



**CONSTRUCTEUR**  
**S.N.CENTRAIR**  
**Aérodrome BP 44 – 36300 Le Blanc – France**

## **MAINTENANCE MANUAL**

### **CENTRAIR GLIDERS**

### **101 – 101 A – 101 P – 101 AP**

"The section 5 "Inspection Procedures" has been recognized by the BUREAU VERITAS on behalf of the minister in charge of the civil aviation and making it possible to comply, for the French users, with the requirements of the approved maintenance program defined in article 10 of the decree of March,17 1978 relating to the airworthiness maintenance of aircrafts.

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D'ENTRETIEN' EDITION 2 REVISION 9 DATED JULY 2014.*

*Translation has been done by best knowledge and judgement.*

*In any case of doubt the original French document is authoritative.*



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## 1.1 Definition

The Centrair gliders 101- 101 P- 101 A - 101 AP are single seat gliders of the standard class.  
There are four versions:

- CENTRAIR 101            Glider with fixed gear.
- CENTRAIR 101 P        Glider with fixed gear and removable winglets.
- CENTRAIR 101 A        Glider with retractable gear.
- CENTRAIR 101 AP      Glider with retractable gear and removable winglets.

The structure is realized in glass fibre reinforced plastic – epoxy resin

The wing has a laminar evolving airfoil.

The airbrakes extend on the upper surface only.

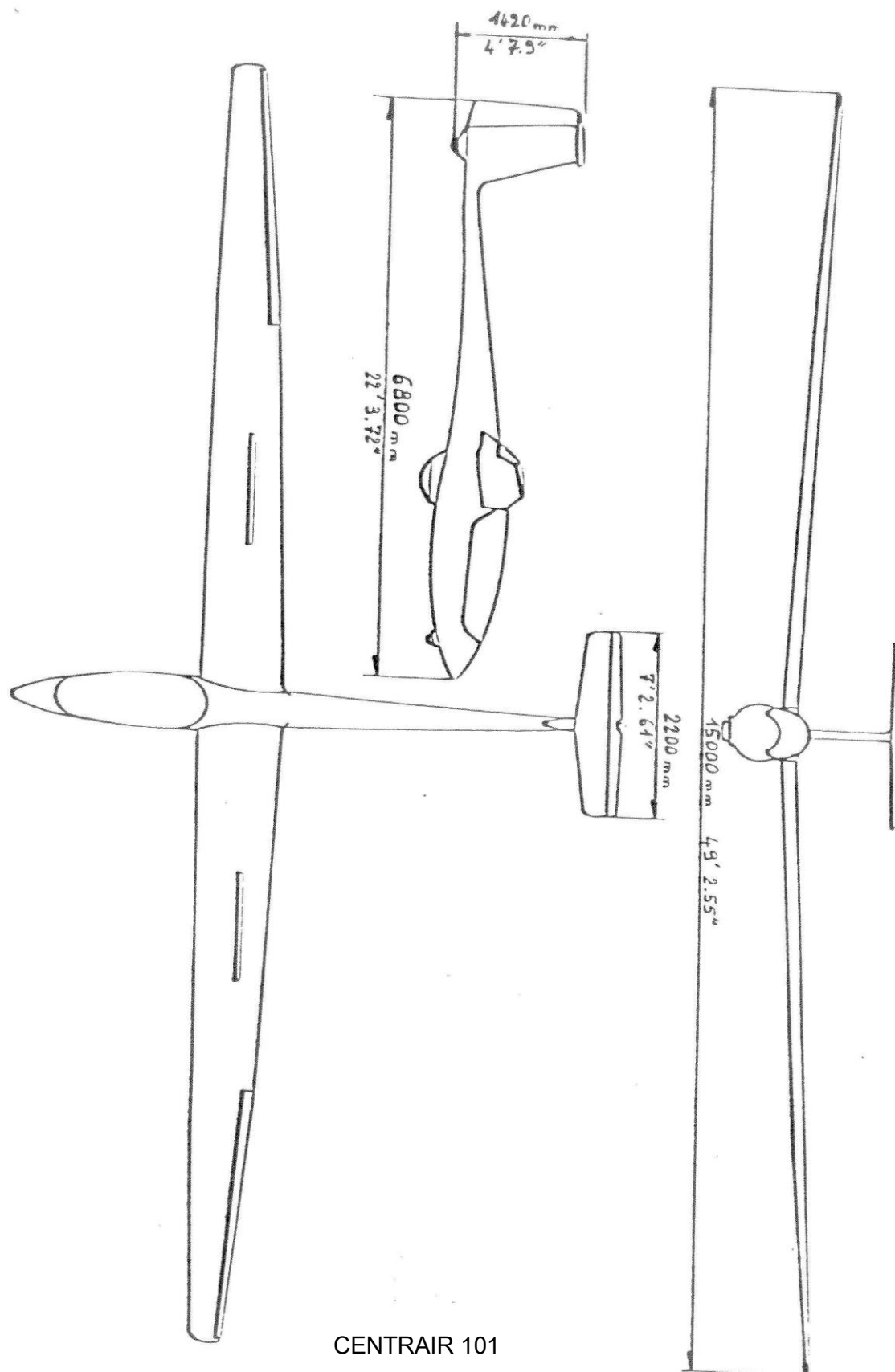
The tail is of the T-type.

All of the external surfaces are protected by white gelcoat.

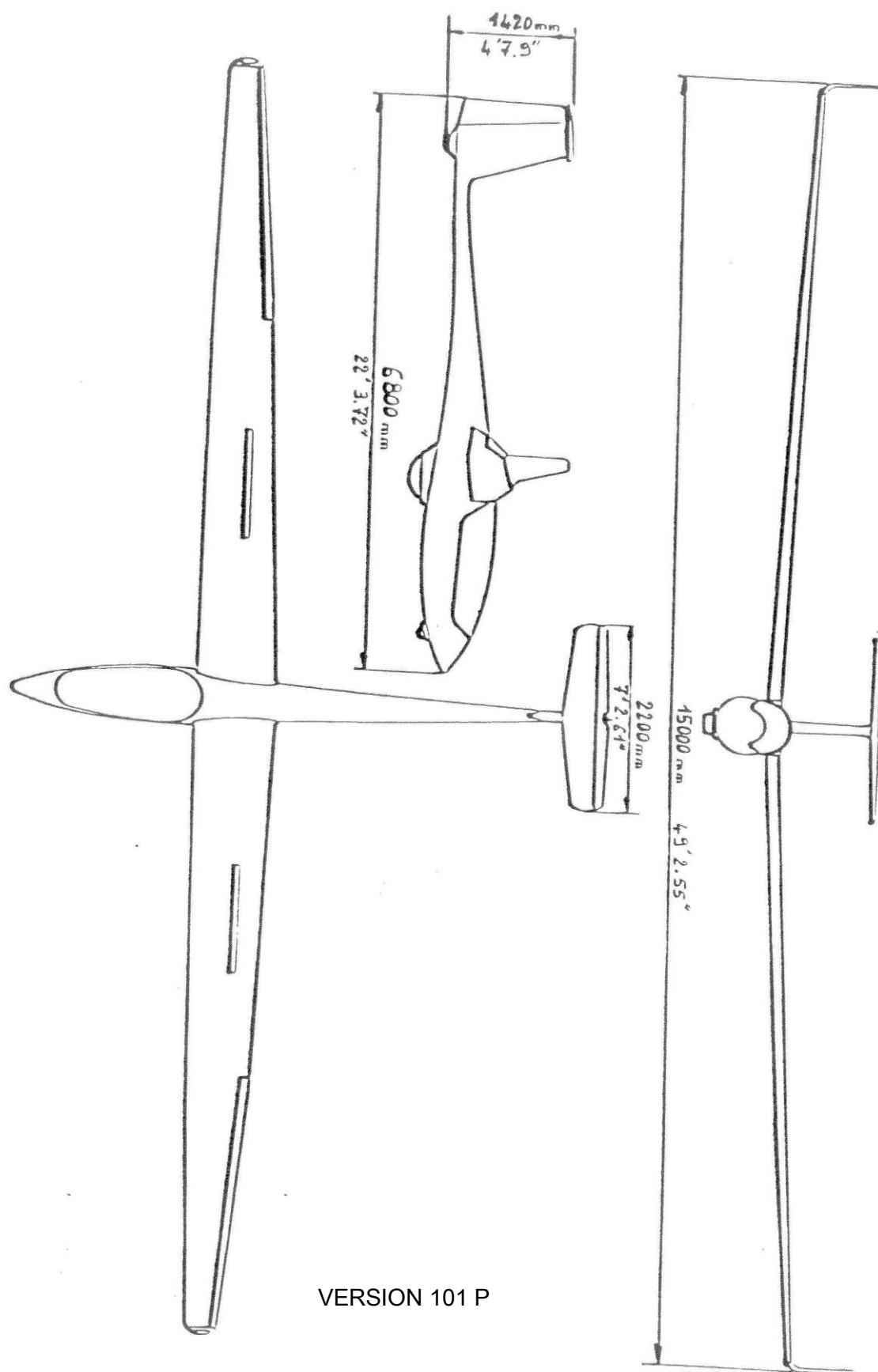
Capacity of the water ballast in the wings: 120 litres.

## 1.2 THREE DIMENSIONAL DRAWINGS

See the four versions on pages 1.2, 1.3, 1.4, 1.5

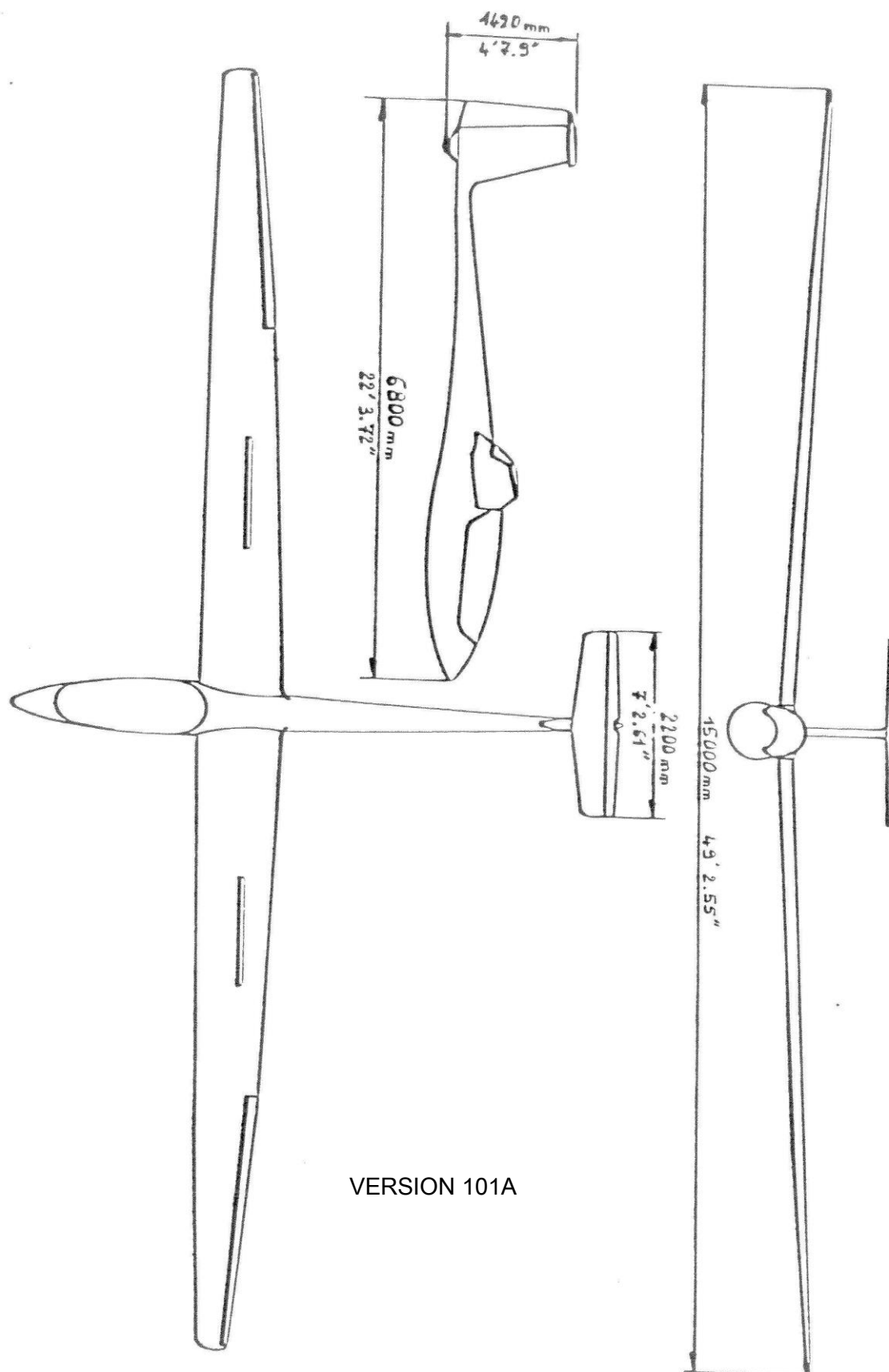


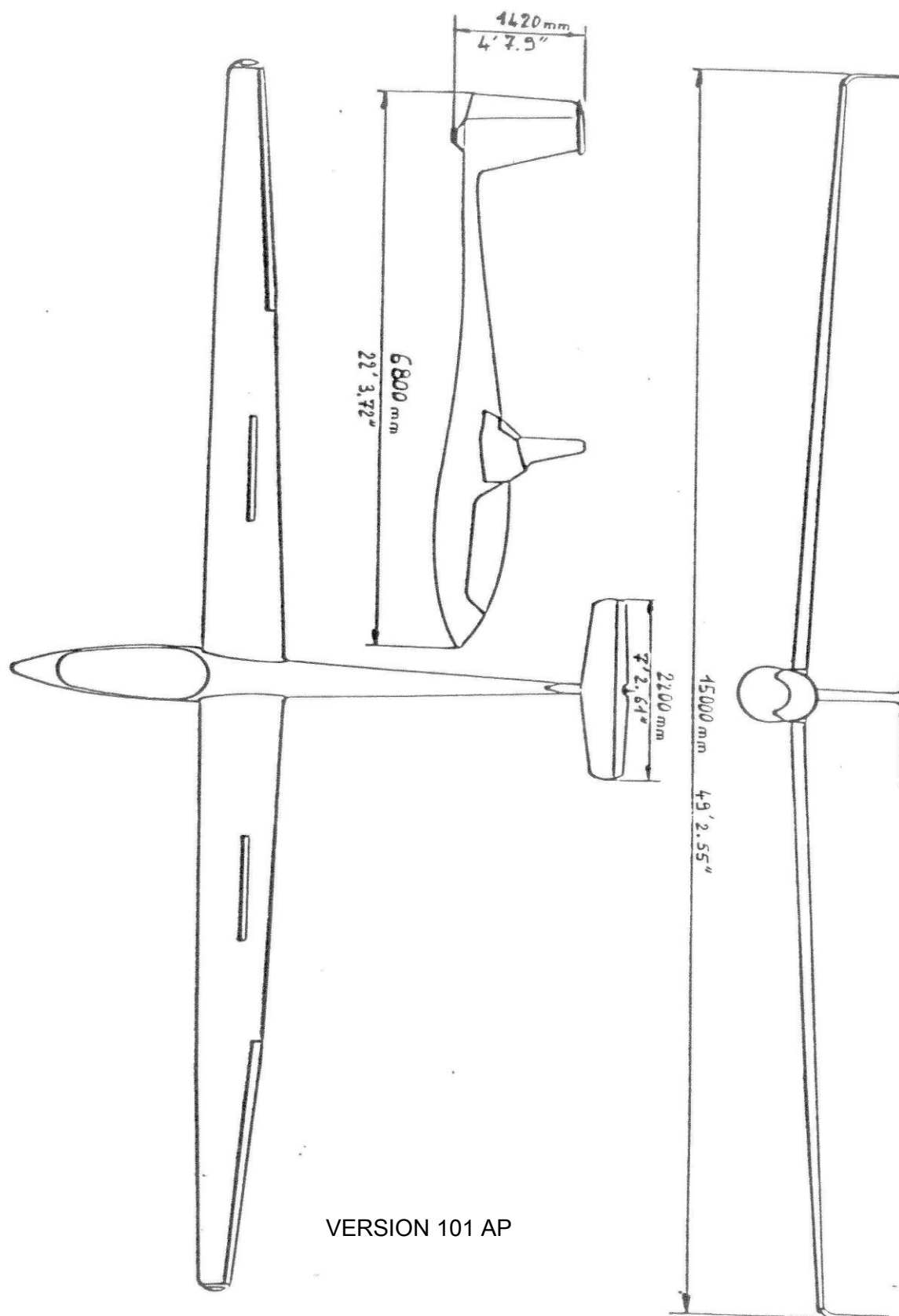
CENTRAIR 101



VERSION 101 P









### 1.3. General dimensions

Wingspan	15,00 m (49 ft 2.55 in)
Total length	6,80 m (22 ft 3.72 in)
Total Height	1,42 m (4 ft 7.9 in)
Wing area	10,50 m <sup>2</sup> (113.02 sqft)

### 1.4. Wings

Evolving profile OAP 01 to OAP 02	
Aspect ratio	21,43
Dihedral	2,3°
Average geometrical chord	0,700 m (27.56 in)
Single aileron surface	0,381 m <sup>2</sup> (4.1 sq ft)

### 1.5. Winglets (CENTRAIR 101 P - 101 AP)

Surface of the vertical projection	0,13 m <sup>2</sup> (1.4sqft)
Height/wing cord	0,80 m(3.15 in)
Length at the winglet's edge	0,095 m(3.74 in)
Depth of the winglet at 65 cm of the edge	0,18 m(7.09 in)

### 1.6. Airbrakes

Top surface *double panel rods driven airbrakes.*

### 1.7 Horizontal tailplane

Area	0,997 m <sup>2</sup> (10.73 sq ft)
------	------------------------------------

### 1.8 Vertical tailplane

Area	1.0 m <sup>2</sup> (10.76 sq ft)
Rudder area	0.3 m <sup>2</sup> (3.23 sq ft)
Airfoil FX 71 – L 150/3	

### 1.9 Landing gear

Type: monotracer retractable landing gear, drum brake.

Tire: 500 x 5

Control of main landing gear by rigid transmission

Tail skid of expanded foam with metal shoe.

Tyre inflation:

- 2.5 to 2.7 bar for mass of 350 kg
- 3.2 to 3.4 bar for 455 kg

(Page 7.3 of the flight manual)



## 2.1 RIGGING

See flight manual section 8.

## 2.2 DE-RIGGING

See flight manual section 8.

## 2.3 AIR PRESSURE PORTS

See flight manual section 7.

## 2.4 BALLAST WEIGHT DISCS

A threaded rod situated in front of the pedals allows fixing 7 weights of 1 kg(2.2lbs) each in order to keep the CoG within the limits.

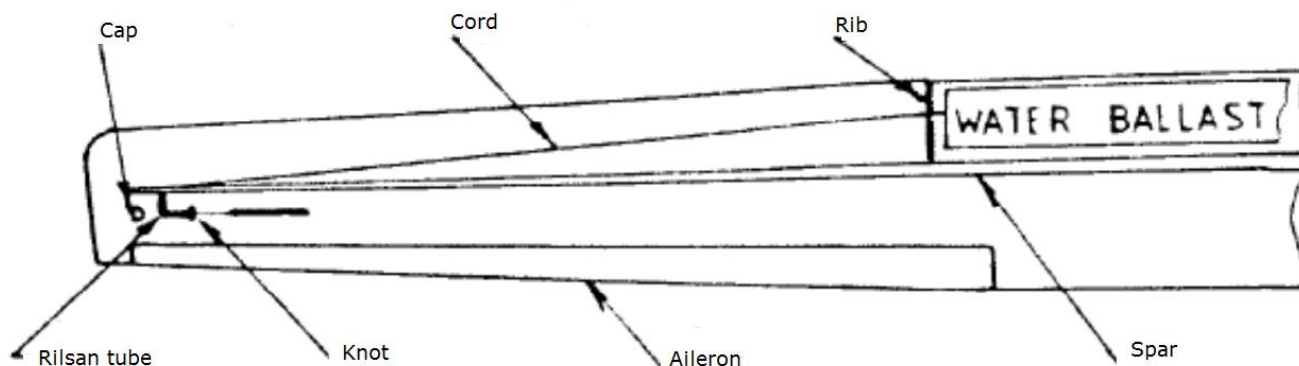
The securing is done by a butterfly nut and a Fokker safety pin.

## 2.5 DISMANTLING THE WATER-BALLASTS

### Manually connected Water-ballast:

Remove the small cap located at the bottom side near the wing tip. Take out the string and untie the knot in order to pull freely the water-ballast bag through the hole at the wing root rib.

Pay attention not to let go the string's end inside the wing.





#### **Automatic connected Water-ballast:**

Unscrew the nut fixing the drain valve at the wing root rib.

Unscrew the threaded part of the valve and take the control rod out (take care not to lose the O ring gasket).

Disjoint the valve from the wing's drain opening and untie the string from the wing root rib.

Pull freely the bag through the opening in the wing root rib and pay attention not to lose the end of the string inside the wing.

### **2.6 ASSEMBLING THE WATER-BALLAST**

#### **Manually connected Water-ballast:**

Pull the water ballast bag by means of the cord until it touches against the rib. Then slide the rilsan (polyamide) pipe against the spar and make a knot to lock.

Roll up the rest of the cord, band it with adhesive tape making a roll of about 30 to 40 cm (one feet) length.

Insert the taped string through the hole at the bottom side of the wingtip and put the cap back on.

#### **Automatically connected Water-ballast:**

Pull the water ballast bag by means of the cord (the cord goes through a countershaft inside the wing).

Place the valve in the wing's drain opening. Replace the O-ring gasket, the control rod and the treated part of the valve. The treated part has to be tightened without excess so the rod can slide under the action of the spring of the valve. Clamp the valve by tightening the nut on the treated rod (take care that the valve does not turn during the tightening)

### **2.7 Control rods**

The detailed description of the control systems is given in the spare parts catalogue

### **2.8 Placards and markings**

See flight manual section 2

### **2.9 Pictographs**

See flight manual section 2



### 3.1 Storage and maintenance

Moisture is an enemy of fibreglass.

Always take care that no water remains in the different parts of the glider.

The airbrake housings are not drained for performance reasons. They have to be kept dry using a sponge if necessary.

If water is suspected to have soaked inside a wing, this wing must be put in a dry room and stored upside down for one day.

Do not underestimate the amount of condensation which can get inside the sailplane. That is why hangars and trailers should always be well ventilated. Eventually remove the instruments before a long period of storage.

Excessive solar radiation is harmful for the finish; therefore the sailplane should never be exposed to sunlight longer than necessary.

The maintenance of the finish with a polishing compound (silicon-free if possible) prolongs the life of the gelcoat and improves the surface quality.

### 3.2 Road transport

It is important that the wings be fixed in rigid stands at the wing spar root or are supported near the wing root rib.

Attachment points for the fuselage are the tail skid, the wheel, the bottom side of the fuselage onto a trolley or the wing connection pins.

If the glider is transported on an open trailer, it is possible to avoid, up to a certain point, that water gets inside the glider by putting adhesive tape on the aileron slots, the airbrakes, the canopy, the nose and the static ports.

It is important to keep a closed trailer well ventilated to avoid high temperatures and high relative humidity.



### 3.3 Lubrication

\* Before each rigging, clean and lubricate the following parts with a grease for general use.

- Main pins of the wings,
- connecting teats wings-fuselage,
- Connecting teats of the horizontal stabilizer,
- Locking screw of the horizontal stabilizer,
- All l'Hotelier ball fittings,
- Pins and axles of winglets or wing-tips (101 P and 101 AP)

\* At the annual inspection and general (large) inspection, clean and lubricate in addition of the above parts also all the connections of the accessible mechanical parts with neutral engine oil:

- Hinges of the movable surfaces; grease when dismantling (general inspection and so on...),
- Airbrakes; grease the upper hinges of the airbrakes arms when dismantling (general inspection),
- Pedals,
- Slide bar of the pedals,
- Controls,
- Canopy hinges and locks,
- Hook(s),
- Landing gear; grease when dismantling (general inspection, and so on...)
- Airbrakes control arm in the fuselage.



### **3.4 PARTICULAR INSPECTION**

In case of rough landing or ground loop, check the following parts:

- Landing gear: state of the lower and upper forks and their joining's. Condition of the tyre and the landing gear doors.
- Structure: no cracks, particularly on the fuselage near the rudder bottom, at the wing root, on the landing gear supports.
- Iron batter: no abnormal play in the batter of the wings, winglets, horizontal stabilizer.

Then carry out a functional check of all the elements of the sailplane.





#### 4.1 BALANCE OF THE CONTROLS

		BALANCE OF THE CONTROLS					
		MASSES		BALANCE			
		Mass tolerance (kg)	Measured mass (kg)	Lever arm (cm)	Balance at trailing edge P (kg)	STATIC MOMENT	
						Tolerance (kg x cm)	Measured mts (kg x cm)
Rudder	(a)	2.988 to 3.652				8.58 to 10.53	
	(b)	3.942 to 4.818				5.46 to 6.69	
Elevator		2.16 to 2.64				6.60 to 8.10	
Left aileron	(c)	3.78 to 4.62				5.11 to 6.26	
	(d)	3.72 to 5.02				4.6 max	
Right aileron	(c)	3.78 to 4.62				5.11 to 6.26	
	(d)	3.72 to 5.02				4.6 max	

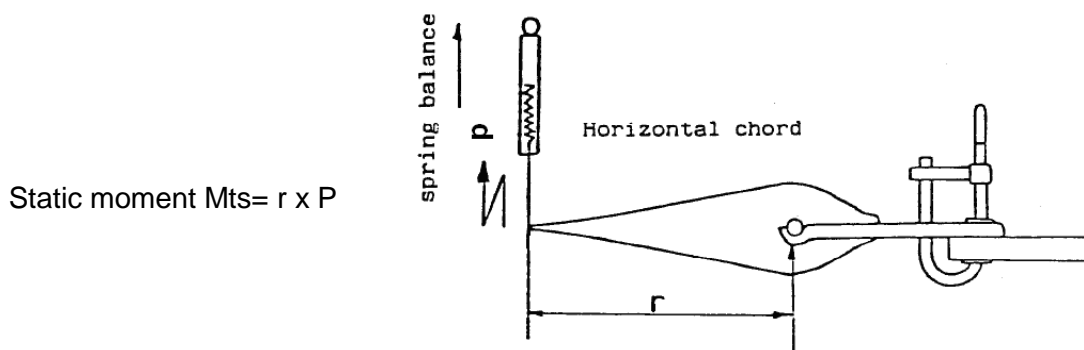
(a) : type 101 and 101A

(b) : type 101P and 101AP

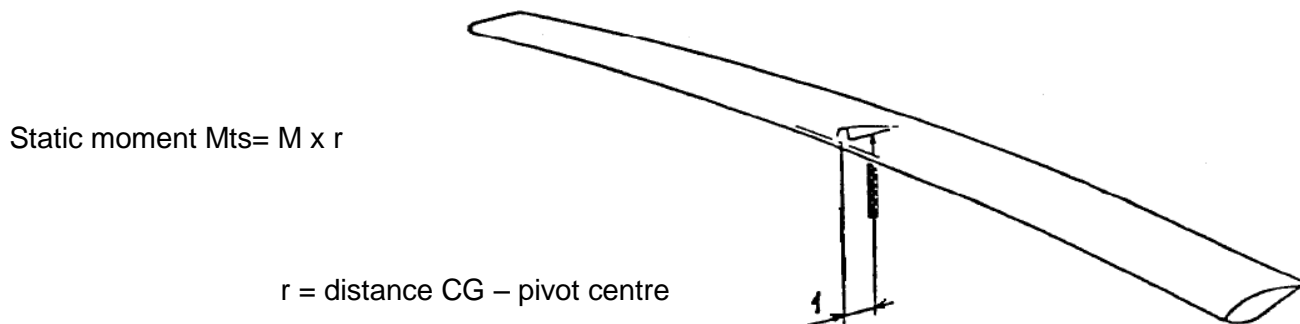
(c) : old balance

(d) : new balance (see §4.1 bis)

#### RUDDER, ELEVATOR AND AILERONS with major change 101-31:



#### AILERONS without major change 101-31:



$r$  = distance CoG – pivot centre



## 4.2 PARTICULAR BALANCE OF THE AILERONS

According to the flight manual paragraph 3.5 particular balance can be applied on the ailerons.

### **New tolerance:**

Mass:

- Max. Possible mass: 5.02 kg
- Min. possible mass: 3.72 kg

Static moment less than 4.6 kg.cm

- Disassembling of the ailerons:

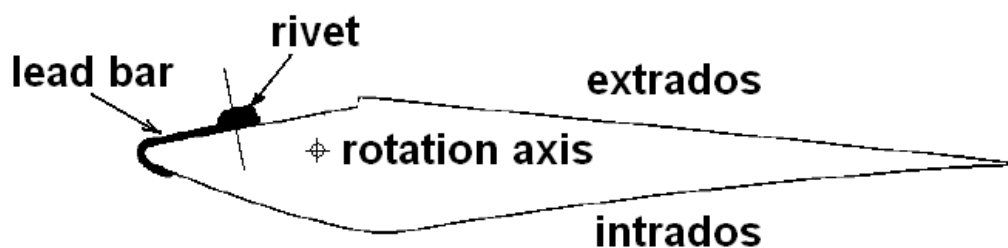
Disconnect the rod by removing the tubular rivet with diameter greater than 6mm. Cut off the head of the rivet with a drill of 7 mm. Then pierce the rivet on half of its length with a 5mm drill. Insert a pin punch of 5mm and hit it in order to take out the rivet. Take care to apply a counter mass at the end of a short pipe and place it at opposite side of the tube to enclose the rivet.

Remove the adhesive tape at the upper side of the wing and remove the pop rivets which secure the hinge pins (drill Ø 2.5mm). Punch the centre of the rivets before drilling the heads. Clean the ailerons and remove their hinge pins.

- Procedure for rebalancing the ailerons

Add lead to the leading edge as illustrated by the following figure to regain a static moment less than 4.6 kg.cm.

Take care to comply the new mass tolerance.



The bars must have a maximum width of 15mm and a maximum thickness of 1.6mm.

They have to be placed on the extrados as near as possible to the leading edge of the aileron. Use as many bars as needed and divide them over the whole length of the aileron.



Fix the positioned balance bars with tape and make a test assembly of the aileron.

Check the aileron deflection (see paragraph 4.3). If the specified deflection can't be obtained contact the manufacturer.

If the deflection is within the limits, reassemble the aileron. Glue the bars with resin. (As thin as possible) and fix them with rivets of 2.4x6 (1 rivet each 8 cm).

- Reassembling of the ailerons:

Act in the opposite way of disassembling.

- Alu pop rivets securing the hinge pins diam. 2,4 x 6
- Tubular steel rivet securing the command rod diam. 6 x 25

Verify and write down the application of the technical bulletin in the flight-log and specify the old and the new mass of the aileron as well as the new static moment.



### 4.3 DEFLECTIONS AND TOLERANCES OF THE COMMANDS

		DEFLECTIONS OF THE CONTROLS	
		Angular values	Metrical values (1) mm/in
Ailerons	Up	$22 \pm 2^\circ$	$57.1 \pm 5.1$ / $22.48 \pm 2.01$
	Down	$14 \pm 2^\circ$	$36.5 \pm 5.2$ / $14.37 \pm 2.05$
Elevator	Up	$22 \pm 3.5^\circ$	$60.0 \pm 10$ / $23.62 \pm 3.94$
	Down	$18 \pm 2^\circ$	$50.0 \pm 5$ / $19.68 \pm 1.97$
Rudder	Right Left	$30 \pm 3^\circ$	$160 \pm 15$ / $62.99 \pm 5.90$
Airbrakes	Right and Left : $180 \pm 10$ mm / $708.6 \pm 3.94$ in		
	Max. deviation between the two airbrakes : 5 mm / 1.97 in (1)		

(1) Measurement of the metrical values:

#### Ailerons and elevator

Measure at the inside limit of the trailing edge.

Radius of the deflection circle of the ailerons: 150mm / 59.05 in

Radius of the deflection circle of the elevator: 160mm / 62.99 in

#### Rudder

Measure at the lower limit of the trailing edge.

Radius of the deflection circle: 310mm / 122.04 in

#### Airbrakes

Measure, at the leading edge side and about 50cm/19.68in of the inner side of the airbrake cabinet, between the extrados of the wing and the upper part of the cap.

### 4.4 ADMISSIBLE PLAYS

ADMISSIBLE PLAY		
	Angular values	Metrical values (1) mm/in
Ailerons	$1.23^\circ$	2.9mm / 1.14in
Elevator	$1.27^\circ$	3.2mm / 1.26in
Rudder	$0.90^\circ$	4.4mm / 1.73in
Airbrakes		3.0mm / 1.18in



## 5.1 Inspection types and frequency

### - **Small maintenance inspection.(V.P.E/SMI)** (*visite petit entretien*)

The small maintenance check has to be executed after each glider rigging or every 100 flight hours.

### - **Annual inspection (VA/AI)** (*visite annuelle*) :

The annual inspection program has to be executed whenever the first of the two following conditions occurs:

- Annually
- After 500hrs flight time.

### - **Major inspection. (GV/MI)** (*grande visite*):

The major inspection program has to be executed whenever the first of the two following conditions occurs:

- Every 5 years
- After every 3000hrs flight time.



## **5.2 EQUIPMENT AND PARTS WITH PARTICULAR MAINTENANCE**

- Verification of the instruments as prescribed by the manufacturer.
- Inspection of the towing hook(s) according to the instructions of the manufacturer and the constructor.(TOST hooks)
- Replacement of the seatbelts based on condition and indications of the manufacturer
- All outside surfaces should be covered with gelcoat for the composite parts or with paint for the metal parts. A tolerance is admitted for anti-collision markings following the scheme 101 BE 08-13 available at SN CENTRAIR
- All l'Hotelier balls and sockets have to be inspected following the manufacturer maintenance instructions.
- Nevertheless, the mandatory replacement asked by the l'Hotelier company every 10 years or at 3000Hrs of flight time whichever occurs first can be replaced by an inspection on absence of cracks or the initiation of cracks on the 2 components (ball and socket) at every annual inspection performed after this 10Yrs period.
- During this inspection, the scheduled inspection program described by the manufacturers l'Hotelier maintenance procedure has to be carried out.
- Disassembling the ailerons push rods inside the wings and verify the wear at the coupling guides. (The maximum admissible wear is 0.1mm): Perform this inspection after each 3000Hrs of flight starting for the first time at 6000Hrs. (In case the push rods are renewed, inspect them after 6000Hrs of flight time since renewal and continue afterwards each 3000Hrs.)

## **5.3 ADDITIONAL MAINTENANCE DOCUMENTS**

- Manufacturer manuals or recommendations the for the following parts:
  - Tost towing hooks
  - Standard instruments
  - Seatbelts
  - l'Hotelier couplings



## **5.2 Inspection program**

	<b>SMI</b>	<b>AI</b>	<b>MI</b>
<b>I. ON THE RIGGED GLIDER, CONDITION OF THE COUPLINGS, JUDGE THE MECHANICAL PLAYS</b>			
Connections of the wings, elevator	x	x	x
Play on the principal pins and bearings . (manually apply horizontal and vertical agitations at the tips)		x	x
Actuation of the elevator, rudder, ailerons, airbrakes (agitate manually the commands inside the cockpit while the rudders are being blocked)		x	x
Play on the aileron/elevator actuation:  The play should stay within the limits mentioned in paragraph 4.3. When the control surfaces are blocked and play is found to be bigger than described in paragraph 4.3, there's a malfunction and a repair is needed.  The admissible play is the summary of the different plays accumulated on the command circuit. If the play should originate in well-defined location or if the play is excessive a supplemental analyse has be made to verify the conformity of these points.  The applied forces shouldn't be too excessive because there might be between play and elasticity of the commands.  When a significant play is noticed in the aileron actuation the seat pan and access hatches have to be removed and repairs have to be made  If the play is found inside the wings, access holes will have to be made at the wing's intrados. In this case, it is necessary to perform the repair according to the rules of the art and according to the applicable legislation. (see paragraph 7.1)		x	x



	S.I.	A.I.	M.I.
Rudder actuation play  Play in the rudder actuation is impossible because of the presence of the springs keeping the cables under tension. When the end of the spring is reached an increased force allows us to push the pedal more forward because of the elasticity of the cable. This should not be confused with rudder play.		x	x
<b>II. CONDITION OF THE COATINGS</b>			
<b>2.1 Composite structures:</b>			
Surface condition (especially on the intrados of the wings, the horizontal tailplane and the bottom side of the fuselage)	x	x	x
Mechanical condition of stressed coatings. (By visual inspection and sensing detect holes, local curving, crack lines, delaminated areas)		x	x
<b>2.2 Condition of the connection fairings</b> (wing connection, horizontal tailplane)			
Cracks, splits, bumps, deformation, loosened bindings		x	x
<b>2.3 Condition of the draining or decompression holes. (pierce if needed)</b>			
bottom side of the fuselage	x	x	x
At the root ribs of the wings (trailing edge compartment)		x	x
On the control surfaces and the fixed horizontal tail plane when disassembling for the major inspection			x





	S.I.	A.I.	M.I.
<b>III. CANOPY</b>			
Condition of the Perspex, scratches, reduced transparency	x	x	x
Condition of the window, good functionality		x	x
Condition of the frame, hinging deformation, centring pins		x	x
Verify the operational condition of the opening, closing and locking device	x	x	x
Evaluate the humidity barrier with closed canopy			x
Verify the canopy jettison system (emergency) with a simulated action		x	x
<b>IV. COCKPIT</b>			
General neatness, floor and front section	x	x	x
Condition of the seat, the fixations and adjustability		x	x
Inspection of the harness, condition of the straps,(dirt, deformation, cuts) and the fixation to the structure. Good functioning of the fastener and the strap adapters. (distortion, oxidation)		x	x
Condition of the ventilation system and its controls		x	x
Functionality of the pedals adjustment and lubrication of the lock and slide bar parts		x	x
Condition of the wheel brake cable and the control. Adjustment	x	x	x
Functionality of the tow and water ballast release controls. Condition of the cables		x	x
Overall condition of all the control handles, colours in accordance to the standards (see flight manual sec.2)		x	x



	S.I.	A.I.	M.I.
<b>III. CONTROLS</b> <b>(ailerons, elevator, direction, airbrakes)</b>			
Evaluation of the free deflection, friction, hard points, play. Verify their accordance to the table paragraph 4.3 page 4.4	x	x	x
Airbrakes: Evaluation of the locking and unlocking strains, condition of the handle, deformation		x	x
Measurement of the deflection of the ailerons and elevator controls, rudder and airbrakes. Check compliance with the table in paragraph 4.2 page.4.4			x
Disassembling of all the control surfaces and the airbrake plates, inspection of the hinges, connections and control rods, fixation to the structure, cleaning, greasing			x
Measurement of the masses and balance. Verify the accordance's to the table on page 4.1			x
Inspection of the aileron push rod inside the wing, see §5.2			x
NOTE: In case of replacement, painting or repair, a review of the balance of the control(s) is necessary. See the constructor certification criteria mentioned in the table on p4.1. After refitting of the ailerons or the elevator seal the hinges by means of adhesive linen tape type Tesaband 4651 38mm with (ref SN CENTRAIR 520074). Make sure the tape, once fitted, does not restrict the deflection. In order to obtain a proper attachment, first fit the tape on the fixed part of the surface. Next, with the control disconnected and fully downward deployed, apply a wrinkle in the slot with a finger and then fit on to the control.			

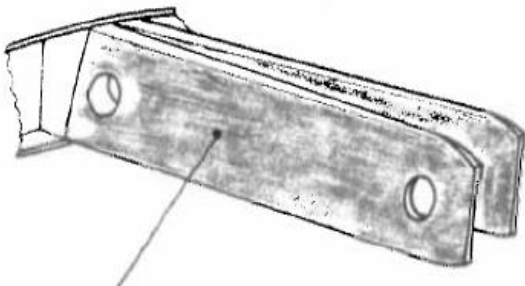


	S.I.	A.I.	M.I.
<b>VI. CONTROL COMMANDS INCLUDING:</b> <b>- the 3 major commands: ailerons, elevator, direction</b> <b>- the other commands: airbrakes, trim, hooks, etc...</b>			
Visual inspection of the stick and pedals (cracks, deformation, play)	x	x	x
Inspection of the mountings of the rod supports of ailerons and elevator to the fuselage at the base of the stick. Retighten the nuts if possible; be cautious not to damage the wood		x	x
Elevator trim: verify the notching, movement and locking	x	x	x
Inspection, cleaning, greasing, disassemble if necessary, guiding's, axes, bell cracks, pins, supports, ball fittings, bearings, rods, guiding devices (piano wire, Bowden), etc... (see greasing plan §5.3)		x	x
Cables: replace the cables if signs of wear or corrosion; visual inspection		x	x
Replace the rudder and the hook release cables every 3000Hrs flight time or every 20 Yrs. whichever occurs first.			x

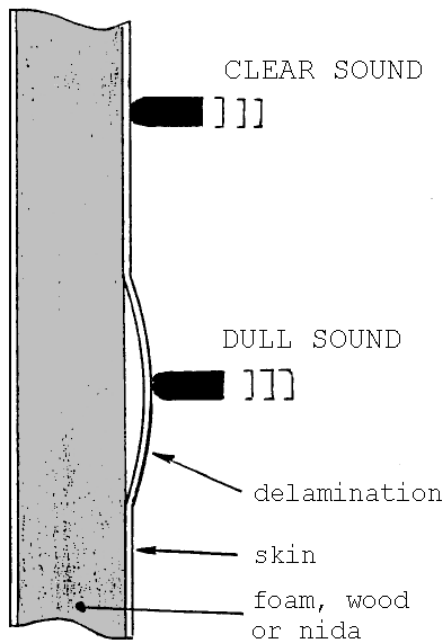


	S.I.	A.I.	M.I.
<b>VII. TOWING HOOKS:</b>			
Cleaning in place	x		
Uninstall and inspect: according to the manufacturer's manual			
Evaluate the effort to release		x	x
<b>NOTE: the towing hooks of the brand 'TOST' have to be overhauled recurrently following the constructor's specifications. the TOST lifetime recommendation has to be interpreted as mandatory.</b>			
<b>VIII. UNDERCARRIAGE</b>			
External inspection and cleaning of the wheel compartment	x	x	x
Greasing of the undercarriage		x	x
Tension and wear of the tire 2.5 to 2.7 for a load of 350kg/700lbs and 3.2 to 3.4 for a load of 455kg/1000lbs	x	x	x
Inspection of the bonding of the rubber tailskid		x	x
Condition of the wheel suspension, the retraction system, up and down locks, spring or damper actuation, verify functionality		x	x
Condition of the gear doors and hinges or the cover of the fixed gear.		x	x
Condition of the gear door sandows	x	x	x
Condition of the wheel bake, wear, efficiency		x	x
Disassemble the landing gear, inspect the welding's, deformation, corrosion, cracks, cover.			x
Disassemble and reassemble the wheel, verify absence of cracks and corrosion.			x



	S.I.	A.I.	M.I.
<b>IX. STRUCTURE:</b>			
<p>Inspection of the internal structure of the glider, in particular, the vital elements and the parts which are locally subjected to damage.</p> <ul style="list-style-type: none"> <li>wing spar, especially the interface area of the windings on the attachment points and the birch core guard plate (inspect by Percussion)</li> </ul>  <p>Surface to inspect (shaded area) (2 sides on male spar, 4 surfaces on female spar)</p> <ul style="list-style-type: none"> <li>Wing compartments</li> <li>Wing attachments</li> <li>condition of the wing tips and the winglets</li> <li>Attachments of the winglets</li> <li>Spars and compartments of the tail sections.</li> <li>Connections of the tail plane</li> <li>Rear and bottom parts of the fuselage</li> <li>Casing of the fuselage supporting the wings</li> <li>Complete cockpit structure, seat, reinforcements, canopy, bulkheads</li> </ul>		X	X
<p>In the composite glass/resin structures:</p> <ul style="list-style-type: none"> <li>Tightness of the metal inserts</li> <li>Through delamination denoted areas (visual or by touching)</li> </ul>		X	X
<p>In the mechanical parts (Spar pins)</p> <ul style="list-style-type: none"> <li>Evaluation of the free play</li> <li>Markings, hammer, corrosion</li> </ul>			



	S.I.	A.I.	M.I.
<p><b>Percussion check:</b></p> <p>This simple procedure does not require any tools but should be performed by a skilled technician.</p> <ul style="list-style-type: none"> <li>- Tap the whole surface with a coin or a metallic rod with rounded top , etc...</li> <li>- Analyse the by impact generated sound: if it is a clear sound the bond is correct. If on the contrary the sound is dull and unclear, an incorrect bond can be suspected. (The vibrations are not passing on to the entire structure)</li> </ul> 			
<b>X. PARTICULAR DEVICES:</b>			
Water ballast: general condition		x	x
Sealing test, do not fill under pressure. See filling technique in the flight manual			x
Oxygen compartment: condition of the tank support, pipes, connection ...		x	x



	S.I.	A.I.	M.I.
<b>XI AIRCRAFT INSTRUMENTS</b>			
Presence of the essential instruments <ul style="list-style-type: none"> <li>• Speed indicator (speed limit marks, ref flight manual)</li> <li>• Altimeter</li> <li>• Magnetic compass</li> <li>• Slip indicator</li> <li>• Variometer</li> </ul>		x	x
Cleanliness of the static ports and the total pressure port	x	x	x
Condition of the tubes and check on the absence of improper parts inside (water, sand, earth)		x	x
Inspection of the altimeter by QFE reading		x	x
Inspection of all instruments as described by their manufacturer		x	x
<b>XII. PLANCARDS AND MARKINGS</b>			
Presence and readability in the pilot seat of: <ul style="list-style-type: none"> <li>• Indication placards or pictographs</li> <li>• Operating limits placards</li> </ul>	x	x	x
Presence and readability of the external markings		x	x
<b>XIII. PARTICULAR ITEMS TO INSPECT</b>			
Check on the absence of excessive friction of the control surfaces in their slots		x	x
<b>In case of a “rough” landing check:</b> <ul style="list-style-type: none"> <li>• Undercarriage</li> <li>• The condition of the structure, in particular the attachment points.</li> <li>• The play at the connection points of the wings, winglets, stabilizer</li> <li>• Scaled off particles of the gelcoat or the paint (anti-collision or registration)</li> <li>• Verify the bonding and the condition of the frames and reinforcements inside the fuselage</li> </ul>		x	x



	S.I.	A.I.	M.I.
Renew this inspection if following events occur: <ul style="list-style-type: none"> <li>• Gear up landing or when gear collapsed upon landing</li> <li>• Ground loop during take-off or landing</li> <li>• Clearly rough landing where afterwards damage is noticed at the intrados of the fuselage (scaled of gelcoat)</li> </ul>	x (on request)		
<b>XIV. REGULATION:</b>			
Release of performed modifications, mandatory and/or advised.		x	x
Release of executed service bulletins		x	x
Release of executed airworthiness directives (always mandatory)	x	x	x
NOTE: This paragraph has to be updated whenever needed in order to comply the applicable regulations.			
<b>XI. WEIGHING</b>			
See procedure in section 8 Perform a weighing at each M.I., after a repair or after a major modification The validity of the weighing certificate is 5 years.			x
<b>XVI CONTROL FLIGHT</b>			
A control flight has to be performed: <ul style="list-style-type: none"> <li>• After a major repair (class 1) or when a flight control, a rudder or other vital element has been replaced, repaired or disassembled (except for rigging of the wings and elevator)</li> <li>• after each M.I.</li> </ul>			x
See the flight program in section 6			





## 6.1 Conditions

Mass:	..... kg/lbs	QFE. TWR:	.....mb	QAN:	.... / ....Kts
Balance:	..... %	QFE Ind.:	.....mb	QFU:	.... °
		Zi at QNH:	.... m		

Zi: indicated height

## 6.2 Program

TO PERFORM	GOAL	OBTAINED	OBSERVATIONS
<b>Aligned on the RWY</b>		<b>DEVIATIONS</b>	
Magnetic compass	In accordance with QFU + or – 5°		
Altimeter	In accordance with QFE + or – 2mb		
Towing system	Satisfying release test		
<b>TOWING</b>			
Climb to Zp 1000m/3500ft			Take off : .....h
Speed indicating system	In accordance with the tug plane		
Elevator trim	Satisfying balance		
Handling behind the tug plane	Repositioning possible after deviation		
Cable release and retracting the gear	Easy handling		
<b>LOW SPEED</b>			
Efficient control response	Good response over the 3 axes upon stalling speed.		
<b>STATIC STALL</b>			
Flight configuration	About 69km/h at 340 kg (43mph/750lbs) About 80km/h at 455 kg (50mph/1003lbs)		
Landing configuration (Airbrakes deployed)	About 74km/h at 340 kg (46mph/750lbs) About 85km/h at 455 kg (53mph/1003lbs)		
<b>GEAR HANDLING</b>			
	Good functionality, normal strains. Locking “gear up” and “gear down” effective up to $V_{lo}$ =170 Km/h (106mph)		



TO PERFORM	GOAL	OBTAINED	OBSERVATIONS
<b>HIG SPEED</b>			
<p>In gliding configuration:</p> <p>Handling of the controls</p> <p>Max authorized deployment up to 170km/h(106mph), 1/3 of the max deployment up to <math>V_{NE}</math> = 250km/h(155mph) (220km/h/137mph with winglets)</p>	<p>Good stability over the 3 axes</p> <p>No tendency of maintained oscillations or vibrations. No suction of the airbrake covers</p> <p>Fly at <math>V_{NE}</math> in calm air</p>	<p><math>V_i</math> obtained</p> <p>= . . . . . km/h</p> <p>= . . . . . mph</p>	
<b>AIRBRAKES DEPLOYED</b>			
<p>From <math>V_a</math> up to <math>V_{NE}</math>, perform multiple deployments of the airbrakes with retraction at <math>0.75 V_{NE}</math>. Caution on the glider handling when unlocking</p>	<p>Retraction possible up to 190km/h (118mph) Max force of 20 DaN</p>		
<b>DURING FLIGHT</b>			
Basic instruments	Good indications, no haze behind the glass, no influence of the electric circuits (battery) on the magnetic compass.		
Particular optional instruments	Operational check of the functions.		
Canopy	Good sealing , no aerodynamic noise		
Cockpit ventilation	Adjustment, efficiency and distribution. Tightness when 'closed'		
Landing preparation	Approach : Advised $V_i$ AB deployed = 97km/h (57mph)		
Landing	Wheel brake: Good response Progressive reaction		



## 7. THE REPAIRS

### 7.1 Legal environment

The repairs have to be executed by persons possessing the skills and required qualifications and using the information provided by the constructor in accordance with the ruling legal demands (EASA Part M and part 21).

The repairs have to be executed using the materials specified for this the purpose. This materials have to be conform to the demands set by the manufacturer and should be stored following the manufacturers guidelines..(see paragraph 7.5.3)

### 7.2 Technical information

**The basic principle on repairs is to repair the initial damaged structure by an equivalent structure (same number of layers, same type and orientation for each layer as the original structure)**

In order to avoid local concentration of tension forces which normally are homogeneously distributed it is preferred not to create changes in thickness. To accomplish this, all repairs have to be performed in a way the layers are replaced by round cut shapes.

The exchange tissue needs have a greater surface one layer to another to obtain a gradual transition once in place and laminated.

The splice ratio for a glass fibre is normally 1/50 to 1/100 (max thickness /length) Thin glass fibre can't be spliced. In this case the ideal solution is a overlaying joint.

The advised length of the splice is as follows.

- Bidirectional cloth (equal strands in the two directions) 10mm for each 100g/m<sup>2</sup> of the mass specification of the tissue.
- Unidirectional cloth: 20mm of overlay in the direction of the most dense strands direction for each 100g/m<sup>2</sup> of the mass specification of the tissue

**For small surface coverage refer to the table in Paragraph 7.5.1 (column small surface)**

During the grinding with waterproof abrasive paper the used water will penetrate in the cloth layers deteriorating these over prolonged time. Due to this matter no grinding shall be performed using grinding papers which need the addition of water. After repair , all treated surfaces will be recovered with a moisture tight finish (gel coat on the external composite surfaces and paint or gel coat on the other surfaces)



### 7.3 Classification of the repairs

The following parts are considered as major structural elements:

- On the wings
  - Spars
  - Wing root rib
  - False spar
  - Control coatings
  - Controls
- On the fuselage
  - Fuselage cone behind the wings and vertical fin
  - Area around the hinge pins of the wings
  - Horizontal tail plane
  - Controls

The following classification shows the classes in order of importance.

<b>Class 1</b>	Major damage which requires partial replacement of a part or demands an important repair. for example, damaged structural part.
<b>Class 2</b>	Small damage or small holes having perforated a sandwich element and destroyed the upper and bottom fibre layers.
<b>Class 3</b>	Minor damage or small holes in the upper layer without damaging the bottom layer or the central section.
<b>Class 4</b>	Worn surfaces by rubbing, scratches, scuff marks which are not caused by a rupture or a perforation.



## 7.4 Principal repair procedures

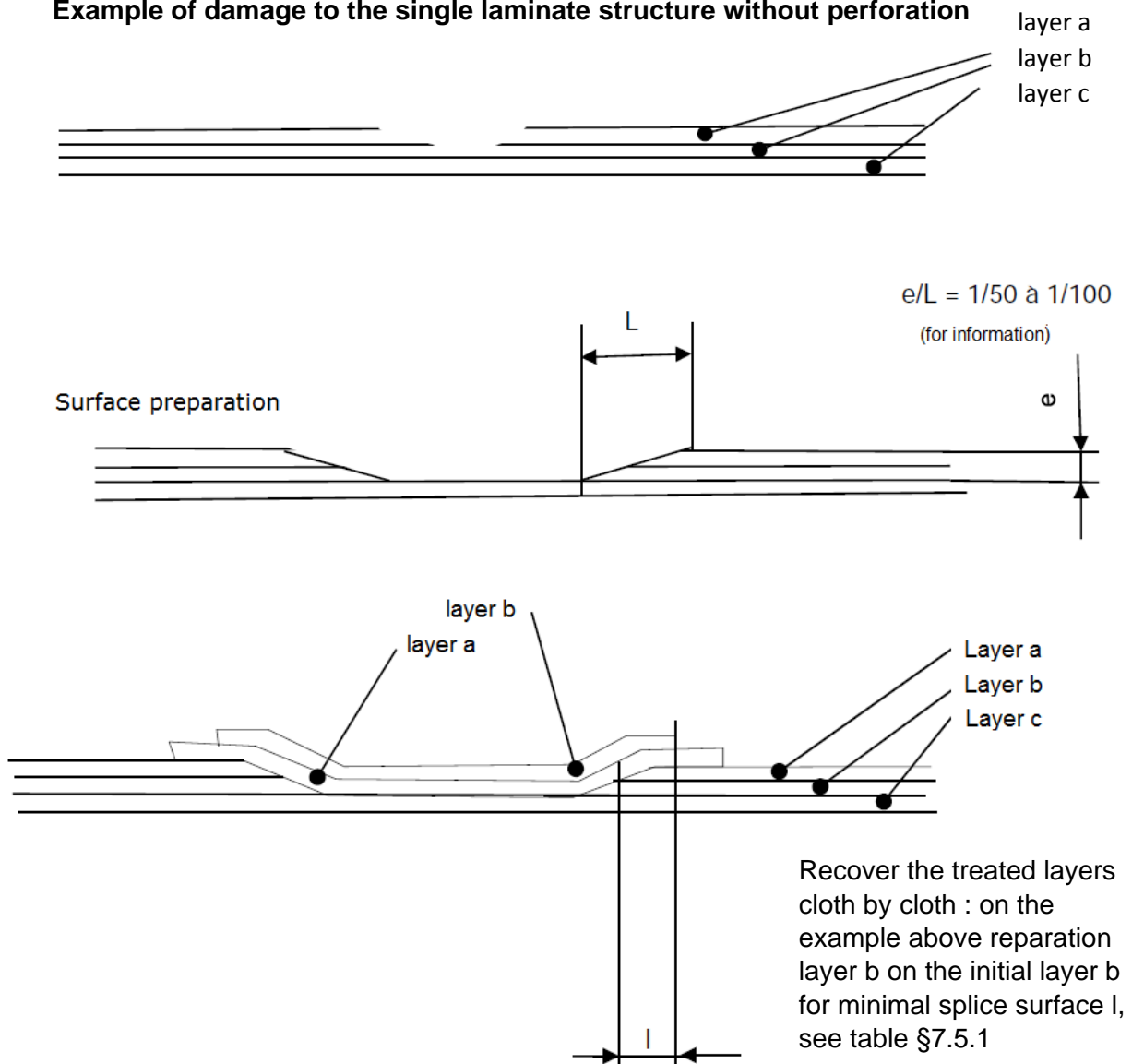
### 7.4.1 Procedure for a class 4 repair

The surface damage caused by all kinds of friction or scratching, taken into account that the fibre glass structure is not damaged, usually only need a fresh layer of finishing paint. In this case gel coat should be used.

Deeper scratches can be filled up using the gel coat after it's started to gelify (about 30' after the mixing). In case the glass fibre laminate is damaged but without being perforated, the surface has to be cleaned and sanded with sanding paper. The damaged layers have to be repaired (cf §7.2) and afterwards the whole repaired area has to be recovered by a thin layer of gel coat.

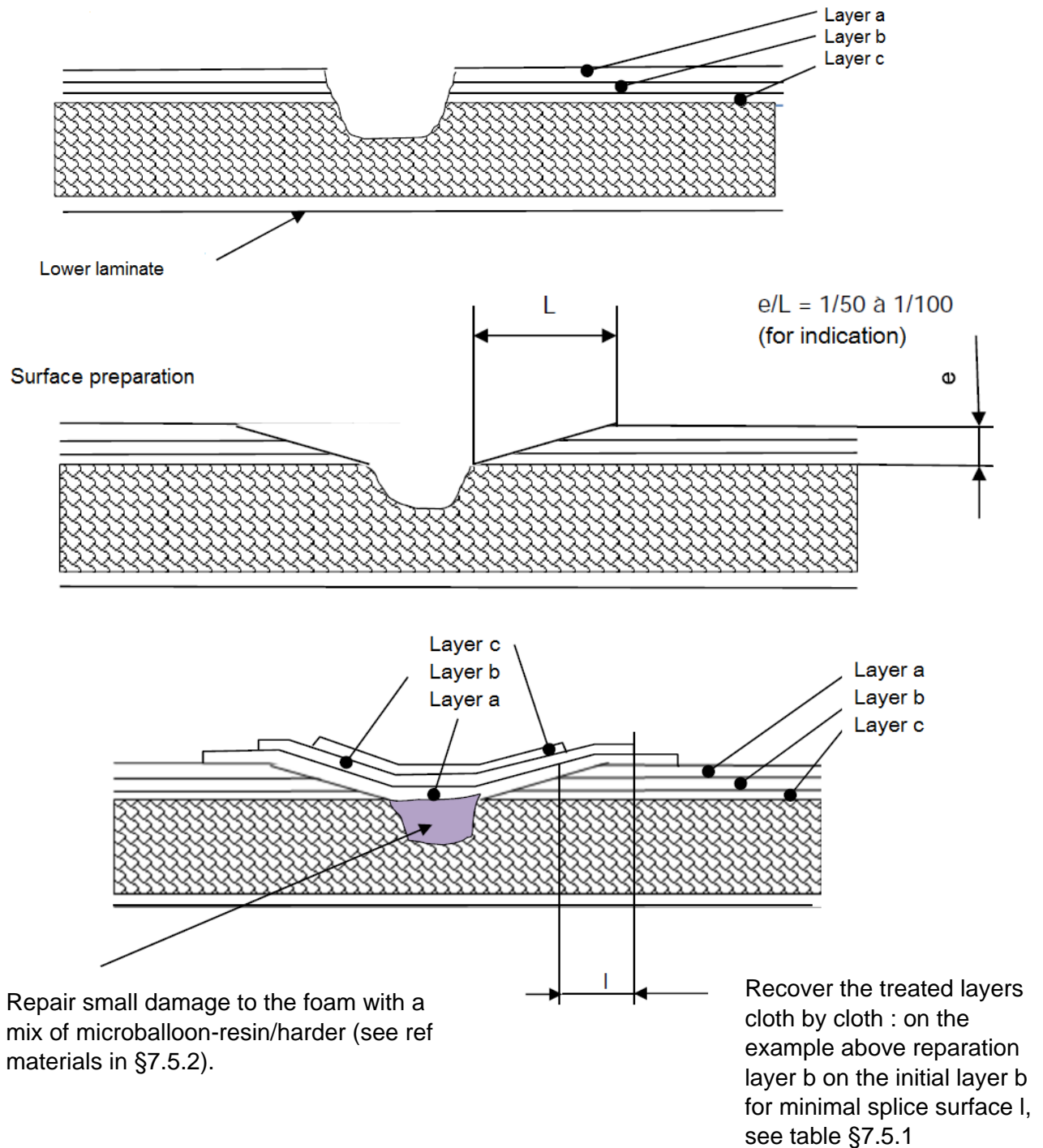
### 7.4.2 Procedure for a class 3 repair

#### Example of damage to the single laminate structure without perforation



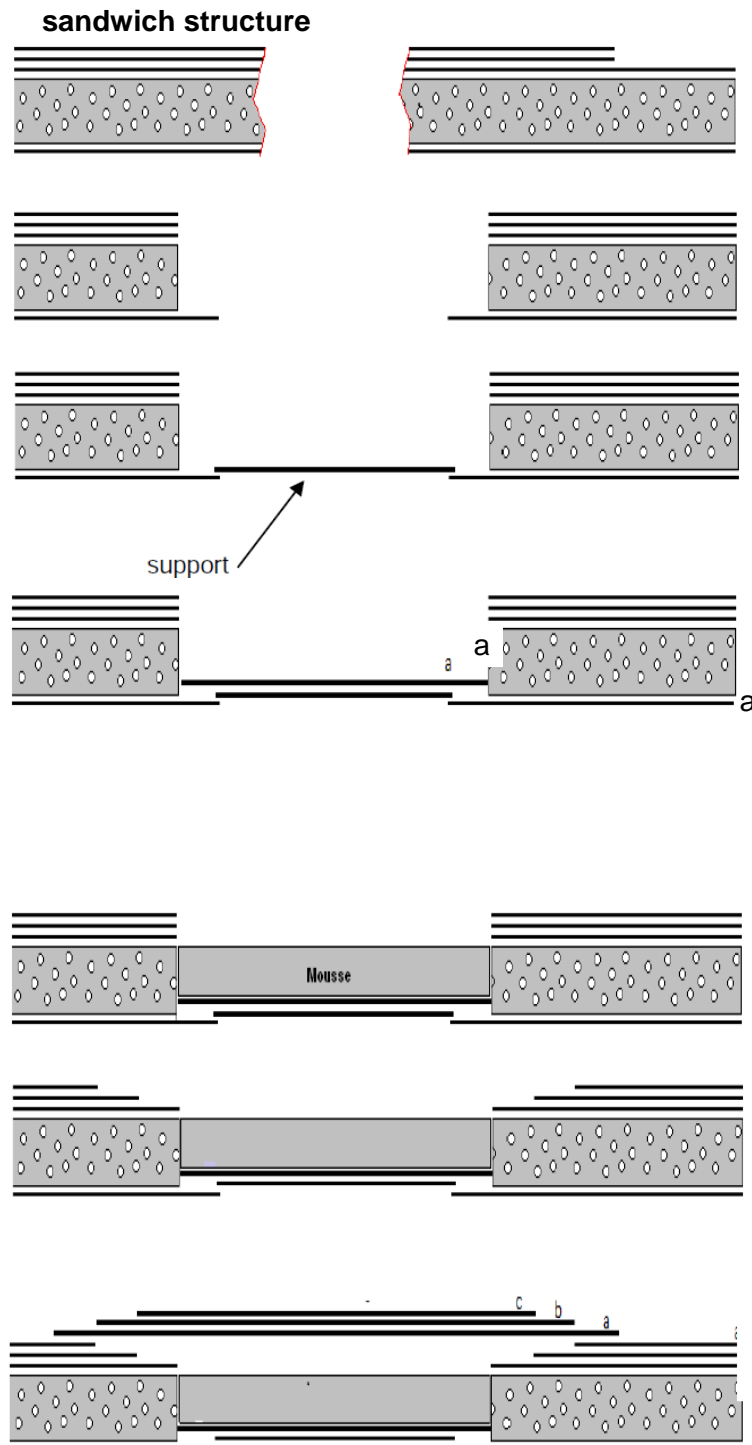


example of damage to sandwich structure without perforation of the structure





#### 7.4.2 Procedure for a class 2 repair



Example of damage with perforation of the upper and lower laminate of the sandwich structure

#### Operational phases:

hole enlarged and cleaned

Preparation of internal skin joint

Glue the pre-formed support over about 2mm (example of technical solution, can be replaced by a support glued on to the external surface of the lower laminate). In both cases, if the support is maintained in place after the repair, it should be as light as possible.

Stratification of the inner skin:  
Recover the layers applied one by one: In the opposite example repair cloth a on to the initial layer a.  
For min. splice see §7.5.1

bonding of a piece of foam with a mixture of microballoon and resin/harder (c.f. §7.5.1 and 7.5.2)  
Note : keep light pressure on the foam to evacuate bubbles

Profile the foam and prepare the bonding surface of the upper skin (cf. repairs class 3 previous page)

Stratification of the external skin:  
proceed as repair class 3 on previous page.  
Keep in place by applying vacuum (advised) or mechanical pressure (weights)



#### 7.4.1 Procedure for a class 1 repair

The principles for a class 1 repair are the same as these of a class 2 or 3 previously described.

In order of the function and the degradation of the structure it might be necessary to replace the damaged surface with a pre constructed part having equal principal characteristics as the damaged structure.

It is important to make sure that the geometrical structure of the added part equals the curve of the initial structure.

#### 7.5 Repair materials

All the repair materials can be delivered by SN CENTRAIR

It is absolutely essential to, before each repair, determinate the number of fibre layers, the weight in g/m<sup>2</sup> of the used glass fibre and the prevailing direction of the fibre strands.

The resin-hardener mixture has to be prepared at ambient temperatures of about 20°C (18°C to 25°C)

When the mixture begins to gel, or in other terms, when it becomes very viscous, it can't be used any longer. In this phase, the epoxy has lost its ability to penetrate and impregnate the glass fibre properly.

For repairs of class 1 and 2 and also class 3 repairs of major surfaces, it's necessary to cure the repaired parts (12h at 55°C minimum)

The polymerization of the other class 3 or class 4 repairs can be accomplished with by example a hair dryer (not to close to the surface to prevent overheating)

#### 7.5.1USED MATERIALS

- **Tissue:**

See table on page 7.7

- **Resin:**

Reference: SN CENTRAIR 200001

- **Hardener:**

Reference: SN CENTRAIR 200002

- **Additives:**

Silica powder ref. SN CENTRAIR 260008

Phenolic Microballoon ref. SN CENTRAIR 260004

Whitened cotton fibre ref. SN CENTRAIR 260005

Hollow glass microspheres ref. SN CENTRAIR 260019

- **Gelcoat:**

Reference SN CENTRAIR 240008 with catalyser 240010 (for external surfaces)





• **Foam for wing's sandwich**

Foam reference SN CENTRAIR 280018

SN CENTRAIR REFERENCE	Interglass (info) REFERENCE	TYPE	BINDING	MIN. COVERING (mm)
220026	90070	GLASS E	BIDIRECTIONAL	10
220027	92110	GLASS E	BIDIRECTIONAL	17
220028	92125	GLASS E	BIDIRECTIONAL	28
220030	92140	GLASS E	BIDIRECTIONAL	39
220031	92145	GLASS E	UNIDIRECTIONAL	44 or side to side
220032	92146	GLASS E	UNIDIRECTIONAL	44 or side to side
220008	02902	CARBON	UNIDIRECTIONAL	50 or side to side

### 7.5.2 Processing methods of the materials

In all cases the mixtures have to be done at ambient temperature

- surface paintings

100 mass parts of gelcoat with 2 mass parts of hardener or catalyst  
0 to 20 mass parts of diluent.

The mixture of gelcoat, his catalyst and his thinner is realized:

- by sequenced weighing
- by jar or calibrated pipet for the catalyst and the thinner.

The stirring is done by hand (stick) or with the aid of an electric stirrer.

• **Resin**

The proportions are as follows:

Resin  $100 \pm 1$  mass parts

Hardener  $38 \pm 0.5$  mass parts

• **Gluing paste**

The bonding's of the different pieces on to each other are assured by mixtures designated to the purpose.

These mixtures shall be demanded at the constructor for each application.

### 7.5.3. Storage of the materials

- Glass tissue : store in a dry environment at about 20°C. Leave the rolls of tissue horizontally to avoid heaping up (deformation or cracking of the tissue)
- Depending on the effective storage conditions it might be necessary to dry the tissue before use.
- resin : Store in a dry and from light obscured location and with respect to the storage temperature. (ambient temperature between 18 and 25°C)



- Verify the expiring dates before use.

## 7.6 Conclusions

The crucial factors for a good repair are:

1. A well illuminated room at a regular temperature (20°C) and humidity (60% relative humidity)
2. Avoid any presence of grease or transpiration coming from the hands
3. Use materials which correspond to the constructor's specifications
4. Utilize glass fibre in good condition which was stored in a dry place.
5. Verify the expiring dates of the products as well as the 'best use before' and application times.

After a major repair, perform a weighing as described on page 8.1 and verify that the empty weight centre of gravity is within the limits given by the graphic on page 8.2.

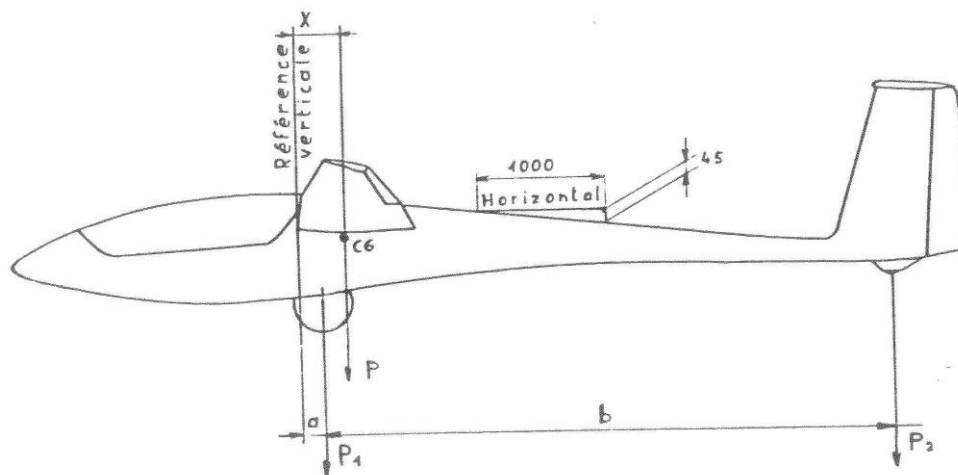
Afterwards calculate the balance for the different loads as described on pages 8.3 and 8.4 to determinate, if necessary, a new table of removable weights in relation to the pilots mass.



## 8.1 Weighing

Datum : Leading edge of the wing at the root rib.  
Levelling means: slope 45/1000 placed on upper side of fuselage boom

Loaded balance limits : - Front : Ca = 0.230 m  
- Rear : Cr = 0.375 m



Force	Lever arm (m)	weight (kg)	Lever arm empty weight X <sub>0</sub> (B L V in m)
FW P1	a = .....	.....	$X_0 = P_2 * \frac{b}{P_1 + P_2} + a = \dots\dots\dots$
RW P2	b = .....	.....	

$$\text{Min pilot mass} = MVE * \frac{X_0 - Cr}{L + Cr}$$

Max pilot mass =  $MVE * \frac{X_0 - Ca}{L + Ca}$  or useful load minus optional equipment: **The smallest value must be taken into account**

X<sub>0</sub> = empty lever arm

Cr = CoG rearward limit

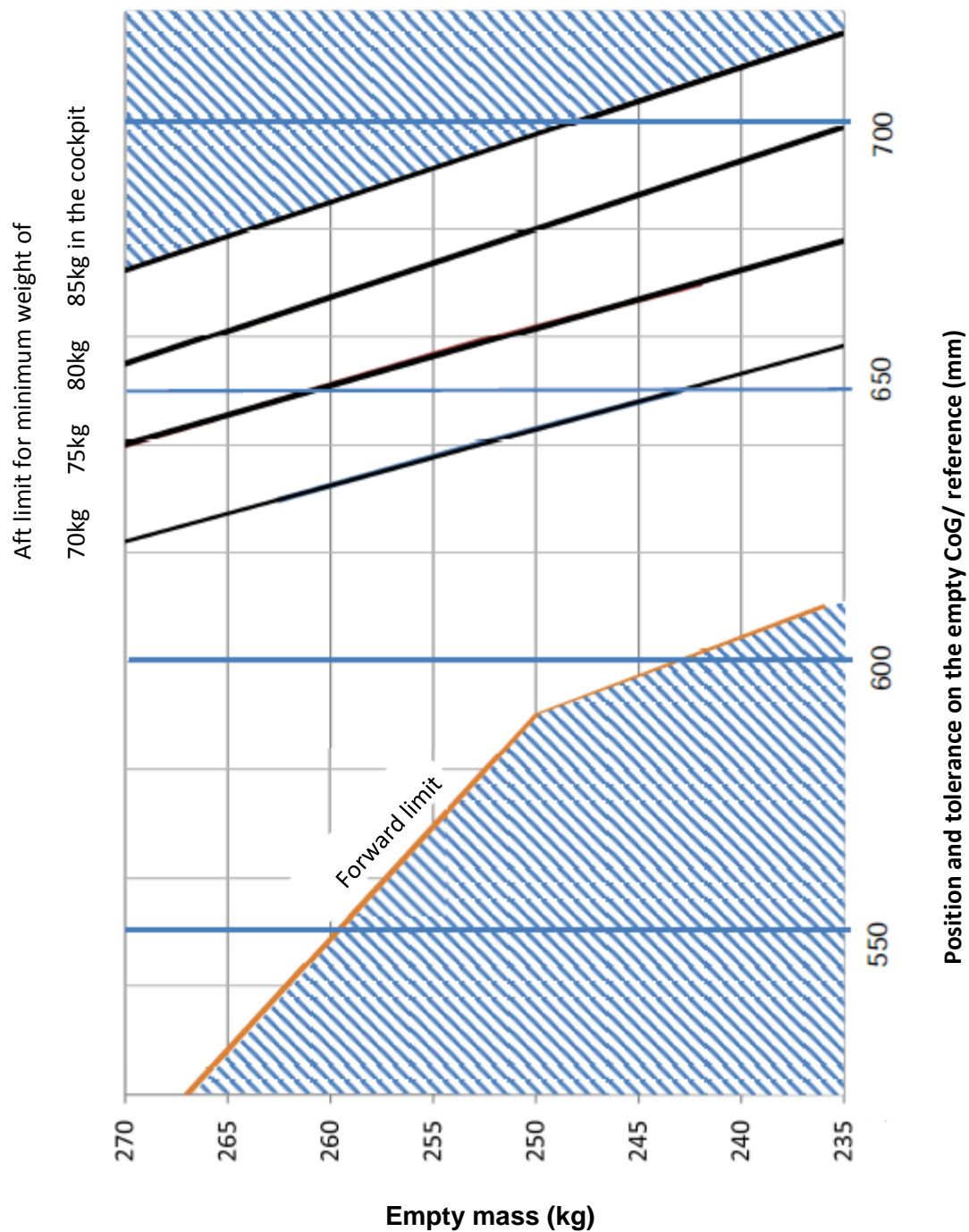
Ca = CoG forward limit

MVE = Equipped empty mass

Average pilot lever arm: L = 0.65m



## 8.2 EMPTY WEIGHT CENTER of GRAVITY DIAGRAM





### 8.3 prevalent balance

Using the values on page 8.4 verify if the prevalent balance of the loaded glider is still within the authorized limits (X situated between 0.230 and 0.375m) for the different pilot masses with and without removable trim weights. If the balance determination table for removable trim weights available in the flight manual and recalled below can't be applied, set a new specific table for the concerned glider.

NOTE: After a major repair at the front of the fuselage a fixed weight can be added if necessary at the height of the tail skid to compensate the balance (apply the constructor's drawing)

The balance table for the removable trim weights of a glider equipped with standard instruments and not repaired.

Number of weights	Min mass of the equipped pilot (kg)
0	70
1	67
2	65
3	63
4	61
5	59
6	57
7	55

Mass of one weight: 1 kg +/- 20g



## 8.4 ARITHMETIC BALANCE CALCULATION

balance calculation example		
Serial Number of the glider	101.....	
Registration	.....	
Lever arm of the empty glider (BLV)	.....m	(.....in)
Empty equipped mass (MVE)	.....kg	(.....lbs)
Lever arm of removable elements:		
Trim weights	-1,84m(-72.44in)	
Instrument panel	-1.10m (-43.31in)	
Pilot	-0.65m (-25.59in)	
Water ballast	+0.15m (+5.91in)	
Battery	+0.65m (25.59in) fuselage or +0.15m (+5.91in)luggage comp	
Oxygen bottle	+0.20m (+7.87in)	

Example of a balance calculation

	Mass		Lever arm		Moment
Empty equipped glider (MVE)	255	x	0.630 (BLV)	=	160.65
Pilot witch parachute	77	x	-0.65	=	-50.05
Trim weights	0	x	-1.84	=	0
Radio VHF	1.2	x	-1.10	=	-1.32
Battery	3.5	x	0.65	=	2.275
Water-ballasts	118.3	x	0.15	=	17.745
TOTAL	455kg				129.3m.kg

$$X = \frac{129,3}{455} = 0,284 \text{ m}$$

Reference chord (at root rib) : c= 0.887m (34,92in) from where the position of the CoG in % of the chord: 0.284/0.887 =0.32 or 32%

Calculation table

	Mass kg(lbs)		Lever arm (m)		Moment m.kg (in.lbs)
Empty equipped glider (MVE)	.....	x	.....	=	.....
Pilot with parachute	.....	x	-0.65	=	.....
Trim weights	.....	x	-1.84	=	0
Supplemental equipment on instrument panel	.....	x	-1.10	=	.....
Battery	.....	x	.....	=	.....
Water-ballasts	.....	x	.....		.....
TOTAL	.....		.....		.....

$$\text{Balance X} = = \frac{\text{Resulting moment}}{\text{Total Mass}} = \dots \text{ M } (\dots \text{ in})$$