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NOTE: Integrated (wet inner surface) water ballast tanks are vented at the wing tip below the winglet to wing intersection. **That port must never be taped over!**

8. The "Multiprobe" must be installed into its socket in the nose of the fin.

WARNING: Without the probe installed the ASI readings are unusable.

9. A considerable performance improvement can be achieved with little effort by taping all the gaps between the wing and tail junctures with plastic, self-adhesive tape (on the non-moving parts only). The canopy must not be taped shut because this would impair bailing out.
   It is recommended that areas to be taped should be thoroughly waxed beforehand, so that the adhesive tape can be removed without lifting the gelcoat.

10. If flexible water ballast tanks are fitted in the wing-panels, connect both vent tubes from the water bags to the vent mounted in the fuselage skin above the baggage compartment.
    This check is obsolete when integrated (wet inner wing surface) water ballast tanks are installed!
    However for integrated tanks the cover of the big ventilation (and filling) hole on the upper wing surface must be checked for proper seat and taped over water tight during flight.

11. Use the check list (See section 4.4) to carry out a pre-flight check.
    Under point 2, Control surface clearances at trailing edge min. 1.5 mm = 1/16 in!, check that the wing control surfaces have the minimum clearance from each other and from the inboard and outboard wing fixed surfaces. This clearance is necessary to ensure that these controls do not foul each other or the wing when deformed under flight loads.

De-rigging

To **de-rig**, proceed in the reverse order for rigging. The following suggestions are added:

1. Drain all water ballast. Ensure that all the water has drained out by lowering alternately each wing tip several times.

2. If the horizontal tail is very firmly seated, it will be more easily dismantled by two people pushing forward alternately at the tips.

3. Before removing the wings from the fuselage, do not forget to disconnect the vent hoses (not applicable for integrated water ballast tanks!) and remove the winglets!

4.3 Daily inspection

Before commencing flying operations, the aircraft must be thoroughly inspected and its controls checked; this also applies to aircraft kept in a hangar, as experience indicates they are vulnerable to hangar damage and vermin.

1. Open canopy and check canopy jettison system.

2. Are main pins fully inserted and secured?

3. Perform a Positive Control Check. Control connections (ailerons, flaps, and airbrakes) in fuselage to wing intersection as far as visible from the cockpit.

4. Check cockpit and control runs for loose objects or components.

5. Check full and free operation of all controls through full deflections. Hold controls firmly while loads are applied to control surfaces. A competent person should assist you when doing this check.

6. Check ventilation opening and optional Pitot tube in fuselage nose.

7. Check inflation and condition of tires:
   Main wheel: 2.3 bar ± 0.2 bar (33 psi ± 3 psi)
   Tail wheel: 2.5 bar ± 0.1 bar (36 psi ± 2 psi)

8. Check condition and operation of tow hook(s). Release operating freely? Release checks done?

9. Check wheel brake for operation and fluid leaks. With airbrakes fully extended, the brake pressure from the main brake cylinder should be felt through spoiler handle.

10. If installed, check connections to wing and fuselage water ballast tank ventilation lines (not applicable for integrated water ballast tanks!).

11. Check battery voltage to be > 12 V.

12. Check both upper and lower wing surfaces for damage and water ballast openings for dirt.
    For integrated wing water ballast tanks only: Check ventilation port at the wing tip to be clean as well as the cover on the upper outer wing surface for proper seating watertight taping!
    Are the Winglets undamaged and taped?

13. Ailerons and flaps:
    Check condition and full and free movement (control-surface clearances). Check external linkage fairings for clearance.

4.5.8 Flying with Water Ballast

WARNING: Cloud flying with water ballast is **not approved**! (See also section 2.11).

For weak weather conditions, the wing loading of the ASW 27 is already optimum with no or little (about 60 l or 15 U.S. gallons) additional water ballast.
If the achieved rate of climb in lift is markedly greater than 2 m/s (400 ft/min), the wing loading can be increased to a maximum of 55.56 kg/m² equivalent to 11.38 lb./ft² by use of water ballast.

NOTE: Remember that ballast will increase the stall speeds and take-off runs.
Ensure that the condition of the airfield and the length of take-off run available for the power of the towplane or winch permit a safe launch.

(1) Filling of Water Ballast:

CAUTION: For integrated wing water ballast tanks the ventilation (and filling) cover on the upper outer wing surface must be checked for proper seating and watertight taping!

It is most important to fill the tanks only by means of the filling nozzles provided because they are fitted with a strainer designed to prevent contamination of the valves.
The fill and dump ports for the water ballast are situated about 30 cm (12 in.) left and right of the fuselage and about 23 cm (9 in.) behind the wing leading edge on the lower wing surface.
The water-ballast operating lever in the right hand cockpit arm rest should be positioned OPEN (forward = valve-open position).
Start by filling the tanks with the wings level. The tank venting is designed such that the tanks will be well vented in this position.

WARNING: For integrated wing water ballast tanks it is necessary to **keep the sailplane level**, as otherwise the low wing will drain slowly through the ventilation port at the wing tip!

To do so use one (or two) Y-type hose(s) with two (or even three) filling nozzles because both the corresponding left and right (or all three) valves must remain open during filling. This is an important LBA requirement to prevent inadvertent draining of one tank only in one wing.
Integrated (wet inner wing surface) water ballast tanks may also be filled through the ventilation holes at the outer upper wing surface. In that case close the water ballast valves. After filling fasten and tape the covers!
With the wings level, carry out a balance test to ensure that the ballast loads are equal. Should one wing prove heavier, seal the opening in the lighter wing briefly by hand or stopper while opening the valves until equilibrium is achieved. Close the water ballast valves now!

WARNING: It is expressly prohibited to use pressurised water sources (mains, immersion pump, etc.) for filling ballast tanks due to the great possibility of damage to the wing structure.

It is recommended to fill the tanks from slightly elevated containers (on the wing or car roof, and so on). If water under pressure is used, it is essential to interpose an open intermediate vessel (funnel, standpipe, etc.) to ensure that the pressure head cannot rise above 1.5 m (5 ft) during filling.
When the wings are filled to capacity, it can happen that the soft bag tanks or the optional integrated water ballast tanks slowly drain out of the vents while the aircraft is parked. In this case, we recommend that the wing tips be supported level but, on no account, to tape up the vents!

The maximum permissible water-ballast weight can be calculated as follows:

	Maximum weight	500 kg (1102 lb.)
minus	Empty weight	-XXX kg (-YYY lb.)
minus	Cockpit Load	-XXX kg (-YYY lb.)
= maximum water ballast		XXX kg (YYY lb.)

You will find a table with precise values in Section 6.2.2 .

(2) Jettisoning the Water Ballast.

We distinguish between two distinct circumstances under which ballast is normally jettisoned:

A) Partial reduction in wing loading:

Every time any water is jettisoned, it is most important to look at the wing trailing edges to ensure that the water is draining at an equal rate from both opened valves!
Open the lever in the cockpit and expect a flow rate of about 1 kg per second (2.2 lb. per second) of water ballast, a bit faster when the tanks are full, slower when the tanks are nearly empty.

B) Rapid ballast jettison:

When the water ballast must be jettisoned beyond the above-mentioned amount, the lever for the water tanks is also set to the OPEN position. Check both wings for proper draining and do not rely only on the lever setting.

The time to drain of the full soft water bags is about 3 ½ Minutes (or 200 Seconds) and about 3 Minutes for the integrated (wet inner wing surface) water ballast tanks.

Should the ballast fail to drain as intended, the valves should be closed immediately; try again to achieve even drainage by operating the valves again or, if icing is suspected, after descending into warmer air.
If this fails after several attempts, the situation should be regarded as an emergency and the instructions in Section 3.9 (5) should be followed.

6.2.2 Water ballast load

The following table gives the possible water ballast load in kg (lb.) depending from the empty weight (mass) of the sailplane plus the useful load.

Empty Weight kg (lb.)	Useful Load, kg (lb.) Pilot + Parachute + Baggage						
	70 (154)	80 (176)	90 (198)	100 (221)	110 (243)	120 (265)	130 (287)
230 (507)	full	full	full	170* (375)	160* (353)	150* (331)	140 (309)
240 (529)	full	full	170* (375)	160* (353)	150* (331)	140 (309)	+)
250 (551)	full	170* (375)	160* (353)	150* (331)	140 (309)	+)	+)
260 (573)	170* (375)	160* (353)	150* (331)	140 (309)	+)	+)	+)

+) These combinations are precluded because they would cause the maximum permissible weight (mass) of non-lifting parts to be exceeded!

* Fill wing water tanks fully and fill the remaining rest into the fuselage water tank (if installed) !

NOTE: 1 kg of water is equivalent to 2.2 lb. or 0.265 U.S.-gallons

CAUTION: Always fill the wing water tanks first, then fill the remaining water into the fuselage tank.
This is about 140 Litres or 37 US - Gallons for the optional bigger soft water ballast bags then fill the fuselage tank, or about 155 Litres or 51 US - Gallons for integrated wet wing tanks, then fill the fuselage tank .

Water ballast system

Normally the wings are equipped with water ballast bags of about 100 litres (26 US-Gal.) capacity.

Bigger water ballast tanks holding about 140 litres (about (37 US-Gal.) together with a fuselage water ballast tank holding 35 litres (9.25 US-Gal.) may be installed instead of the baggage compartment floor as an option. This allows also light weight pilots to fly with maximum wing loading, see section 6.2.2 .
Integrated (wet inner surface) wing water ballast tanks hold about 155 Litres (51 US - Gallons). On the upper outboard wing surface there is a ventilation hole in order to dry the tanks, when not used. A cover is safetied by elastic tape (for example: Fascaltape or Tesaflex 4163, white, Ø 60 mm). At the cover of the hole at the front wing root rib an automatic valve opener is installed which keep the valve open when the wins are de-rigged from the fuselage.

All water ballast valves are actuated mechanically. The control lever is fitted on the arm rest of the right cockpit wall behind the landing gear lever.

The **FORWARD** position
of the control lever
is all valves **OPEN**.

When the fuselage water tank is installed the appropriate valve is also operated by this lever.
By controlling all the valves with a single lever, an inadvertent opening of only one valve, which would result in an asymmetric and/or tail heavy ballast load, becomes impossible.

7.12 Electrical system

The electric circuit is activated by a switch on the instrument panel.
Each electrical device is protected by its own fuse.
A rather strong fuse next to every battery protects the electric circuits in case of a crash. See also Fig. 7.12-1 at the end of this section.

If the aircraft is parked in a hangar for protracted periods, it is also recommended that only the canopy be covered. Complete dust covers retain moisture in wet weather for long periods, which can adversely affect the dimensional stability and even the strength of fibre-reinforced composites.

NOTE: For this reason, protracted periods of parking with water ballast on board are also not recommended!
The water ballast valves must be opened in such a case! On integrated (wet inner surface) wing water ballast tanks also the ventilation opening on the outboard upper wing surface must be opened!

(c) Tie-down

To tie down the wings, stands should be used which ensure that the ailerons cannot be stressed by the tie-down ropes.

(d) Road transport

Alexander Schleicher GmbH & Co. can supply dimensioned drawings of the glider which will provide all the measurements needed for building a closed trailer.
Names and addresses of reputable trailer manufacturers can also be supplied.

Above all, it is important to ensure that the wings are supported in properly shaped and fitted wing cradles or, at the very least, that the spar ends are securely supported as closely as possible to the root ribs.

Reinforced points on the fuselage are the main wheel (remember the suspension springing !), and the tail wheel; also, the drag-spar pins (make support bushes from plastic material like Nylon!) and the area under the canopy arch between the c.g.-hook and the lap-strap area.

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Masses (Weights)

Empty mass	approx.	235 kg	(518 lb.)
Max. useful load	approx.	130 kg	(286.7 lb.)
Max. load pilot seat		115 kg	(253.6 lb.)
Max. mass of non-lifting parts		280 kg	(617.4 lb.)
Max. all-up mass **with** water ballast		500 kg	(1102 lb.)
Max. all-up mass **without** water ballast		395 kg	(871 lb.)
Wing loading		32.8 - 55.56 kg/m²	
		(6.72 - 11.38 lb./ft²)	
Max. loading of baggage compartment		15 kg	(33 lb.)
Max. trim ballast (battery) in the fin		6 kg	(13.2 lb.)
Water ballast	max.	165 kg	(364 lb.)
serial water bags	approx.	100 kg	(220 lb.)
big water bags	approx.	140 kg	(309 lb.)
integrated water tanks	approx.	155 kg	(342 lb.)
fuselage water tank	approx.	35 kg	(77 lb.)

See also **Flight Manual** Section 2 !

2.4 Water Ballast System

The water ballast installation allows the all-up weight of the ASW 27 to be increased to a maximum of 500 kg (1102 lb.). This corresponds to a wing loading of 55.56 kg/m² (11.38 lb./ft²).

There are three versions of water ballast systems:
Serial version is a system with wing water bags of 100 lt. (26.5 US-Gal) capacity, see Fig. 2.4-3.
As an option bigger water bags of about 140 lt (37 US-Gal) can be installed together with a fuselage water tank of about 35 lt. (9.25 US-Gal) instead of the baggage compartment above and rear of the main spar (Fig. 2.4-4 & 2.4-5). With this system the maximum wing loading is possible.
According to TN 2 integrated (wet inner wing surface) tanks are directly built into the wings which hold 155 Litres (41 US-Gal) together, see Fig. 2.4-6. The ventilation port is placed at the wing tip. At the cover for the opening in the front wing root rib an automatic valve opener is installed, see Fig. 2.4-7, which keeps the drain valves open when the sailplane is de-rigged. On the upper outer wing surface there is a ventilation (and filling) opening, which protected against small animals by a mesh and closed by a cover disc, see Fig. 2.4-8 .
The operation of the water ballast valves is done by a lever on the right-hand cockpit wall behind the landing gear lever. Two Bowden cables lead to the fuselage side wing root ribs. When a fuselage water tank is installed, the fuselage valve is also connected to this lever which controls the valves.
The actuation of all valves by only one cockpit lever avoids inadvertent opening of a valve with consequent asymmetric or tailheavy water load.
When rigging the wings to the fuselage the water ballast system is automatically connected.
Inside the wings a push rod actuates the water ballast valve.

NOTE 1: **Maintenance Instruction B** must be regarded. This avoids bending of the valve actuating push rod.

NOTE 2: In order to avoid asymmetric water ballast the ballast valves must open equally and fully. This is so when a minimum travel of 12 mm (.5 in) of the actuating rod is achieved. This can only be checked when an ASW 27 is rigged, see Fig. 2.4-1 .

The water ballast drain ports are situated about 30 cm (1 ft) left and right of the fuselage about 23 cm (9 inches) behind the wing leading edge on the lower wing surface and for the fuselage tank behind the landing gear doors. The ports are covered by an elastic Mylar fairing.

The wing water ballast is filled into 2 mutually independent water bags made from plastic. According to TN 2 integrated (wet inner wing surface) water ballast tanks are available as an option.

The water ballast is filled intc the bags by using the extension AS-No. 99.336.0022. This part contains a mesh which allows no dirt to stick in the valves.
Filling the water ballast is best done by means of a Y-shaped hose coupling (or triple hose connection when a fuselage water tank is installed) so that all water bags are filled simultaneously. The wings should be supported level.

If no Y-shaped hose coupling is used and each water bag is filled separately, the respective other drain valve(s) must be closed and sealed by means of cap AS-No. 99.000.8861 while the water is filled.
After closing the valves, the cap(s) must be removed from the wing and then **check that all drain ports are open** and the Mylar covers attach to the wing surface.

CAUTIONS:
Grossly unequal filling of ballast can cause failure of the wing shells during a spin. Therefore the water ballast system should be carefully maintained as follows:

- Use only clean water for ballast, which must be further filtered through the strainer in the filling appliance.

- As the prolonged effect of moisture can harm structures incorporating an epoxy resin matrix, (e.g. wavy deformation of the wing shell and impaired wing profile), it is strongly recommended that after each flight with water ballast the ballast bags should be checked for leakage.

- After water ballast has been used, the drain valves **must always be kept open.** For integrated water ballast tanks built according to TN 2 the drain valves are always held open by an automatic valve opener.

- If the bags are not going to be used for any appreciable time they should in any case be removed.

- Never fill direct from the water supply, or by means of any pumps. Even low pressures can damage the wing. A head-of-pressure of about only 7 m = 0.7 bar (or 10.15 psi) will break the wing shells.

There is a way of checking the symmetrical draining of the ballast bags in flight:

The water trails from drain valves are easily seen from the cockpit. This visual check should never be omitted !

Fitting and Dismantling of Water Ballast Bags, Maintenance Instructions

Removing the wing water bags:
Detach the vent tubes from the vent fitting in the fuselage and de-rig the wing.
Remove the cover from the wing root rib and pull the push-rod out of the valve.
If the ventilation is integrated in the wing, the vent tubes are disconnected at the wing root.
The water ballast bag is fixed at the front root rib by means of two nylon cords. Untie the fixing cords and tie the end of the longer fixing cord back to the root rib so that the cord cannot be pulled out of the wing.
Remove the nut at the water outlet on the lower wing using the fork-type tool (Gedore Nr. 44/7") with 3 mm diameter pins.

The water bags may now be carefully drawn out from the apertures in the root ribs; please pay attention that there is a plastic tube (about 2.5 m = 8.2 ft long) inside the bag, running from the valve to the constriction of the water bag. Lay the bags out on a clean surface. Untie the long nylon fixing cords from the bags and leave them inside the wing.
Valves of integrated water ballast tanks can be removed for maintenance in the same way as described for soft water ballast bags, see also Fig. 2.4 - 1 .

Removing the fuselage water tank:

Remove the hose clamp on the lower tank surface. Then remove drain fitting (spanner 24 mm) from the tank. Remove four bolts (spanner 10 mm) at the rear canopy frame. Pull the tank carefully forward and out. Put the drain fitting back to the drain hose and safety with the hose clamp so that the drain hose cannot drop into the control gear below and jam it, see also Fig. 2.4 - 5.
Install baggage compartment above/rear of the spar.

WARNING: When the fuselage water tank is removed the baggage compartment floor above and behind the wing main spar **must** be installed, so that no loose items can get from the cockpit or the baggage compartment in front of the spar into the area full of control gear behind and below the spar.

Testing the Valves

The valves are commercially available products of the GF factory modified by inserting a stainless steel spring to close the valve.
According to **Maintenance Instruction** "Water Ballast Valves" and as shown in Fig. 2.4-1 the valve is opened for cleaning by unscrewing the union nut; inspect sealing ring, ball and spring and replace if necessary.
If the valve has a leak at its actuation rod, replace the groove sealing ring.

Testing the Water Bags for Leakage while dismantled from Aircraft

Close the valve. Disconnect the vent tubes at the Y-piece. Now take the longer vent tube and make a U/tube manometer as shown in Fig.2.4-2, and fill with water.

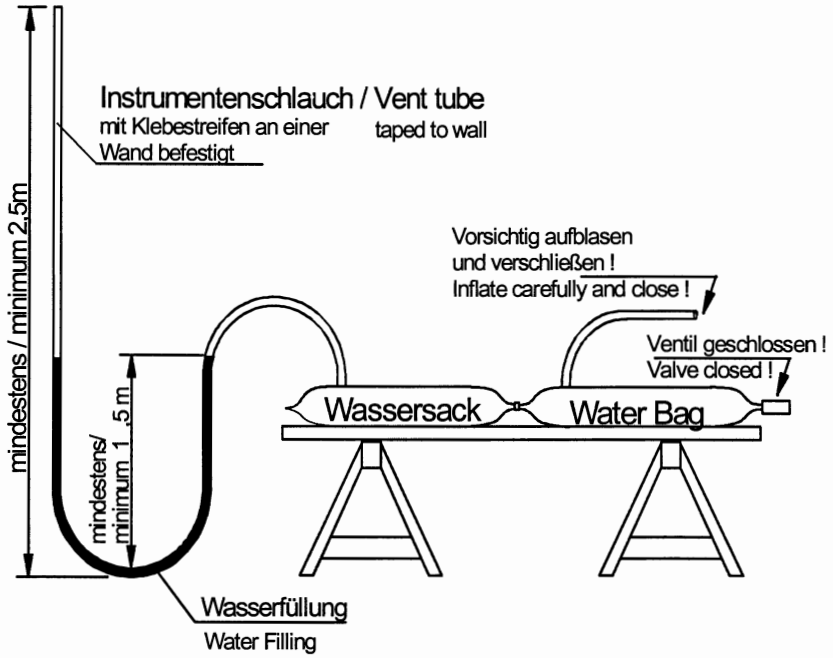


Fig. 2.4-2 Simple U/Tube Manometer for Leakage Tests of Ballast Bags.

Through the other vent tube, now inflate the water bag carefully by means of an air pump or compressed air to a pressure of about 0.2 bar (2.90 psi), or 2 m (6.56 ft) water column, (i.e. 2 m height difference between the two water surfaces in the U/tube manometer vent tube), and then close it. If no pressure drop can be observed after 5 minutes, it may be assumed that the bag is watertight.
All water bags must be tested for leakage!

When integrated water ballast tanks are leaking the manufacturer of the sailplane has to be contacted.

Re-Fitting of Water Ballast Equipment

Re-fitting of the wing water ballast bags:

- Tie the nylon fixing cords to the bags and draw the bags carefully into the wings by means of the fixing cords. Take care that cords as well as the ventilation hoses are on top of the bags and that the push rod refitted to the valve is not bent!

- Re-fit the valve to the outlet port by holding it in position by a hook and holding the valve at the actuating push rod. Tighten the fixing screw R3/4" / M 18x1,5 after some Teflon sealing tape was wrapped over the thread. Safety with the safety bolt.

- Tighten the fixing cords of the bags and tie them to the wing root rib; stow remaining cord in the wing. Install the cover plate to the wing root rib opening not forgetting to put the push rod into its guide.

Installation of the valve of an integrated wing water ballast tank:

- Grease the valve in the area of the O-ring using Vaseline push it into the sleeve of the integrated tank and fix it at the drain opening by use of nut R3/4"/M 18x1,5. Seal the threads with Teflon sealing tape, see Fig. 2.4 - 1.

Re-installation of the fuselage water tank:
The re-installation is done in the reverse way as the removal.

Check for leaks after re-installation!
In case of difficulties or problems, consult Messrs. Schleicher.

Storing the bags outside the wing

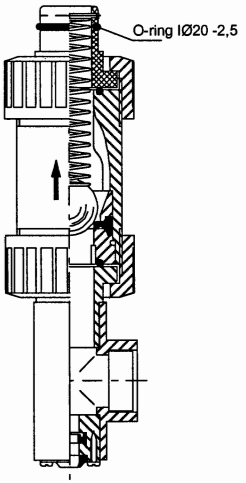
Water bags must always be kept in a dark, cool and dry place.

Repair

"Smiley" water bags may be repaired using bicycle repair kit.

Fig. 2.4 - 1 Water Ballast Valve in the Wing

Valve for extra version
with integrated water ballast tanks
AS-No. 270.76.1011



Valve for serial version
with water bags 5,03 m
AS-No. 270.76.1003

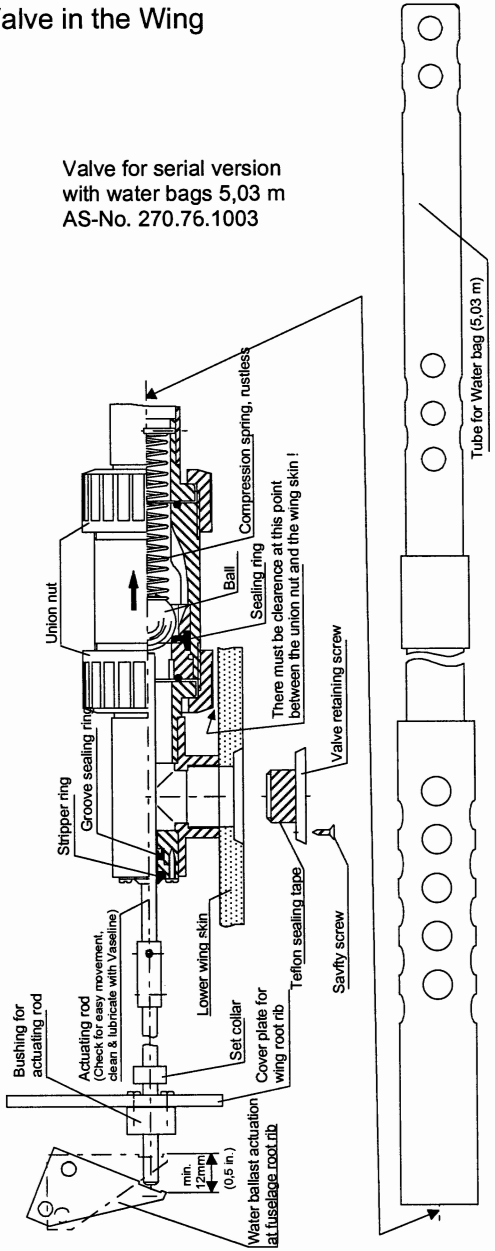
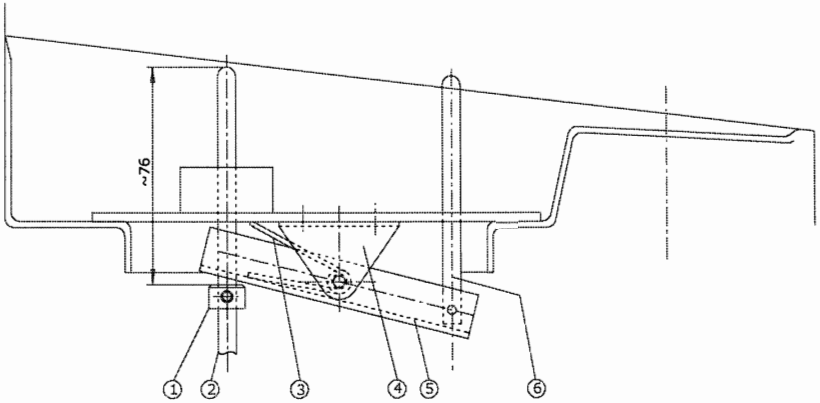
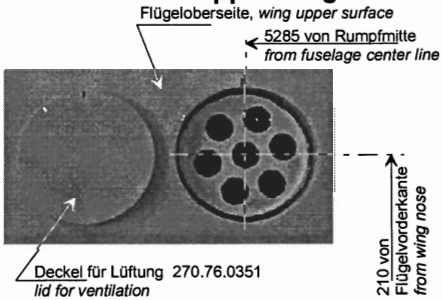


Fig. 2.4 - 7 Automatic Valve Opener at the Wing Root Rib

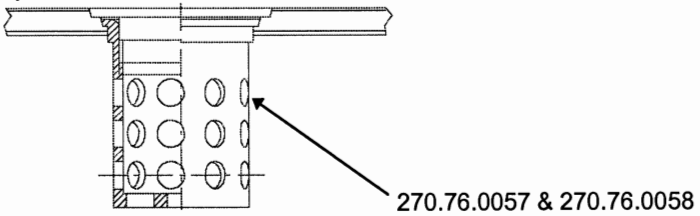


(1) Adjustment ring IØ6,1 A - 6/913 (Stellring)
(2) Extension for push rod, 270.76.0004 (Verlängerung für Druckstange)
(3) Spring for automatic valve opener, 270.76.0055 (Feder für autom. Ventilöffner)
(4) U-fitting for automatic valve opener, 270.76.0053 (U-Bock für autom. Ventilöffner)
(5) Rocker arm for automatic valve opener, 270.76.0054 (Wippe für autom. Ventilöffner)
(6) Push rod for automatic valve opener, 270.76.0056 (Druckstange für autom. Ventilöffner)

Fig. 2.4 - 8 Ventilation for integrated (wet inner surface) wing water ballast tank on upper wing surface



optional version with a mesh:



10. Examine the Pitot and static ports in the fuselage and fin for blockages and leaks.

11. Check condition and proper functioning - and, if appropriate, permitted service life span - of all instruments, and VHF transceiver.

12. The condition and proper functioning of the TOST tow release fitted near the C.G. and the tow release fitted at the forward fuselage must be checked. The release actuating cable must have free movement and some play when the tow releases are closed and locked, so that they are not under any tension.

13. The canopy jettison release must be operated and examined for corrosion and burrs etc., if necessary, rectified and in any case freshly lubricated !

14. The water ballast bags and valves (also integrated wing water ballast tanks according to TN 2) as well as the fuselage water tank must be checked for leaks and proper operation, see Section 2.4 and next section 7.1 "Trial Filling of Water Bags".

15. The wing bending frequency should be measured and compared with that shown in the latest inspection report. For this test the fuselage must be rigidly supported in two supports in order to obtain comparable values. For the positions of the supports, see Fig.3.0-1!

16. Compare equipment and instrumentation with that shown in the equipment list.

17. After repairs or changes in equipment fitted, the empty mass (weight) and C.G. position must be re-determined by calculation or weighing, and recorded in the **Weight (Mass) And Balance Record**, in Section 6.2 of the **Flight Manual**.

After landings in high crops or high grass

1. Check flap control circuit! Check control deflections for ailerons and flaps, as levers inside fuselage or wings may have been bent.

After Flying with Water Ballast

After de-rigging the aircraft, briefly raise the tips of the wings and check whether water originating from the ballast bags accumulates behind the root ribs.
If water is found there, the water bags and the valves should be checked for leaks. Seeping or leaking valves must be overhauled in accordance with Section 2.4 without fail.

When integrated (wet inner wing surface) water ballast tanks are leaking or leaking is suspected, the manufacturer A. Schleicher must be contacted.

Do not forget to dry the wings out ! **Always** store the aircraft with valves **open** !

When a fuselage water tank is installed, check if water has gathered behind the landing gear box inside the fuselage.
When water is found check all hose clamps, hoses and valve for leaks.

Trial Filling of Water Bags

In the course of the annual C of A inspection, a test filling of the water ballast system should be carried out. During this test, special attention should be paid to water seepage from the bags and to dripping valves.
Also check the proper opening of both valves, see section 2.4, in order to avoid unequal water flow when draining, which may lead to an asymmetric wing load after a while.