603 -637	603 -656	603 -675	603 -694	603 -713	603 -733	603 -753
244	602 -636	602 -655	602 -674	602 -693	602 -712	602 -732	602 -752
245	600 -635	600 -654	600 -673	600 -691	600 -711	600 -730	600 -750
246	599 -634	599 -653	599 -671	599 -690	599 -710	599 -729	599 -749
247	597 -633	597 -652	597 -670	597 -689	597 -708	597 -728	597 -747
248	596 -632	596 -651	596 -669	596 -688	596 -707	596 -726	596 -746
249	594 -631	594 -650	594 -668	594 -687	594 -706	594 -725	594 -744
250	593 -630	593 -649	593 -667	593 -686	593 -705	593 -724	593 -743
251	591 -629	591 -648	591 -666	591 -684	591 -703	591 -722	591 -742
252	590 -628	590 -647	590 -665	590 -683	590 -702	590 -721	590 -740
253	588 -627	588 -646	588 -664	588 -682	588 -701	588 -720	588 -739
254	587 -626	587 -645	587 -663	587 -681	587 -700	587 -719	587 -738
255	586 -625	586 -644	586 -662	586 -680	586 -699	586 -717	586 -736
256	584 -625	584 -643	584 -661	584 -679	584 -698	584 -716	584 -735
257	583 -624	583 -642	583 -660	583 -678	583 -696	583 -715	583 -734
258	581 -623	581 -641	581 -659	581 -677	581 -695	581 -714	581 -732
259	580 -622	580 -640	580 -658	580 -676	580 -694	580 -712	580 -731
260	579 -621	579 -639	579 -657	579 -675	579 -693	579 -711	579 -730
261	577 -620	577 -638	577 -656	577 -674	577 -692	577 -710	577 -729
262	576 -619	576 -637	576 -655	576 -673	576 -691	576 -709	576 -727
263	575 -619	575 -636	575 -654	575 -671	575 -690	575 -708	575 -726
264	573 -618	573 -635	573 -653	573 -670	573 -688	573 -707	573 -725
265	572 -617	572 -634	572 -652	572 -669	572 -687	572 -705	572 -724
266	571 -616	571 -634	571 -651	571 -668	571 -686	571 -704	571 -722
267	569 -615	569 -633	569 -650	569 -667	569 -685	569 -703	569 -721
268	568 -614	568 -632	568 -649	568 -666	568 -684	568 -702	568 -720
269	567 -614	567 -631	567 -648	567 -665	567 -683	567 -701	567 -719
270	566 -613	566 -630	566 -647	566 -664	566 -682	566 -700	566 -718
271	564 -612	564 -629	564 -646	564 -663	564 -681	564 -699	564 -716
272	563 -611	563 -628	563 -646	563 -663	563 -680	563 -698	563 -715

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Empty mass C.G. range tables cont.

(empty mass up to 272 kg, cockpit load 95 – 110 kg) **Table for <kg> and <mm>**

Partly, given values for Minimum Cockpit Load exceed permissible Maximum Cockpit Load considerably. **These values are required for the use of the vertical tail fin ballast tank as a distinct warning, that its use is limited.**

Empty mass <kg>	<i>Cockpit load <kg> / Empty mass C.G. range <mm></i>								
	<i>max. + min. cockpit load</i>						<i>min. cockpit load</i>		
	<i>110-95</i>	<i>110-100</i>	<i>110-105</i>	<i>110-110</i>	<i>- 115</i>	<i>- 120</i>	<i>-125</i>		
235	616 -786	616 -808	616 -830	616 -853	-876	-900	-926		
236	615 -784	615 -806	615 -828	615 -851	-874	-898	-924		
237	613 -783	613 -804	613 -827	613 -849	-872	-896	-922		
238	611 -781	611 -803	611 -825	611 -847	-870	-894	-919		
239	610 -780	610 -801	610 -823	610 -846	-868	-892	-917		
240	608 -778	608 -799	608 -821	608 -844	-866	-890	-915		
241	607 -776	607 -798	607 -820	607 -842	-864	-888	-913		
242	605 -775	605 -796	605 -818	605 -840	-862	-886	-911		
243	603 -773	603 -794	603 -816	603 -838	-860	-884	-909		
244	602 -772	602 -793	602 -814	602 -836	-859	-882	-907		
245	600 -770	600 -791	600 -813	600 -835	-857	-880	-905		
246	599 -769	599 -789	599 -811	599 -833	-855	-878	-903		
247	597 -767	597 -788	597 -809	597 -831	-853	-876	-901		
248	596 -766	596 -786	596 -808	596 -829	-851	-874	-898		
249	594 -764	594 -785	594 -806	594 -828	-849	-872	-896		
250	593 -763	593 -783	593 -804	593 -826	-848	-870	-895		
251	591 -761	591 -782	591 -803	591 -824	-846	-869	-893		
252	590 -760	590 -780	590 -801	590 -823	-844	-867	-891		
253	588 -759	588 -779	588 -800	588 -821	-842	-865	-889		
254	587 -757	587 -777	587 -798	587 -819	-841	-863	-887		
255	586 -756	586 -776	586 -797	586 -818	-839	-861	-885		
256	584 -754	584 -774	584 -795	584 -816	-837	-859	-883		
257	583 -753	583 -773	583 -793	583 -814	-835	-858	-881		
258	581 -752	581 -771	581 -792	581 -813	-834	-856	-879		
259	580 -750	580 -770	580 -790	580 -811	-832	-854	-877		
260	579 -749	579 -768	579 -789	579 -810	-830	-852	-875		
261	577 -748	577 -767	577 -787	577 -808	-829	-851	-874		
262	576 -746	576 -766	576 -786	576 -806	-827	-849	-872		
263	575 -745	575 -764	575 -784	575 -805	-825	-847	-870		
264	573 -744	573 -763	573 -783	573 -803	-824	-845	-868		
265	572 -742	572 -762	572 -782	572 -802	-822	-844	-867		
266	571 -741	571 -760	571 -780	571 -800	-821	-842	-865		
267	569 -740	569 -759	569 -779	569 -799	-819	-840	-863		
268	568 -739	568 -757	568 -777	568 -797	-818	-839	-861		
269	567 -737	567 -756	567 -776	567 -796	-816	-837	-860		
270	566 -736	566 -755	566 -775	566 -794	-814	-836	-858		
271	564 -735	564 -754	564 -773	564 -793	-813	-834	-856		
272	563 -734	563 -752	563 -772	563 -791	-811	-832	-855		

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Empty mass C.G. range tables

(empty mass from 273 kg on, min. cockpit load 60 – 90 kg)

Table for <kg> and <mm>

Empty mass <kg>	Cockpit load <kg> / Empty mass C.G. range <mm>						
	110-60	110-65	110-70	110-75	110-80	110-85	110-90
273	562 -611	562 -628	562 -645	562 -662	562 -679	562 -696	562 -714
274	561 -610	561 -627	561 -644	561 -661	561 -678	561 -695	561 -713
275	559 -609	559 -626	559 -643	559 -660	559 -677	559 -694	559 -712
276	558 -608	558 -625	558 -642	558 -659	558 -676	558 -693	558 -711
277	557 -608	557 -624	557 -641	557 -658	557 -675	557 -692	557 -710
278	556 -607	556 -624	556 -640	556 -657	556 -674	556 -691	556 -709
279	555 -606	555 -623	555 -639	555 -656	555 -673	555 -690	555 -707
280	553 -605	553 -622	553 -639	553 -655	553 -672	553 -689	553 -706
281	552 -605	552 -621	552 -638	552 -654	552 -671	552 -688	552 -705
282	551 -604	551 -620	551 -637	551 -653	551 -670	551 -687	551 -704
283	550 -603	550 -620	550 -636	550 -652	550 -669	550 -686	550 -703
284	549 -602	549 -619	549 -635	549 -651	549 -668	549 -685	549 -702
285	548 -602	548 -618	548 -634	548 -651	548 -667	548 -684	548 -701
286	547 -601	547 -617	547 -633	547 -650	547 -666	547 -683	547 -700
287	545 -600	545 -617	545 -633	545 -649	545 -665	545 -682	545 -699
288	544 -600	544 -616	544 -632	544 -648	544 -664	544 -681	544 -698
289	543 -599	543 -615	543 -631	543 -647	543 -664	543 -680	543 -697
290	542 -598	542 -614	542 -630	542 -646	542 -663	542 -679	542 -696
291	541 -598	541 -614	541 -629	541 -645	541 -662	541 -678	541 -695
292	540 -597	540 -613	540 -629	540 -645	540 -661	540 -677	540 -694
293	539 -596	539 -612	539 -628	539 -644	539 -660	539 -676	539 -693
294	538 -596	538 -611	538 -627	538 -643	538 -659	538 -675	538 -692
295	537 -595	537 -611	537 -626	537 -642	537 -658	537 -674	537 -691
296	536 -594	536 -610	536 -626	536 -641	536 -657	536 -673	536 -690
297	535 -594	535 -609	535 -625	535 -640	535 -656	535 -672	535 -689
298	534 -593	534 -609	534 -624	534 -640	534 -656	534 -672	534 -688
299	533 -592	533 -608	533 -623	533 -639	533 -655	533 -671	533 -687
300	532 -592	532 -607	532 -623	532 -638	532 -654	532 -670	532 -686
301	531 -591	531 -606	531 -622	531 -637	531 -653	531 -669	531 -685
302	530 -590	530 -606	530 -621	530 -636	530 -652	530 -668	530 -684
303	528 -590	528 -605	528 -620	528 -636	528 -651	528 -667	528 -683
304	528 -589	528 -604	528 -620	528 -635	528 -651	528 -666	528 -682
305	527 -588	527 -604	527 -619	527 -634	527 -650	527 -665	527 -681
306	526 -588	526 -603	526 -618	526 -633	526 -649	526 -664	526 -680
307	525 -587	525 -602	525 -618	525 -633	525 -648	525 -664	525 -679
308	523 -586	523 -601	523 -616	523 -631	523 -647	523 -662	523 -678
309	522 -585	522 -600	522 -615	522 -630	522 -646	522 -661	522 -678
310	521 -585	521 -600	521 -615	521 -629	521 -645	521 -660	521 -677

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Empty mass C.G. range tables cont

(empty mass from 273 kg on, cockpit load 95 – 110 kg) **Table for <kg> and <mm>**

Empty mass <kg>	Cockpit load <kg> / Empty mass C.G. range <mm>										
	max. + min. cockpit load								min. cockpit load		
	110-95		110-100		110-105		110-110		- 115	- 120	-125
273	562	-732	562	-751	562	-770	562	-790	-810	-831	-853
274	561	-731	561	-750	561	-769	561	-789	-808	-829	-851
275	559	-730	559	-748	559	-768	559	-787	-807	-828	-850
276	558	-729	558	-747	558	-766	558	-786	-805	-826	-848
277	557	-728	557	-746	557	-765	557	-784	-804	-825	-846
278	556	-726	556	-745	556	-764	556	-783	-803	-823	-845
279	555	-725	555	-743	555	-762	555	-782	-801	-822	-843
280	553	-724	553	-742	553	-761	553	-780	-800	-820	-842
281	552	-723	552	-741	552	-760	552	-779	-798	-819	-840
282	551	-722	551	-740	551	-759	551	-778	-797	-817	-838
283	550	-721	550	-739	550	-757	550	-776	-795	-816	-837
284	549	-719	549	-737	549	-756	549	-775	-794	-814	-835
285	548	-718	548	-736	548	-755	548	-774	-793	-813	-834
286	547	-717	547	-735	547	-754	547	-772	-791	-811	-832
287	545	-716	545	-734	545	-752	545	-771	-790	-810	-831
288	544	-715	544	-733	544	-751	544	-770	-789	-808	-829
289	543	-714	543	-731	543	-750	543	-768	-787	-807	-828
290	542	-713	542	-730	542	-749	542	-767	-786	-806	-826
291	541	-712	541	-729	541	-747	541	-766	-785	-804	-825
292	540	-711	540	-728	540	-746	540	-765	-783	-803	-823
293	539	-710	539	-727	539	-745	539	-763	-782	-801	-822
294	538	-709	538	-726	538	-744	538	-762	-781	-800	-820
295	537	-708	537	-725	537	-743	537	-761	-779	-799	-819
296	536	-707	536	-724	536	-742	536	-760	-778	-797	-818
297	535	-705	535	-723	535	-740	535	-759	-777	-796	-816
298	534	-704	534	-721	534	-739	534	-757	-775	-795	-815
299	533	-703	533	-720	533	-738	533	-756	-774	-793	-813
300	532	-702	532	-719	532	-737	532	-755	-773	-792	-812
301	531	-701	531	-718	531	-736	531	-754	-772	-791	-811
302	530	-700	530	-717	530	-735	530	-753	-771	-789	-809
303	528	-699	528	-716	528	-734	528	-751	-769	-788	-808
304	528	-698	528	-715	528	-733	528	-750	-768	-787	-807
305	527	-697	527	-714	527	-732	527	-749	-767	-786	-805
306	526	-696	526	-713	526	-730	526	-748	-766	-784	-804
307	525	-696	525	-712	525	-729	525	-747	-764	-783	-803
308	524	-695	524	-711	524	-728	524	-746	-763	-782	-801
309	523	-694	523	-710	523	-727	523	-745	-762	-781	-800
310	522	-693	522	-709	522	-726	522	-743	-761	-779	-799

Maintenance Manual LS4

Empty mass C.G. range continued

(empty mass up to 272 kg <600 lbs.>, min. cockpit load 132 – 165lbs.)

Table for <lbs.> and <in.>

Empty mass <lbs.>	<i>Cockpit load <lbs.> / Empty mass C.G. range <in.></i>			
	<i>243-132</i>	<i>243-143</i>	<i>243-154</i>	<i>243-165</i>
518	24,25 -25,39	24,25 -26,14	24,25 -26,93	24,25 -27,72
520	24,21 -25,35	24,21 -26,10	24,21 -26,89	24,21 -27,68
522	24,13 -25,32	24,13 -26,06	24,13 -26,85	24,13 -27,60
525	24,06 -25,28	24,06 -26,02	24,06 -26,81	24,06 -27,56
527	24,02 -25,24	24,02 -25,98	24,02 -26,73	24,02 -27,52
529	23,94 -25,20	23,94 -25,95	23,94 -26,69	23,94 -27,48
531	23,90 -25,16	23,90 -25,91	23,90 -26,65	23,90 -27,40
534	23,82 -25,12	23,82 -25,87	23,82 -26,61	23,82 -27,36
536	23,74 -25,08	23,74 -25,83	23,74 -26,58	23,74 -27,32
538	23,70 -25,04	23,70 -25,79	23,70 -26,54	23,70 -27,28
540	23,62 -25,00	23,62 -25,75	23,62 -26,50	23,62 -27,21
542	23,58 -24,96	23,58 -25,71	23,58 -26,42	23,58 -27,17
545	23,50 -24,92	23,50 -25,67	23,50 -26,38	23,50 -27,13
547	23,47 -24,88	23,47 -25,63	23,47 -26,34	23,47 -27,09
549	23,39 -24,84	23,39 -25,59	23,39 -26,30	23,39 -27,05
551	23,35 -24,80	23,35 -25,55	23,35 -26,26	23,35 -27,01
553	23,27 -24,76	23,27 -25,51	23,27 -26,22	23,27 -26,93
556	23,23 -24,72	23,23 -25,47	23,23 -26,18	23,23 -26,89
558	23,15 -24,69	23,15 -25,43	23,15 -26,14	23,15 -26,85
560	23,11 -24,65	23,11 -25,39	23,11 -26,10	23,11 -26,81
562	23,07 -24,61	23,07 -25,35	23,07 -26,06	23,07 -26,77
564	22,99 -24,61	22,99 -25,32	22,99 -26,02	22,99 -26,73
567	22,95 -24,57	22,95 -25,28	22,95 -25,98	22,95 -26,69
569	22,87 -24,53	22,87 -25,24	22,87 -25,95	22,87 -26,65
571	22,84 -24,49	22,84 -25,20	22,84 -25,91	22,84 -26,61
573	22,80 -24,45	22,80 -25,16	22,80 -25,87	22,80 -26,58
575	22,72 -24,41	22,72 -25,12	22,72 -25,83	22,72 -26,54
578	22,68 -24,37	22,68 -25,08	22,68 -25,79	22,68 -26,50
580	22,64 -24,37	22,64 -25,04	22,64 -25,75	22,64 -26,42
582	22,56 -24,33	22,56 -25,00	22,56 -25,71	22,56 -26,38
584	22,52 -24,29	22,52 -24,96	22,52 -25,67	22,52 -26,34
586	22,48 -24,25	22,48 -24,96	22,48 -25,63	22,48 -26,30
589	22,40 -24,21	22,40 -24,92	22,40 -25,59	22,40 -26,26
591	22,36 -24,17	22,36 -24,88	22,36 -25,55	22,36 -26,22
593	22,32 -24,17	22,32 -24,84	22,32 -25,51	22,32 -26,18
595	22,28 -24,13	22,28 -24,80	22,28 -25,47	22,28 -26,14
597	22,21 -24,09	22,21 -24,76	22,21 -25,43	22,21 -26,10
600	22,17 -24,06	22,17 -24,72	22,17 -25,43	22,17 -26,10

Maintenance Manual LS4

Empty mass C.G. range continued

(empty mass up to 272 kg <600 lbs.>, min. cockpit load 176 – 209 lbs.)

Table for <lbs.> and <in.>

Empty mass <lbs.>	<i>Cockpit load <lbs.> / Empty mass C.G. range <in.></i>			
	<i>243-176</i>	<i>243-187</i>	<i>243-198</i>	<i>243-209</i>
518	24,25 -28,50	24,25 -29,29	24,25 -30,12	24,25 -30,95
520	24,21 -28,47	24,21 -29,25	24,21 -30,04	24,21 -30,87
522	24,13 -28,39	24,13 -29,17	24,13 -30,00	24,13 -30,83
525	24,06 -28,35	24,06 -29,13	24,06 -29,92	24,06 -30,75
527	24,02 -28,31	24,02 -29,09	24,02 -29,88	24,02 -30,71
529	23,94 -28,23	23,94 -29,02	23,94 -29,80	23,94 -30,63
531	23,90 -28,19	23,90 -28,98	23,90 -29,76	23,90 -30,55
534	23,82 -28,15	23,82 -28,90	23,82 -29,69	23,82 -30,51
536	23,74 -28,07	23,74 -28,86	23,74 -29,65	23,74 -30,43
538	23,70 -28,03	23,70 -28,82	23,70 -29,61	23,70 -30,39
540	23,62 -27,99	23,62 -28,74	23,62 -29,53	23,62 -30,32
542	23,58 -27,95	23,58 -28,70	23,58 -29,49	23,58 -30,28
545	23,50 -27,87	23,50 -28,66	23,50 -29,41	23,50 -30,20
547	23,47 -27,84	23,47 -28,58	23,47 -29,37	23,47 -30,16
549	23,39 -27,80	23,39 -28,54	23,39 -29,29	23,39 -30,08
551	23,35 -27,76	23,35 -28,50	23,35 -29,25	23,35 -30,04
553	23,27 -27,68	23,27 -28,43	23,27 -29,21	23,27 -29,96
556	23,23 -27,64	23,23 -28,39	23,23 -29,13	23,23 -29,92
558	23,15 -27,60	23,15 -28,35	23,15 -29,09	23,15 -29,88
560	23,11 -27,56	23,11 -28,31	23,11 -29,06	23,11 -29,80
562	23,07 -27,52	23,07 -28,23	23,07 -28,98	23,07 -29,76
564	22,99 -27,48	22,99 -28,19	22,99 -28,94	22,99 -29,69
567	22,95 -27,40	22,95 -28,15	22,95 -28,90	22,95 -29,65
569	22,87 -27,36	22,87 -28,11	22,87 -28,82	22,87 -29,61
571	22,84 -27,32	22,84 -28,03	22,84 -28,78	22,84 -29,53
573	22,80 -27,28	22,80 -27,99	22,80 -28,74	22,80 -29,49
575	22,72 -27,24	22,72 -27,95	22,72 -28,70	22,72 -29,45
578	22,68 -27,21	22,68 -27,91	22,68 -28,62	22,68 -29,37
580	22,64 -27,17	22,64 -27,87	22,64 -28,58	22,64 -29,33
582	22,56 -27,09	22,56 -27,84	22,56 -28,54	22,56 -29,29
584	22,52 -27,05	22,52 -27,76	22,52 -28,50	22,52 -29,21
586	22,48 -27,01	22,48 -27,72	22,48 -28,43	22,48 -29,17
589	22,40 -26,97	22,40 -27,68	22,40 -28,39	22,40 -29,13
591	22,36 -26,93	22,36 -27,64	22,36 -28,35	22,36 -29,09
593	22,32 -26,89	22,32 -27,60	22,32 -28,31	22,32 -29,02
595	22,28 -26,85	22,28 -27,56	22,28 -28,27	22,28 -28,98
597	22,21 -26,81	22,21 -27,52	22,21 -28,19	22,21 -28,94
600	22,17 -26,77	22,17 -27,48	22,17 -28,15	22,17 -28,90

Maintenance Manual LS4

Empty mass C.G. range continued

(empty mass up to 272 kg <600 lbs.>, min. cockpit load 220 – 243 lbs.)

Table for <lbs.> and <in.>

Partly, given values for Minimum Cockpit Load exceed permissible Maximum Cockpit Load considerably. **These values are required for the use of the vertical tail fin ballast tank as a distinct warning, that its use is limited.**

Empty mass <kg>	Cockpit load <kg> / Empty mass C.G. range <mm>					
	max. + min. cockpit load			min. cockpit load		
	243-220	243-231	243-243	-254	-265	-276
518	24,25 -31,81	24,25 -32,68	24,25 -33,58	-34,49	-35,43	-36,46
520	24,21 -31,73	24,21 -32,60	24,21 -33,50	-34,41	-35,35	-36,38
522	24,13 -31,65	24,13 -32,56	24,13 -33,43	-34,33	-35,28	-36,30
525	24,06 -31,61	24,06 -32,48	24,06 -33,35	-34,25	-35,20	-36,18
527	24,02 -31,54	24,02 -32,40	24,02 -33,31	-34,17	-35,12	-36,10
529	23,94 -31,46	23,94 -32,32	23,94 -33,23	-34,09	-35,04	-36,02
531	23,90 -31,42	23,90 -32,28	23,90 -33,15	-34,02	-34,96	-35,95
534	23,82 -31,34	23,82 -32,21	23,82 -33,07	-33,94	-34,88	-35,87
536	23,74 -31,26	23,74 -32,13	23,74 -32,99	-33,86	-34,80	-35,79
538	23,70 -31,22	23,70 -32,05	23,70 -32,91	-33,82	-34,72	-35,71
540	23,62 -31,14	23,62 -32,01	23,62 -32,87	-33,74	-34,65	-35,63
542	23,58 -31,06	23,58 -31,93	23,58 -32,80	-33,66	-34,57	-35,55
545	23,50 -31,02	23,50 -31,85	23,50 -32,72	-33,58	-34,49	-35,47
547	23,47 -30,95	23,47 -31,81	23,47 -32,64	-33,50	-34,41	-35,35
549	23,39 -30,91	23,39 -31,73	23,39 -32,60	-33,43	-34,33	-35,28
551	23,35 -30,83	23,35 -31,65	23,35 -32,52	-33,39	-34,25	-35,24
553	23,27 -30,79	23,27 -31,61	23,27 -32,44	-33,31	-34,21	-35,16
556	23,23 -30,71	23,23 -31,54	23,23 -32,40	-33,23	-34,13	-35,08
558	23,15 -30,67	23,15 -31,50	23,15 -32,32	-33,15	-34,06	-35,00
560	23,11 -30,59	23,11 -31,42	23,11 -32,24	-33,11	-33,98	-34,92
562	23,07 -30,55	23,07 -31,38	23,07 -32,21	-33,03	-33,90	-34,84
564	22,99 -30,47	22,99 -31,30	22,99 -32,13	-32,95	-33,82	-34,76
567	22,95 -30,43	22,95 -31,22	22,95 -32,05	-32,87	-33,78	-34,69
569	22,87 -30,35	22,87 -31,18	22,87 -32,01	-32,84	-33,70	-34,61
571	22,84 -30,32	22,84 -31,10	22,84 -31,93	-32,76	-33,62	-34,53
573	22,80 -30,24	22,80 -31,06	22,80 -31,89	-32,68	-33,54	-34,45
575	22,72 -30,20	22,72 -30,98	22,72 -31,81	-32,64	-33,50	-34,41
578	22,68 -30,16	22,68 -30,95	22,68 -31,73	-32,56	-33,43	-34,33
580	22,64 -30,08	22,64 -30,87	22,64 -31,69	-32,48	-33,35	-34,25
582	22,56 -30,04	22,56 -30,83	22,56 -31,61	-32,44	-33,27	-34,17
584	22,52 -30,00	22,52 -30,79	22,52 -31,58	-32,36	-33,23	-34,13
586	22,48 -29,92	22,48 -30,71	22,48 -31,50	-32,32	-33,15	-34,06
589	22,40 -29,88	22,40 -30,67	22,40 -31,46	-32,24	-33,07	-33,98
591	22,36 -29,80	22,36 -30,59	22,36 -31,38	-32,21	-33,03	-33,90
593	22,32 -29,76	22,32 -30,55	22,32 -31,34	-32,13	-32,95	-33,86
595	22,28 -29,72	22,28 -30,51	22,28 -31,26	-32,05	-32,91	-33,78
597	22,21 -29,69	22,21 -30,43	22,21 -31,22	-32,01	-32,84	-33,70
600	22,17 -29,61	22,17 -30,39	22,17 -31,14	-31,93	-32,76	-33,66

Maintenance Manual LS4

Empty mass C.G. range continued

(empty mass from 273 kg <602 lbs.> on, min. cockpit load 132 – 165 lbs.)

Table for <lbs.> and <in.>

Empty mass <lbs.>	<i>Cockpit load <lbs.> / Empty mass C.G. range <in.></i>			
	<i>243-132</i>	<i>243-143</i>	<i>243-154</i>	<i>243-165</i>
602	22,13 -24,06	22,13 -24,72	22,13 -25,39	22,13 -26,06
604	22,09 -24,02	22,09 -24,69	22,09 -25,35	22,09 -26,02
606	22,01 -23,98	22,01 -24,65	22,01 -25,32	22,01 -25,98
608	21,97 -23,94	21,97 -24,61	21,97 -25,28	21,97 -25,95
611	21,93 -23,94	21,93 -24,57	21,93 -25,24	21,93 -25,91
613	21,89 -23,90	21,89 -24,57	21,89 -25,20	21,89 -25,87
615	21,85 -23,86	21,85 -24,53	21,85 -25,16	21,85 -25,83
617	21,77 -23,82	21,77 -24,49	21,77 -25,16	21,77 -25,79
619	21,73 -23,82	21,73 -24,45	21,73 -25,12	21,73 -25,75
622	21,69 -23,78	21,69 -24,41	21,69 -25,08	21,69 -25,71
624	21,65 -23,74	21,65 -24,41	21,65 -25,04	21,65 -25,67
626	21,61 -23,70	21,61 -24,37	21,61 -25,00	21,61 -25,63
628	21,58 -23,70	21,58 -24,33	21,58 -24,96	21,58 -25,63
631	21,54 -23,66	21,54 -24,29	21,54 -24,92	21,54 -25,59
633	21,46 -23,62	21,46 -24,29	21,46 -24,92	21,46 -25,55
635	21,42 -23,62	21,42 -24,25	21,42 -24,88	21,42 -25,51
637	21,38 -23,58	21,38 -24,21	21,38 -24,84	21,38 -25,47
639	21,34 -23,54	21,34 -24,17	21,34 -24,80	21,34 -25,43
642	21,30 -23,54	21,30 -24,17	21,30 -24,76	21,30 -25,39
644	21,26 -23,50	21,26 -24,13	21,26 -24,76	21,26 -25,39
646	21,22 -23,47	21,22 -24,09	21,22 -24,72	21,22 -25,35
648	21,18 -23,47	21,18 -24,06	21,18 -24,69	21,18 -25,32
650	21,14 -23,43	21,14 -24,06	21,14 -24,65	21,14 -25,28
653	21,10 -23,39	21,10 -24,02	21,10 -24,65	21,10 -25,24
655	21,06 -23,39	21,06 -23,98	21,06 -24,61	21,06 -25,20
657	21,02 -23,35	21,02 -23,98	21,02 -24,57	21,02 -25,20
659	20,98 -23,31	20,98 -23,94	20,98 -24,53	20,98 -25,16
661	20,95 -23,31	20,95 -23,90	20,95 -24,53	20,95 -25,12
664	20,91 -23,27	20,91 -23,86	20,91 -24,49	20,91 -25,08
666	20,87 -23,23	20,87 -23,86	20,87 -24,45	20,87 -25,04
668	20,79 -23,23	20,79 -23,82	20,79 -24,41	20,79 -25,04
670	20,79 -23,19	20,79 -23,78	20,79 -24,41	20,79 -25,00
672	20,75 -23,15	20,75 -23,78	20,75 -24,37	20,75 -24,96
675	20,71 -23,15	20,71 -23,74	20,71 -24,33	20,71 -24,92
677	20,67 -23,11	20,67 -23,70	20,67 -24,33	20,67 -24,92
679	20,63 -23,11	20,63 -23,70	20,63 -24,29	20,63 -24,88
681	20,59 -23,07	20,59 -23,66	20,59 -24,25	20,59 -24,84
683	20,55 -23,03	20,55 -23,62	20,55 -24,21	20,55 -24,80

Maintenance Manual LS4

Empty mass C.G. range continued

(empty mass from 273 kg <602 lbs.> on, min. cockpit load 176 – 209 lbs.)

Table for <lbs.> and <in.>

Empty mass <lbs.>	<i>Cockpit load <lbs.> / Empty mass C.G. range <in.></i>			
	<i>243-176</i>	<i>243-187</i>	<i>243-198</i>	<i>243-209</i>
602	22,13 -26,73	22,13 -27,40	22,13 -28,11	22,13 -28,82
604	22,09 -26,69	22,09 -27,36	22,09 -28,07	22,09 -28,78
606	22,01 -26,65	22,01 -27,32	22,01 -28,03	22,01 -28,74
608	21,97 -26,61	21,97 -27,28	21,97 -27,99	21,97 -28,70
611	21,93 -26,58	21,93 -27,24	21,93 -27,95	21,93 -28,66
613	21,89 -26,54	21,89 -27,21	21,89 -27,91	21,89 -28,58
615	21,85 -26,50	21,85 -27,17	21,85 -27,84	21,85 -28,54
617	21,77 -26,46	21,77 -27,13	21,77 -27,80	21,77 -28,50
619	21,73 -26,42	21,73 -27,09	21,73 -27,76	21,73 -28,47
622	21,69 -26,38	21,69 -27,05	21,69 -27,72	21,69 -28,43
624	21,65 -26,34	21,65 -27,01	21,65 -27,68	21,65 -28,39
626	21,61 -26,30	21,61 -26,97	21,61 -27,64	21,61 -28,31
628	21,58 -26,26	21,58 -26,93	21,58 -27,60	21,58 -28,27
631	21,54 -26,22	21,54 -26,89	21,54 -27,56	21,54 -28,23
633	21,46 -26,18	21,46 -26,85	21,46 -27,52	21,46 -28,19
635	21,42 -26,14	21,42 -26,81	21,42 -27,48	21,42 -28,15
637	21,38 -26,14	21,38 -26,77	21,38 -27,44	21,38 -28,11
639	21,34 -26,10	21,34 -26,73	21,34 -27,40	21,34 -28,07
642	21,30 -26,06	21,30 -26,69	21,30 -27,36	21,30 -28,03
644	21,26 -26,02	21,26 -26,65	21,26 -27,32	21,26 -27,99
646	21,22 -25,98	21,22 -26,61	21,22 -27,28	21,22 -27,95
648	21,18 -25,95	21,18 -26,58	21,18 -27,24	21,18 -27,91
650	21,14 -25,91	21,14 -26,54	21,14 -27,21	21,14 -27,87
653	21,10 -25,87	21,10 -26,50	21,10 -27,17	21,10 -27,84
655	21,06 -25,83	21,06 -26,46	21,06 -27,13	21,06 -27,76
657	21,02 -25,83	21,02 -26,46	21,02 -27,09	21,02 -27,72
659	20,98 -25,79	20,98 -26,42	20,98 -27,05	20,98 -27,68
661	20,95 -25,75	20,95 -26,38	20,95 -27,01	20,95 -27,64
664	20,91 -25,71	20,91 -26,34	20,91 -26,97	20,91 -27,60
666	20,87 -25,67	20,87 -26,30	20,87 -26,93	20,87 -27,56
668	20,79 -25,63	20,79 -26,26	20,79 -26,89	20,79 -27,52
670	20,79 -25,63	20,79 -26,22	20,79 -26,85	20,79 -27,48
672	20,75 -25,59	20,75 -26,18	20,75 -26,81	20,75 -27,44
675	20,71 -25,55	20,71 -26,14	20,71 -26,77	20,71 -27,40
677	20,67 -25,51	20,67 -26,14	20,67 -26,73	20,67 -27,40
679	20,63 -25,47	20,63 -26,10	20,63 -26,69	20,63 -27,36
681	20,59 -25,43	20,59 -26,06	20,59 -26,69	20,59 -27,32
683	20,55 -25,43	20,55 -26,02	20,55 -26,65	20,55 -27,28

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Empty mass C.G. range continued

(empty mass empty mass from 273 kg <602 lbs.> on, min. cockpit load 220 – 243 lbs.) **Table for <lbs.> and <in.>**

Partly, given values for Minimum Cockpit Load exceed permissible Maximum Cockpit Load considerably. **These values are required for the use of the vertical tail fin ballast tank as a distinct warning, that its use is limited.**

Empty mass <kg>	Cockpit load <kg> / Empty mass C.G. range <mm>					
	max. + min. cockpit load			min. cockpit load		
	243-220	243-231	243-243	-254	-265	-276
602	22,13 -29,57	22,13 -30,32	22,13 -31,10	-31,89	-32,72	-33,58
604	22,09 -29,53	22,09 -30,28	22,09 -31,06	-31,81	-32,64	-33,50
606	22,01 -29,45	22,01 -30,24	22,01 -30,98	-31,77	-32,60	-33,47
608	21,97 -29,41	21,97 -30,16	21,97 -30,95	-31,69	-32,52	-33,39
611	21,93 -29,37	21,93 -30,12	21,93 -30,87	-31,65	-32,48	-33,31
613	21,89 -29,33	21,89 -30,08	21,89 -30,83	-31,61	-32,40	-33,27
615	21,85 -29,25	21,85 -30,00	21,85 -30,79	-31,54	-32,36	-33,19
617	21,77 -29,21	21,77 -29,96	21,77 -30,71	-31,50	-32,28	-33,15
619	21,73 -29,17	21,73 -29,92	21,73 -30,67	-31,42	-32,24	-33,07
622	21,69 -29,13	21,69 -29,88	21,69 -30,63	-31,38	-32,17	-32,99
624	21,65 -29,09	21,65 -29,80	21,65 -30,55	-31,30	-32,13	-32,95
626	21,61 -29,02	21,61 -29,76	21,61 -30,51	-31,26	-32,05	-32,87
628	21,58 -28,98	21,58 -29,72	21,58 -30,47	-31,22	-32,01	-32,84
631	21,54 -28,94	21,54 -29,69	21,54 -30,39	-31,14	-31,93	-32,76
633	21,46 -28,90	21,46 -29,61	21,46 -30,35	-31,10	-31,89	-32,72
635	21,42 -28,86	21,42 -29,57	21,42 -30,32	-31,06	-31,81	-32,64
637	21,38 -28,78	21,38 -29,53	21,38 -30,24	-30,98	-31,77	-32,60
639	21,34 -28,74	21,34 -29,49	21,34 -30,20	-30,95	-31,73	-32,52
642	21,30 -28,70	21,30 -29,41	21,30 -30,16	-30,91	-31,65	-32,48
644	21,26 -28,66	21,26 -29,37	21,26 -30,12	-30,83	-31,61	-32,40
646	21,22 -28,62	21,22 -29,33	21,22 -30,04	-30,79	-31,54	-32,36
648	21,18 -28,58	21,18 -29,29	21,18 -30,00	-30,75	-31,50	-32,28
650	21,14 -28,54	21,14 -29,25	21,14 -29,96	-30,67	-31,46	-32,24
653	21,10 -28,50	21,10 -29,21	21,10 -29,92	-30,63	-31,38	-32,21
655	21,06 -28,47	21,06 -29,13	21,06 -29,88	-30,59	-31,34	-32,13
657	21,02 -28,39	21,02 -29,09	21,02 -29,80	-30,51	-31,30	-32,09
659	20,98 -28,35	20,98 -29,06	20,98 -29,76	-30,47	-31,22	-32,01
661	20,95 -28,31	20,95 -29,02	20,95 -29,72	-30,43	-31,18	-31,97
664	20,91 -28,27	20,91 -28,98	20,91 -29,69	-30,39	-31,14	-31,93
666	20,87 -28,23	20,87 -28,94	20,87 -29,65	-30,35	-31,06	-31,85
668	20,79 -28,19	20,79 -28,90	20,79 -29,57	-30,28	-31,02	-31,81
670	20,79 -28,15	20,79 -28,86	20,79 -29,53	-30,24	-30,98	-31,77
672	20,75 -28,11	20,75 -28,82	20,75 -29,49	-30,20	-30,95	-31,69
675	20,71 -28,07	20,71 -28,74	20,71 -29,45	-30,16	-30,87	-31,65
677	20,67 -28,03	20,67 -28,70	20,67 -29,41	-30,08	-30,83	-31,61
679	20,63 -27,99	20,63 -28,66	20,63 -29,37	-30,04	-30,79	-31,54
681	20,59 -27,95	20,59 -28,62	20,59 -29,33	-30,00	-30,75	-31,50
683	20,55 -27,91	20,55 -28,58	20,55 -29,25	-29,96	-30,67	-31,46

2.4 Max. mass of non-lifting parts

Note: With TN LS-S-01 the procedure to determine the max. mass of the non-lifting parts used for the LS4-b will also be allowed for the LS4 and LS4-a.

2.4.1 Calculation of max. mass of non-lifting parts (standard water bags)

Maximum mass of non-lifting parts of 230 kg (507 lbs) may be increased in relation to empty mass and empty mass C.G. position. **Table for <kg> and <mm>**

Empty mass <kg>	Empty mass c.G. Xs <mm> from-up to / mass of non lifting parts <kg>											
	540 559	560 579	580 599	600 619	620 639	640 659	660 679	680 699	700 719	720 739	740 759	760 779
235	230	230	230	230	230	230	230	230	231	232	233	234
236	230	230	230	230	230	230	230	230	231	232	233	235
237	230	230	230	230	230	230	230	230	231	232	234	235
238	230	230	230	230	230	230	230	230	231	232	234	235
239	230	230	230	230	230	230	230	230	231	233	234	235
240	230	230	230	230	230	230	230	230	232	233	234	235
241	230	230	230	230	230	230	230	230	232	233	234	235
242	230	230	230	230	230	230	230	231	232	233	234	235
243	230	230	230	230	230	230	230	231	232	233	234	236
244	230	230	230	230	230	230	230	231	232	233	234	236
245	230	230	230	230	230	230	230	231	232	233	235	236
246	230	230	230	230	230	230	230	231	232	233	235	236
247	230	230	230	230	230	230	230	231	232	234	235	236
248	230	230	230	230	230	230	230	231	232	234	235	236
249	230	230	230	230	230	230	230	231	233	234	235	236
250	230	230	230	230	230	230	230	231	233	234	235	236
251	230	230	230	230	230	230	230	232	233	234	235	237
252	230	230	230	230	230	230	230	232	233	234	235	237
253	230	230	230	230	230	230	231	232	233	234	236	237
254	230	230	230	230	230	230	231	232	233	234	236	237
255	230	230	230	230	230	230	231	232	233	235	236	237
256	230	230	230	230	230	230	231	232	233	235	236	237
257	230	230	230	230	230	230	231	232	234	235	236	237
258	230	230	230	230	230	230	231	232	234	235	236	238
259	230	230	230	230	230	230	231	233	234	235	236	238
260	230	230	230	230	230	230	231	233	234	235	236	238
261	230	230	230	230	230	230	231	233	234	235	237	238
262	230	230	230	230	230	230	232	233	234	235	237	238
263	230	230	230	230	230	230	232	233	234	236	237	238
264	230	230	230	230	230	230	232	233	234	236	237	238
265	230	230	230	230	230	231	232	233	234	236	237	238
266	230	230	230	230	230	231	232	233	235	236	237	239
267	230	230	230	230	230	231	232	233	235	236	237	239
268	230	230	230	230	230	231	232	234	235	236	238	239
269	230	230	230	230	230	231	232	234	235	236	238	239
270	230	230	230	230	230	231	232	234	235	236	238	239
271	230	230	230	230	230	231	233	234	235	237	238	239
272	230	230	230	230	230	231	233	234	235	237	238	239

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Calculation of max. mass of non-lifting parts cont. (standard water bags)

empty mass from 273 kg on

Table for <kg> and <mm>

Empty mass <kg>	Empty mass c.G. Xs <mm> from-up to / mass of non lifting parts <kg>											
	540 559	560 579	580 599	600 619	620 639	640 659	660 679	680 699	700 719	720 739	740 759	760 779
273	230	230	230	230	230	231	233	234	235	237	238	240
274	230	230	230	230	230	231	233	234	236	237	238	240
275	230	230	230	230	230	232	233	234	236	237	238	240
276	230	230	230	230	230	232	233	234	236	237	239	240
277	230	230	230	230	230	232	233	235	236	237	239	240
278	230	230	230	230	231	232	233	235	236	237	239	240
279	230	230	230	230	231	232	233	235	236	238	239	240
280	230	230	230	230	231	232	233	235	236	238	239	240
281	230	230	230	230	231	232	234	235	236	238	239	241
282	230	230	230	230	231	232	234	235	237	238	239	241
283	230	230	230	230	231	232	234	235	237	238	239	241
284	230	230	230	230	231	233	234	235	237	238	240	241
285	230	230	230	230	231	233	234	235	237	238	240	241
286	230	230	230	230	231	233	234	236	237	238	240	241
287	230	230	230	230	231	233	234	236	237	239	240	241
288	230	230	230	230	231	233	234	236	237	239	240	242
289	230	230	230	230	232	233	234	236	237	239	240	242
290	230	230	230	230	232	233	235	236	237	239	240	242
291	230	230	230	230	232	233	235	236	238	239	240	242
292	230	230	230	230	232	233	235	236	238	239	241	242
293	230	230	230	231	232	233	235	236	238	239	241	242
294	230	230	230	231	232	234	235	236	238	239	241	242
295	230	230	230	231	232	234	235	237	238	240	241	242
296	230	230	230	231	232	234	235	237	238	240	241	243
297	230	230	230	231	232	234	235	237	238	240	241	243
298	230	230	230	231	232	234	235	237	238	240	241	243
299	230	230	230	231	233	234	236	237	239	240	241	243
300	230	230	230	231	233	234	236	237	239	240	242	243
301	230	230	230	231	233	234	236	237	239	240	242	243
302	230	230	230	231	233	234	236	237	239	240	242	243
303	230	230	230	231	233	234	236	237	239	240	242	243
304	230	230	230	232	233	235	236	238	239	241	242	244
305	230	230	230	232	233	235	236	238	239	241	242	244
306	230	230	230	232	233	235	236	238	239	241	242	244
307	230	230	230	232	233	235	236	238	239	241	243	244
308	230	230	230	232	233	235	237	238	240	241	243	244
309	230	230	230	232	234	235	237	238	240	241	243	244
310	230	230	231	232	234	235	237	238	240	241	243	244

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Calculation of max. mass of non-lifting parts cont. (standard water bags)

empty mass up to 272 kg <600 lbs.>

Table for <lbs.> and <in.>

Maximum mass of non-lifting parts of 230 kg (507 lbs) may be increased in relation to empty mass and empty mass C.G. position.

Empty mass <lbs.>	Empty mass c.G. Xs <in.> from-up to / mass of non lifting parts <lbs.>											
	21.260	2-047	22.835	23.622	24.409	25.197	25.984	26.772	27.559	28.346	29.134	29.921
	22.008	22.795	23.583	24.370	25.157	25.945	26.732	27.520	28.307	29.094	29.882	30.669
518	507	507	507	507	507	507	507	507	509	511	514	516
520	507	507	507	507	507	507	507	507	509	511	514	518
522	507	507	507	507	507	507	507	507	509	511	516	518
525	507	507	507	507	507	507	507	507	509	511	516	518
527	507	507	507	507	507	507	507	507	509	514	516	518
529	507	507	507	507	507	507	507	507	511	514	516	518
531	507	507	507	507	507	507	507	507	511	514	516	518
534	507	507	507	507	507	507	507	509	511	514	516	518
536	507	507	507	507	507	507	507	509	511	514	516	518
538	507	507	507	507	507	507	507	509	511	514	516	520
540	507	507	507	507	507	507	507	509	511	514	518	520
542	507	507	507	507	507	507	507	509	511	514	518	520
545	507	507	507	507	507	507	507	509	511	516	518	520
547	507	507	507	507	507	507	507	509	511	516	518	520
549	507	507	507	507	507	507	507	509	514	516	518	520
551	507	507	507	507	507	507	507	509	514	516	518	520
553	507	507	507	507	507	507	507	511	514	516	518	522
556	507	507	507	507	507	507	507	511	514	516	518	522
558	507	507	507	507	507	507	509	511	514	516	520	522
560	507	507	507	507	507	507	509	511	514	516	520	522
562	507	507	507	507	507	507	509	511	514	518	520	522
564	507	507	507	507	507	507	509	511	514	518	520	522
567	507	507	507	507	507	507	509	511	516	518	520	522
569	507	507	507	507	507	507	509	511	516	518	520	522
571	507	507	507	507	507	507	509	511	516	518	520	525
573	507	507	507	507	507	507	509	514	516	518	520	525
575	507	507	507	507	507	507	509	514	516	518	522	525
578	507	507	507	507	507	507	511	514	516	518	522	525
580	507	507	507	507	507	507	511	514	516	520	522	525
582	507	507	507	507	507	507	511	514	516	520	522	525
584	507	507	507	507	507	509	511	514	516	520	522	525
586	507	507	507	507	507	509	511	514	518	520	522	527
589	507	507	507	507	507	509	511	514	518	520	522	527
591	507	507	507	507	507	509	511	516	518	520	522	527
593	507	507	507	507	507	509	511	516	518	520	525	527
595	507	507	507	507	507	509	511	516	518	520	525	527
597	507	507	507	507	507	509	511	516	518	522	525	527
600	507	507	507	507	507	509	514	516	518	522	525	527

Maintenance Manual LS4

Calculation of max. mass of non-lifting parts cont. (standard water bags)

(standard water bags), empty mass from 273 kg <602 lbs.> on

Table for <lbs.> and <in.>

Maximum mass of non-lifting parts of 230 kg (507 lbs) may be increased in relation to empty mass and empty mass C.G. position.

Empty mass <lbs.>	Empty mass c.G. Xs <in.> from-up to / mass of non lifting parts <lbs..>											
	21.260	2-047	22.835	23.622	24.409	25.197	25.984	26.772	27.559	28.346	29.134	29.921
	22.008	22.795	23.583	24.370	25.157	25.945	26.732	27.520	28.307	29.094	29.882	30.669
602	507	507	507	507	507	509	514	516	518	522	525	527
604	507	507	507	507	507	509	514	516	520	522	525	529
606	507	507	507	507	507	511	514	516	520	522	525	529
608	507	507	507	507	507	511	514	516	520	522	525	529
611	507	507	507	507	507	511	514	518	520	522	527	529
613	507	507	507	507	509	511	514	518	520	522	527	529
615	507	507	507	507	509	511	514	518	520	522	527	529
617	507	507	507	507	509	511	514	518	520	525	527	529
619	507	507	507	507	509	511	516	518	520	525	527	531
622	507	507	507	507	509	511	516	518	520	525	527	531
624	507	507	507	507	509	511	516	518	522	525	527	531
626	507	507	507	507	509	511	516	518	522	525	529	531
628	507	507	507	507	509	514	516	518	522	525	529	531
631	507	507	507	507	509	514	516	520	522	525	529	531
633	507	507	507	507	509	514	516	520	522	525	529	531
635	507	507	507	507	509	514	516	520	522	527	529	531
637	507	507	507	507	511	514	516	520	522	527	529	534
639	507	507	507	507	511	514	518	520	522	527	529	534
642	507	507	507	507	511	514	518	520	525	527	529	534
644	507	507	507	507	511	514	518	520	525	527	531	534
646	507	507	507	509	511	514	518	520	525	527	531	534
648	507	507	507	509	511	516	518	520	525	527	531	534
650	507	507	507	509	511	516	518	522	525	527	531	534
653	507	507	507	509	511	516	518	522	525	529	531	534
655	507	507	507	509	511	516	518	522	525	529	531	536
657	507	507	507	509	511	516	518	522	525	529	531	536
659	507	507	507	509	514	516	520	522	525	529	531	536
661	507	507	507	509	514	516	520	522	527	529	534	536
664	507	507	507	509	514	516	520	522	527	529	534	536
666	507	507	507	509	514	516	520	522	527	529	534	536
668	507	507	507	509	514	516	520	522	527	529	534	536
670	507	507	507	511	514	518	520	525	527	531	534	538
672	507	507	507	511	514	518	520	525	527	531	534	538
675	507	507	507	511	514	518	520	525	527	531	534	538
677	507	507	507	511	514	518	520	525	527	531	534	538
679	507	507	507	511	514	518	520	525	529	531	536	538
681	507	507	507	511	516	518	522	525	529	531	536	538
683	507	507	509	511	516	518	522	525	529	531	536	538

2.4.2 Calculation of max. mass of non-lifting parts according to TN 4046 with water bags V112 according to TN 4047

Maximum mass of non-lifting parts of 250 kg (551 lbs) may be increased in relation to empty mass and empty mass C.G. position.

Table for <kg> and <mm>

Empty mass <kg>	Empty mass c.G. Xs <mm> from-up to / mass of non lifting parts <kg>											
	540 559	560 579	580 599	600 619	620 639	640 659	660 679	680 699	700 719	720 739	740 759	760 779
235	250	250	250	250	250	250	250	250	251	252	253	254
236	250	250	250	250	250	250	250	250	251	252	253	255
237	250	250	250	250	250	250	250	250	251	252	254	255
238	250	250	250	250	250	250	250	250	251	252	254	255
239	250	250	250	250	250	250	250	250	251	253	254	255
240	250	250	250	250	250	250	250	250	252	253	254	255
241	250	250	250	250	250	250	250	250	252	253	254	255
242	250	250	250	250	250	250	250	251	252	253	254	255
243	250	250	250	250	250	250	250	251	252	253	254	255
244	250	250	250	250	250	250	250	251	252	253	254	256
245	250	250	250	250	250	250	250	251	252	253	255	256
246	250	250	250	250	250	250	250	251	252	253	255	256
247	250	250	250	250	250	250	250	251	252	254	255	256
248	250	250	250	250	250	250	250	251	252	254	255	256
249	250	250	250	250	250	250	250	251	253	254	255	256
250	250	250	250	250	250	250	250	251	253	254	255	256
251	250	250	250	250	250	250	250	252	253	254	255	257
252	250	250	250	250	250	250	250	252	253	254	255	257
253	250	250	250	250	250	250	251	252	253	254	256	257
254	250	250	250	250	250	250	251	252	253	254	256	257
255	250	250	250	250	250	250	251	252	253	255	256	257
256	250	250	250	250	250	250	251	252	253	255	256	257
257	250	250	250	250	250	250	251	252	254	255	256	257
258	250	250	250	250	250	250	251	252	254	255	256	257
259	250	250	250	250	250	250	251	252	254	255	256	258
260	250	250	250	250	250	250	251	253	254	255	256	258
261	250	250	250	250	250	250	251	253	254	255	257	258
262	250	250	250	250	250	250	252	253	254	255	257	258
263	250	250	250	250	250	250	252	253	254	256	257	258
264	250	250	250	250	250	250	252	253	254	256	257	258
265	250	250	250	250	250	251	252	253	254	256	257	258
266	250	250	250	250	250	251	252	253	255	256	257	259
267	250	250	250	250	250	251	252	253	255	256	257	259
268	250	250	250	250	250	251	252	254	255	256	257	259
269	250	250	250	250	250	251	252	254	255	256	258	259
270	250	250	250	250	250	251	252	254	255	256	258	259
271	250	250	250	250	250	251	252	254	255	257	258	259
272	250	250	250	250	250	251	253	254	255	257	258	259

Maintenance Manual LS4

Calculation of max. mass of non-lifting parts according to TN 4046 with water bags V112 according to TN 4047, empty mass from 273 kg on

Table for <kg> and <mm>

Empty mass <kg>	Empty mass c.G. Xs <mm> from-up to / mass of non lifting parts <kg>											
	540 559	560 579	580 599	600 619	620 639	640 659	660 679	680 699	700 719	720 739	740 759	760 779
273	250	250	250	250	250	251	253	254	255	257	258	259
274	250	250	250	250	250	251	253	254	256	257	258	260
275	250	250	250	250	250	252	253	254	256	257	258	260
276	250	250	250	250	250	252	253	254	256	257	258	260
277	250	250	250	250	250	252	253	255	256	257	259	260
278	250	250	250	250	251	252	253	255	256	257	259	260
279	250	250	250	250	251	252	253	255	256	257	259	260
280	250	250	250	250	251	252	253	255	256	258	259	260
281	250	250	250	250	251	252	254	255	256	258	259	261
282	250	250	250	250	251	252	254	255	256	258	259	261
283	250	250	250	250	251	252	254	255	257	258	259	261
284	250	250	250	250	251	252	254	255	257	258	260	261
285	250	250	250	250	251	253	254	255	257	258	260	261
286	250	250	250	250	251	253	254	256	257	258	260	261
287	250	250	250	250	251	253	254	256	257	258	260	261
288	250	250	250	250	251	253	254	256	257	259	260	261
289	250	250	250	250	252	253	254	256	257	259	260	262
290	250	250	250	250	252	253	255	256	257	259	260	262
291	250	250	250	250	252	253	255	256	258	259	260	262
292	250	250	250	250	252	253	255	256	258	259	261	262
293	250	250	250	251	252	253	255	256	258	259	261	262
294	250	250	250	251	252	254	255	256	258	259	261	262
295	250	250	250	251	252	254	255	257	258	259	261	262
296	250	250	250	251	252	254	255	257	258	260	261	262
297	250	250	250	251	252	254	255	257	258	260	261	263
298	250	250	250	251	252	254	255	257	258	260	261	263
299	250	250	250	251	253	254	256	257	258	260	261	263
300	250	250	250	251	253	254	256	257	259	260	262	263
301	250	250	250	251	253	254	256	257	259	260	262	263
302	250	250	250	251	253	254	256	257	259	260	262	263
303	250	250	250	251	253	254	256	257	259	260	262	263
304	250	250	250	252	253	255	256	258	259	261	262	264
305	250	250	250	252	253	255	256	258	259	261	262	264
306	250	250	250	252	253	255	256	258	259	261	262	264
307	250	250	250	252	253	255	256	258	259	261	262	264
308	250	250	250	252	253	255	256	258	260	261	263	264
309	250	250	250	252	254	255	257	258	260	261	263	264
310	250	250	251	252	254	255	257	258	260	261	263	264

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Calculation of max. mass of non-lifting parts LS4-b according to TN 4046 with water bags V112 according to TN 4047 cont. , empty mass up to 272 kg <600 lbs.>

Maximum mass of non-lifting parts of 250 kg (551 lbs) may be increased in relation to empty mass and empty mass C.G. position.

Table for <lbs.> and <in.>

Empty mass <lbs.>	Empty mass c.G. Xs <in.> from-up to / mass of non lifting parts <lbs..>										
	21.260 22.008	2-047 22.795	22.835 23.583	23.622 24.370	24.409 25.157	25.197 25.945	25.984 26.732	26.772 27.520	27.559 28.307	28.346 29.094	29.134 29.882
518	551	551	551	551	551	551	551	551	553	556	558
520	551	551	551	551	551	551	551	551	553	556	558
522	551	551	551	551	551	551	551	551	553	556	560
525	551	551	551	551	551	551	551	551	553	556	560
527	551	551	551	551	551	551	551	551	553	558	560
529	551	551	551	551	551	551	551	551	556	558	560
531	551	551	551	551	551	551	551	551	556	558	560
534	551	551	551	551	551	551	551	553	556	558	560
536	551	551	551	551	551	551	551	553	556	558	560
538	551	551	551	551	551	551	551	553	556	558	560
540	551	551	551	551	551	551	551	553	556	558	562
542	551	551	551	551	551	551	551	553	556	558	562
545	551	551	551	551	551	551	551	553	556	560	562
547	551	551	551	551	551	551	551	553	556	560	562
549	551	551	551	551	551	551	551	553	558	560	562
551	551	551	551	551	551	551	551	553	558	560	562
553	551	551	551	551	551	551	551	556	558	560	562
556	551	551	551	551	551	551	551	556	558	560	562
558	551	551	551	551	551	551	553	556	558	560	564
560	551	551	551	551	551	551	553	556	558	560	564
562	551	551	551	551	551	551	553	556	558	562	564
564	551	551	551	551	551	551	553	556	558	562	564
567	551	551	551	551	551	551	553	556	560	562	564
569	551	551	551	551	551	551	553	556	560	562	564
571	551	551	551	551	551	551	553	556	560	562	564
573	551	551	551	551	551	551	553	558	560	562	564
575	551	551	551	551	551	551	553	558	560	562	567
578	551	551	551	551	551	551	556	558	560	562	567
580	551	551	551	551	551	551	556	558	560	564	567
582	551	551	551	551	551	551	556	558	560	564	567
584	551	551	551	551	551	553	556	558	560	564	567
586	551	551	551	551	551	553	556	558	562	564	567
589	551	551	551	551	551	553	556	558	562	564	567
591	551	551	551	551	551	553	556	560	562	564	567
593	551	551	551	551	551	553	556	560	562	564	569
595	551	551	551	551	551	553	556	560	562	564	569
597	551	551	551	551	551	553	556	560	562	567	569
600	551	551	551	551	551	553	558	560	562	567	569

Maintenance Manual LS4

Calculation of max. mass of non-lifting parts LS4-b according to TN 4046 with water bags V112 according to TN 4047 on cont. ,
empty mass from 273 kg <602lbs.> on

Table for <lbs.> and <in.>

Empty mass <lbs.>	Empty mass c.G. Xs <in.> from-up to / mass of non lifting parts <lbs.>										
	21.260 22.008	2-047 22.795	22.835 23.583	23.622 24.370	24.409 25.157	25.197 25.945	25.984 26.732	26.772 27.520	27.559 28.307	28.346 29.094	29.134 29.882
602	551	551	551	551	551	553	558	560	562	567	569
604	551	551	551	551	551	553	558	560	564	567	569
606	551	551	551	551	551	556	558	560	564	567	569
608	551	551	551	551	551	556	558	560	564	567	569
611	551	551	551	551	551	556	558	562	564	567	571
613	551	551	551	551	553	556	558	562	564	567	571
615	551	551	551	551	553	556	558	562	564	567	571
617	551	551	551	551	553	556	558	562	564	569	571
619	551	551	551	551	553	556	560	562	564	569	571
622	551	551	551	551	553	556	560	562	564	569	571
624	551	551	551	551	553	556	560	562	567	569	571
626	551	551	551	551	553	556	560	562	567	569	573
628	551	551	551	551	553	558	560	562	567	569	573
631	551	551	551	551	553	558	560	564	567	569	573
633	551	551	551	551	553	558	560	564	567	569	573
635	551	551	551	551	553	558	560	564	567	571	573
637	551	551	551	551	556	558	560	564	567	571	573
639	551	551	551	551	556	558	562	564	567	571	573
642	551	551	551	551	556	558	562	564	569	571	573
644	551	551	551	551	556	558	562	564	569	571	575
646	551	551	551	553	556	558	562	564	569	571	575
648	551	551	551	553	556	560	562	564	569	571	575
650	551	551	551	553	556	560	562	567	569	571	575
653	551	551	551	553	556	560	562	567	569	573	575
655	551	551	551	553	556	560	562	567	569	573	575
657	551	551	551	553	556	560	562	567	569	573	575
659	551	551	551	553	558	560	564	567	569	573	575
661	551	551	551	553	558	560	564	567	571	573	578
664	551	551	551	553	558	560	564	567	571	573	578
666	551	551	551	553	558	560	564	567	571	573	578
668	551	551	551	553	558	560	564	567	571	573	578
670	551	551	551	556	558	562	564	569	571	575	578
672	551	551	551	556	558	562	564	569	571	575	578
675	551	551	551	556	558	562	564	569	571	575	578
677	551	551	551	556	558	562	564	569	571	575	578
679	551	551	551	556	558	562	564	569	573	575	580
681	551	551	551	556	560	562	567	569	573	575	580
683	551	551	553	556	560	562	567	569	573	575	580

3 Inspections

3.1 Regular inspections

3.1.1 Daily Inspections

Daily Inspections and preflight check see flight manual

LS4 and LS4-a: page 3-4

LS4-b: section 4.3 and 4.4

Postflight check see flight manual

LS4 and LS4-a: page 3-5

LS4-b: section 4.6

3.1.2 Annual Inspections

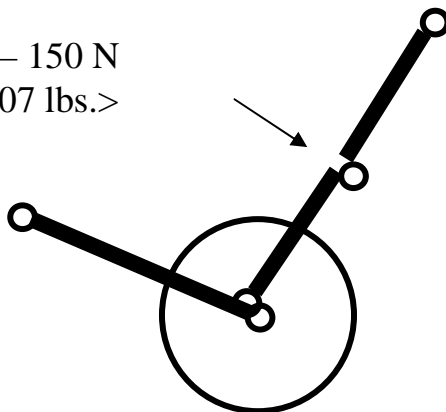
1. The aileron sandwich shell is pressure-sensitive. If there are any pressure marks the sailplane may be no more airworthy. Because of resulting possible danger of flutter you must contact DG Flugzeugbau GmbH for damage classification and repair.
2. **Only LS4-b:** The automatic aileron connectors at the fuselage have deflectors to prevent incorrect mounting.
Check if rigging of the second wing is impossible with intentionally incorrect aileron deflection (aileron deflected upward).
3. Lubricate various parts according to plan see section 3.4
4. Protect gelcoat with car polish (see section 12). This wax film protects the gelcoat against brittleness and cracking due to ultra violet light. If you use a polishing machine, be careful not to damage anti-collision colour marking or registration signs or seals.
5. **Only LS4 and LS4-a:** Check gap sealing tape on aileron upper side (textile tape) for existence and if tape has shrunk. Replace if necessary according to section 4.2.2.1.
LS4-b, LS4 and LS4-a optionally: Check gap seals on aileron upper side (plastic sealing strips and internal seals) for existence and damage. Replace if necessary according to section 4.2.2.2.
6. Check gap seals on elevator and rudder for existence and damage. Replace if necessary according to sections 4.2.3 and 4.2.4.

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Annual Inspections continued

7. **LS4-b, LS4 and LS4-a optionally:** Check 3D turbulator (zig-zag tape) on wing lower side (flight performance!) and restore if necessary. Installation see section 4.2.5.
8. Check airbrakes
 - a) **Only LS4-b:** Check air brake friction damper at outer side of air brake box for proper operation of damper rod and pads free from grease.
 - b) **All LS4 variants:** Check wing air brake levers for corrosion at lower end.
Pull with about 25 kg <55 lbs> force at upper end of each lever against flight direction, simultaneously retract without twisting upper blade (do not counter hold at cockpit lever!).
When under load of last item jamming at wing structure results, then bearings at related lever must be exchanged immediately by repair station according to repair instruction "Air Brake Levers".
9. Check landing gear folding strut for
 - a) proper overcenter lock of folding strut
 - b) pre-load of folding strut
For testing press against the pre-load until the strut starts folding, the force should be in the limits see sketch. In case the pre-load is too small, the landing gear drive gas strut must be exchanged.
 - c) rubber torsion elements for deformation or separation of rubber from metal.
 - d) When adjustments are being made, check for identical overcenter lock at both folding struts and for locking of adjusters.

pre-load 120 – 150 N
< 26.46 – 33.07 lbs.>



Maintenance Manual LS4

Annual Inspections continued

10. Perform Annual Inspection according to checklist in section 14.1.
The annual inspection contains items (aileron lateral bearing play, aileron vent holes), which may only be checked after removing seals. Unless changes are suspected (for instance lateral control surface gaps differing from design values see section 4.1), it is not necessary to remove (destroy) seals just for inspection purposes. Existence of retaining washer at fixed bearings can be checked after lifting sealing strips cautiously.
11. Check water ballast bags and vertical tail fin tank (if existent) for function (for instance chafe marks, tightness etc.). Leaking system parts – water dripping from drain ports – must be uninstalled and repaired. Wire meshing at tail fin tank upper end and in filling funnel are mandatory to establish proper function of vertical tail fin valve. With fin tank installed the fin tank filling hose must be with the glider (minimum equipment!).
12. With fin tank installed: Outside air temperature gauge - check for correct indication, e.g. by comparing with another thermometer.
13. Check canopy locking and emergency release function according to section 4.9:
Measure force to open canopy emergency release according to section 4.9.
Only LS4-b: If this measurement or an operational check is performed without a helper, the spring at the LS-Latch (Röger hook) **TN 4032** located at the fuselage becomes deformed and must be exchanged!.
14. **LS4-b, with TN 4032 executed also LS4 and LS4-a:**
Check function of LS-latch (Röger hook) for canopy emergency release according to section 4.9.

Annual Inspections continued

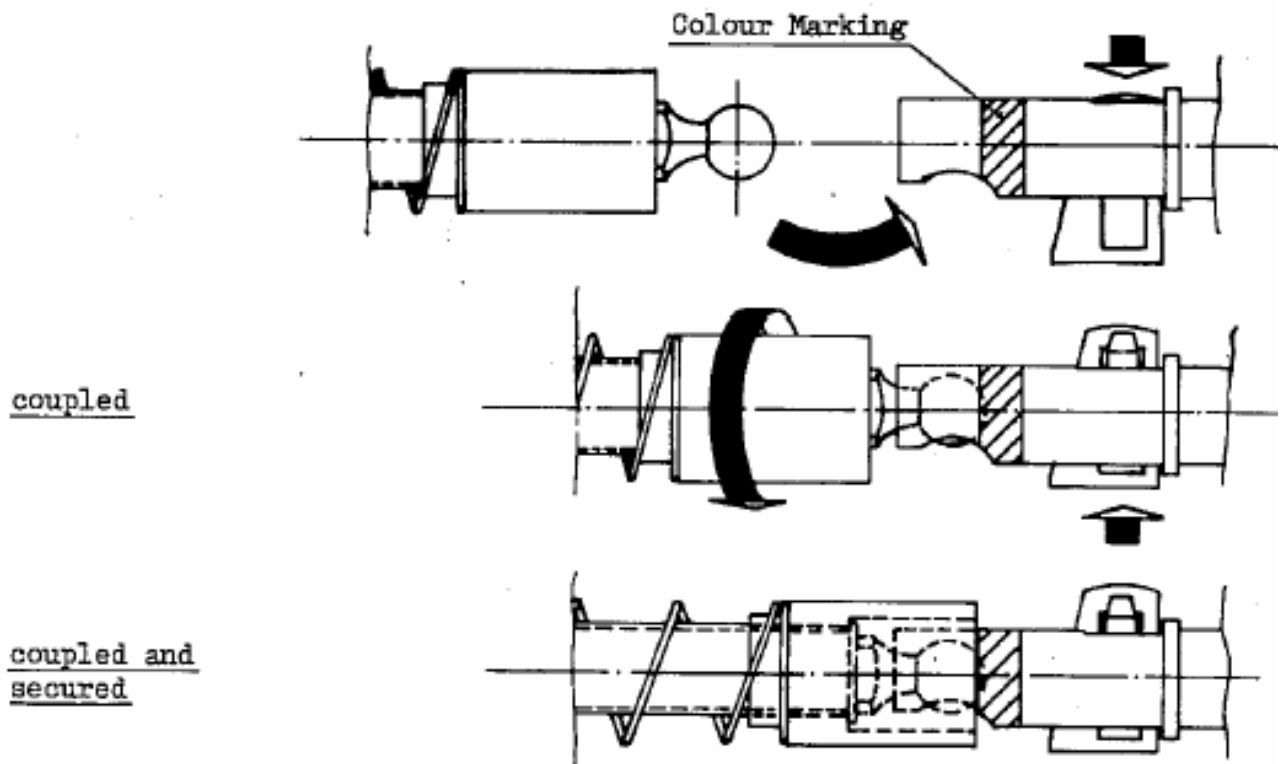
15. Only LS4 and LS4-a: L'Hotellier control quick connectors:

Check connectors of ailerons and airbrakes.

Secure connectors after connection by turning LS-sleeves over joints as far as possible.

Check securing by trying to disassemble connectors with lock plate pressed down: Minor free play about 1 mm <0.4 in.> is acceptable.

Check connection visually using built in mirrors and colour markings.



a) Inspection according to L'Hotellier IM.10.01 see section 14.2.

b) Inspection of the spring force of the lock plate.

Warning: Don't replace or fix damaged or kinked springs. Exchange the complete joint in such a case.

c) Remove any grease from the lock plate with Acetone.

d) Check colour markings at the quick connectors and restore if necessary.

16. Perform a new weight and balance (see section 2):

a) if equipment was changed, see last valid equipment list.

b) with equipment not altered at least **every 4 years**.

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3.2 Extraordinary inspections after heavy landings

Extraordinary inspections should be performed, depending on circumstances (rough landings, ground loops etc.), on these components:

- Landing gear functioning, attachment and pre-load of the overcentre locking (landing gear struts)
- Check rubber mounts in landing gear box for deformation
- Landing gear box for damage
- Tail skid bonding or tail wheel for attachment, function and tyre pressure
- Wings, fuselage and tail for damage (cracks, buckling, compression)
- Wing's oscillation number
- Control surfaces function and deflections
- Tangential tubes across fuselage for straightness

3.3 Inspection procedure for increase of service time

1. General

The results of fatigue tests of wingspar sections have demonstrated that the service time of GFRP/CFRP gliders and motorgliders may be limited to 12000 hours, if for each individual glider (in addition to the obligatory annual inspections) the airworthiness is demonstrated according to a special multi-step inspection program particularly with regard to the service life.

2. Dates

When the glider has reached a service time of 3000 hours, an inspection must be done in accordance with the inspection programme mentioned under item 3. If the results of this inspection are positive or if any defects found have been duly repaired, the service time of the glider is extended by another 3000 hours to a total of 6000 hours (first step).

The above inspection programme must be repeated when the glider has reached a service time of 6000 hours. If the results of this inspection are positive or if any defects found have been duly repaired, the service time of the glider is extended to 9000 hours (second step).

When the glider has reached a service time of 9000 hours, the above inspection programme must be repeated. If the results of the inspection are still positive, or if any defects found have been duly repaired, the service time may be extended to a total of 10000 hours (third step).

Proceed analogous when reaching 10000 and 11000 hours (4. + 5. step).

3. Ask DG Flugzeugbau for the necessary inspection document.

When you request the inspection document, the following data should be submitted: Model/Type, Registration, Serial Number and the operating hours at which the inspection will be performed. A charge will be made for the inspection document.

4. The inspection must only be done by a licensed repair station or inspector.

5. The results of the inspections have to be recorded in an inspection report, wherein comments are required for each inspection instruction. If the inspections are done outside the DG Flugzeugbau facilities, a copy of the records must be sent to DG Flugzeugbau for evaluation and information.

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3.4 Lubrication schedule

Location	Frequency	Lubricant
Main pins and matching bushes Pins and matching bushes of elevator connections LS4, LS4-a: Connector and ball of L'Hotellier connectors for aileron and air brake control LS4-b: Wing side bearings at automatic aileron and air brake system connectors, which are inserted into fuselage couplings	Before assembly	Water insoluble bearing grease or Molykote BR2 (Temperature range from -30°C to 130°C, -22°F to 266°F)
Landing gear: all joints at rubber bearings all metal parts	Once a year	Oil or Spray oil Note: Protect rubber parts against oil
Bearings of control surfaces	After disassembly only	Molykote grease BR2 (Temperature range from -30°C to 130°C, -22°F to 266°F) or Molykote grease 33 (Temperature range from -70°C to 180°C, -94°F to 356°F)

Caution: Never grease longitudinal motion pushrod bearings. They will soon be destroyed by collection of foreign matter. These bearings are used in the elevator system, aileron system and air brake system.

Caution only LS4-b: The friction damper inside the air brake boxes prevents oscillations during extension of air brakes. Therefore, friction pads should never be greased or oiled !

Tow Hooks: see Maintenance Instructions of manufacturer (TOST)

Multiple point buckle of FAG 7H or FAG-12H safety harness: see Maintenance Instructions of manufacturer (Autoflug)

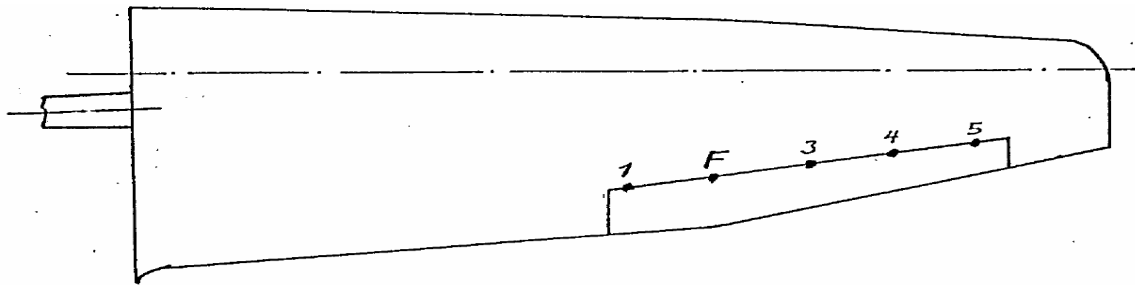
4 Working instructions

4.1 Removal and installation of control surfaces

Note: Instead of nuts LN9348 self-locking nuts DIN985-8 zn may be used.

4.1.1 Ailerons

Wing scheme with aileron bearings,
F= laterally fixed hinge



4.1.1.1 Removal of ailerons

- **LS4 and LS4-a:** Remove gap tape on upper surface.
- **LS4-b, LS4 and LS4-a optionally:** Remove Teflon tape of gap sealing on upper surface.
- **If existing:** Detach internal lower side sealing tapes (Teflon Tape) from aileron.
- Remove fillet on outside upper edge of aileron near bearing No. 5.
- **If existing:** Turn wing upside down: remove internal lower side sealing tape completely.
- Disconnect drive rods (6mm thread, nut M6 LN9348), width over flats 10mm), remember sequence and position of washers, if applicable.
- Loosen nut (6mm thread, LN9348, width over flats 10 mm) from bearings No. 2, remember sequence and position of washers.
- Deflect aileron upward and remove it from pins towards wingtip. Use two people to avoid damage!
- Watch washers, if present, at inner side of hinge pin of laterally fixed bearing.

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4.1.1.2 Installation of ailerons

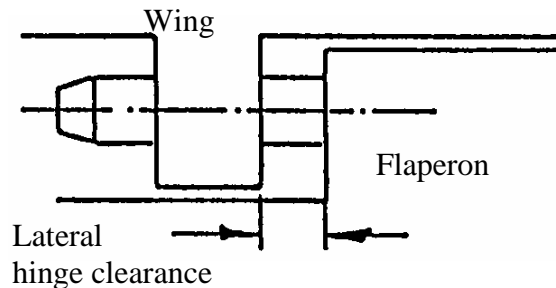
- **LS4-b, LS4 and LS4-a optionally:** Install internal lower side seal according to section 4.2.1.

Note: If the aileron upper side is sealed according to section 4.2.2.1 or 4.2.2.2 an internal lower side seal is not necessary and must not be reinstalled-

- Grease bearings according to lubrication schedule, section 3.4.
- Make sure that washers, if present, are on inner side of bearings No. 2
- Match aileron pins with bearings with aileron deflected fully upwards, using two people. Do not use force.
- Set up washers at laterally fixed hinge as found during disassembly.
- Tighten nut (6 mm thread, LN9348, width over flats 10 mm) at laterally fixed hinge with maximum torque of 6,4 Nm (4.7 ft lbs).

Check lateral clearance:

bearing No.	1	2	3	4	5
play (mm)	0.5	fixed	0.5	1.0	1.5
<in>	0.02		0.02	0.04	0.06



- Check lateral aileron gaps:
at tip and root: min. 2mm (0.08 in)
Connect pushrods to ailerons using bolts, washers and nuts (6 mm thread, LN9348, width over flats 10 mm). Maximum torque is 6,4 Nm (4.7 ft lbs).
- **LS4-b, LS4 and LS4-a optionally:** Bond internal seal on lower wing surface over aileron gap with aileron deflected fully upwards, see section 4.2.1.
- Bond fillet at aileron tip recess with contact adhesive (e.g. Pattex)
- **LS4 and LS4-a** Reinstall sealing tape on upper side according to section 4.2.2
- **LS4-b, LS4 and LS4-a optionally:** Install new upper side seals if necessary according to section 4.2.3.

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4.1.2 Elevator

4.1.2.1 Removal of elevator

- Remove seal from upper side of elevator
- Loosen nut (5 mm thread, LN9348 or DIN985-8 zn, width over flats 8 mm) from left inner fixed hinge, remember sequence and position of washers.
- Remove elevator towards left side, Watch washers, if existent, at pin of laterally fixed hinge.
- Remove internal sealing from stabilizer.

4.1.2.2 Installation of elevator

- **LS4-b, LS4 and LS4-a optional:** Install internal seal on upper side of stabilizer according to section 4.2.1.
- Grease bearings according to Lubrication Schedule, page section 3.4.
- Make sure that washers, if present, are on laterally fixed hinge pin.
- Insert pins into bearings from right to left, do not use force.
- Tighten nut (5 mm thread, LN9348 or DIN985-8 zn, width over flats 8 mm) at fixed hinge with maximum torque 6.4 Nm (0.64 mdaN, 4.7 ft lbs).
- **LS4-b, LS4 and LS4-a optionally:** Fix internal gap seal to elevator according to section 4.2.1.
- **LS4 and LS4-a** Reinstall textile sealing tape on upper side according to section 4.2.2
-

4.1.3 Rudder

4.1.3.1 Rudder removal

Caution: Rudder cables can be pre-drilled. This must not be changed, otherwise the rudder neutral position is changed.

- **LS4 and LS4-a:** Detach inner seals from rudder.
- Disconnect rudder cables, don't lose spacer bushings.
- remove nut at lower bearing (6 mm thread, LN9348, width over flats 10 mm) using a socket wrench, remember sequence and position of washers.
- Mark rear fin trailing edge with rudder in neutral position at both sides of upper rudder end using a soft pencil.
- Lift rudder upward from bearings.
- **LS4 and LS4-a:** Remove internal seals completely,

4.1.3.2 Rudder installation

- **LS4-b, LS4 and LS4-a optionally:** If necessary install new internal V-tape seals to both sides of fin analogous to description in section 4.2.5.2.
- Grease bearings according to Lubrication Schedule, see section 3.4.
- Set rudder into bearings from above, do not use force! If both pencil markings are not visible in neutral rudder position, the upper bearing pin is located in front of the bearing, not in the bearing!
- Check radial play of upper hinge, max. 0.5 mm <0.02 in.>. If necessary install a new needle bearing or a new bush. In case a bush is installed make sure that the possible eccentric position of the bush is kept. Glue in the bush with Loctite 638.
- Connect rudder cables provisionally, do not forget to insert spacer bushings into thimbles.
- Check rudder pedal alignment: with pedals in neutral position and rudder deflected to one side, twist **opposite** cable clockwise (maximum 5 turns) until properly aligned.
Should more than 5 turns be required for alignment, replace cables.

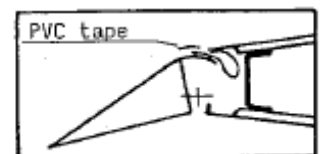
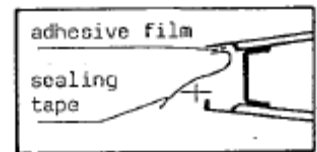
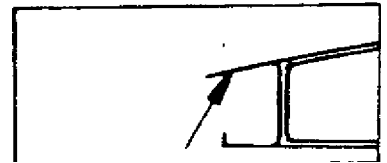
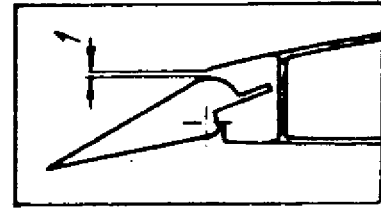
Caution: Never turn cables counter clockwise!

- Tighten nuts at rudder cable connection (6 mm thread, LN9348, width over flats 10 mm) with maximum torque 6.4 Nm (0.64 daNm, 4.7 ft lbs).
- First install the large, then the small washer under the bottom bearing, then tighten nut with maximum torque of 6.4 Nm (0.64 daNm, 4.7 ft lbs).. Axial rudder movement should be audible. Maximum axial play 1 mm (0.04 in).
- **LS4 and LS4-a:** Fix internal seals on both sides of rudder, see section 4.2.1.

4.2 Installation of control surface gap sealings and turbulators

4.2.1 Installation of internal seals

1. The control surface gap on the side where the seal will be installed should be at least 1 mm (0.04 in) wide in all positions. Enlarge smaller gap on wing side only using 60 grade sandpaper glued to 0.5 mm (0.02 in) thick sheet metal.
2. Deflect control surface fully away from seal, mark trailing edge of wing or stabilizer or fin on control surface using soft pencil. Remove control surface.
3. Roughen gluing area on inside upper rear wing or fin edge using sanding paper grade 60. Round sharp edge slightly (sanding paper grade 180) and blow off dust.
4. Clean gluing area at inner wing-, stabilizer- or fin-trailing edge, on control surface and on sealing tape using petroleum ether (pure petroleum spirit).
5. Lay Teflon sealing strip on table and stick adhesive film edge flush to sealing tape edge.
6. Mark rear gluing edge inside rear wing edge approximately 2 mm (0.08 in) forward of rear edge.
7. Pull masking tape off prepared seal and glue to inside rear wing edge along marked line. Press gluing temporarily using plastic spatula or similar.
8. Clean leading edge of control surface behind mark (see step 2) and second side of seal using petroleum ether (pure petroleum spirit).
9. Stick adhesive film to leading edge of control surface flush behind marking line.
10. Assemble aileron and deflect fully downward. Pull sealing tape cautiously out of gap, pull masking tape off and lay sealing tape on adhesive film avoiding branching or lateral displacement. Press adhesive film area temporarily using roller or plastic spatula.
11. Cut excess sealing tape along rear edge of adhesive film using sharp knife and straightedge.
12. Mask rear edge of sealing tape with white PVC tape (12mm wide) to avoid warping.



4.2.2 Gap seals aileron

Warning: It is not allowed to operate the glider without aileron gap seals.

4.2.2.1 Gap seals aileron upper side LS4 and LS4-a

Apply tape (Tesaband 651 white 38 mm <1.5 in.> wide) with ailerons deflected fully downwards.

Note: Don't pull the tape too tight as with time the tape will shrink.

Remove residuals of adhesive with petroleum ether (pure petroleum spirit).

4.2.2.2 Gap seals aileron upper side LS4-b, optionally LS4 and LS4-a

Mylar seals in combination with selfadhesive Teflon glas tape is used.

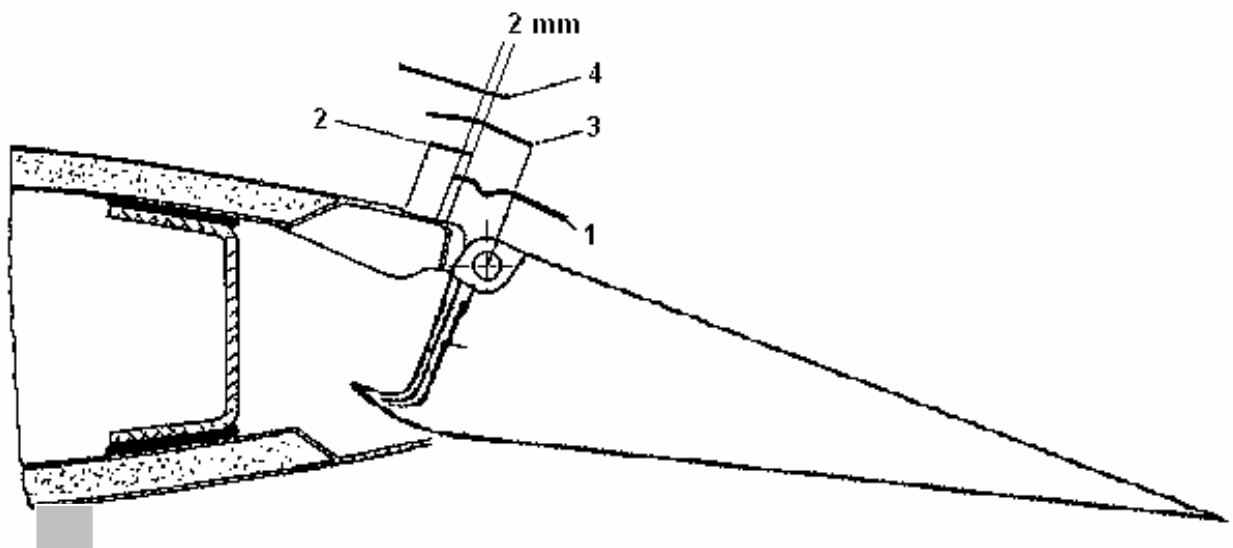
Installation see sketch below.

Glue the Teflon glas tape to the aileron in such a way that the trailing edge of the Teflon glas tape is approx. 2 mm <0.08 in.> behind the trailing edge of the Mylar seal with the aileron deflected fully upwards.

The bonding film should be 2 mm over the Teflon glas tape.

Warning: The sealing effect is only by the Teflon glas tape (2). Mylar seals alone are not sufficient.

No.	Denomination	Part No.	Amount
1	Teflon glas tape 38mm	30003136	2 * 3,00 m
2	Tesafix 4965, 12mm,	45002076	2 * 3,00 m
3	Mylar seal convex, 30mm	30003128	2 * 3,00 m
4	Tesafilm white 4104, 19mm	70000229	2 * 3,00 m



Vollausschlag nach unten
Full downward deflection

4.2.2.3 Gap seals aileron lower side

Standard is an internal seal according to section 4.2.1.

However if the aileron upper side is sealed according to section 4.2.2.1 or 4.2.2.2 a lower side seal is not necessary.

4.2.3 Gap sealings elevator

4.2.3.1 Gap seals elevator LS4 und LS4-a

Apply tape (Tesaband 651 white 38 mm <1.5 in.> wide) with elevator deflected fully downwards.

4.2.3.2 Gap seals elevator LS4-b, optional LS4 und LS4-a

Internal seal with Teflon tape on upper side, see section 4.2.1.

4.2.4 Gap seals rudder

4.2.4.1 Gap seals rudder LS4 und LS4-a

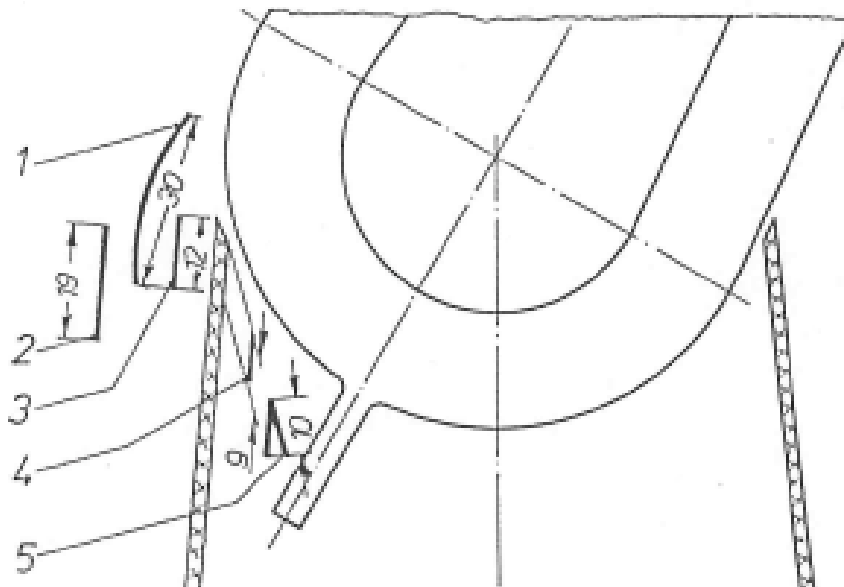
Originally: Internal seals with Teflon tape on both sides, see section 4.2.1.

4.2.4.2 Gap seals rudder LS4-b, optional LS4 und LS4-a

Convex sealing strips outside with internal V sealing tapes. Installation see sketch.

Lfd. Nr.	Bezeichnung	Artikelnummer	Bedarf
1	Mylar seal convex, 30mm	30003128	2 * 1,2m
2	Tesafilm white 4104, 19mm	70000229	2 * 1,2m
3	Tesafix 4965, 12mm,	45002076	2 * 1,2m
4	Tesafix 4965, 9mm,	70000253	2 * 1,2m
5	V sealing tape, 20mm self adhesive	70000295	2 * 1,2m

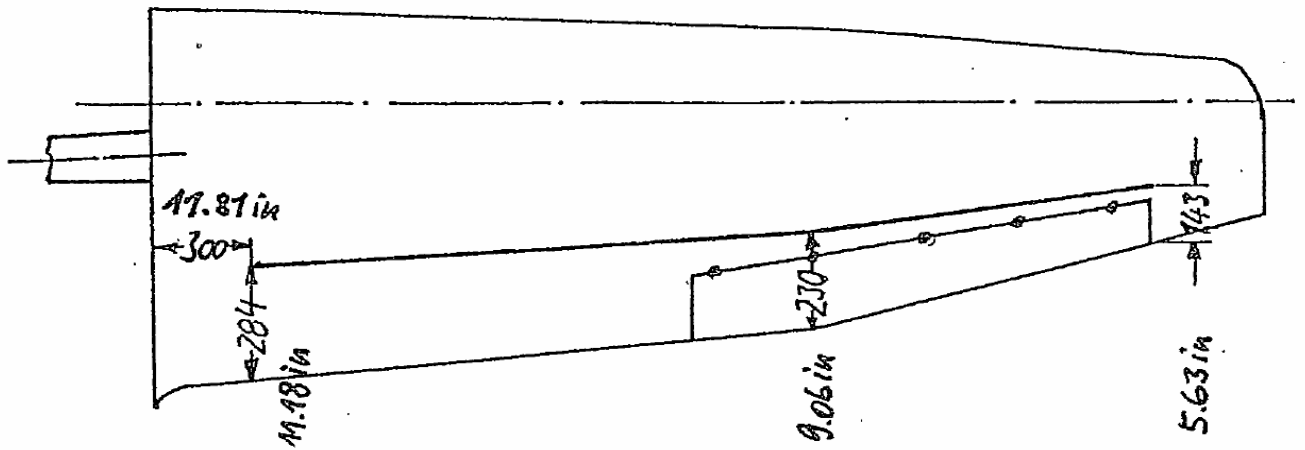
Note: item 4 is only required with V-tape not self adhesive.



4.2.5 Turbulator on lower wing surface

90° zig-zag tape (approx. 0,4 mm <0.016 in.> thick and 12 mm <0.47 in.> wide) is used.

Given measurements are from leading edge of turbulator to wing trailing edge in mm and inches.



4.3 Removal and installation of seat shell

4.3.1 Removal and installation of seat shell LS4 and LS4-a

4.3.1.1 Removal of seat shell LS4 and LS4-a

- Disconnect the seat back at the base and the seat back adjustment cable at the left cockpit wall, swivel seat back out of the cockpit to the right hand side.
- Remove the rear part of the seat shell (3 bolts boltsULS-M6 (6 mm thread), hexagon recess No. 4 per side and 4 countersunk screws Philipps recess at front end).
- Remove the screws of the front part of the seat shell (5 countersunk screws M4 with Philipps recess per side) and .
- Remove the bolt fixing the bracket at the right hand side of the instrument panel to the rudder pedal suspension.
- Now you can lift the front part of the seat shell including the instrument panel for maintenance work.
- To remove the front part of the seat shell completely you have to remove the instrument panel. This work should only be done for installation or removal of the nose hook.

4.3.1.2 Seat shell installation LS4 and LS4-a

Follow disassembly steps in reverse order, in addition observe the following:

- Inspect seat area for foreign matter, tools etc.
- Check control system after installation for proper operation.
Check especially function of release system: hook opening completely as well as clearance (approx. 3 mm <0.12 in.>) at T-shaped handle with landing gear down and locked.

4.3.2 Removal and installation of seat shell LS4-b

4.3.2.1 Removal of seat shell LS4-b

- Disconnect the seat back at the base, swivel seat back out of the cockpit.
- Remove 8 boltsULS-M6 (6mm thread), hexagon recess No. 4 and 4 countersunk screws Philipps recess at front end. Watch for bolt length and installation position.
- Remove T-shaped handle from pedal adjuster cable (nut M5 width over flats 8 mm, prevent rotation of the cable by holding the cable end with pliers), pull cable through seat guide tube.
- Loosen stick cover, move air brake handle into rearward position
- Swivel left seat side up and take seat out to upper left.
- Disconnect release cable pulley from forward mounting at pedal support, store seat shell sideways.

Removal and installation of seat shell LS4-b cont.

4.3.2.2 Seat shell installation LS4-b

Follow disassembly steps in reverse order, in addition observe the following:

- Inspect seat area for foreign matter, tools etc.
- Rest right side of seat on support, direct control stick into cutout and pedal adjuster cable into guide, place air brake handle into rearward position
- Screw T-shaped handle to pedal adjuster cable and use pliers to prevent rotation of the cable end fitting.
- Connect release cable pulley cage to mounting at pedal support.
- Check control system after installation for proper operation.
Check especially function of release system: hook opening completely as well as clearance at T-shaped handle with landing gear down and locked.

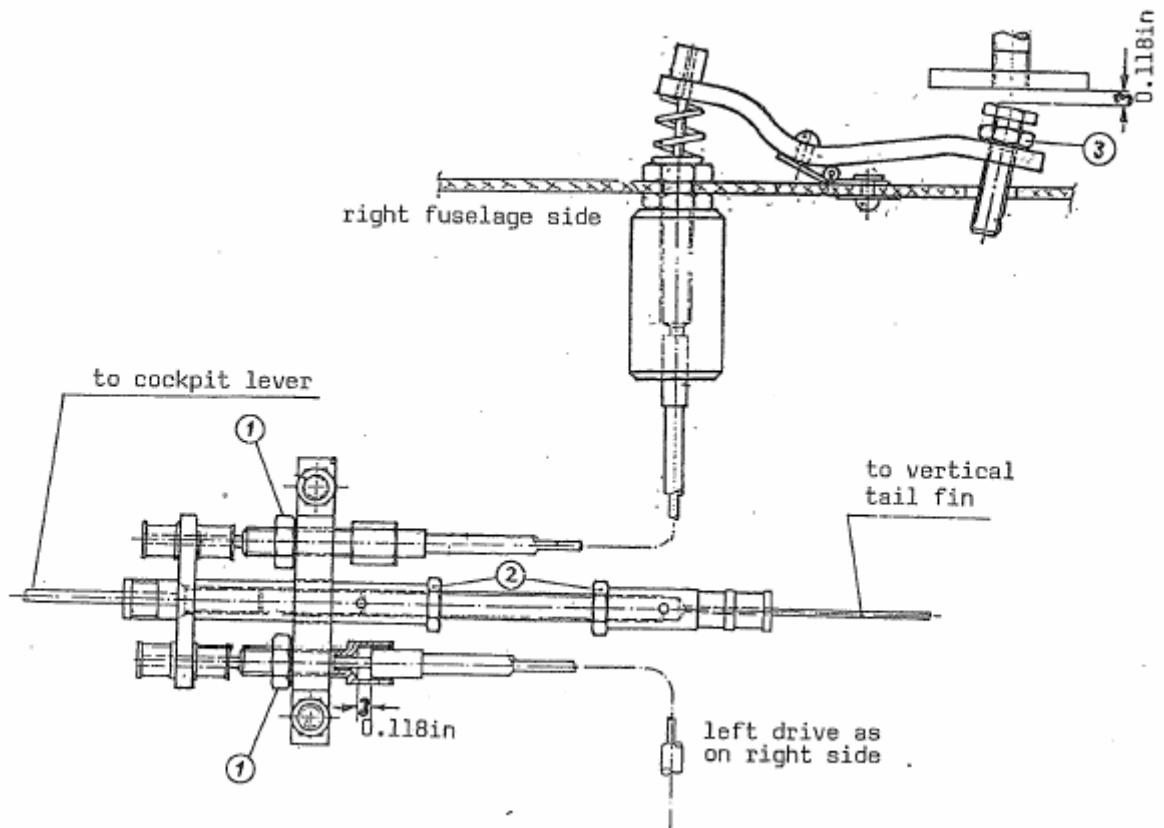
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4.4 Adjustment of water ballast valves

with fin tank installed:

- Check cockpit operating handle for overcenter lock in open position
- check bowden cable clearance at fuselage to wing mechanisms ① for nominal value of 3 mm (0.118 in) (knurled nuts at drive inside baggage compartment must be turned clockwise against stop).
- check vertical tail fin tank opening after filling in some water: nominal value 5 to 7 mm (0.197 to 0.276 in) travel at end of operating handle (in cockpit). If necessary, adjust at ②
- check clearance at ③ by pressing fuselage to wing mechanisms until touching wing valve stems for nominal value 3 mm (0.118 in). If necessary, adjust at fuselage side, nominal value 3 mm (0.118 in).
- do not forget to counter lock nuts after adjusting

Sketch for LS4-b



4.5 Removal and installation of the wing water ballast bags:

The water bags are kept in straight position by nylon rope, running from bag end over a pulley to the root rib, tension approx. 100 N <45 lbs>.

Note: The large waterbags 3F5-25 (installed in LS4-a) consist of 2 bags per wing which are connected via a tube running from the valve at the root through the inner bag to the outboard bag.

Installation is similar to the single bags but take care not to kink the tube.

4.5.1 Removal of the wing water ballast bags

Dump valve version 1 S/N. 4000 up to 4784 (see sketch in section 1.7.1):

- Use valve opener tool part no. 4F5-111 item 1 to open the cap nut of the valve, access from the root rib.

Dump valve version 2 from S/N. 4785 on (see sketch in section 1.7.1):

- Use water valve key part no. 4F05-82 (standard equipment), disconnect screwed joint of valve with dump tube from wing under side through dump tube.
- Unscrew large PVC-nut at root rib.

Both versions

- Open knot at rope end at root rib and connect approx. 15 m <49 ft> of braided nylon rope (ends heat sealed) by stitching for about 50 mm <2 in>. Do not connect by knot, this will not pass through pulley guide.

Dump valve version 1:

- Move dump valve body with water bag approx. 50 mm <2 in.> towards the wing tip, position mounting tool 4F5-111 item 2 on the pins protruding out of the valve body and pull valve and bag through opening in root rib, disconnect rope from bag.

Dump valve version 2:

- Pull valve and bag through opening in root rib, disconnect rope from bag.

Caution: If water bags are taken out of wings without additional rope, the wing shell must be cut open near the pulley to reinstall the rope !

Both versions

- Check bags for tightness with pressure 0.2 bar <2.9 psi.>.
- Exchange untight bags.
- Prior to removal of the valve body from the bag note the angle between the flat bag and the valve (e.g. by producing a card board pattern) for each bag.

4.5.2 Assembly of the wing water ballast bags

- Pull a piece of bicycle type tube over valve end, 60 mm <2.4 in> long.

Dump valve version 1:

- Adjust ballast bag with seam to leading edge and to valve with the pattern.
- If there are brass eyes along one side of the bag this side must be at the spar and the lower rope must be pulled through the eyes.

Dump valve version 2:

- Adjust ballast bag with seam to leading edge and to valve as shown below.

Both versions:

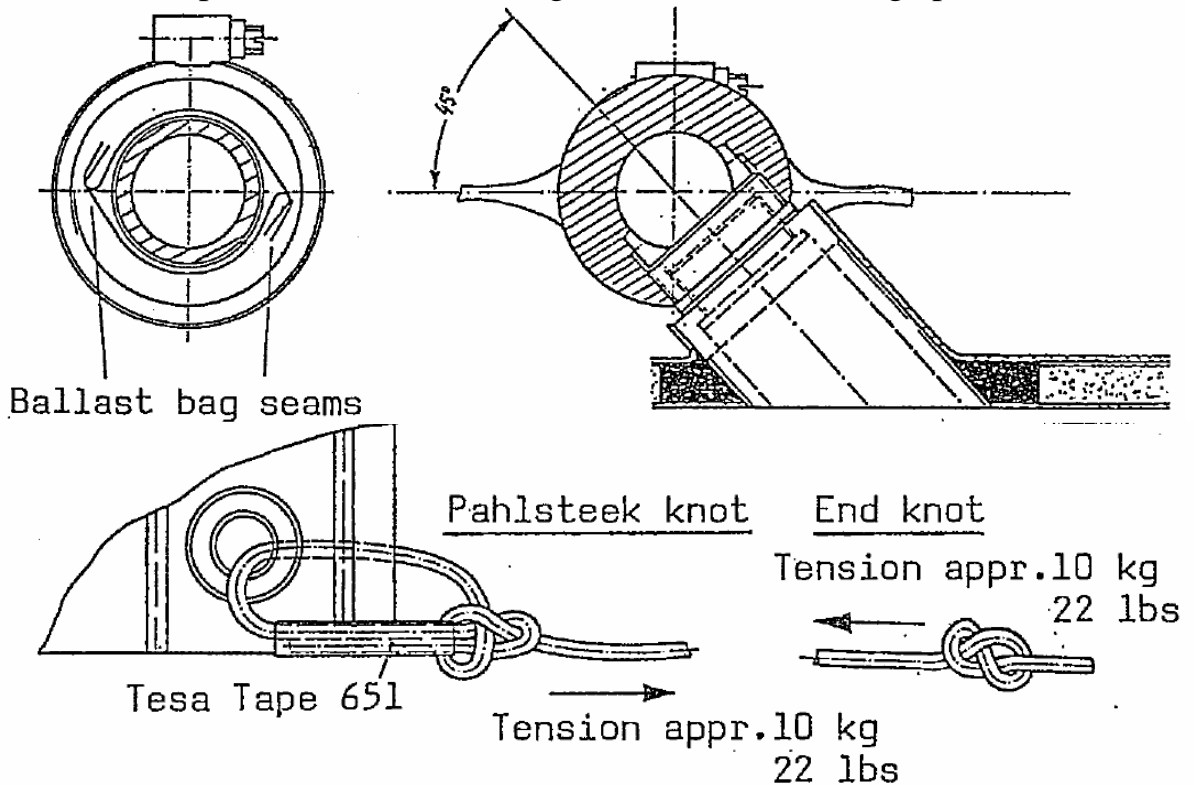
- Different valve direction may extend discharge time considerably.
- Push bag on valve stub, cover bag on stub with tape (example Tesaflex 4163) to protect bag against damage from hose clamps. Turn both seams during taping in the same circumferential direction, otherwise the discharge time will increase.
- Tighten hose clamps and check for watertightness before installation into wing.
- Connect braided nylon rope to brass eye at bag end by special knot ("Pahlsteek") as shown below.

Dump valve version 2:

- Fix free rope end with tape.

Both versions:

- Connect rope to intermediate rope in wing (if no longer connected) by stitching.
- Check for presence of bonded-on gasket at valve discharge port.



4.5.3 Installation of the wing water ballast bags

Dump valve version 1:

- Place bag with seam to leading edge, roll bag lengthwise and push into root rib cutout, pull cautiously on intermediate rope.
- Grease the thread at the dump valve body with Vaseline to prevent seizing of the thread due to water contamination.
- Use mounting tool 4F5-111 item 2 to pull the valve body into the holder mounted inside the wing. The pins protruding out of the valve body must be inserted into the notches of the holder.
- Screw on the cap nut by hand. Then tighten the cap nut using the valve opener tool part no. 4F5-111 item 1. Don't tighten too much.

Dump valve version 2:

- Place bag with seam to leading edge and valve discharge port 45° downward to the trailing edge, roll bag and push into root rib cutout, pull cautiously on intermediate rope.
- Screw brass nut from the outside through ballast dump port using water valve key 4F05-82 to assemble valve.
- Reinstall large PVC-nut at root rib, tighten nut only by hand.

Both versions:

- Pretension rope with about 100 N (45 lbs), place end knot as shown in sketch in section 4.5.2. Fix rope end (about 0.5 m <20 in> long) at root rib, do not cut off.
- Check adjustment of water valves as outlined in section 4.4.
- Fill bags according to instructions given in Flight Manual, check for tightness, proper discharge function and discharge time.
- If discharge time exceeds 4.5 minutes, the bag may be twisted. If the bag is not tight, water may drip from one of the drain holes. Disassembly is required again to find and solve the problem in order to clear the plane for flight!

4.6 Removal and installation of the tail fin water ballast tank (Option)

4.6.1 Tail fin water ballast tank removal

- Disconnect operating cable from cockpit distributor at position ②, see sketch in section 4.4 and extend with approx. 6 m (20 ft) of thin nylon cord
- Loosen clamp (or cut bonding) at right lower rudder cutout, holding discharge tube, push stiff tube of approx. 7 to 8 mm (0.28 to 0.32 in) outside diameter and 1.5 m (5 ft) length into discharge tube.
- Dismount 2 bolts holding upper tank end (and horizontal tail bracket), 8 mm thread, LN9037, width over flats 13 mm.
- Cut silicon rubber sealing at upper end cautiously with sharp knife.
- Pull tank upward and push auxiliary tube from lower end accordingly. Remove tank from auxiliary tube and nylon cord, which must stay in the tail fin for re-installation.

4.6.2 Tail fin water ballast tank installation:

- Before installation, check valve tightness using water, also tightness with valve fully open, but discharge tube held closed. Total valve travel between 7 and 9 mm (0.27 to 0.35 in). (In fully open position spring coils are solid)
- Push auxiliary tube into discharge tube, cover joint with tape to avoid edge catching at ribs or webs.
- Connect drive cable with auxiliary cord.
- Insert tank into vertical tail fin upper end, at the same time guide auxiliary tube and pull carefully on cord from cockpit.
- Valve must be inserted into a cutout in the lower tail fin rib, use caution to avoid valve damage.
- Seal upper tank edge with silicon rubber to surrounding structure.
- Mount 2 bolts holding upper tank end (and horizontal tail bracket), 8 mm thread, LN 9037, width over flats 13 mm. When tank is combined with battery box, these bolts also hold the battery box cover.
- Clamp end of discharge tube (or fix by bonding with hot-melt adhesive) in right lower rudder cutout.
- Adjust valve operation according to section 4.4.

Operation Check:

- a) Watertight with valve closed
- b) Opening before wing system
- c) Tightness during filling (back to front via funnel). With valve open, water level in filling tube must remain constant.

4.7 Removal and installation of the C.G. Hook

Tools: 3/8" or 1/4" drive ratchet, 8 and 10 mm sockets, 8 and 10 mm ring- or open end spanners.

Note: Note length of bolts and positioning of washers for all assembly positions. Do not include hook fixing bolts, when sending to overhaul.

4.7.1 Removal of the C.G. Hook

- Take canopy off the fuselage with a helper after pulling emergency canopy release (see section 4.9).
- Disassemble seat according to section 4.3.
- Under seat, disconnect C.G. release cable from pulley, watch for spacer bushing.
- Remove fixing bolts >4< and >5<.
- pull hook downward.
- Open screwed joints >1< at cable end, remove cable end and bush >6<.

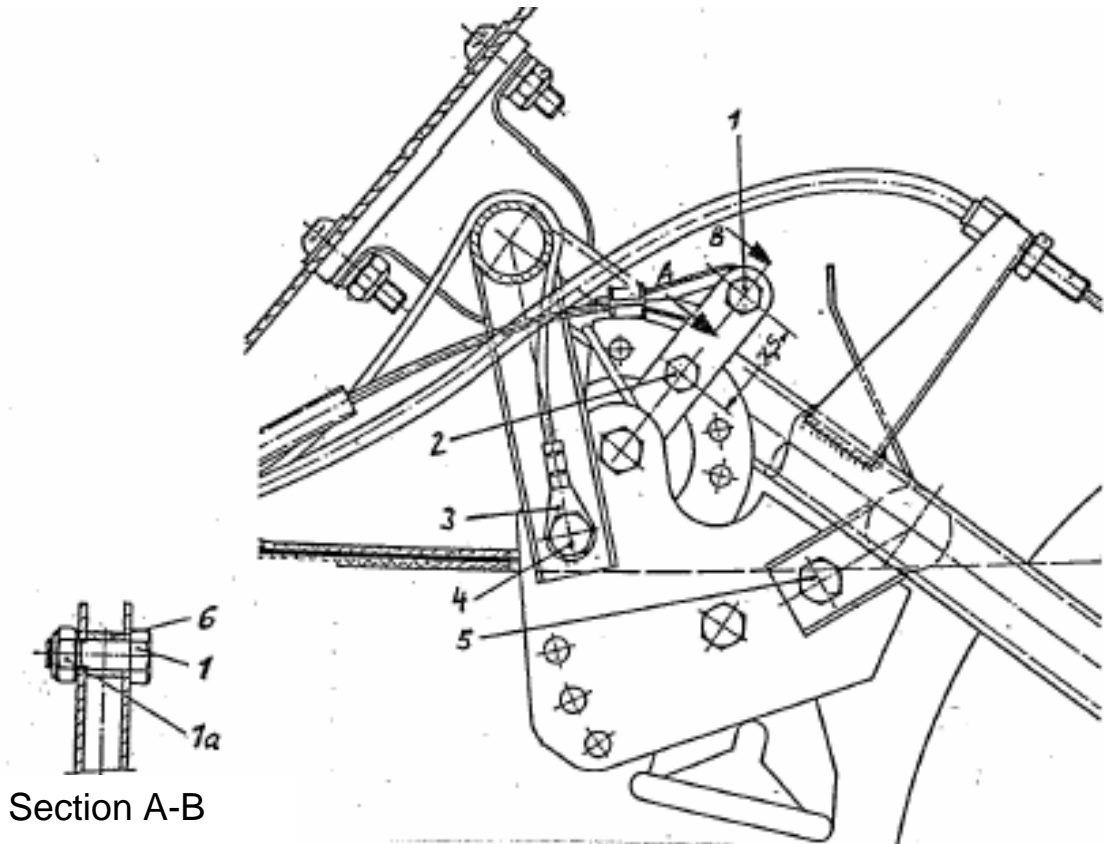
4.7.2 Installation of the C.G. hook

Installation is in reverse order, watch out especially for the following:

- Replace cable if wear is considerable, replacement of cables see section 11.6.
- Cable must be routed **below** tube of landing gear fork.
- For position of drive lever at circular segment and fixing bores see sketch below.
- Insert cable end with spacer bushing >6< between shortened lever arms at hole >1< (24.5 mm (0.965 in.) from hole >2<). Install and secure bolt >1< and if necessary >2<.
- Connect ground cable >3< (leading to control stick) together with forward fixing bolt >4<.
- Connect hook operating cable to pulley under seat and check function of C.G. hook.
- For proper overcenter lock of C.G. hook, 5 mm (0.2 in) of free cable travel at cockpit handle must be available with landing gear down and locked.
- Before installation of seat, check for foreign matter.

Caution: Wrong drive lever length, cable above tube of landing gear fork, wrong drive lever position at segment or use of other hook fixing positions may result in aborted takeoffs or make release impossible.

Removal and installation of the C.G. Hook cont.



4.8 Removal and installation of the nose hook (Option)

Tools: Ratchet with 8 and 10 mm sockets, 3 and 4 mm hex head driver sockets, 10 mm ring spanner, 12 mm open end spanner.

Note: Note length of bolts and positioning of washers for all assembly positions. Do not include hook fixing bolts, when sending to overhaul.

4.8.1 Removal of the nose hook

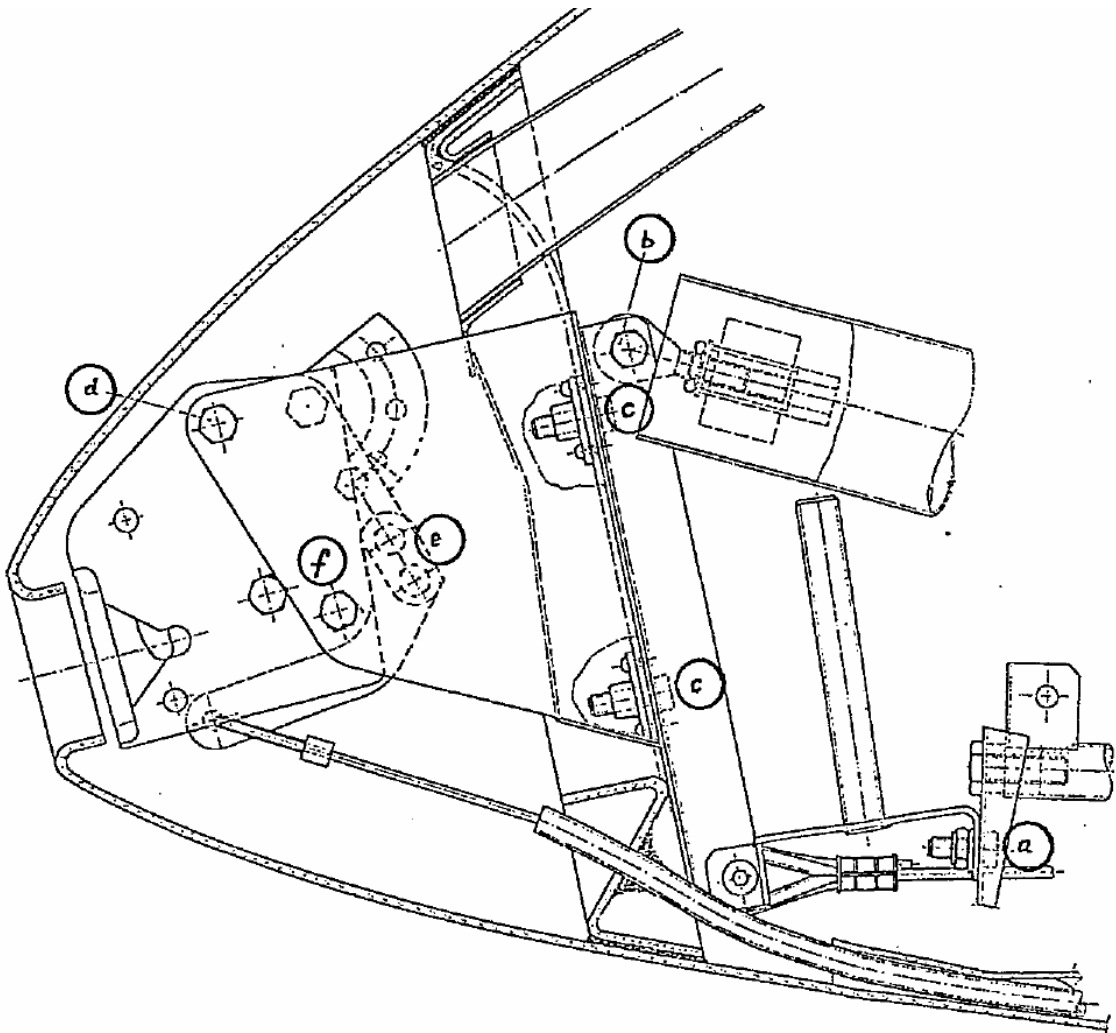
- take canopy off the fuselage with a helper after pulling emergency canopy release (see section 4.9).
- disassemble seat according to section 4.3.
- under seat, disconnect C.G. release cable from pulley, watch for spacer bushing.
- pull pedals to rearmost position
- **Only LS4, LS4-a:** remove rudder pedal assembly and trim weight holder.
- **Only LS4-b:** disconnect trim weight holder from pedal guide >a<
- **Only LS4-b:** disconnect 2 bolts >b< at front end of canopy support from bracket, move support as far back into cockpit as possible, perhaps disconnecting gas strut at one end as well.
disconnect both canopy support brackets including trim mass holder from nose bulkhead >c< and move backwards
- pull nose hook together with brackets backward from bulkhead
- disassemble nose hook from support >d< and >f<, watch for 4 spacers between nose hook case and support, at >f< 1 additional spacer inside nose hook case
- disassemble drive extension with cable at >e< from drive lever

4.8.2 Installation of nose hook

Installation is in reverse order, watch out especially for the following:

- insert spacer at >f< before assembly of drive lever extension
- when assembling nose hook into support, direct spacers into position using the 12 mm open ended wrench
- after assembly at >c< and connection of C.G. hook cable to pulley (spacer!), check function of both hooks
- before installation of seat, check functions of pedal system and locking of pedal adjustment, function of canopy support, electrical and pneumatic installations of all instrumentation and check for foreign matter.

Removal and installation of the nose hook cont.



4.9 Canopy emergency release

Function check of canopy emergency release on the ground

- a) "Pilot" in seat, both canopy locking handles opened. One person at the front end to lift the canopy.

Only LS4-b: The person at the front end should make sure that the canopy is not lifted too far up by the gas strut. Otherwise this would unduly deform the spring of the LS-Latch (Röger hook) located at the fuselage.

After pulling the emergency canopy release handle the canopy must be freely moveable at the front.

LS4 and LS4-a with TN4032 executed: The canopy must be lifted at the front by the spring at the hinge by about 30 mm <1.2 in.>

LS4-b: The canopy must be lifted at the front by the instrument panel.

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- b) After pulling the emergency canopy release handle, the pilot pushes the canopy up at the rear to disengage the LS-Latch (Röger hook) from the spring on the fuselage.
- c) Then the pilot lifts the canopy at the rear end up as far as possible, the person at the front end holds the canopy on the canopy hinge.

Caution*: The person at the front end should not lift the canopy too far up. Otherwise this would unduly deform the spring of the LS-Latch (Röger hook) located at the fuselage.

Note: b) and “Caution*” apply only if TN 4032 LS-latch (Röger Hook) has been performed.

Reinstalling the canopy:

2 persons are needed

LS4 and LS4-a:

- a) Pull the canopy hinge up to the open position.
- b) One person (at the front end) holds with one hand the emergency release lock in open position and places the canopy with the other hand onto the hinge. The other person holds the canopy rear end so far up that it matches the canopy hinge.

With TN4032 executed: The spring fixed at the canopy must be inserted into the ring at the canopy lifting mechanism. When pressing down the canopy make sure that the spring doesn't buckle.

- c) The front person engages the canopy by turning the emergency release lock to the stop.

LS4 -b:

- a) One person (at the front end) moves the right hand side canopy handle completely backwards to the emergency release position.
- b) The other person holds the canopy rear end so far up that it matches the canopy hinge.
- c) The front person places the canopy onto the hinge, pushes the locking device up and engages the canopy by rotating the locking lever counter clockwise up to the stop. Move the canopy slightly in all directions to facilitate the procedure.

With TN 4032 executed check function of LS-latch (Röger hook) for canopy emergency release:

Measure force required to pull bolt free from spring during opening of canopy at rear canopy edge: force should be between 8 and 15 kg (18 to 33 lbs).

When force is clearly lower, the spring must be exchanged to guarantee proper separation of canopy from fuselage during jettison.

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5 Control surfaces

5.1 Control surface deflection limits

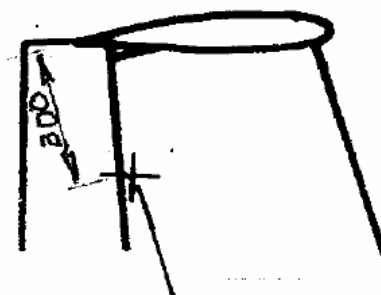
Rudder:	to both sides	27° up to 29° or
	at radius 310mm	140 up to 160 mm
	12.2 in.	5.51 in. up to 6.3 in.
Aileron:	up	21° up to 25° or
	at radius 165mm	60 up to 71 mm
	6.50 in.	2.36 in. up to 2.8 in.
	down	13° up to 15° or
	at radius 165mm	37 up to 43 mm
	6.50 in.	1.46 in. up to 1.69 in.
Elevator:	up	24° up to 30° or
	at radius 148mm	359 – 369 mm from reference point
	5.83 in.	14.13 in. up to 14.53 in.
	down	19° - 23° or
	at radius 148mm	240 – 250 mm from reference point
	5.83 in.	9.45 in. up to 9.84 in.

Caution elevator: The values in mm / in. are only valid for **LS4 and LS4-a**.

For **LS4-b** the values in mm / in. are to be found in section 5.5.

You can't compare the values for LS4 and LS4-a with the LS4-b values as with LS4-b the reference point was moved further forward.

For all variants the reference point is located 300 mm <11.81 in.> from the elevator trailing edge at zero setting, below the elevator and in front of the fin trailing edge.



elevator reference point

Note LS4-b: During LS4-b production the control surface trailing edges haven't been cut at the same radius., so the radius is not a fixed value.

You may determine the value from the production inspection deflections report or by measuring.

You find the control surface tolerances in mm / in. for different radii in the tables in section 5.5.

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5.2 Control surface weight and mass balance

(Check when suspecting changes of mass and after repairs)

Weight and mass balance should be within given limits for safety against flutter.

LS4 and LS4-a:

Surface	Mass <kg> <lbs.>	Horizontal reference line	radius <mm> <in.>	Trailing edge load at measuring point <kg> <lbs.>
Elevator	1.41 up to 1.90 3.11 up to 4.19	Centreline of section	148 5.83	0,33 up to 0,44 0.728 up to 0.970
Rudder	3.70 to 4.50 8.16 up to 9.92	Centreline of section	310 12.2	-0,04 up to +0,10 -0.088 up to +0.220
Aileron	3.50 up to 5.00 7.72 up to 11.02	Upper side	165 6.5	0,60 up to 0,80 1.323 up to 1.764

LS4-b:

Surface	Mass <kg> <lbs.>	Horizontal reference line	Hinge Moment <kg*cm> <in. lbs.>
Elevator	1.41 up to 1.90 3.11 up to 4.19	Straight region of upper side	4.88 up to 6.50 4.24 up to 5.64
Rudder	3.70 to 4.50 8.16 up to 9.92	Centreline of section	0 up to 3.50 0 up to 3,04
Aileron	3.50 up to 5.00 7.72 up to 11.02	Upper side	10.00 up to 13.70 8.68 up to 11.89

Measuring technique for hinge moments: Control surfaces should be attached individually at two bearings without any tension or friction.

Measure load at trailing edge with reference line level

Only LS4-b: Measure additionally radius from hinge line to measuring point, multiply load and radius to yield hinge moment.

When using identical locations for measuring as used in final production inspection, only trailing edge load must be checked.

Caution: Repairs are possible only in exceptional cases.

After changes of local static moments due to repairs, local mass balance must be fixed in order to yield identical static moment values as in the factory-built condition.

Maintenance Manual LS4

5.3 Control surfaces free play

(Should be inspected annually)

Free play should be measured with control stick fixed to neutral position. Measure at the trailing edge of the control surface.

Elevator: maximum 3 mm (0.12 in) at inner edge

Aileron: maximum 3 mm (0.12 in) at inner edge

Rudder: not applicable

5.4 Control surfaces friction

(Should be inspected annually)

Elevator: maximum 1.5 N <0.331 lbs> at 30 mm <1.2 in.> below top end of control stick

Aileron **LS4 and LS4-a** with fabric tape seal at upper side (see section 4.2.2.1): approx. 2 N <0.441 lbs> at 30 mm <1.2 in.> below top end of control stick

Aileron **LS4-b and LS4 and LS4-a optionally** with complete seal (see section 4.2.2.2): 2 N up to 5 N <0.441 to 1.102 lbs> at 30 mm <1.2 in.> below top end of control stick

Rudder: up to 5 N <1.102 lbs> at reference point 310mm <12.2 in.> behind hinge line

Caution: The seals must be installed for measurement.

Measuring technique for friction:

All surfaces: Use a spring balance with suitable measuring range.

Start measurement from neutral position of control surface. Measure the force when the control or surface starts moving. Don't measure at larger deflections. Measure in both directions.

Elevator friction should be measured with trim setting neutral.

Maintenance Manual LS4

5.5 Limit values for control surface deflections in mm/in. ,only LS4-b

Elevator

local radius mm/in	down * 23°to 19°	up * 24°to 30°
145 mm 5.709 in.	241 to 251 mm 9.488 to 9.882 in.	352 to 363 mm 13.858 to 14.291 in.
146 mm 5.748 in.	241 to 251 mm 9.499 to 9.882 in.	352 to 364 mm 13.858 to 14.331 in.
147 mm 5.787 in.	241 to 251 mm 9.488 to 9.882 in.	353 to 365 mm 13.898to 14.370 in.
148 mm 5.827 in.	241 to 251 mm 9.488 to 9.882 in.	353 to 365 mm 13.898 to 14.370 in.
149 mm 5.8665 in.	241 to 251 mm 9,488 to 9.882 in.	354 to 366 mm 13.937 to 14.409 in.
150 mm 5,906 in.	241 to 251 mm 9.488 to 9.882 in.	355 to 367 mm 13.976 to 14.449 in.
151 mm 5.945 in.	241 to 251 mm 9.488 to 9,882 in.	355 to 367 mm 13.976 to 14.449 in.
152 mm 5.984 in.	241 to 251 mm 9.488 to 9.882 in.	356 to 368 mm 14.016 to 14,488 in.
153 mm 6.024 in.	241 to 251 mm 9.488 to 9.882 in.	357 to 369 mm 14.055 to 14.528 in.
154 mm 6.063 in.	241 to 252 mm 9.488 to 9.921 in.	357 to 369 mm 14.055 to 14.528 in.
155 mm 6.102 in.	241 to 252 mm 9.488 to 9.921 in.	358 to 370 mm 14.094 to 14.567 in.

* measured up to reference point see section 5.1.

Maintenance Manual LS4

Limit values for control surface deflections in mm/in. ,only LS4-b cont.

Rudder

** mm/in	local radius mm/in '	26°to 30°
309 mm 12.165 in	305 mm 12.008 in	137 to 158 mm 5.394 to 6.221 in
310 mm 12.205 in	306 mm 12.047 in	138 to 158 mm 5.433 to 6.221 in
311 mm 12.244 in	307 mm 12.087 in	138 to 159 mm 5.433 to 6.260 in
312 mm 12.283 in	308 mm 12.126 in	139 to 159 mm 5.472 to 6.260 in
313 mm 12.323 in	309 mm 12.165 in	139 to 160 mm 5.472 to 6.299 in
314 mm 12.362 in	310 mm 12.205 in	139 to 160 mm 5.472 to 6.299 in
315 mm 12.402 in	311 mm 12.244 in	140 to 161 mm 5.512 to 6.339 in
316 mm 12.441 in	312 mm 12.283 in	140 to 162 mm 5.512 to 6.378 in
317 mm 12.480 in	313 mm 12.323 in	141 to 162 mm 5.551 to 6.378 in
318 mm 12.520 in	314 mm 12.362 in	141 to 163 mm 5.551 to 6.417 in
319 mm 12.559 in	315 mm 12.402 in	142 to 163 mm 5.591 to 6.417 in

** measure this value from rudder trailing edge to center of one of the rudder cable fixing bolts

Maintenance Manual LS4

Limit values for control surface deflections in mm/in. ,only LS4-b cont.

Aileron

local radius mm/in	Down 13° to 15°	Up 21° up to 25°
155 mm 6.102 in.	35 to 40 mm 1.378 to 1.575 in.	56 to 67 mm 2.205 to 2.6381 in.
156 mm 6.142 in.	35 to 41 mm 1.378 to 1.614 in.	57 to 68 mm 2.244 to 2.6771 in.
157 mm 6.181 in.	36 to 41 mm 1.417 to 1.614 in.	57 to 68 mm 2.244 to 2.6771 in.
158 mm 6.221 in.	36 to 41 mm 1.417 to 1.614 in.	58 to 68 mm 2.284 to 2.677 in.
159 mm 6.260 in.	36 to 42 mm 1.417 to 1.654 in.	58 to 69 mm 2.284 to 2.717 in.
160 mm 6.299 in.	36 to 42 mm 1.417 to 1.654 in.	58 to 69 mm 2.284 to 2.717 in.
161 mm 6.339 in.	36 to 42 mm 1.417 to 1.654 in.	59 to 70 mm 2.323 to 2.756 in.
162 mm 6.378 in.	37 to 42 mm 1.457 to 1.654 in.	59 to 70 mm 2.323 to 2.756 in.
163 mm 6.417 in.	37 to 43 mm 1.457 to 1.693 in.	59 to 71 mm 2.323 to 2.795 in.
164 mm 6.457 in.	37 to 43 mm 1.457 to 1.693	60 to 71 mm 2.362 to 2.7951 in.
165 mm 6.496 in.	37 to 43 mm 1.457 to 1.693 in.	60 to 71 mm 2.362 to 2.795 in.

Maintenance Manual LS4

6 Special tools:

Tool	Function
Ratchet Key	for assembly / disassembly of the horizontal tailplane
Filling tube and funnel with wire meshing	for filling of water ballast system through discharge openings
Vertical tail tank adapter (if fin tank is existent)	for testing of vertical tail fin valve, to avoid take-offs with unintentionally filled vertical tail tank, as well as for filling of tail tank together with filling funnel including wire meshing
Water ballast dump valve Version 1 (see sketch in section 1.7.1)	
Valve opener 4F5-111 item 1	for removal and installation of the waterbag and dump valve body from the elbow in the wing
Mounting tool 4F5-111 item 2	
Water ballast dump valve Version 2 (see sketch in section 1.7.1)	
Valve key 4F05-82	for removal and installation of the water valve from the wing dump outlet

7 Placards and markings

7.1 Placards and markings LS4

MINIMUM COCKPIT LOAD....kg

- LS4 CHECKLIST**
 This sailplane must be operated in compliance with operating limitations as stated in the form of markings, placards and flight manual.
1. Lock main pins
 2. Lock aileron connections
 3. Lock dive brake connections
 4. Lock horizontal tail
 5. Test controls
 6. Check loading conditions
 7. Fasten seat belt harness
 8. Connect parachute static line
 9. Lock dive brakes
 10. Lock canopy
 11. Trim forward for take off
 12. Check release

under instrument panel cover

on right side of cockpit

BATTERY in fin baggage comp.

ROLLADEN SCHNEIDER FLUGZEUGBAU GMBH

Type	Serial No.		
AIRSPEED LIMITS (IAS)			
	km/h	MPH	kts
Never Exceed (VNE)	270	168	146
In Rough Air (VB)	180	112	97
Maneuvering (VA)	180	112	97
Aero Tow (VT)	180	112	97
Winch Tow (VW)	130	81	70
Dive Brakes	270	168	146
Landing Gear (VL)	270	168	146

Maximum Weight **472 kg (1041 lbs)** including water ballast.

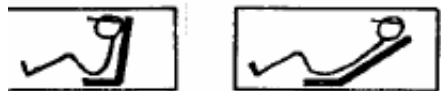
No aerobatic maneuvers approved.

Weight Limitations		kg	lbs
Pilot Weight incl. parachute	Max.		
	Min.		

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

When using the battery in the vertical tail fin, Minimum Cockpit Load must be redetermined by weighing.

at battery box in vertical tail fin



Backrest Adjustment Placard

VNE up to **6500 ft** **9800 ft** **19700 ft** **32800 ft**

Airspeed Indicator Placards

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

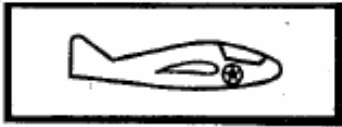
Baggage Compartment Placard

Maintenance Manual LS4

Placards and markings LS4 cont.

Holladen Schneider Flugzeugbau GmbH	
Type	LS4
Serial No.	_____
FAA TC	_____ Made in West-
Reg.No.	_____ Germany

Type placard at main bulkhead



Gear up



Gear down

Tyre Pressure
3-3.5 bar (43-50 psi)

on left main wheel door



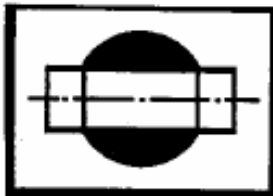
Trim nose down



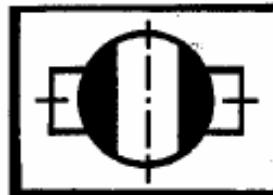
Trim nose up

Tyre Pressure
2.5-5 bar (36-72 psi)

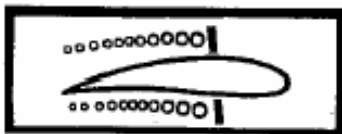
near tailwheel, if fitted



Water ballast
valve open



Water ballast
valve closed



Divebrake
control



Towrope release
on panel



Canopy release on rim



Canopy emergency
release on panel



Air vent on panel



Pedal adjustment on panel

Max. Flying Altitude
20000 ft

Near Altimeter, when range 20000 ft

OFF

Electrical switch positions

ON

Maintenance Manual LS4

7.2 Placards and markings LS4-a

MINIMUM COCKPIT LOAD....kg

- LS4 CHECKLIST**
 This sailplane must be operated in compliance with operating limitations as stated in the form of markings, placards and flight manual.
1. Lock main pins
 2. Lock aileron connections
 3. Lock dive brake connections
 4. Lock horizontal tail
 5. Test controls
 6. Check loading conditions
 7. Fasten seat belt harness
 8. Connect parachute static line
 9. Lock dive brakes
 10. Lock canopy
 11. Trim forward for take off
 12. Check release

under instrument panel cover

on right side of cockpit

**BATTERY in fin
baggage comp.**

ROLLADEN SCHNEIDER FLUGZEUGBAU GMBH

Type	Serial No.
------	------------

Maximum Weight 525 kg | 1157 lbs.
including water ballast.

AIRSPPEED LIMITS (IAS)

	km/h	MPH	kts
Never Exceed (VNE)	280	174	151
In Rough Air (VB)	190	118	103
Maneuvering (VA)	190	118	103
Aero Tow (VT)	190	118	103
Winch Tow (VW)	140	87	76
Dive Brakes	280	174	151
Landing Gear (VL)	280	174	151

No aerobatic maneuvers approved.

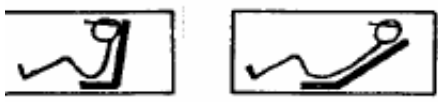
Weight Limitations

	kg	lbs
Pilot Weight incl. parachute	Max. <input type="text"/>	<input type="text"/>
	Min. <input type="text"/>	<input type="text"/>

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

When using the battery in the vertical tail fin, Minimum Cockpit Load must be redetermined by weighing.

at battery box
in vertical tail fin



Backrest Adjustment Placard

VNE up to 6500 ft | 9800 ft | 19700 ft | 32800 ft

Airspeed Indicator Placards

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

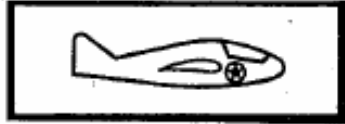
Baggage Compartment Placard

Maintenance Manual LS4

Placards and markings LS4-a cont.

Rolladen Schneider Flugzeugbau GmbH	
Type	LS4-a
Serial No.	_____
FAA TC	Made in West-
Reg.No.	Germany

Type placard at main bulkhead



Gear up



Gear down

Tyre Pressure
3-3.5 bar (43-50 psi)

on left main wheel door



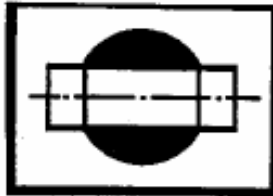
Trim nose down



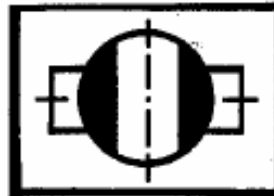
Trim nose up

Tyre Pressure
2.5-5 bar (36-72 psi)

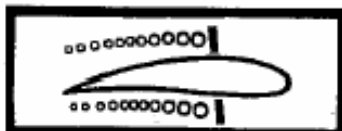
near tailwheel, if fitted



Water ballast
valve open



Water ballast
valve closed



Divebrake
control



Towrope release
on panel



Canopy release on rim



Canopy emergency
release on panel



Air vent on panel



Pedal adjustment on panel

Max. Flying Altitude
20000 ft

Near Altimeter, when range 20000 ft

OFF
ON

Electrical switch positions

Maintenance Manual LS4

7.3 Placards and markings LS4-b

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

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

at main bulkhead

Tyre Pressure
 3 to 3.5 bar
 43.5 to 50.8 psi

on right
 landing gear door

Tyre Pressure
 2.5 to 3.5 bar
 36.3 to 50.8 psi

above tail wheel,
 if fitted

ROLLADEN-SCHNEIDER Flugzeugbau GMBH
 TYPE LS4-b
 TCDS No. _____
 Serial Number 4xxx
 Registration _____

Type Placard at main bulkhead
 >4<

>1< at under side of instrument panel

Minimum cockpit load	kg/	lbs
Minimum Cockpit Load with		
tail fin tank empty	kg/	lbs

>2< under instrument panel cover

>3< at right cockpit side

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

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

Ball of bearing
 must be fixed

at forward horizontal
 tail attachment on
 vertical tail fin

Batt. I
Batt. II
OFF

Electrical switch positions

Maintenance Manual LS4

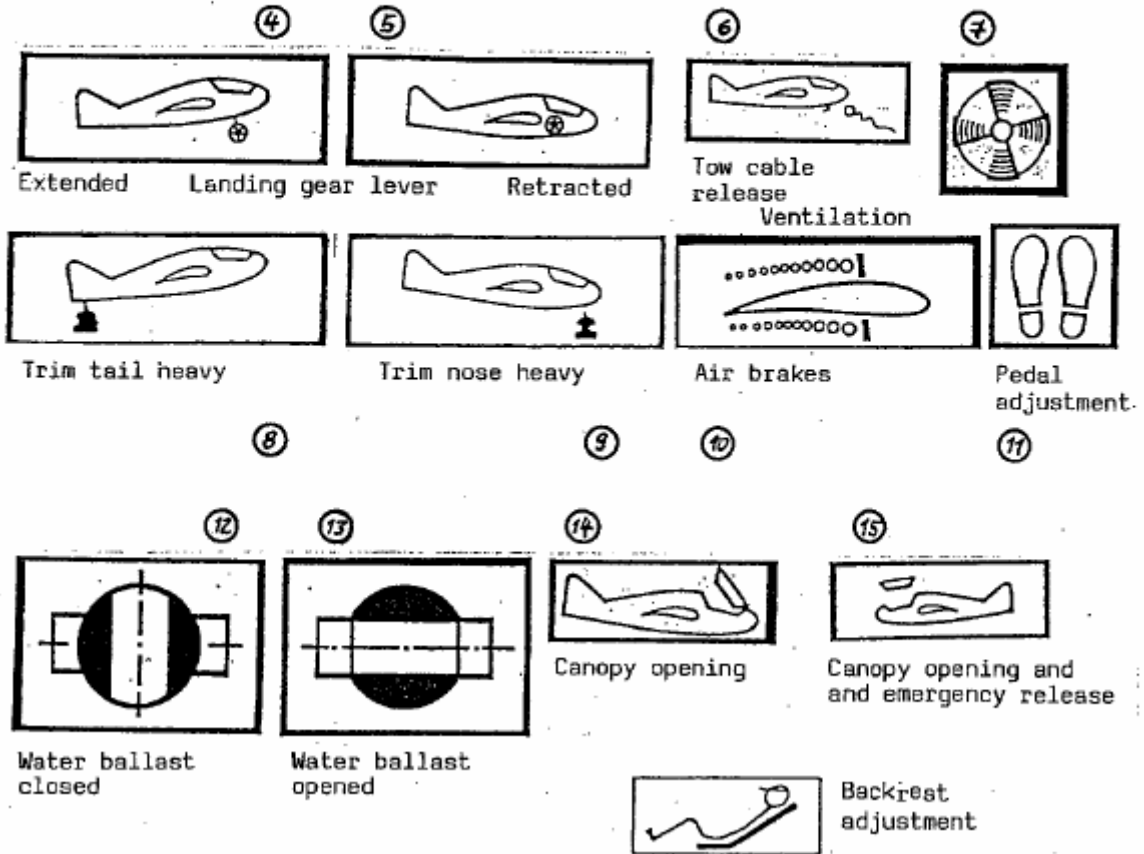
Placards and markings LS4-b cont.

Use vertical tail fin battery only with main fuse at battery

(under battery box cover of vertical tail, if fitted)

When using a battery in the vertical tail fin, Minimum Cockpit Load must be redetermined by weighing

(under battery box cover of vertical tail, if fitted)



CanopyEmergency Release: open left side normally, Pull right side with approx. 15 kg/33 lbs. force to stop

near right canopy opening handle

8 Permanent installation of fixed ballast and equipment

Caution: After permanent installation of fixed ballast, empty mass C.G. position and loading limits should be redetermined by weighing. See Chapter 2.

8.1 Fixed ballast under instrument panel

If empty mass C.G. position is too far back to allow 70 kg <154 lbs> as Minimum Cockpit Load, permanent installation of ballast under seat in front of control stick is possible.

Lever arm 1050 mm <41.3 in.> in front of datum).

Mass should be fixed in flight direction, using large washers and self-locking nuts such that vibration will not allow mass to rotate.

One mass of 2.45 kg <5.4 lbs> reduces the min. cockpit load by about 3 kg <6.6 lbs.>.

8.2 Fixed Ballast at rear fuselage end

In special cases empty weight C.G. position may be shifted rearward to allow heavy pilots to fly with rearward in-flight C.G. positions.

Therefore it is possible to install a battery, see section 9.9 (when a battery box is fitted), a heavy tail wheel hub or a trim weight (drawing 4R8-109) at the vertical tail fin web lower end using a holder (according to drawing 4R8-107b), see sketch (Tail wheel box and lower rudder bearing not drawn).

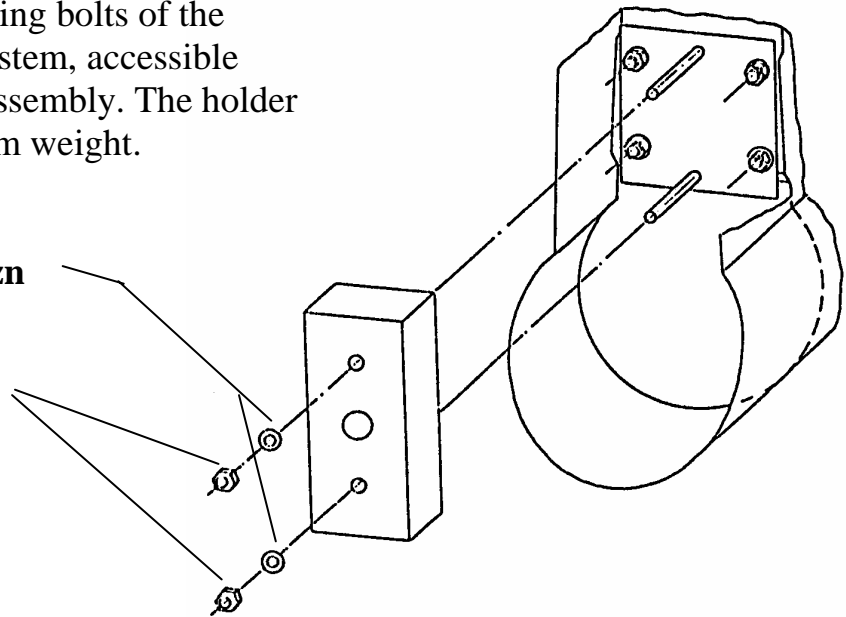
The rear trim weight holder must be fitted to 4 mounting bolts of the elevator drive system, accessible after rudder disassembly. The holder can carry one trim weight.

Washers

B6.4 DIN9021-Stzn

Nuts

**M6 LN9348 or
M6 DIN985-8zn**
(width over flats
10 mm)



Warning: Never dismount the rear trim weight holder, bolts and nuts are fixing points for the elevator system!

Disassembly and assembly of rudder see section 4. Check for unobstructed movement of rudder and measure rudder deflections after work!

After permanent installation of fixed ballast, execute a new empty mass and balance weighing, see section 2.

Maximum weight of rear trim weight: approx. 2.45 kg <5.4 lbs>. (Part 4R8-109)

Maintenance Manual LS4

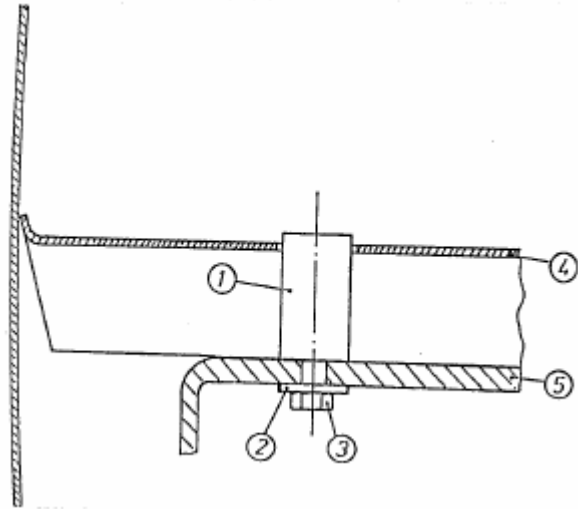
8.3 Permanent installation of equipment in baggage compartment

Installation is possible as follows:

- a) Equipment must be attached to landing gear box >5< (not to the baggage compartment floor) using threaded spacers >1<, three of which are necessary per unit.

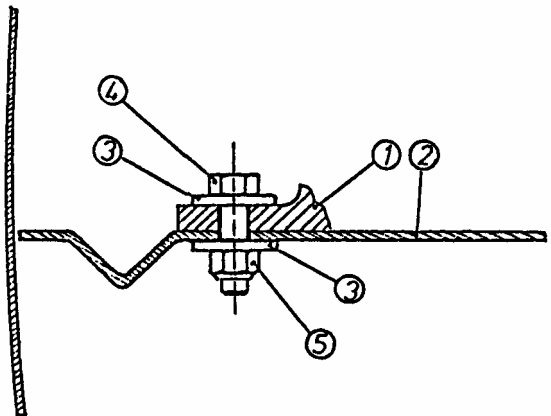
Baggage compartment cover >4< has to be cut to for the spacers (numbers see sketch).

1. Spacer, diameter 15 mm (0.6 in), length 23 mm (0.91 in). (part 4R7-8d)
2. Large washer B 6.4 DIN9021
3. Screw M6*10 DIN85-A2, stainless steel (secured with Loctite 243)
4. Baggage compartment cover
5. Landing gear box



- b) **Only LS4-b:** Attach to cover ② behind spar connection (only approved for ELT and Barograph) as close as possible to stiffening corrugation. Use large steel washers ③ according to DIN 9021 (15 mm diameter for 5 mm thread) and self locking nuts ⑤.

- 1 Flange of equipment part
- 2 Rear baggage compartment floor
- 3 Washer B5,3 DIN9021-St zn outside dia.: 15mm
- 4 Bolt M5 length according to thickness of flange
- 5 Lock nut M5 width over flats: 8mm (M5 DIN985-8)



Caution: Don't exceed the max. baggage compartment load of 5 kg (11 lbs.) with loose and permanently installed items.

Maintenance Manual LS4

9 Instruments- and Equipment List (Master Equipment List)

9.1 Airspeed Indicator

LS4

Manufacturer	Type	TCDS No.
Winter	6FMS 4 (Diameter 80mm) 0-300 km/h Ident.No.. LS-4-1 0-186 mph Ident.No.. LS-4M-1 0-160 kts Ident.No.. LS-4K-1	TS 10.210/15
Winter	7FMS 4 (Diameter 58mm) speed ranges and Ident.No. see 6FMS4	TS 10.210/19

LS4-a, LS4-b

Manufacturer	Type	TCDS No.
Winter	6FMS 4 (Diameter 80mm) 0-300 km/h Ident.No.. LS-4A-1 0-186 mph Ident.No.. LS-4AM-1 0-160 kts Ident.No.. LS-4AK-1	TS 10.210/15
Winter	7FMS 4 (Diameter 58mm) speed ranges and Ident.No. see 6FMS4	TS 10.210/19

or other instruments approved according to TSO, JTSO or ETSO for use in aircraft.

The ASI must have colour markings according to flight manual LS4 and LS4-a: page 1-3 and LS4-b section 2.3.

Maintenance Manual LS4

9.2 Altimeter

Manufacturer	Type	TCDS No.
Winter	4 FGH 10 (Diameter 80mm) 1000-10000m Ident.No.. 4100 3000-30000ft Ident.No.. 4330	TS 10.220/46
Winter	4 FGH 20 (Diameter 58mm) 1000-10000m Ident.No. 4220	TS 10.220/47
Winter	4 FGH 40 (Diameter 58mm) 1000-20000ft Ident.No.. 4550	TS 10.220/48
PZL	W-12S in m	

or other Altimeters approved according to TSO, JTSSO or ETSO for use in aircraft; one turn of dial max. 1000 m or 3000 ft. A similar FAA approved altimeter to meet TSO C10 with a range of approximately 30000 ft and a mercury or millibar or hektopascal subscale may be used.

When an altimeter of up to 20000 ft only is being used, a placard must be near the altimeter stating: Maximum flying altitude 20000 ft. See also Flight Manual section 2-8.

9.3 Seat Belt Harness (with multiple point buckles)

Manufacturer	Type	TCDS No.
Schroth	4-01-0104(Lap belt and shoulder strap)	40.073/11
Gadringer	BAGU 4502 mit SCHUGU 2300	40.070/32 no central 40.071/05 buckle
Gadringer	BAGU 5402 oder BAGU 5302 with SCHUGU 2700	40.070/32 40.071/05
Autoflug	BAGU FAG-7 D SCHUGU FAG-7 H	40.070/30 40.071/21

9.4 Compass

Manufacturer	Type	TCDS No.
Ludolph	FK 16, FK 5, FK 10	10.410/3
Airpath	C 2300	TS 10.220/47
Airpath	C 2400 P	
PZL	BS1, KJ-13A	FD 19/77
Bohli	46 MFK 1	Not approved, only as additional system

Maintenance Manual LS4

9.5 UHF – Transmitter and Receiver

Manufacturer	Type	TCDS No.
Dittel	FSG-40 S	10.911/45
	FSG-50	10.911/71
	FSG-60 M	10.911/72
	FSG-70, 71 M	10.911/81
	FSG-90	10.911/98JTSO
	FSG 2T	LBA.0.10.911/103JTSO
Becker	AR 3201-(1)	10.911/76
	AR 2008/25 (A)	10.911/48
	AR 4201	JTSO-2C37 D, ED-23A
	AR 6201	EASA.210.1249
Filser / Funkwerk	ATR 720 A	10.911/74
	ATR 720 C	10.911/83
	ATR 600	O.10.911/106JTSO
	ATR 500	LBA.0.10.911/113JTSO
	ATR 833	EASA.210.0193

or other radios approved according to TSO, JTSO or ETSO for use in aircraft.

9.6 Variometer

Manufacturer	Type	TCDS No.
Winter	5 StVM5 (Diameter 58mm)	TS 10.230/14
	+ 5 m/s Ident.No. 5451	
	+1000 ft/min Ident.No. 5452	
	+ 10 kts Ident.No. 5453	
Winter	5 STV 5 (Diameter 80mm)	TS 10.230/13
	+ 5 m/s Ident.No. 5251	
	+1000 ft/min Ident.No. 5252	
	+ 10 kts Ident.No. 5253	
Thommen	4A16() or 4A58()	
Bohli	68PVF1 or 68PVF2 in m/s	
PZL	WRS-5D in m/s	

9.7 Turn and Bank Indicator

Manufacturer	Type	TCDS No.
Apparatebau Gauting	WZ 402/31 12V	10.241/8
Kelvin & Hughes	KTS 0406 or KTS 0406 R	TS 10.210/19
PZL	EZS-3	

Maintenance Manual LS4

9.8 Thermometer

Only necessary with fin tank installed

Manufacturer	Type	
Störck	TF-00-059K, sensor in landing gear box or in air duct	

9.9 Electrical Supply

Only sealed batteries with built in fuse may be used.

Vertical Tail Fin Battery: Optional. Only batteries according to drawing No. 3BR-185a are approved for use.

Battery in baggage compartment: Optional. Fixing to landing gear box only according to section 8.3. E.g. Dittel ZT 092 12 V 6.5Ah with test set

Position of main fuse: At battery

Position of instrument fuses: At instrument panel.

Name: Microfuse 20x5 mm DIN 41571

Rating: 2A quick action for radios.

1A quick action for electrical variometers and turn and bank indicator

9.10 Equipment, not being part of minimum equipment:

Transponder: Units approved according to TSO, JTSO or ETSO for use in airplanes can be installed.

Installation of transponder and transponder antenna must be accomplished according to technical note DG-G-03.

Other equipment as gliding computers or loggers: These instruments can be installed, as long as it is guaranteed, that they themselves or their effect on the aircraft do not impair safe operation.

The installation must be must be accomplished according to technical note DG-G-07.

After installation a new weighing report must be filed.

Maintenance Manual LS4

10 Materials for repair

Resinsystems for repairs

Resin Momentive EPIKOTE™ Resin MGS LR 285 with
Hardener EPIKURE™ Curing Agent MGS LH 286
 mixing ratio 100:40 ±2 by weight

or

Resin Momentive EPIKOTE™ Resin MGS LR 385 with
Hardener EPIKURE™ Curing Agent MGS LH 386
 mixing ratio 100:35 ±2 by weight

Repaired regions must be postcured for 20 hours at a min. of 54°C (129°F) before the next take-off.

Fibre Glass Fabric:

Alkalifree E-glass with finish I-550 or FK 144 Manufacturer: Interglas

Interglas No.	Kind of weave	Mass (g/m ²)	Usage
92110	2/2 twill	163	Wing, stabilizer, all control surfaces
92125	2/2 twill	280	Fin, local reinforcing
92145	Unidir. Plain	216	Wing, stabiliser, fuselage, fin
92146	Unidir. Plain	440	Fuselage

Fibre Glass Rovings:

EC 14-2400-P 185 with Silan finish

Carbon Fibre Fabric (only LS4-b):

Manufacturer Sigri

Interglas No.	Kind of weave	Mass (g/m ²)	Usage
KDU 1006	Linen	368	Fuselage, canopy cut out
MDL-9019	Linen	246	Fuselage, canopy cut out
KDU 1007	Linen	205	Fuselage, canopy cut out

Polyester Fabric:

Manufacturer: Lückenhaus

No.	Kind of weave	mass(g/m ²)	Usage
34048 or 30781	Linen	206	Fuselage

Note: One layer of Polyester fabric should be replaced during repair with 2 layers of 92125.

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Foam:

PVC foam Divinycell H 60, 8 mm thick, mass 60 kg/m²,
<wing shells> Manufacturer: Diab

PVC foam Divinycell HP 80, 10 mm thick, mass 80 kg/m²,
<spar shearweb > Manufacturer: Diab

PVC foam Divinycell H 80 or HP 80, 6 mm thick, mass 80 kg/m²,
<stabilizer> Manufacturer: Diab

Foam Rohacell 71, 2.5 mm thick, mass 70 kg/m²,
<rudder> Manufacturer Röhme

Corrugated cardboard "E Wellpappe einseitig (370) API 80", 80g/m²
<ailerons, elevator> Manufacturer Clemens Wellpappe

alternatively for Rohacell 71

PVC-Hartschaum Divinycell H 60, 3 mm stark, mass 60 kg/m³
<rudder> Manufacturer: Diab

alternatively for Divinycell H60

PVC-foam Klegecell TR 75, 6 / 8mm stark, mass 75 kg/m³,
<wing shells, wing spar shear web, stabilizer> Manufacturer: Polimex

Glue for Plexiglas

To attach the canopy:

glue Teroson Macroplast UK 8303B60
hardener Teroson Macroplast UK5400
mixing ratio: 6 : 1 by mass or 4.4 : 1 by volume,
thickened with Aerosil.

To repair cracks in the canopy:

Röhme Acrifix 192 hardening by exposure to light.

Filler

For glueing, the resin-hardener mix should be thickened with chopped cotton flocks FL 1 f. (add enough so that the resin no longer flows). The surfaces to be glued should be wetted with non-thickened resin + hardener beforehand.

To glue foam pieces into place when repairing sandwich sections and to fill in irregularities and gaps etc. around the repair, Microballoon BJO - 0930 can be used mixed with the resin + hardener. Application and mixing is identical as for cotton flocks.

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Paint UP (Polyester Gelcoats)
Akzo Nobel UP Schwabbellack 03-69066
with hardener 07-20510
mixing ratio: 100:2 by weight
Up to 10 % thinner 0630260 can be used.

or Momentive T35 with hardener SF 2
mixing ratio: 100:2-3 by weight
Up to 10 % thinner SF can be used.

or PUR paint, if such paint was optionally applied

Warning Colour:

Nitro Cellulose Kombilack: Manufacturer: various
reinorange RAL 2004 (orange) or
rot RAL 3000 (red)

Sources for material

All materials can be obtained from the DG Flugzeugbau Factory.

11 Repairs

11.1 Preface

The purpose of this section is to provide basic repair instructions for minor damage to GFRP gliders. (Glass fibre reinforced plastics). Detailed information regarding all the processing of GFRP is not given in this manual assuming that all repair work will only be carried out by people with practical knowledge in the use of these materials.

The repair of gliders should not be used to learn FRP laminating techniques.

Before beginning any repair work carefully determine what materials, tools, jigs and repair methods are to be used. The required information can be found in this manual. To insure that the aircraft performance is maintained, the surface finish of the repair work should be of the same quality as the original finish.

When doubts arise as to the repair ability of damage, the DG Flugzeugbau factory should be contacted for further information.

The information in this manual refers only to repairs of minor damage like holes in the underside of the fuselage resulting from a wheel up landing, or damage from hangar accidents etc, see section 2.

Major damage which is outside the scope of this manual should only be repaired by a certified repair station or by an approved mechanic rated for composite aircraft structure work.

Note: For repair- and servicing work on parts of the equipment. the instructions in the maintenance manual of the aircraft and the manuals belonging to the equipment parts are to be followed.

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11.2 Repairs of composite structures, General

Caution: You are only allowed to use the materials specified in section 10. Use only genuine spare parts.

Warning: Major damage which is outside the scope of the list below should only be repaired by a certified repair station rated for composite aircraft structure work.

For all aircraft under EASA regulations the following applies: According to part 21, subpart M to accomplish major repairs an approved repair instruction is required, see also TN LS-S-01 "Approved repair methods according to EU Commission Regulation 1702/2003 part 21, subpart M"

Definition of minor damage:

- a. All damage to paint and fillers.
- b. Holes on the belly of the fuselage if the maximum diameter does not exceed the following:
Forward fuselage 80 mm
Aft boom 40 mm
Cracks in the belly maximum length:
Forward fuselage 120 mm
Aft boom 80 mm
The blind glue joints of the fuselage boom should not be damaged.
- c. Holes, cracks and blisters in the wings, tail, and control surfaces, not in excess of the following dimensions:

	Diameter	Length
Wings	100 mm	150 mm
Stabilizer	50 mm	80 mm
Elevator	50 mm	80 mm
Aileron	50 mm	80 mm
Rudder	50 mm	80 mm

The parts must not be damaged in the spar area.

Caution: The stabilizer is a load carrying structure without spar. Damage in the region 600 mm (23.6 in) from the centerline must not be repaired.

- d. Replacement of bent fittings.

Caution: Damaged fittings should not be repaired but must be replaced.

Note: Special hints for handling FRP repairs are found in the Petite Plane Patch Primer (Author U. Hänle).

11.3 Tools and facilities required

Tools

- Accurate weighing scales for the correct mixing of resin and hardener
- Containers and wood mixing sticks
- Brushes (short hair) to apply the resin
- Metal roller to press down the glass cloth and to force the air out to reduce the formation of bubbles
- Scissors to cut the fabric
- Adhesive tape
- Plastic film for a tempering tent
- Hot air blower
- Abrasive paper - various grades
- Knife
- Saw(-blades) to cut tough plastic
- Rubber hand gloves
- Accurate thermometer up to 60°C (140° F)

Facilities

To insure proper curing, the room temperature during repair work and at least 12 hours afterwards should be maintained at 21°C (70° F). After that the repaired parts are to be tempered. Therefore you may construct a tempering tent, using plastic film or Styrofoam plates.

11.4 Instructions for FRP repairs

11.4.1 General

See also section 11.2 and 11.3.

Only materials listed in section 10 should be used.

Only damage defined in section 11.2 should be repaired.

Cut out damaged area, roughen the surrounding area for the overlap required (see section 11.5).

Repairs should be made such that bonding is **wet over dry**. Specific details concerning handling and using fibre reinforced plastics can be obtained from various publications ie. "Petite Plane Patch Primer."

All repairs should be postcured for 20 hours at 54°C (129°F) before the next take off.

11.4.2 Repairs of a FRP shell

Prepare the repair area as specified above. Scarf the shell so that the individual layers of fabric can be seen like plywood layers. Remove the gelcoat for at least 20 mm (.8 in.) around the damaged area.

New lay-up as shown on the sketch.

outside



11.4.3 Repairing the outer skin of a foam sandwich panel

Cut out the damaged area, remove the gelcoat over the overlap area +10 mm (0.4 in.) around the damaged area. Fill the damaged foam area with resin thickened with microballoons (microballoons-resin), let harden. Sand down.

Heat the area around the hole to approx. 60°C (140°F). Then tap the outer skin with a round headed hammer so that the foam is somewhat compressed. Apply the new cloth.

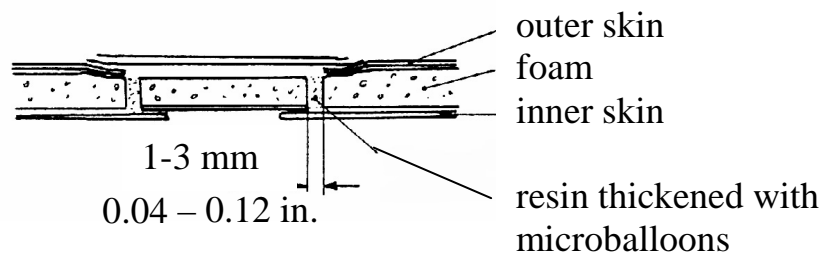
11.4.4 Repair of outer and inner skin of a sandwich panel

See section 11.4.3. Additionally remove as much foam as is needed so that the entire damage to the inner skin can be seen, plus enough undamaged inner skin as is required for overlapping. If the inner skin still holds together, sand properly and lay up the new cloth over it. Insert a suitable cut piece of foam, 1-2 mm (0.04 to 0.08 in.) thinner than the original, glued in with microballoons-resin.

Should the inner skin be so damaged that the above process cannot be used, the inner skin fabric should be applied to the foam first and left to harden before inserting into the repair area. Microballoons-resin should once again be used.

For lay up of the fabric to the foam, a layer of microballoons-resin should be applied first to eliminate the formation of air bubbles.

Apply the outer layers as in section 11.4.3.



11.4.5 Repairing small dents in a sandwich panel skin (no cracks in the gelcoat)

Small dents can usually be removed by heating up to 60° to 70° C (140° - 158°F). Use a hot air blower to heat the area of the dent. The crushed foam will then spring back to its original form, so that the dent will hardly be seen. Final sanding with wet sandpaper grade 600 should finish the job. In more severe cases, one coat of gelcoat will remove all trace of the dent.

11.4.6 Outer skin finish

Repairs should be such that the area is exactly level or only slightly higher than the surrounding skin surfaces. Sand the hardened repair surface with dry grade 80 sandpaper. Fill with Polyesterfiller, let dry and sand with dry sandpaper. When the surface is smooth, sand the repair area and at least 5 cm (2 in.) of the surrounding gelcoat with wet sandpaper grade 400. Allow to dry completely.

Spray the repair area with UP gelcoat.

After the gelcoat has hardened, sand with grade 400, 600 and 800 and eventually 1000 wet sandpaper until the surface is smooth.

Note: In case of Polyurethane painting, the PU paint will be sprayed onto the UP gelcoat surface after sanding with grade 600. When hardened continue sanding with grade 800 and 1000.

Polish with a power buffer (electric drill or similar with cloth polishing wheel). Apply a block of wax onto the rotating polishing wheel and then polish the repaired area. Do not polish in only one direction, and do not polish one spot for too long so that overheating occurs, see sect. 12.2 of this manual.

11.4.7 Repairing control surfaces

After the repair the mass balance must be checked again with the values given in the maintenance manual. Should the maximum values be exceeded, then the parts have to be replaced.

In the aileron and elevator shells corrugated cardboard (Wellpappe) is used as core material.

With small defects as defined in section 11.2 it is permissible to fill the damage in the corrugated cardboard with resin thickened with microballoons.

With larger damage the corrugated cardboard must be replaced. The flat side must show to the exterior surface.

Remove material up to the inner skin or repair the inner skin if damaged and let cure. Sand the inner skin and insert the corrugated cardboard with resin thickened with microballoons at the corrugated side. Then replace the outer skin.

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11.5 Types of materials and overlap dimensions

The following overlap dimensions are to be maintained. Use the materials given, see also section 10. (Smaller reinforcements on high stressed areas are not given in the table below).

Part	Fabric type	No. of layers	Fibre orientation	overlap
Wings				
exterior skin	92145	2	$\pm 45^\circ$	20 mm / 0.79 in. per layer
root up to y= 1.25 m	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
root up to y= 0.5 m	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
foam core				
inner skin	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
root up to y= 4.35 m	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
root up to y= 0.5 m	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
Horizontal tailplane stabilizer				
exterior skin	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
	92145	1	0° in spanwise direction	20 mm / 0.79 in.
foam core				
inner skin	92110	1	$\pm 45^\circ$	20 mm / 0.79 in.
Horizontal tailplane elevator				
exterior skin	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
from centre to y= 0.3 m	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
corrugated cardboard core				
from centre to y= 0.2 m	92125	1	$\pm 45^\circ$	20 mm / 0.79 in.
inner skin	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
Ailerons				
exterior skin	92110	2	$\pm 45^\circ$	30 mm / 1.18 in.
corrugated cardboard core				
inner skin	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
Rudder				
exterior skin	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.
foam core				
inner skin	92110	1	$\pm 45^\circ$	15 mm / 0.59 in.

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Types of materials and overlap dimensions cont.

Part	Fabric type	No. of layers	Fibre orientation	overlap
Fuselage up to S/N. 4698				
shell outside	92145	1	0°	20 mm / 0.79 in.
	92125	1	± 45°	20 mm / 0.79 in.
from 2.75 m behind nose	92125*	2	0°, 90°	20 mm / 0.79 in.
from 0.8 m behind nose	92146	1	0°	40 mm / 1.57 in.
Shell inside	92125	2	± 45°	40 mm / 1.57 in.
Fin up to S/N. 4698				
from outside to inside	92125	1	± 45°	20 mm / 0.79 in.
	92125*	6	0°, 90°	60 mm / 2.36 in.
	92125	1	± 45°	20 mm / 0.79 in.
Fuselage from S/N. 4699 on				
shell outside	92145	1	0°	20 mm / 0.79 in.
	92145	2	± 45°	20 mm / 0.79 in. per layer
from 2.75 m behind nose	92125*	2	0°, 90°	20 mm / 0.79 in.
from 0.8 m behind nose	92146	1	0°	40 mm / 1.57 in.
Shell inside	921425	2	± 45°	20 mm / 0.79 in. per layer
Fin from S/N. 4699 on				
from outside to inside	92145	2	± 45°	20 mm / 0.79 in. per layer
	92125*	6	0°, 90°	60 mm / 2.36 in.
	92125	1	± 45°	20 mm / 0.79 in.

* Instead of the Polyester fabric used during production

The overlap of the fin fabric to the fuselage is from the cross point of the fin leading edge to the fuselage upper side 100 mm <3.94 in.> to the front. The overlap of the fuselage fabric to the fin is from the fuselage upper side 100 mm <3.94 in.> up the fin.

11.6 Control cables and connections

1. Rudder cables

Cable: B 3.2 (construction 7*19) MIL-W-83420 I/A resp. ISO 2020 (former LN9374) zinc plated

Steel thimbles: A 3.5 DIN6899

Cable sleeves: Nicopress NT 283M (28-3-M), 3 pressings required, with tool groove Oval M of tool 64-CGMP, press 3 times.

2. Tow hook operation, pedal adjustment, wheel brake, waterballast control

Cable: A 2.4 MIL-W-83420 I/A resp. ISO 2020 (former LN9374)
A 2.4 LN9389 corrosion resistant (cable for C.G. hook below seat)

2.5 DIN3055 corrosion resistant with steel core (C.G. hook)

Steel thimbles: A 2.5 DIN6899

Cable sleeves: Nicopress NT 282GA (28-2-G), for pressing use tool groove Oval G of tool 64-CGMP. 1 pressing.

Stop sleeve: Nicopress NT S117J (871-17-J), use tool groove "J" of tool 51-MJ 1-pressing.

3. Waterballast control cable to fin tank (LS4-b option)

Cable: 1.2 LN9389 (stainless) resp. 1,25mm D construction 7x7 DIN3055 stainless steel 1.4401

Steel thimble: A 1.7 DIN 6899 connected with screw nipple 4F5-120

Stop sleeve: Nicopress NT S117J (871-17-J), for pressing use

a. groove "J" of tool 51-MJ, thereafter

b. groove "G" of tool 64-CGMP, 1 pressing each in given sequence

Processing of the Nicopress sleeves should only be done using the respective tool. All the procedures and checks noted by the tool manufacturers should be followed.

Please refer to "aircraft inspection and repair FAA AC 43.13-1 B" or later issues.

Caution: When exchanging rudder cables take care that the initial angle of the rudder pedals is kept

11.7 Longitudinal motion pushrod bearings

During repairs, never pull pushrods out of longitudinal motion bearings, because all balls will leave their cages. Consequently, for re-installation near each bearing an opening must be cut and repaired afterwards.

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

Caution: Longitudinal motion pushrod bearings should never be greased or oiled, their plastic balls and bearing surfaces will soon be destroyed due to collection of small foreign matter !

12 Recommendations for maintenance and care of gelcoat surfaces

12.1 General

Protect gelcoat with silicone free car polish or “Schwabbel wax” (see section 12.2).

This wax film protects gelcoat against embrittlement and cracking due to ultra violet light.

If you use a polishing machine, be careful not to damage seals, anti-collision colour markings and registration signs.

According to paint manufacturer recommendations the following mediums may be used for cleaning and care:

Suitable: Water with washing-up liquid added in recommended quantities, car polish with or without silicone

Suitable with reservations: Tar remover based on petrol for cars. 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, they may decompose gelcoat and cause local shrinking.

Completely unsuitable: Trichloroethylene, carbon tetrachloride or similar hydrocarbon chlorides. These liquids destroy the gelcoat.

Other mediums must be checked for suitability before use!

Caution : UP-gelcoat shows distinctive weathering marks due to changes of temperature, ultra violet radiation and humidity unless regularly polished with hardwax.

12.2 "Schwabbel" procedure:

The best method is with an electric polishing machine as we do in the factory. Also an electric drill may be used. Speed approximately 2000 RPM. Two packages of special cloth discs (Schwabbelscheiben) have to be installed. A block of hard wax has to be pressed against the rotating discs. By doing so, the wax becomes hot and is taken up by the cloth. The hard wax and the cloth discs should be purchased from the DG Flugzeugbau factory.

Wax	Part-No. 70000121
Cloth disc	Part-No. 70000600

You get the best effect when polishing 90° to the microscratches of the sanding process.

Caution: Make sure that the surface does not get too hot, otherwise the finish will be damaged. Therefore move the polishing machine all the time, and do not stay on one spot!

13 Transport of sailplane

13.1 Support areas for road-transport

Fuselage	Tail skid, main wheel, and fuselage structure in front of the landing gear, where support should at least be 30cm <11.8 in> wide
Wings	Right wing spar end near pin holes. Left forked wing spar end near both outside pin holes only when both ends are supported. Wing shell at root rib if support is at least 15cm <5.9 in> wide Wing shell near air brake if support is at least 25 cm <9.8 in> wide.
Horizontal tail	Anywhere, the 2 supports should be at least 8 cm <3.1 in> wide.

13.2 Support areas when lifting the entire plane

- Under wing spar near wing root, not on the leading edge
- Under the fuselage shell in front of the wing
- Under the fuselage shell behind the wing

13.3 Ground Towing

- Ground towing at walking speed.
- Use an elastic cord from the tow hook and a helper at the wing tip
- or use tail dolly with towbar and sprung wheel at one wingtip.

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14 Appendix

14.1 Annual inspection checklist

Page 1 of 3

*= LS4 and LS4-a #= LS4-b

Serial No.:	Reg. Signs:	Year of Manuf.:
<p><u>Wings</u> S/N: _____ Finish condition Wings pressure marks Spar stub Root ribs and pins Sandwich shell condition Drain orifices</p> <p><u>Ailerons</u> pressure marks -Drives at ailerons -Drives at root ribs # -ball end * -LS securing sleeves * -Fixed bearing + washer -Bearings -Lateral bearing gaps -Lateral gaps to wing -Seals -Stops -Ventilation -Cracks / buckling</p> <p><u>Air brakes</u> -Bearings -Drive at root rib # -Cover springing -Locking # -Friction damper funct. # -ball end * -LS securing sleeve *</p> <p>Zig-zag turbulator Wing tip skids Main pins</p> <p><u>Wing water system</u> Function + tightness</p>	<p><u>Winglets</u> (optional) shells Spar tube Pins Assembly free from play Locking pin /spring force Ventilation openings</p> <p><u>Horizontal Tail</u> S/N: _____ Finish condition Sandwich shell condition Stabiliser ventilation Elevator ventilation Elevator drive lever - fixed bearing + washer Bearings Fuselage connection Seals</p> <p><u>Fuselage</u> S/N: _____ Finish condition Shell condition Cracks Drain orifices Rudder mounting Stabiliser mounting Tangential tubes Bushes for wing root pins “-securing Cockpit Seat Under seat Safety harness fixing points Control stick Elevator drive under seat Aileron syst. under seat Aileron connectors # Deflectors straight # L’H. Connectors * Air brake system L’H. Connectors *</p>	<p><u>Fuselage continued</u> LS-securing sleeves -colour marking at LS securing sleeves * Air brake connectors # Trim system Trim operation + locking Pedals -Adjustment + locking Rudder cables Ground connections Backrest locking -Upper end anjuster* -Upper end stop # -Lower end pins + bolt Trim weight holder -Fixing nut Nose hook fitting -Drive Tail skid – cable deflector at front end -Skid bonding Tail wheel Connecting means Water ballast system</p> <p><u>Tail fin tank #</u> Volume: _____ Litres Tail tank adapter existent Cable wear + corrosion Valve operating ease Functioning Funnel filter + level ind. Opening before/with wing Closing after wing system Discharge time: _____ (max. 90 Sec) Tail fin battery box -battery box cover Thermometer function Indication check</p>

Place: _____ Date: _____ Stamp: _____ Signature: _____

Issued: May 2011

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Annual inspection checklist

Page 3 of 3

Serial No.: _____ | Reg. Signs: _____ | Year of Manuf.: _____

	Check wing air brake levers for corrosion at lower end.				
	Pull with about 25 kg <55 lbs> force at upper end of each lever against flight direction, simultaneously retract without twisting upper blade (do not counter hold at cockpit lever!).				
	When under load of last item jamming at wing structure results, then bearings at related lever must be exchanged immediately by repair station according to repair instruction "Air Brake Levers".				
	Bearings should be exchanged within 6 months, when corrosion is clearly visible, but no locking or jamming occurs.				
	Valid C.G. weighing dated _____		<u>Flight Hours</u>		Entry of Cockpit Load in Cockpit + Flight Manual 6.2 checked, unaltered changed to _____ kg/lbs
			Total _____ hr.		
	Valid Equipment List dated _____		Last Ann.. _____ hr.		
			<u>Take-offs</u>		
			Total _____		
			Last Ann.. _____		

	Inspect automatic couplings for possible wrong rigging #
	Permanent installation of equipment in baggage compartment according to chapter 8
	Special inspection hints according to chapter 3 taken care of
	Technical Bulletins performed: _____
	AD's performed: _____
	TB-AD-List updated
	Life time limits / Repetitive Inspections taken care of, see MM section 0.4

Findings / Complaints / Remedy

No.	Findings	Remedy / Repair	Inspector

Place: _____ Date: _____ Stamp: _____ Signature: _____

Maintenance Manual LS4

14.2 Instruction for maintenance of L'Hotellier ball and swivel joints

DOCUMENT IMA N° : 10.01 Rev : E		E08-A
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INSTRUCTIONS FOR THE MAINTENANCE L'HOTELLIER BALL AND SWIVEL JOINTS

HISTORIQUE DU DOCUMENT

REV.	DATE	OBJET DE LA MISE A JOUR	RED.	QUAL.	RESP.
A	11/85	Creation of document	BE	MJD	JMB
B	02/86	Representation of 1 swivel	BE	MJD	JMB
C	01/89	Adjunction of Fig.1 and Fig.2	BE	MJD	JMB
D	07/92	Updating of function of CR147	BE	MJD	JMB
E	03/94	Updating following DEI229-EM	BE	MJD	JMB

LISTE DES DESTINATAIRES

B.E.	B.C.	OR. +1 EX.	PRODUCTION	1 EX.
Q.C.	B.C.	1 EX.		
Q.C.	C.B.	1 EX.		

Louis L'HOTELLIER S.A. 93, avenue Charles De Gaulle - 92270 BOIS COLOMBES Tél.(1)42.42.13.94 Télex 611153F LHOTAIR Télécopie (1)47.60.07.07	RED. : BE PAGE : TIT	DATE : 03/94 IND. : E
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PROPRIETE L'H

FORME E11- REV B du 06.02.92

REPRODUCTION INTERDITE 12/73

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Maintenance Manual LS4

Instruction for maintenance of L'Hotellier ball and swivel joints cont.

DOCUMENT IMA N° : 10.01	INSTRUCTIONS FOR THE MAINTENANCE L'HOTELLIER BALL AND SWIVEL JOINTS	E08-A
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COMPOSITION DU DOCUMENT

PAGE	IND.	PAGE	IND.	PAGE	IND.	PAGE	IND.	PAGE	IND.
TIT	E	SOM	E	1	E	2	E		

SUMMARY

1 - PREVENTIVE AND SAFETY MAINTENANCE INSTRUCTIONS

2 - PERIODICAL CHECK

- 2.1. FREE MOVEMENT OF THE BALL INTO THE HOUSING
- 2.2. BALL SPHERICITY MEASUREMENT (See fig. 2)
- 2.3. BALL THREAD CHECK
- 2.4. SWIVEL VISUAL CHECK
- 2.5. MEASUREMENT OF THE LOCKER LOWER PART PROJECTION AFTER ASSEMBLY OF THE SWIVEL ON THE BALL (See fig. 1)
- 2.6. CHECK THE LINK BETWEEN DRIVE ROD AND SWIVEL
- 2.7. SWIVEL ASSY OPERATION CHECK

Fichier : WORD\FICHERS.DOC\FICHETEC\IMA10.01.DOC

Louis L'HOTELLIER S.A. 93, avenue Charles De Gaulle - 92270 BOIS COLOMBES Tél.(1)42.42.13.94 Télax 611153F LHOTAIR Télécopie (1)47.60.07.07	RED. : BE PAGE : SOM	DATE : 03/94 IND. : E
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PROPRIETE L'H

FORME E11- REV B de 06.02.92

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Instruction for maintenance of L'Hotellier ball and swivel joints cont.

DOCUMENT IMA N° : 10.01	INSTRUCTIONS FOR THE MAINTENANCE L'HOTELLIER BALL AND SWIVEL JOINTS	E08-A
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1 - PREVENTIVE AND SAFETY MAINTENANCE INSTRUCTIONS

The rotation of the swivel around the ball must be done with resisting strength, due to minimum frictions. Consequently it is mandatory to lubricate the swivel/ball assy. This lubrication must be done after cleaning and before assembly, with a non cold coagulating grease.

Eg : ESSO purpose (general use) :
Spray containing oils enriched with silicone (recommended for assemblies exposed to sand or other abrasive materials).

It is mandatory to verify, after each assembly, the correct location of the ball in the swivel. To do so, a location hole is drilled in the locker. When the assembly is good, the hole must be visible and must enable to insert the pin "B" réf. L'H 140-31, or other devices, linked to the locker only.

2 - PERIODICAL CHECK

During the annual visit or no later than every 500 flight hours, it is necessary to verify balls and swivels as follows :

2.1. FREE MOVEMENT OF THE BALL INTO THE HOUSING

- Check that the ball move free of friction point.
- Check the angular displacement.
- Check that there is no crack at the base of the ball

2.2. BALL SPHERICITY MEASUREMENT (See fig. 2)

The variation between several measures of the ball diameter must not exceed 0,1 mm.

This check aim is to detect an abnormal ball wear.

2.3. BALL THREAD CHECK

No thread damage is acceptable. During reassembly the collar must be perfectly set on its base. It is mandatory to fix the ball in position with an adequate locking device.

2.4. SWIVEL VISUAL CHECK

No deformation or penning in ball location or in the locking device seat is acceptable.

2.5. MEASUREMENT OF THE LOCKER LOWER PART PROJECTION AFTER ASSEMBLY OF THE SWIVEL ON THE BALL (see fig. 1)

This projection must be higher than 2 mm.
The aim of this requirement is to verify the efficiency of the automatic take up clearance

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Maintenance Manual LS4

Instruction for maintenance of L'Hotellier ball and swivel joints cont.

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2.6. CHECK OF THE LINK BETWEEN DRIVE ROD AND SWIVEL

In the case of an adjustable swivel, verify that the link between swivel and drive rod is tight and properly secured by an adequate locking device.

2.7. SWIVEL ASSY OPERATION CHECK

Seat or locker : no clamping, due to oxydation or other reason, is acceptable.

If after these verifications, one of the above check is out of tolerance, it is mandatory to replace both ball and swivel.
nevertheless it is recommended to replace this assembly every 10 years or every 3000 flight hours.

IMPORTANT NOTE

Any defection parts may be returned to Ets Louis L'HOTELLIER for technical investigation.

FIG. 1

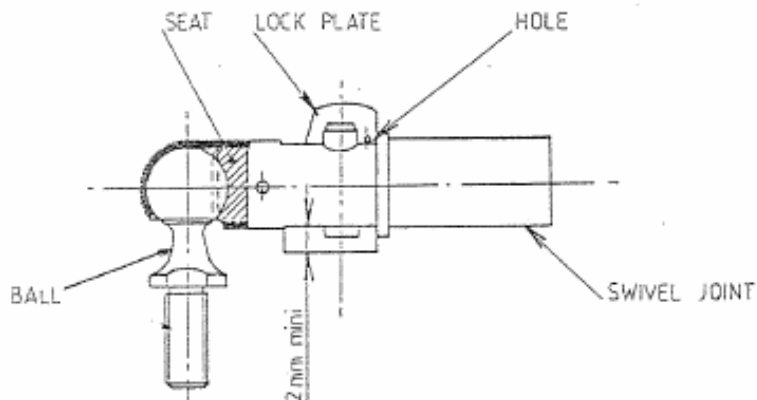
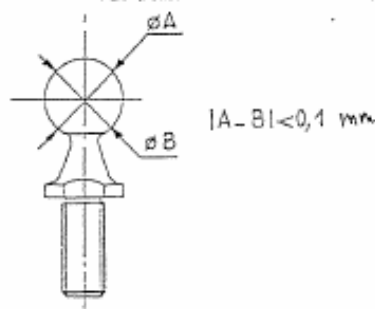


FIG. 2



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PROPRIETE L'H

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