Schempp-Hirth, výroba letadel, spol. s r. o.
565 01 Choceň, Czech Republic

M A I N T E N A N C E M A N U A L
for the sailplane
D I S C U S C S
Translation of the Czech Manual

Issue June 1990

It refers to the sailplane.

Model Discus CS

Registration No.

Serial No.

Manufacturer Schempp-Hirth,
výroba letadel, spol. s r. o.
565 01 Choceň, Czech Republic

Owner

This English edition of the DISCUS CS Maintenance Manual has been translated with care, and is accurate to the best of our knowledge.

However, in all official matters the original Czech text is the authoritative and definite document.

Schempp-Hirth, vyroba letadel, spol. s. r. o.
565 37 Choceň, ČSFR
tel. 0468 / 952
fax. 0468 / 951488

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Diagram 4

DISCUS

Diagram 4

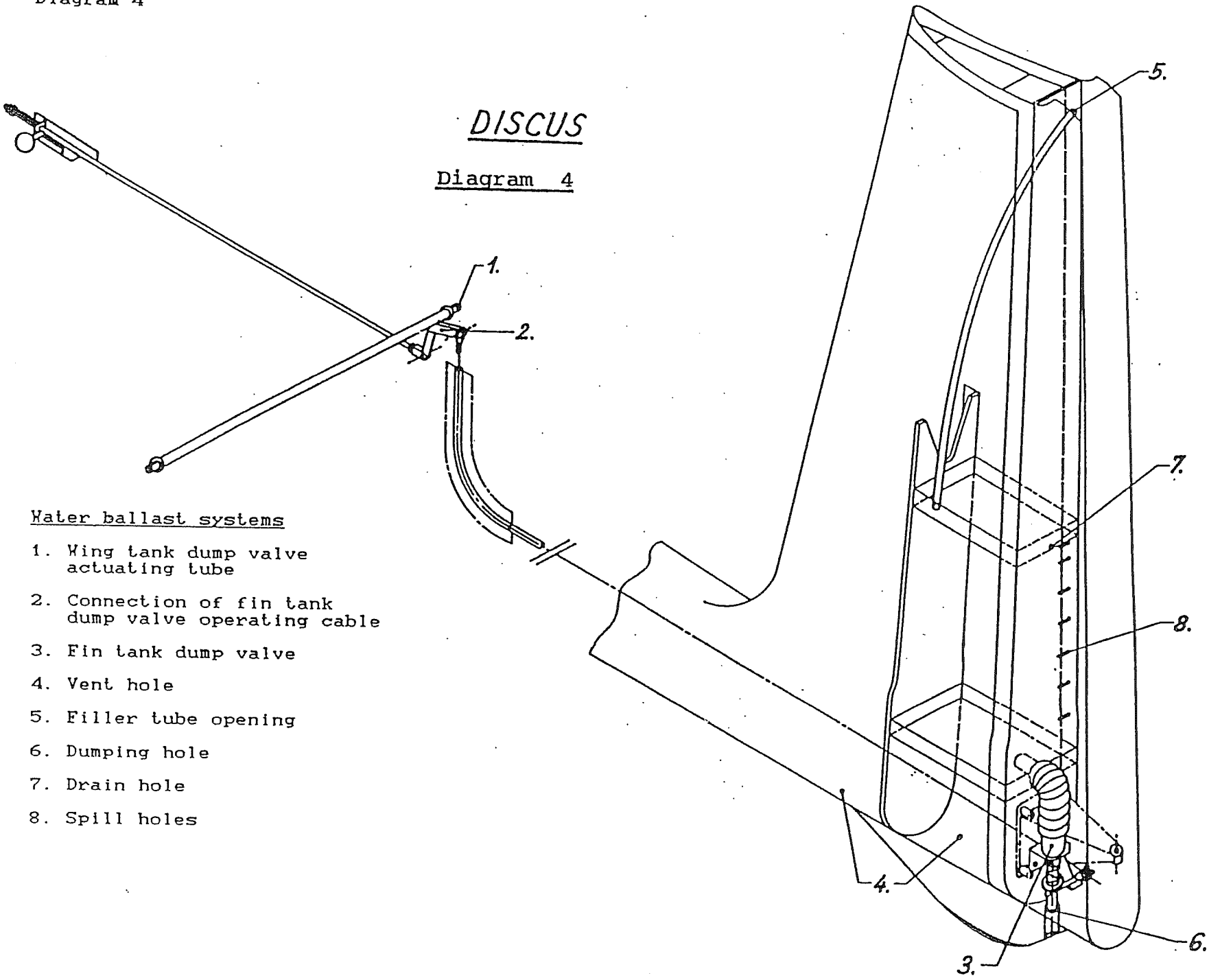

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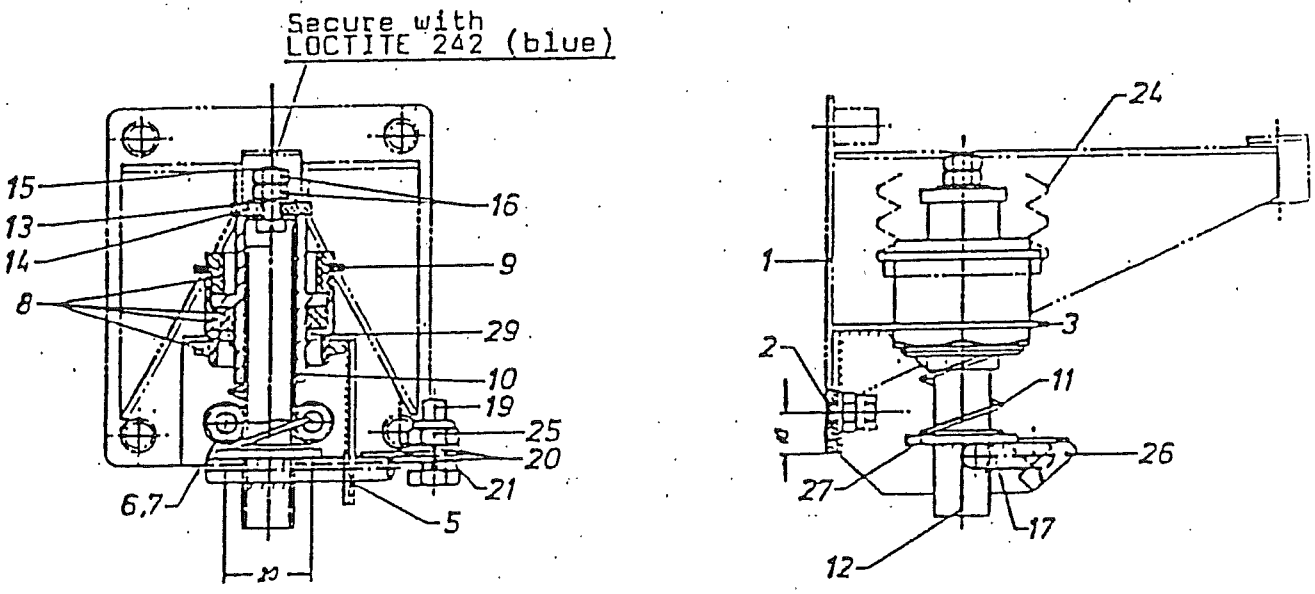
Diagram 4 a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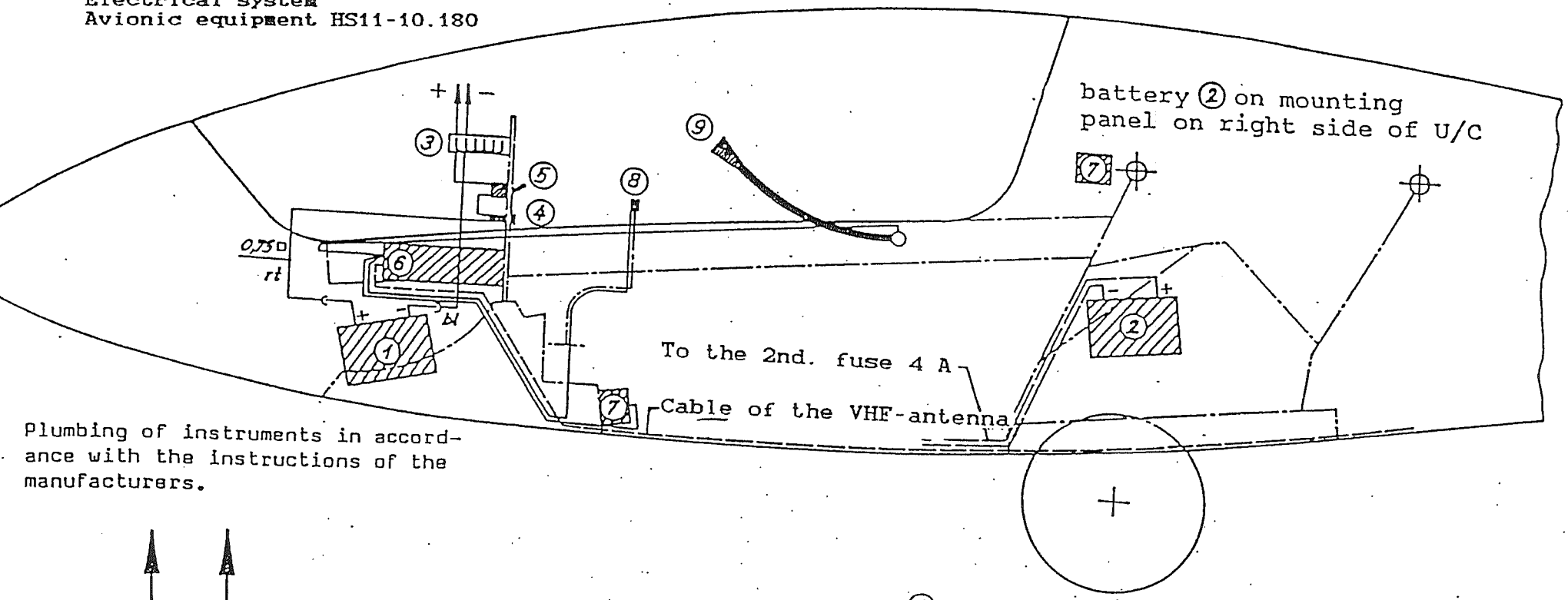
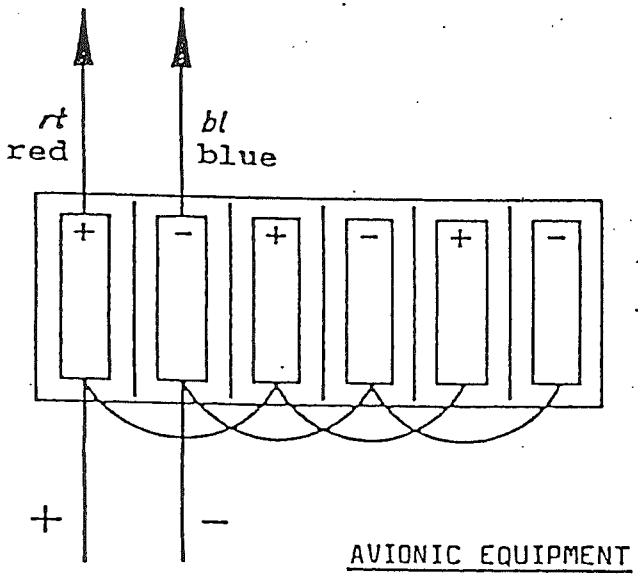
Electrical system
Avionic equipment HS11-10.180



Plumbing of instruments in accordance with the instructions of the manufacturers.



AMP plug board ③
M1:1

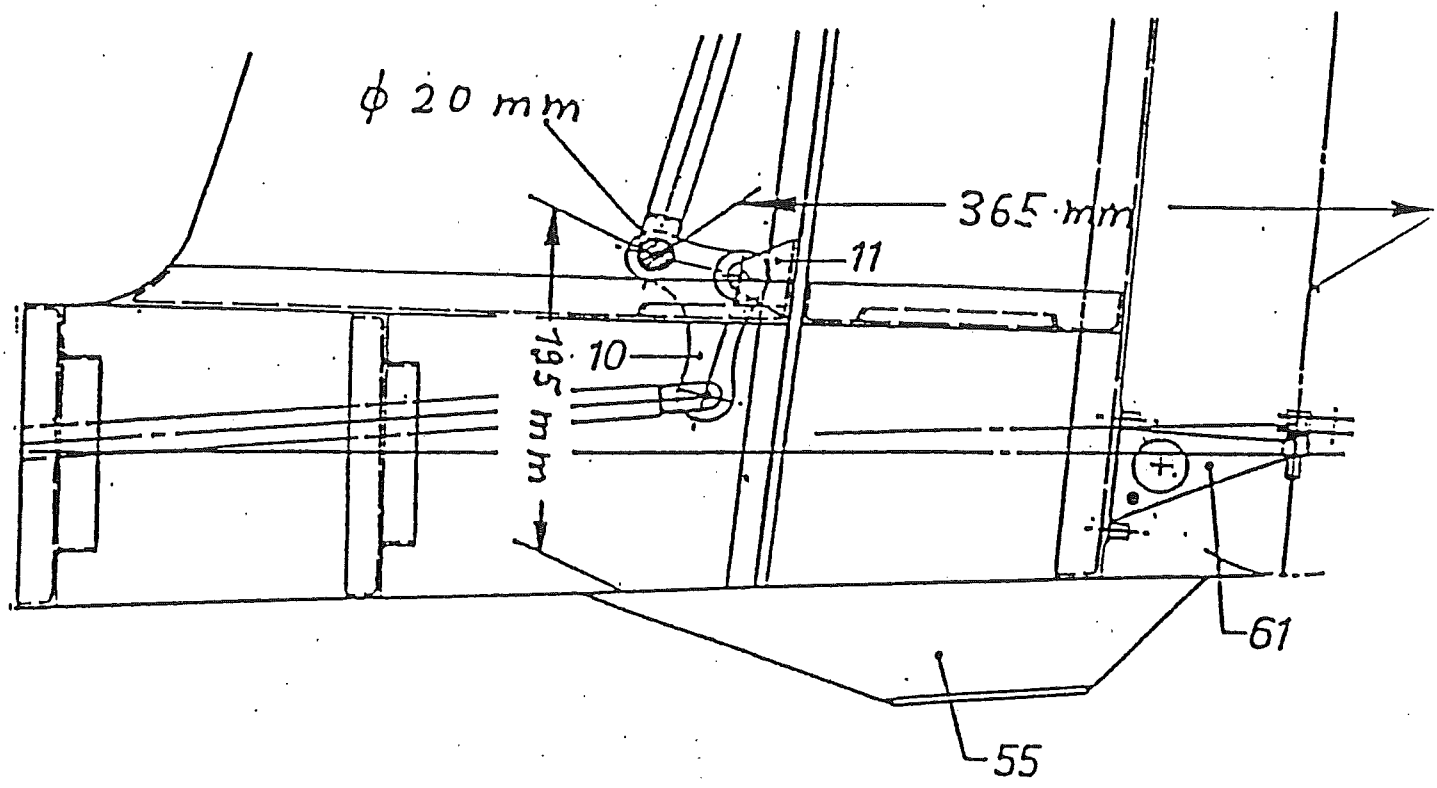
AVIONIC EQUIPMENT
HS11 - 10.180

① 12 V battery
② 2nd. battery, wired to 2nd. 4 A fuse and selector switch
③ AMP plug board
④ 4 A fuse
⑤ Master switch
⑥ VHF-Transceiver
⑦ Speaker
⑧ Push-to-talk button
⑨ Goose neck microphone

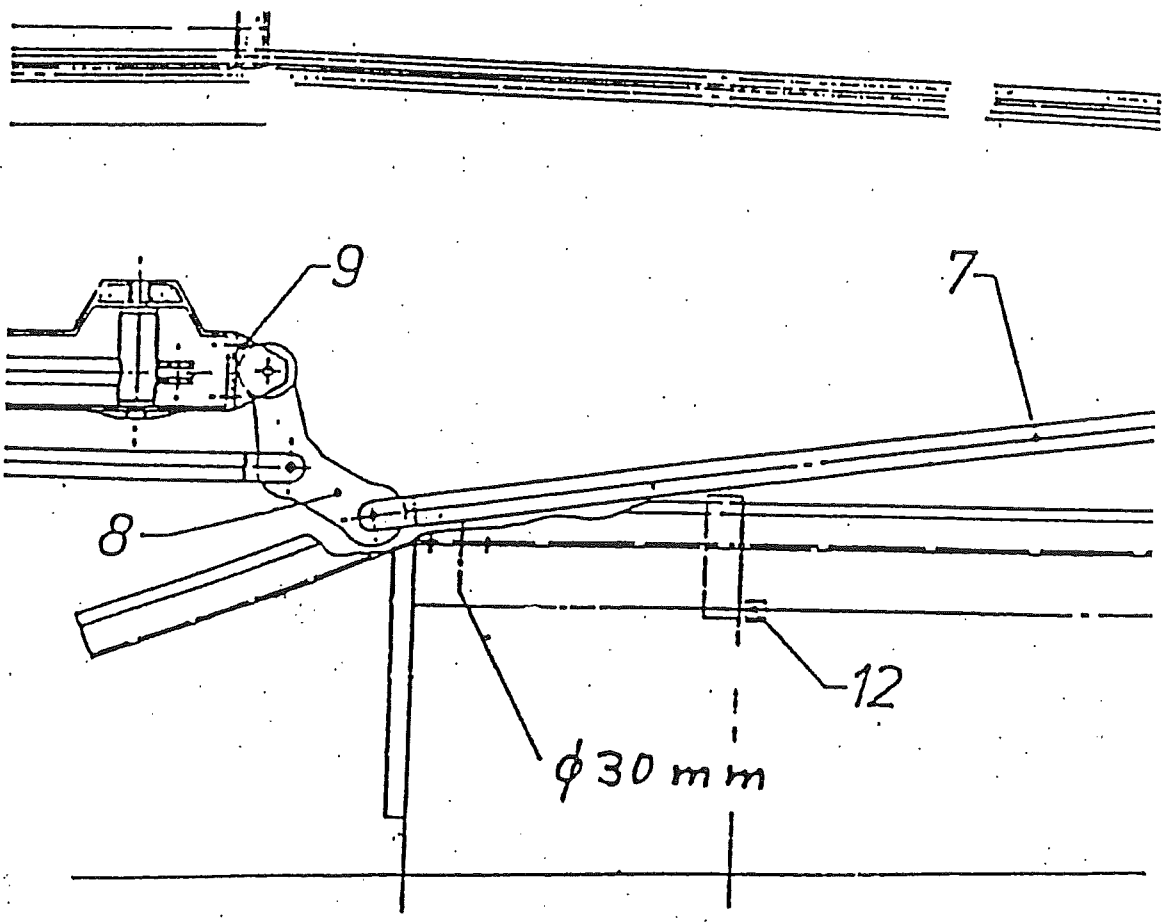
Note: Wiring of the VHF transceiver and other additional equipment in accordance with the instructions of the manufacturers.

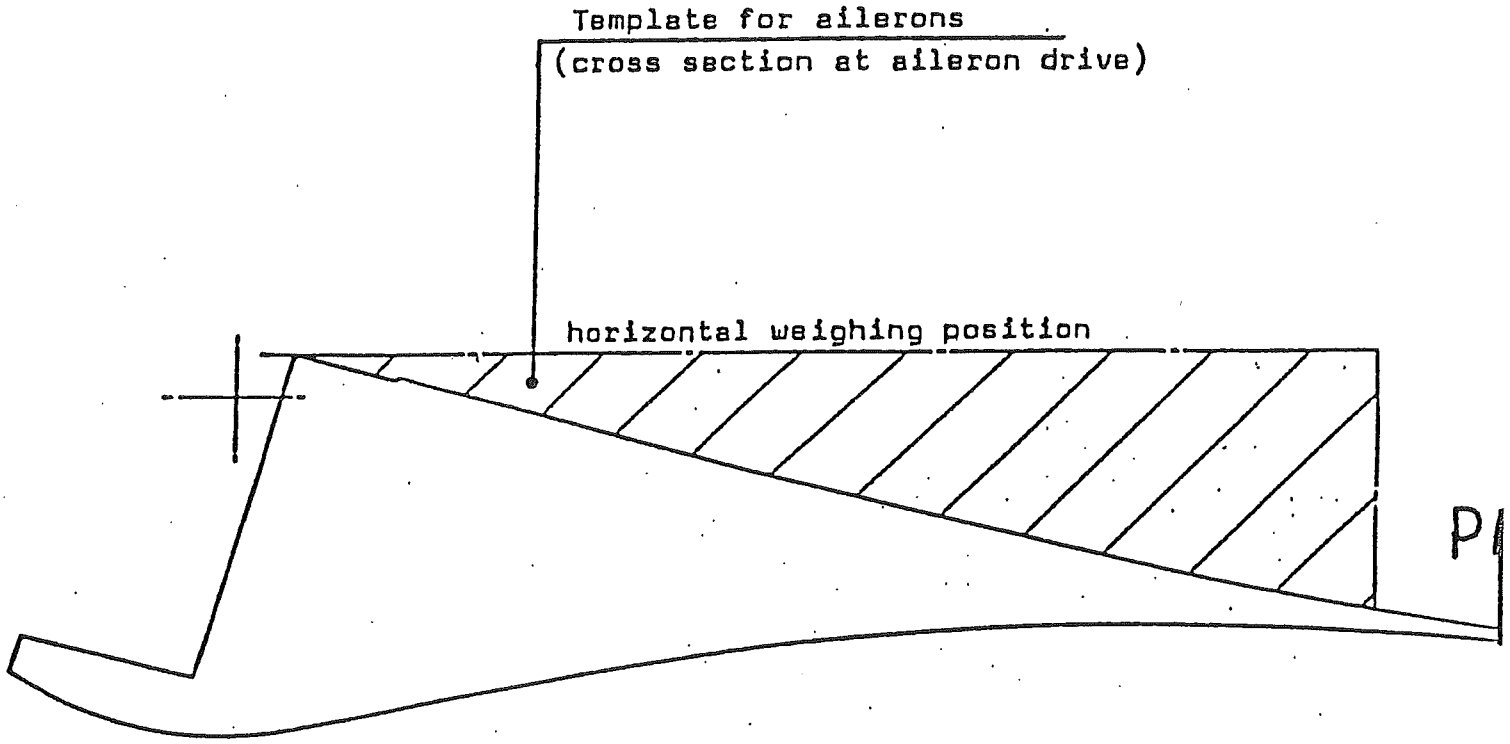
Inspection opening in the fin
(to be cut on one side if required)

For the removal of the vertical elevator push rod an additional opening (with a diameter of approx. 12 mm/0.47 in) can be cut into the far side of the fin.



Inspection opening in the aileron auxiliary spar
(to be cut into the wing if required)




Template for ailerons
(cross section at aileron drive)
horizontal weighing position

Amendment list

(Log of revisions)

Rev. No.	T i t l e	Page	Date
1.	TECHNICAL NOTE NO. 360 - 11 : Extension of the service time, affected: S/N 1 through 159 (standard on S/N 160 and up)	38, 39	January 1994
2.	TECHNICAL NOTE NO. 360 - 13 : Winglets - optional use on all serial numbers	8, diagram 2	June 1994
3.	CHANGE OF THE MANUFACTURER NAME on S/N 225 CS and up	Title pg. 14,16	August 1996
4.	Play in the tailplane attachment fitting	11a	Febr. 1997

1. Description of Installations and Systems

1.1 Control system

Elevator control

Steel tube push rods lead from the stick to the cast aluminium bellcrank at the base of the fin, then upwards to the steel elevator actuator lever (being also the rear horizontal tailplane mount) at the top of the fin spar, see diagram 1. Elevator deflection stops are situaded at the base of the control stick.

Aileron control

Steel tube push rods lead from the stick via bellcranks to the funnels of the automatic hookup system on either side of the fuselage, see diag. 1.

Deflection stops are located at the base of the control stick.

Inside the wing, steel tube push rods lead from the lever of the automatic hook-up systemat the root rib via a bellcrank to the aileron actuator lever, see diagram 2.

Airbrake control

Steel tube push rods connect the operating lever of the airbrakes via an overcentering lever with the funnels of the automatic hook-up system, see diagram 1. Inside the wing, steel tube push rods lead from the lever of the hook-up system at the root rib to the actuator lever of the Schempp-Hirth airbrakes, see diagram 2. For "airbrakes closed" a deflection stop is at the front end of the operating tube. For "airbrakes extended" the travel of the operating tube is limited by a stop on the fuselage side wall.

Rudder

Steel control cables connect the rudder pedals with the rudder actuator lever, see diagram 3.

Deflection limiters are mounted to the lower rudder hinge at the base of the fin spar.

Elevator trim

The trim knob (stepless adjustable) is located on the left hand seat pan support and is connected with the elevator push rod by means of tension springs, see diagram 1.

Wheel brake

A steel cable running in Bowden sleeve leads from the stick mounted wheel brake lever to the drum brake actuator lever on the hub of the landing wheel.

Water ballast systems

The wing tank water dump valves are actuated by a push rod linked to a torsion drive tube.

The fin tank dump valve is cable operated. As shown in diagram 4, a mechanical connection of all three dump valves is provided at the torsion drive tube.

The fin tank dump valve is attached to the lower rudder hinge and is accessible after removal of the rudder.

1.2 Electrical System

The schematic wiring diagram on page HS11-10.180 (see appendix) describes the electrical system which is activated by a master switch.

Power for the gliding avionic equipment is supplied by a 12 V battery.

1.3 Oxygen System

For the installation of an oxygen cylinder attachment pins and a mounting flange are provided in the upper baggage compartment on the skin of the fuselage and on the rear of the fuselage steel tube frame.

For the instalation of an oxygen system drawings can be supplied by the manufacturer.

At present only the following diluter demand oxygen regulators are LBA approved:

type	Manufacturer	Code No.	Data Sheet No.
Höhenatmer 758	Dräger	E20088	40.110/1
Miniregler	Dräger	E24902	40.110/19
Miniregler	Dräger	E24903	40.110/19

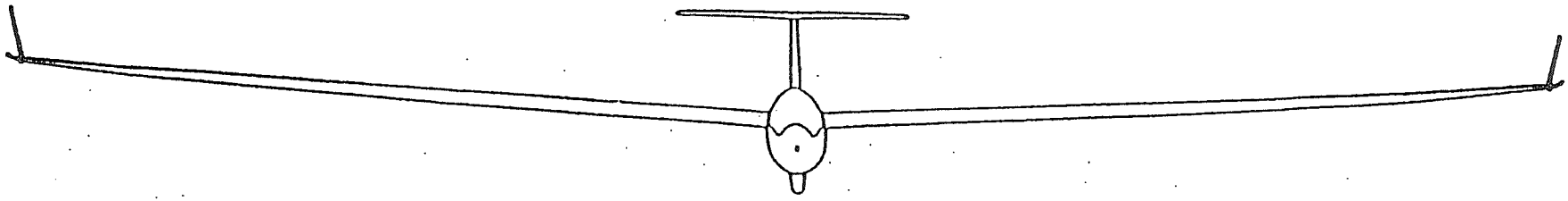
After installation of an oxygen system it is necessary to re-establish the empty weight C.G. position of the sailplane in order to prove that the center of gravity is yet within the permitted range.

2. Rigging Data

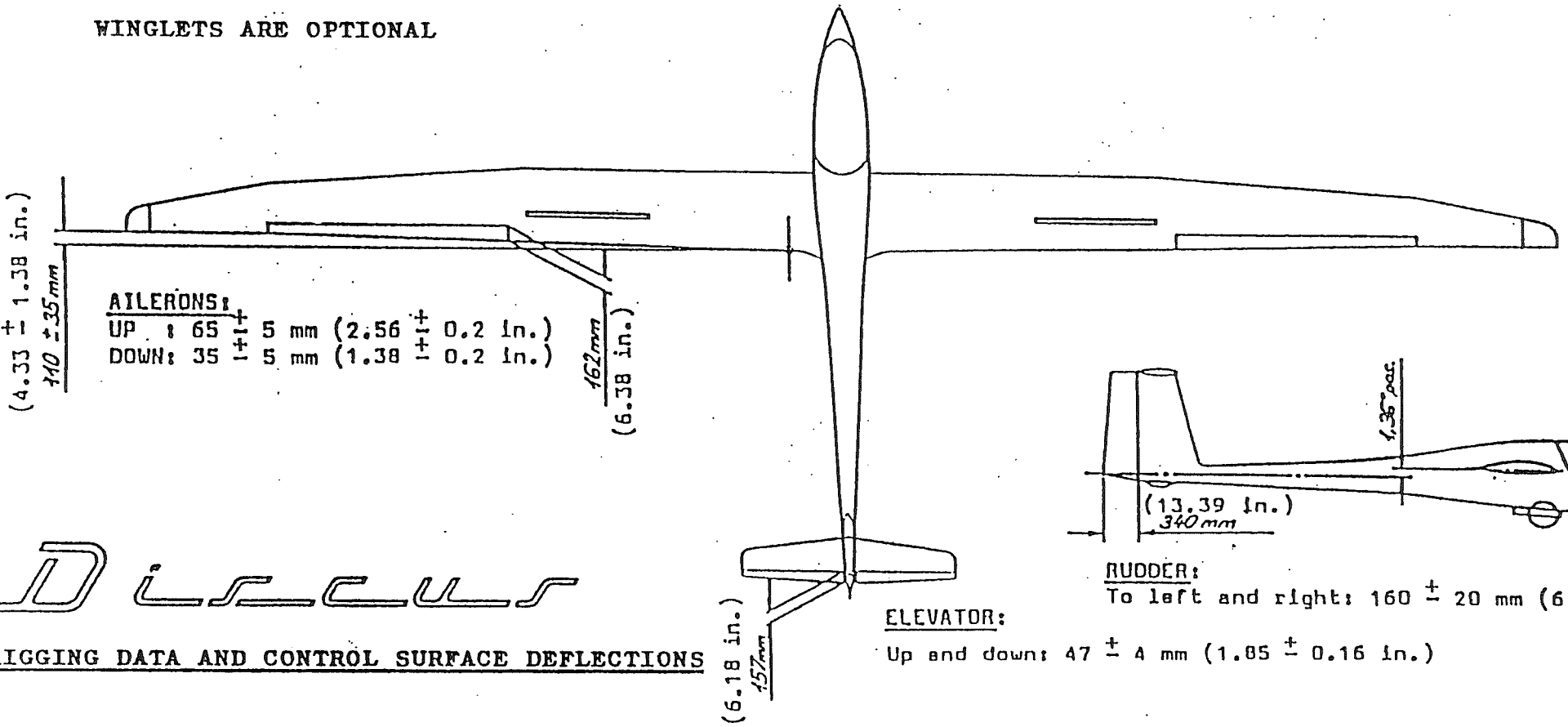
2.1 Rigging data and control surface deflections

Rigging data and control surface deflections are shown on the drawing on page 8.

After repairs it must be ensured that these data are within the permitted tolerances.



WINGLETS ARE OPTIONAL



AILERONS:
UP : 65 ± 5 mm (2.56 ± 0.2 in.)
DOWN: 35 ± 5 mm (1.38 ± 0.2 in.)

RUDDER:
To left and right: 160 ± 20 mm (6.3 ± 0.79 in

ELEVATOR:
Up and down: 47 ± 4 mm (1.85 ± 0.16 in.)

Discus

RIGGING DATA AND CONTROL SURFACE DEFLECTIONS

Sailplane attitude for all measurements:
Fuselage tail boom center line horizontal, i.e. main wheel on the ground and tail jacked up such that the wedge-shaped block placed on the rear top fuselage, is horizontal along its upper edge.

2.2 Weights and moments of control surfaces

After repair work or repainting, the hinge moments and weights of the components must not exceed the following values:

	Weight			Residual Moment		
Component	min	max		min	max	
Rudder	4.43 9.77	4.97 10.96	kg lb	0.0 0.00	2.4 0.17	cm.kg ft.lb
1 Elevator without fitting	0.67 1.48	0.85 1.87	kg lb	2.6 0.19	3.3 0.24	cm.kg ft.lb
Aileron	3.71 8.18	4.21 9.28	kg lb	1.7 0.12	3.7 0.27	cm.kg ft.lb

If the above values are exceeded it will be necessary to add an additional balance weight forward of the hinge line as follows:

1. After repair work: In the area of the repair.

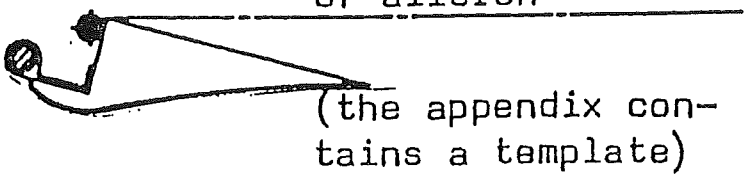
2. After repainting : In the repainted area, distributed along its whole length (if possible)

(Weights and moments of control surfaces,ctd.)

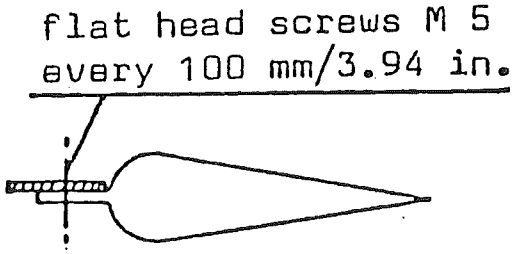
In the case of all control surfaces the ballance weight (strips of lead or steel, max length of single pieces 100 cm (3.28 ft) should be screwed (or bonded with resin and glass fabric when round bars are used) to the leading edge forward of the hinge line.

Ailerons

1 layer 92110 ※
1 layer 92125 ※

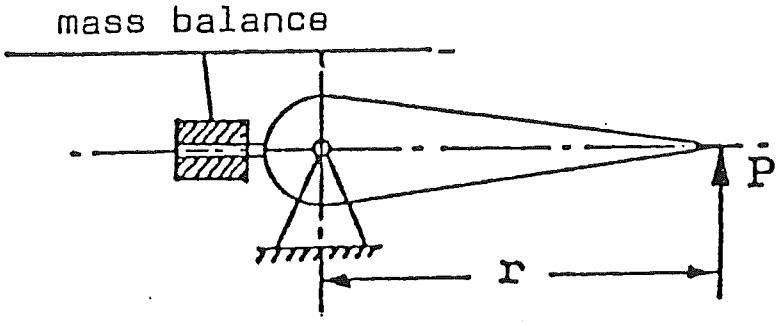


Elevator and rudder



Control surfaces are removed from the sailplane to establish moments of inertia.

$$M = P \times r$$



Force P measured with a spring scale or letter ballance (for the ailerons a template is contained in the appendix).
After fitting additional mass ballance weights it is important to check that the range of deflection of the control surfaces has not been restricted.

2.3 Play in the control circuits

With the cockpit controls fixed the play at the control surfaces must not exceed the following values:

Ailerons: ±3 mm (0.12 in) measured 162 mm (6.37 in) behind hinge point

Elevator: ±3 mm (0.12 in) measured 157 mm (6.18 in) behind hinge point

If there is excessive play in the hinge bearings and linkages they must be replaced or the manufacturer should be contacted regarding possible measures to reduce the play.

The rudder circuit is an open circuit, operated directly by cables and is therefore not subject to play.

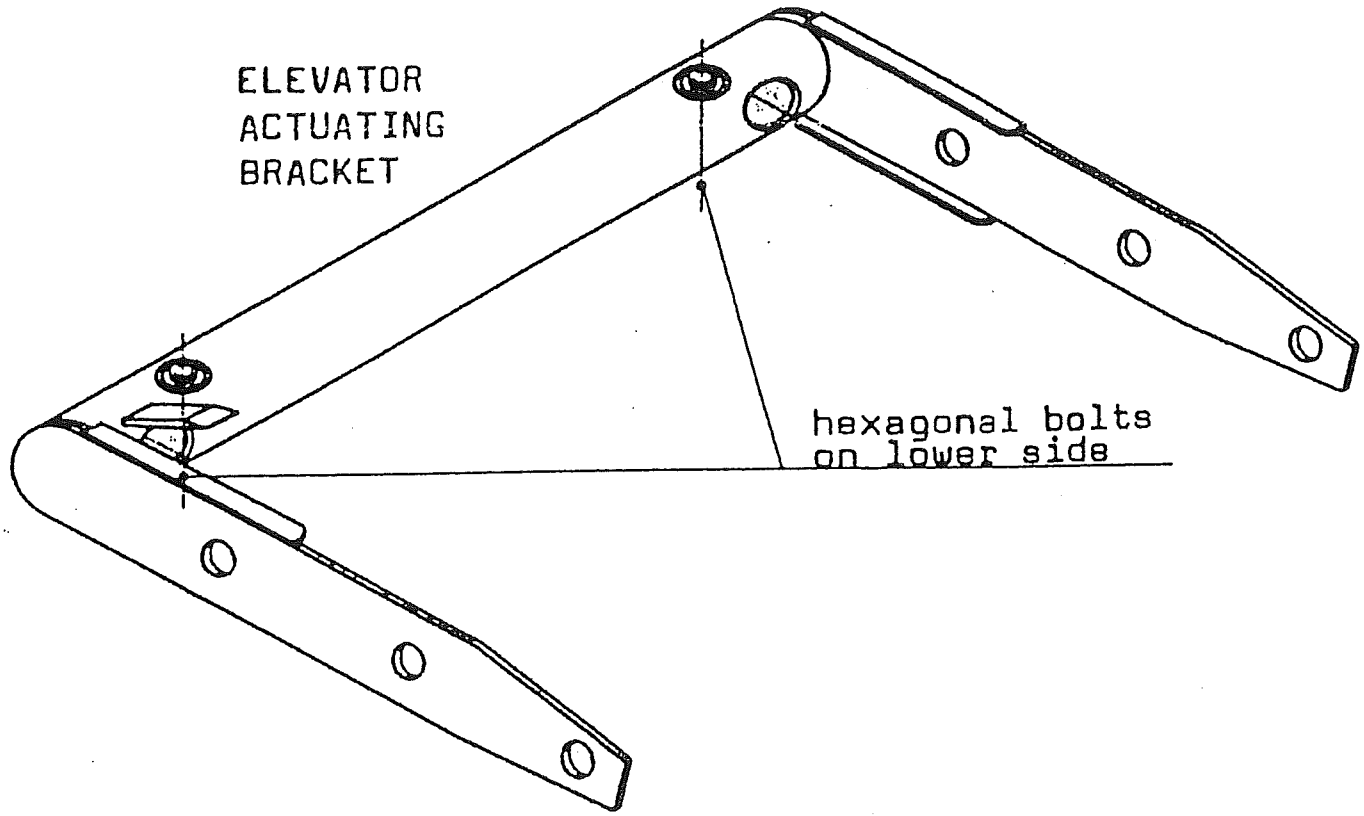
2.4 Play in the wing attachment fittings

Tangential play (fore and aft movement) can occur through wear in the shims on the wing locating pins.

If the wing tips are free to move more than 30 mm (1.18 in) further shims with an internal diameter of 13.95 mm (0.549 in) and a thickness of 0.3 to 0.5 mm (0.012 to 0.020 in) should be added progressively up to the point where the wings rig well, but the play has been eliminated

2.5 Play in the tailplane attachment fitting

If an excessive vertical play is found at the tips of the horizontal stabilizer, then the adjustable bushings of the elevator actuating bracket should be tightened (using a 4 mm Allen key) such that the tailplane will just slide onto its locating pins.



3. Inspections

3.1 Daily Inspection

Before commencing the day's flying or after rigging the sailplane it is very important to inspect carefuly, as accidents often occur when these daily inspections are neglected or carried-out carelessly, see "FLIGHT MANUAL", section 4.1, "Daily Inspection".

3.2 Prescribed inspections of the airframe

Rudder cables

Every 200 flying hours and at every annual inspection the rudder cables are to be inspected at the point where they feed through the S-shaped guides in the pedals, particularly at the point of maximum pedal adjustment. If they are damaged, worn or corroded, they must be replaced. It is permissible for individual strands of the cables to be worn up to 25%.

The specification for new cables is B 3.2 mm LN 9374 (zinc plated c-steel) or its Czechoslovak equivalent. Control cable connections should be made with galvanized thimbles A 3.5 DIN 6899 and Nicopress oval sleeves number 18-3-M or number 28-3-M. The tool to be used for this job is number 51-M-850.

Making cable connections and checking them should be in accordance with the manufacturer's recommendations.

Control cables

When replacing control cables the following cables must be used:

Control cable B 3.2 mm LN 9374 (1/8 in)

(equals MIL-W-1511 A or MIL-W-83420 D) for rudder cables

Control cable B 2.4 mm LN 9374 (3/32 in)

(equals MIL-W-1511 A or MIL-W-83420 D or their Czechoslovak equivalent) for tow release mechanism

Control cable B 1.6 mm LN 9389 (1/16 in)

or its Czechoslovak equivalent for wheel brake, pedal adjustment and fin tank dump valve mechanism.

(Control cables, ctd.)

Cable connections should be made in accordance with the manual

Aircraft Inspection and Repair
FAA AC 43.13-1A

Launching hooks

Check should be carried out in accordance with the

Operating and Maintenance Instructions
for the TOST launching hooks

(See section 9, "Service Instructions").

Instruments

In the case of all installed instruments and equipment the manufacturer's instructions should be followed.

Supply sources

o Thimbles, sleeves, cables, wheels etc.

- **Schempp-Hirth, výroba letadel, spol. s r. o.**
  565 01 Choceň, Czech Republic

- **Schempp-Hirth Flugzeugbau GmbH,**
  Krebenstrasse 25, D 7312 Kirchheim/Teck, BRD

o Nicopress oval sleeves, hand tool

- **R. Lindemann,**
  Osterrade 12, D 2050 Hamburg 80, BRD

o Launching hooks

- **TOST GmbH,**
  Thalkirchnerstrasse 62, D 8000 München, BRD

Annual Inspection

The following maintenance work and inspections are to be carried out before or during the annual inspection.

Note:

Individual sections describe the required maintenace work.

Access to the control circuits (see drawings, diagrams 1..3) is as follows:

- Control circuits in the wing

  Aileron control rods inside the wing through the inspection hole on the underside of the wing. If required for the inspection of the aileron bellcrank, an opening can be cut into the aileron auxiliary spar on the wing as shown in the appendix.

  The airbrake control system is accessible inside the airbrake box.

- Control circuits in the fuselage

  Control circuits in the fuselage are accessible after removing the seat pan and rear access panel.

- Elevator control

  Accessible after removing the horizontal tailplane. If required for the inspection of the elevator bellcrank, an opening can be cut into the fin as shown in the appendix.

- Rudder control circuit

  At the actuating rib.

(Annual inspection, ctd.)

After cleaning the entire sailplane the following checks should be made:

- Check the Discus externally for damage such as cracks, holes, scratches, buckling and delamination.

  If the outer layer of a component, constructed as a sandwich, has been damaged, then the inner surface must be checked as well.

  It is recommended to call upon expert assistance.

- All fittings which are mounted on GRFP must be checked to confirm there has been no movement. Check also the GRFP at the fittings for cracks, white spots and delamination.

- Check all accessible metal parts for damage. It is generally found, however, that if the sailplane is operated according to the Manual, no damage will have occured.

  If repairs are necessary, then contact the manufacturer.

- Check all accessible metal parts such as fittings, push rods and levers for corrosion.

  If necessary, remove the rust, clean thoroughly and apply fresh corrosion protection.

  The special primer and paint for this surface protection are available from the manufacturers (Schempp-Hirth, výroba letadel, spol. s r. o., Choceň or Schempp-Hirth Flugzeugbau GmbH, Kirchheim/Teck).

(Annual inspection, ctd.)

- In case of suspicion or proof of leaking water tanks the manufacturer should be contacted.

- Check the effective valve lift of the water dump valves. The difference of the valve lift between the left and right wing should not be more than 10 mm (0.39 in)

- Check fin tank dump valve for proper function. For this purpose the rudder must be removed. For proper adjustment of the operating cable refer to section 5.1.

- Recommended lubrication

  The Discus CS may be lubricated with acid-free grease and oil customary in trade.

  Fuselage (see diagrams 1 and 3):

  Lubricate all accessible control circuits (ball bearings with a sealed grease filling do not require any service).

  It is recommended that the guide tubes for the rudder pedal adjustment and the cables in the area of the S-shaped guides on the pedals are treated with "Vaseline" to ensure a smooth pedal adjustment.

  Lubricate the trimmer springs in the elevator circuit.

  Lubricate the canopy opening and jettisoning mechanism.

  Wings (see diagram 2):

  Lubricate all accessible points in the airbrake and aileron circuits and also their hinges.

  Horizontal tailplane and fin:

  Lubricate rudder and elevator hinges.

(Annual inspection, ctd.)

o Undercarriage

Check for side play. Check that the wheel axle runs true, that no struts are bent and that their mountings on the steel tube frame are not damaged.

Check the efficiency of the wheel brake.
Refer to section 5.4 for instructions how to remove the main wheel for cleaning, lubricating and maintenance work on the brake system.

Check tire pressure of the main wheel:

up to 360 kg (794 lb) A.U.W.: 3.5 bar (50 psi)
above 360 kg (794 lb) A.U.W.: 4.5 bar (64 psi)

o Check tail skid for damage and wear.

o Tail wheel (if installed)

Check attachment of tail wheel for delamination.
Check tire pressure: 2.0 bar (28 psi)

o Check Static and Pitot pressure ports and all instrumentation plumbing and pipe connectors for blockages and leakages. Check that the glass in the instruments is not loose, broken or lost.

o The harness straps should be checked regularly for damage or stains. The metal harness fittings should be checked regularly for corrosion.

o With the Discus CS rigged, check deflection of control surfaces with the aid of an assistant (see section 2.1) and also check the action of control circuits and the release hooks (for removal and re-installation refer to section 5.2).

There must be a clearance of at least 2.0 mm (0.08 in) between aileron and wing.

Check wing attachment fittings and control circuit connections for excessive play (see section 2.3 and 2.4).

Bearings with excessive radial play must be replaced.

4. Maintenance

4.1 Caring for the sailplane surface

Altrough the coating finish of GRFP/CRFP sailplanes is robust and resistant it nevertheless should be well cared for.

For cleaning and caring it is recommended to proceed as follows:

- The surface of the sailplane should only be washed with clear water and a sponge or chamois leather.
- Don't use additives of rinsings customary in trade too often
- Polishes and polishing material may be used.
- Petrol and alcohol may be used for a short time only.

  Not recommended are thinners of all kinds.
- Never use chlorated hydro carbons as trichlor-ethanol, trichlorethyole (Tri), Tetre (chlorided carbon) methylen chloride, chloroform, Per etc.
- The best polishing method is the buffing wheel fitted to a drilling or polishing machine. Hard wax is applied to the rotating disc and distributed crosswise over the surface. To avoid a local overheating move buffing machine constantly.

(Caring for the sailplane surface,ctd.)

- The canopy should be cleaned with a plexiglass cleaner ("Plexiklar","Mirror Glaze" or similar) and only if necessary, with warm water.

  The canopy should be wiped down only with a clean soft chamois leather or a very soft material.

  Never rub the canopy when it is dry

- This sailplane, like any other, should be protected from the wet.

  If water has found a way in, the sailplane should be stored in a dry environment and the componets turned frequently to eliminate the water.

- The sailplane should not be exposed unnecessarily to intense sunlight or heat and should not be subjected to continual loads in a mechanical sense.

  All external portions of the sailplane exposed to sunlight must be painted white, except the areas for the registrations numbers and (optional) anti-collisions markings.

  Colours other than white can lead to the GRFP or CRFP overheating in direct sunlight, resulting in weakening of the structure or in an insufficient strength.

4.2 Maintenance work on the airframe

Under normal operating conditions no maitenance work is required between the annual surveys except for the routine greasing of the spigots and bearings of the wing and tailplane attachment points and the main pin (see Flight Manual, section 5.1).

If the control system becomes heavy to operate, lubricate places in fuselage where plain bearings are used (undercarriage, airbrake and pedal linkages).

Cleaning and greasing the main wheel and the towing hook(s) depends on the accumulation of dirt.

4.3 Damage

Before every take-off and especially after the sailplane has not been used for a while it should be inspected for damage (see Flight Manual, section 4.1).

Check for any sign of a change in the condition of the sailplane, such as cracks in the surface, holes, delamination in the GRFP etc.

If there is any uncertainty whatsoever regarding the significance of damage discovered, the sailplane should always be inspected by a qualified inspector who is a CRFP/GRFP expert.

There is no objection to minor damage which does not affect airworthiness in any way being repaired on site.

Instructions for repair are included in the appendix.

Major repairs can only be carried out by a certified repair station having an appropriate authorization (or by the manufacturer).

If the plexiglas of the canopy has to be replaced, only clear or green (No. 777, slightly tinted) plexiglass is permitted.

5. Instructions for maintenance work

5.1 Removal and re-installation of the rudder

Fin tank water dump valve

Prior to disconnecting the rudder cables reduce the tension of the cables by pulling back the pedals (pull both back).

Remove the self-locking nut from the lower rudder hinge, undo the nut, raise rudder and pull it off to the rear.

Reverse preceding steps for re-installation.

For maintenance work on the fin tank water dump valve and its actuating system refer to diagram 4a.

Adjusting the valve control cable:

Pull rubber boot from dump valve. With the operating knob in the cockpit locked closed, the valve actuating lever must rest against its slanted guide plate (5). If necessary, re-adjust operating cable at the cable clamp on the valve actuating lever. Perform an operational check:

With the operating knob in the cockpit pulled back, the spring loaded valve tube (12) must be pushed up such that its water outlet is clear.

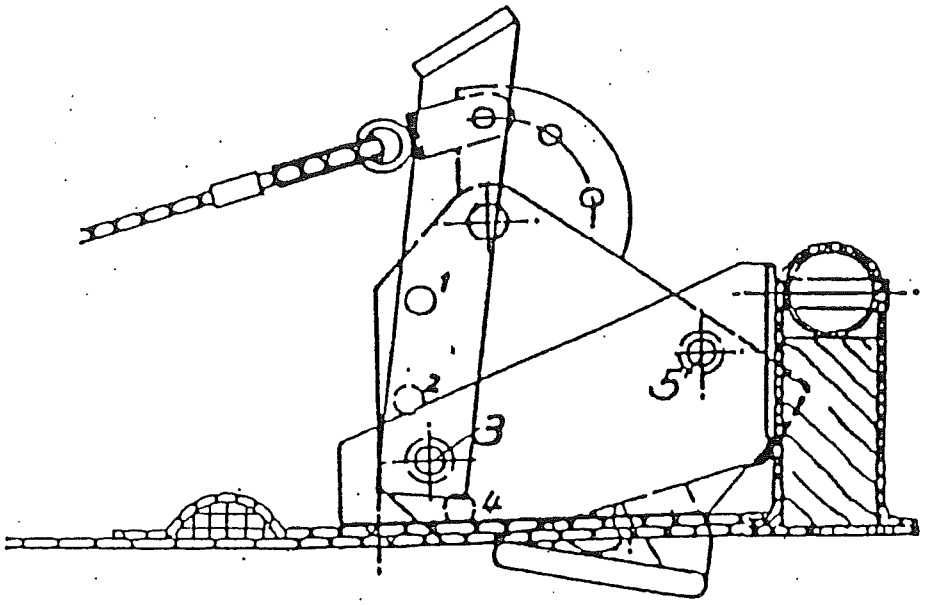
Re-attach rubber boot and fill tank. Check valve for leaks and proper dumping.

5.2 Removal and re-installation of the towing hooks

a) C.G. Towing hook

Being situated in the underside of the fuselage, the C.G. Release hook is vurnelable to the ingress of dirt. It must consequently be checked regularly for damage and also be cleaned and greased.

First remove the seat pan. The release mechanism is now easy to remove. Disconnect the cable from the actuating segment and undo the two mounting bolts, see sketch below. Then pull release mechanism down.



Important:

On the model Discus CS the release mechanism is attached by the bore holes No. 3 and 5 - take care when re-installing the release mechanism.