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 gel coat.

10. Flexible water ballast tanks: 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.
    Integrated water ballast tanks: 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.
    Double gate valve: When a double gate valve is installed inside the fuselage, instead of two wing valves, both water ballast hoses must be connected inside the baggage compartment.

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.

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. Flexible water ballast tanks: Check connections to wing water ballast tank ventilation lines.
    Fuselage water ballast tank: Check connections of fuselage water ballast tank ventilation lines to the ports on top of the fuselage.
    Double gate valve: When installed, check the water ballast hose connection inside the baggage compartment.

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, safetied and taped?

13. Ailerons and flaps:
    Check condition and full and free movement (control-surface clearances). Check external linkage fairings for clearance.
    Friction areas of the elastic control gap covers must be carefully cleaned!

14. Airbrakes:
    Check condition and control connections. Check both airbrakes have good over-centre locks. Check both airbrake boxes for loose objects, stones, water etc.
    The seat areas of the airbrake cover plates must be carefully cleaned!

15. Check fuselage, especially underside, for damage and water ballast exit for dirt if applicable.
    Double gate valve: When installed, check the water ballast exit ports behind the landing gear doors to be clean and not obstructed.
    Flexible water ballast tanks and fuselage water ballast tank: Check ventilation ports of the water ballast system at the top of the fuselage for dirt and/or free flow .

16. Check that static pressure ports in the fuselage tail boom are unobstructed.

17. Check that rudder, horizontal tail, and elevator are correctly fitted and for damage or excessive play. Check that tail bolt is tight and locked.

18. Check probe in fin:
    Is probe properly seated and tight ?
    Fin (tail) water tank: When installed, check fin (tail) tank port to be clean!

19. Check water-ballast system for leaks after it is filled.

4.5.6 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:

WARNING: Only either the fin (tail) tank **or** the fuselage tank must be filled. Filling both tanks leads to hazardous tail heavy conditions.
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.
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.

Flexible water ballast tanks: 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. 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.

When the wings are filled to capacity, it can happen that the soft bag 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!

Integrated wing water ballast tanks: Integrated (wet inner wing surface) water ballast tanks may 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!

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!

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!

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!

Fuselage water ballast tank: To do so use one hose with filling nozzles. The fill and dump ports are on the lower fuselage surface behind the landing gear doors. In order to avoid that the wings drain empty, the closing caps must be screwed into the wing exit ports. The water-ballast operating lever in the right hand cockpit arm rest should be positioned OPEN. After the filling is done, close the valves and remove the closing caps.

Fin (tail) water tank: Hold the hose with filling nozzles vertically and close to the filling marks on the side surface of the fin. Open the valve with the operating lever in the right hand cockpit arm rest. See also Fig. 7.9-1 and Section 4.5.10 & 5.3.2.3 !

CAUTION: When an optional fin (tail) water ballast tank is installed, it must be filled at first, then the wing tanks !

Double gate valve: When - on option - a double gate valve is installed in the fuselage, the water ballast exit ports are left and right behind the landing gear doors. The double gate valve is closed by pulling the cable loop installed at the left hand cockpit wall below the canopy frame forward.

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:

There is a way of checking the symmetrical draining of the ballast bags in flight (only when the fill and dump ports on the lower wing surface):

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

A) Partial reduction in wing loading:

Open the lever in the cockpit and expect a flow rate of about 0,5 kg per second (1.1 lb. per second) of water ballast, a bit faster when the tanks are full, slower when the tanks are nearly empty.

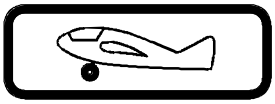
B) Rapid ballast jettison:

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.

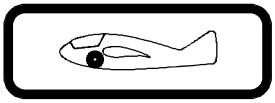
The time to drain of the full soft water bags (130 l) is about 4 Minutes (or 240 Seconds) and about 4 ½ Minutes for the integrated (wet inner wing surface) water ballast tanks (about 150 l).
The small remaining ballast water will be fully jettisoned after 8 to 12 minutes.
Should the ballast fail to drain as intended, the valves should be closed immediately (pull the operating lever backwards and when installed, the double gate valve is closed by pulling the cable loop installed at the left hand cockpit wall below the canopy frame forward); 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.

7.4 Landing gear system

The landing gear is extended and retracted and locked in either position by means of the black-handled lever mounted on the right cockpit wall.



Landing gear extended
(lever forward)



Landing gear retracted
(lever aft)

Tire pressures: Main wheel: 2.3 bar ± 0.2 bar (33 psi ± 3 psi)
Tail wheel: 2.5 bar ± 0.1 bar (36 psi ± 1.5 psi)

The wheel brake is operated with the airbrake control lever, see section 7.7 .

7.5 Seats and safety harness

7.5.1 Seat and seating positions

The seat including back and head rests is designed according to latest studies of TÜV Rheinland.
Tall and medium sized pilots can sit comfortably and may adjust their position by adjusting the back rest on its low end (three positions with screws) and on the upper end by actuating the eccentric winch in high right hand cockpit wall position (2,5 to 3 cm [1 to 1.2 in.] per turn of the winch) which is possible in flight.
An optional light weight version of the back rest can only be adjusted before the flight in 5 positions.
The backrest requires the use of (rigid foam!) cushions or an appropriate parachute.
Optimum seating position is achieved when the upper thighs contact the wedge of the seat pan and the backside fits into the corner to the cockpit floor.

The anchor points of the lap straps are fixed in such a relation to the seat pan that the seating position described above is maintained and submarining (sliding forward from underneath) is extremely remote.
The geometry of the seat is designed such that tall pilots are comfortably seated. For tall pilots, we recommend the use of thin parachute packs of the latest type.
Very short pilots must adjust their seating position by means of a firm cushion (energy absorbing semi-rigid foams are optimum) so that all controls are within comfortable reach, that their view to the outside is improved.
A small pilot is positioned high enough when the instrument panel does not restrict the forward view. The instrument cover is so designed that the panel edge is in line with the front contour of the glas.

For all sizes of pilots it is very important to adjust and lock the backrest such that they are prevented from sliding aft during the initial take-off (winch-launch) acceleration.
For the same reason the cushions used must be sufficiently rigid and stiff.

Carefully ensure that the lever of the eccentricwinch of the backrest is locked!

This placard is not installed, when the optional light weight version of the back rest is used, which engages into 5 holes in a gate at the cockpit wall. Then the winch to adjust back rest inclination is also not installed.

7.5.2 Safety harness

The safety harness is anchored in such a way that it cannot jam the control runs underneath the seat pan.

7.9 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 engaging into a thread is used to close this port. 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.
When - on option - a double gate valve is installed in the fuselage, a the water ballast hoses coming from the wings have to be connected to this double valve. All water ballast valves are actuated mechanically. The control lever is fitted on the arm rest of the right cockpit wall behind into the landing gear gate.

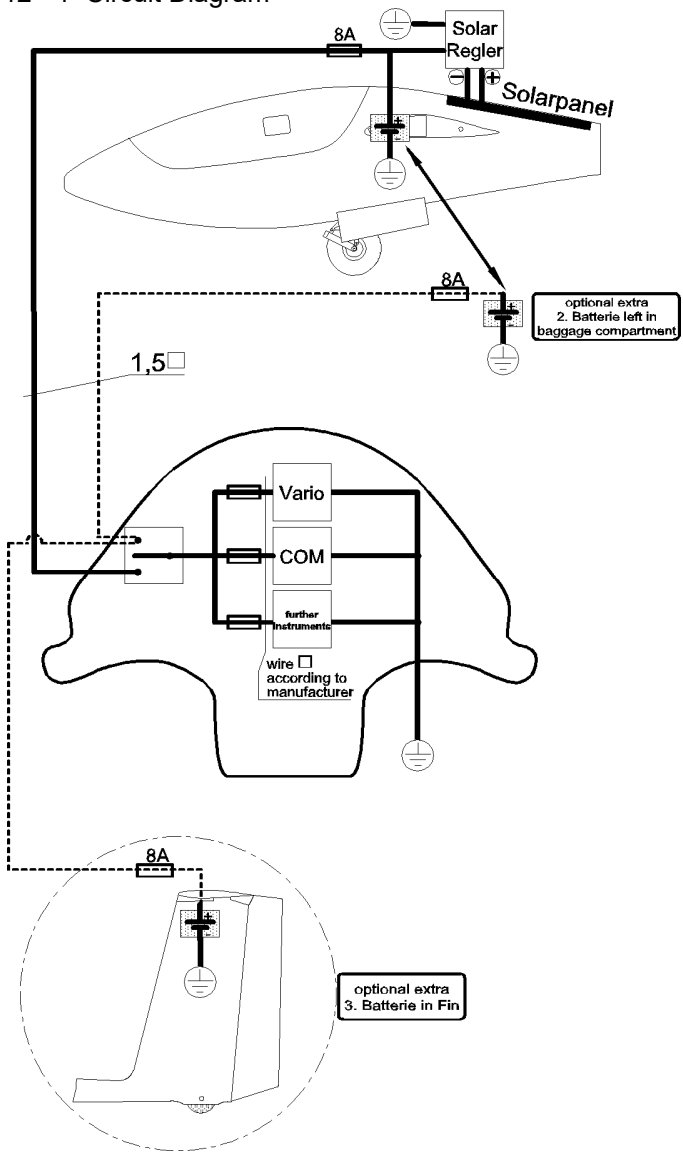
The **FORWARD** position
of the control lever
is all valves **OPEN**.

When the fuselage water tank or an optional fin (tail) tank is installed their valves are simultaneously operated by this cockpit lever.
The fin (tail) water ballast tank is used for fine tuning the c. g.-position in dry and wet configurations.
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.
The double gate valve is closed by pulling the cable loop installed at the left hand cockpit wall below the canopy frame forward.

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.

Fig. 7.12 - 1 Circuit Diagram



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 different 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.
The operation of the water ballast valves is done by a lever on the right-hand cockpit wall in the landing gear gate. 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 tail heavy 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.
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.
The water ballast is filled into 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!

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. Integrated water ballast tanks can be filled through the (ventilation) ports on the top surface of the wing.

For the optional double gate valve installed inside the fuselage a hose connected to the outlet port of the integral tank (wet inside tank surface) leads through the root ribs to the gate valve. When rigging the sailplane the latter connection has to be made, see Fig. 2.4 - 10. For the double gate valve the exit or drain ports are left and right on the lower fuselage side behind the landing gear doors, see 2.4 - 11. Open the gate valve by actuating the right-hand cockpit wall near the landing gear gate, see Fig. 2.4 - 12. Close the gate valve by pulling the cable loop left-hand below the canopy frame forward, see Fig. 2.4 - 13.

A fin water ballast tank can be installed as an option, which allows for fine adjustment of the c. g. when a water load is carried, see Flight Manual Fig. 7.9-1 . On the lower fuselage contour in front of the tail wheel a filling and dumping port is installed. A ventilation port is found at left upper side of the fin. Opening and closing of the tail tank valve is done from the water ballast operation lever on the right hand cockpit wall in the landing gear lever gate. A Bowden cable leads through the fuselage tail cone, where it operates the valve pull rod.

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.

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

- 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 .

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 .

Instead of both serial valves inside the wings on option a double gate valve can be installed in the baggage compartment of the fuselage. For Maintenance and/or exchange of the o-ring seals the upper cover of the valve can be unscrewed and removed. When the valve gets tight, grease with silicone oil only ! See Fig. 2.4 - 10 .

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 or 2.4 - 9 .
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 ballast tanks in the fin for Leakage:
Attach the filling hose with its adapter to the Filling/exit port in an air tight manner.
Open the valve and fill the fin tank with water until a column of about 1m (3.3 feet) is measured relative to the lower contour of the fuselage.
The ventilation port at the upper left fin surface must be closed air tight !
After one minute for setting the pressure mark the level at the hose.
The water column must not go down for the following **ten Minutes** !
When water ballast tanks or the valve in the fin are leaking the manufacturer of the sailplane should be contacted.

Fig. 2.6 - 1 Circuit Diagram

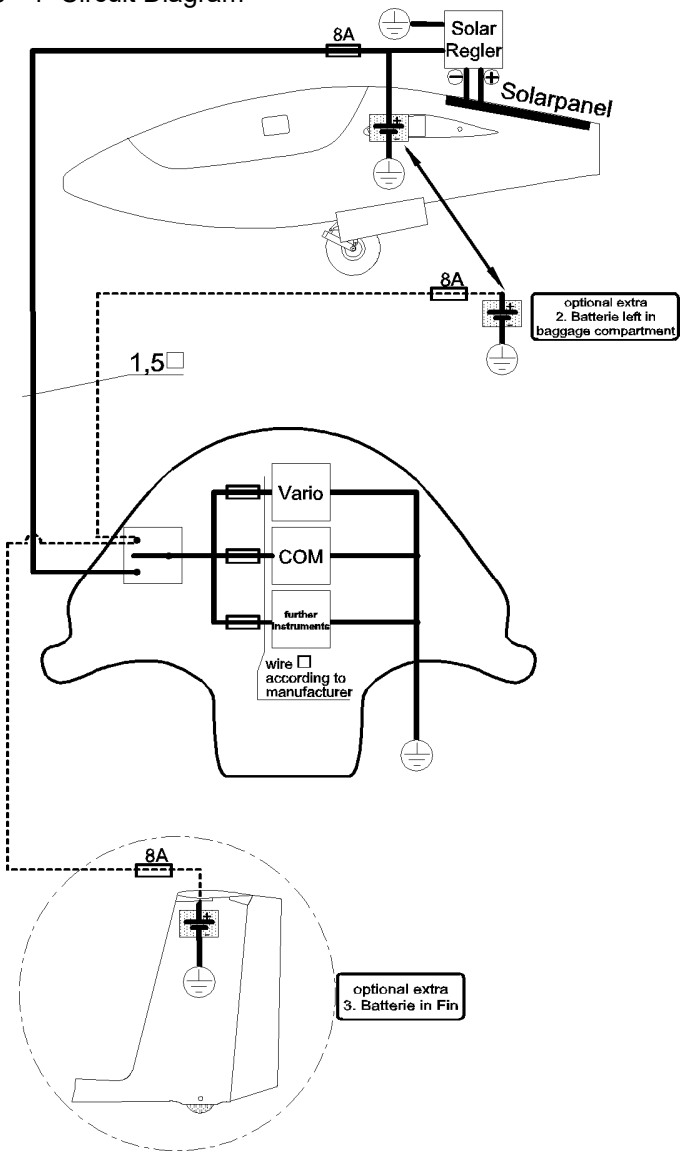
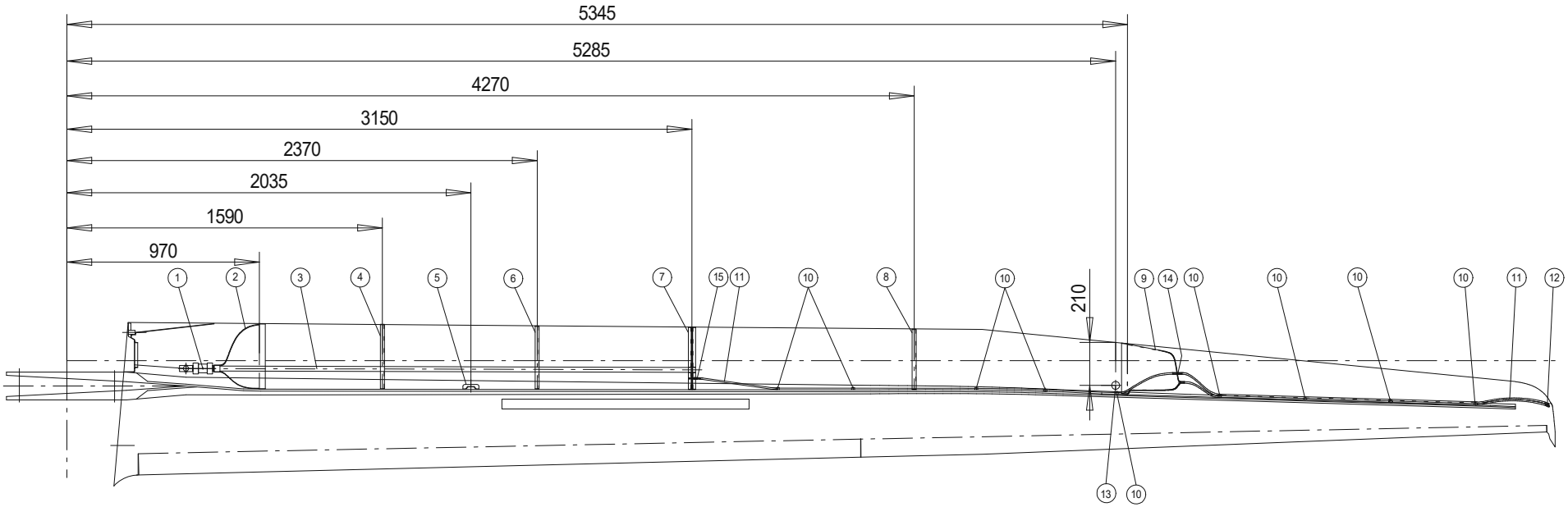


Fig. 2.4 - 6 General viev of the wing including integrated water ballast tank



(1) 99 010 8883 Valve with O-ring connector, Version S with 99 010 5477 Reduction Ø32/25 (Ventil mit O-Ring-Steckverbindung, Ausf. S mit 99 010 5477 Reduktion Ø32/25 für Auslaßrohr)
(2) 270.51.0369 Inboard rib for water tank at span station y = 0,97m (Rippe für Wassertank bei y = 0,97m, Auslaß Ø39)
(3) 270.76.0257 Tube Ø25x1,5 with socket piece & with sleeve I-Ø32 for integrated water ballast tank (Rohr Ø25x1,5 mit Stutzen & Muffe I-Ø32 für Integralwassertank)
(4) 270.51.0364 Baffle rib 1 at span station y = 1,59m (Schlingerrippe 1 bei y = 1,59m)
(5) 270.51.0367 Cover for bolts at main spar at span station y = 2,035m (Abdeckung am Holmsteg bei y = 2,035m)
(6) 270.51.0365 Baffle rib 2 at span station y = 2,37m (Schlingerrippe 2 bei y = 2,37m)
(7) 270.51.0362 Dividing rip for water tank at span station y = 3,15m (Trennrippe für Wassertank bei y = 3,15m)
(8) 270.51.0366 Baffle rib 3 at span station y = 4,27m (Schlingerrippe 3 bei y = 4,27m)
(9) 270.51.0363 Outboard rip for water tank at span station y = 5,345m (Endrippe für Wassertank bei y = 5,345m)
(10) 99 010 8201 Hose clamp I for water ballast tank ventilation (Schlauchschelle I Für WaBa-Tankentlüftung)
(11) / PVC-hose I-∅6x1 (PVC-Schlauch I-∅6x1)
(12) 270.76.0052 Ventilation port I-Ø5 mm for integrated water ballast tank at the wing tip (Entlüftung I-Ø5 mm für Integralwassertank am Randbogen)
(13) 99 000 7260 & 99 010 1546 Ventilation opening for integrated water ballast tank on upper wing surface (Lüftung für Integralwassertank auf Oberseite)
(14) 99 000 7263 hose fitting for 2. vent, l=72 mm (Schlauchanschluß für 2. Lüftung, l=72 mm)
(15) 99 000 7263 hose fitting for 2. vent, l=49 mm (Schlauchanschluß für 2. Lüftung, l=49 mm)

Fig. 2.4 - 10 Double gate valve inside the baggage compartment

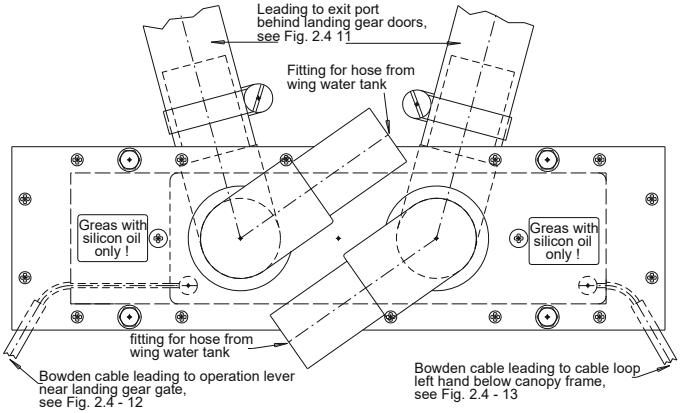


Fig. 2.4 - 11 Water ports behind the landing gear doors

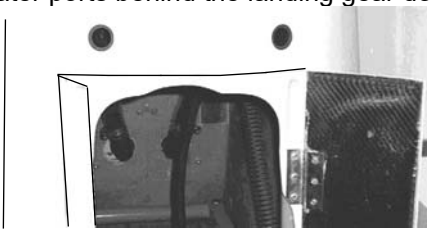


Fig. 2.4 - 12 Water ballast lever on the right-hand cockpit wall

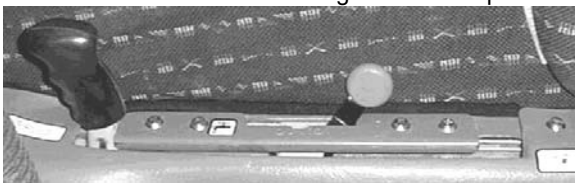


Fig. 2.4 - 13 Gate valve cable loop left-hand cockpit wall