MAINTENANCE MANUAL
CENTRAIR GLIDER
101 – 101 A – 101 P – 101 AP

"Section 5 "Inspection procedures" was approved by BUREAU VERITAS on behalf of the ministry in charge of Civil Aviation as meeting for French users the requirement of the approved maintenance program defined in article 10 of the order of 17 March 1978 relative to maintaining the airworthiness of aircraft."

(Ref.: AERO – 3730/DCO of 28/07/1983
AERO – 810 DT/Z of 24/05/1991
AERO – 029 DT /Z of 03/05/1993

All measures have been translated in English measures for indication. In case of unconsistency, only SI system measures are considered. In that case, thank you to contact the manufacturer

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0	0.0 (1)	Issue 3 Rev. 1	March 2016
	0.1 (1)	Issue 3 Rev. 1	March 2016
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(1) Coded page including at least code A.
The maintenance manual (DGAC) Issue 3 is made of non coded or A coded pages.

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1.1 Definition

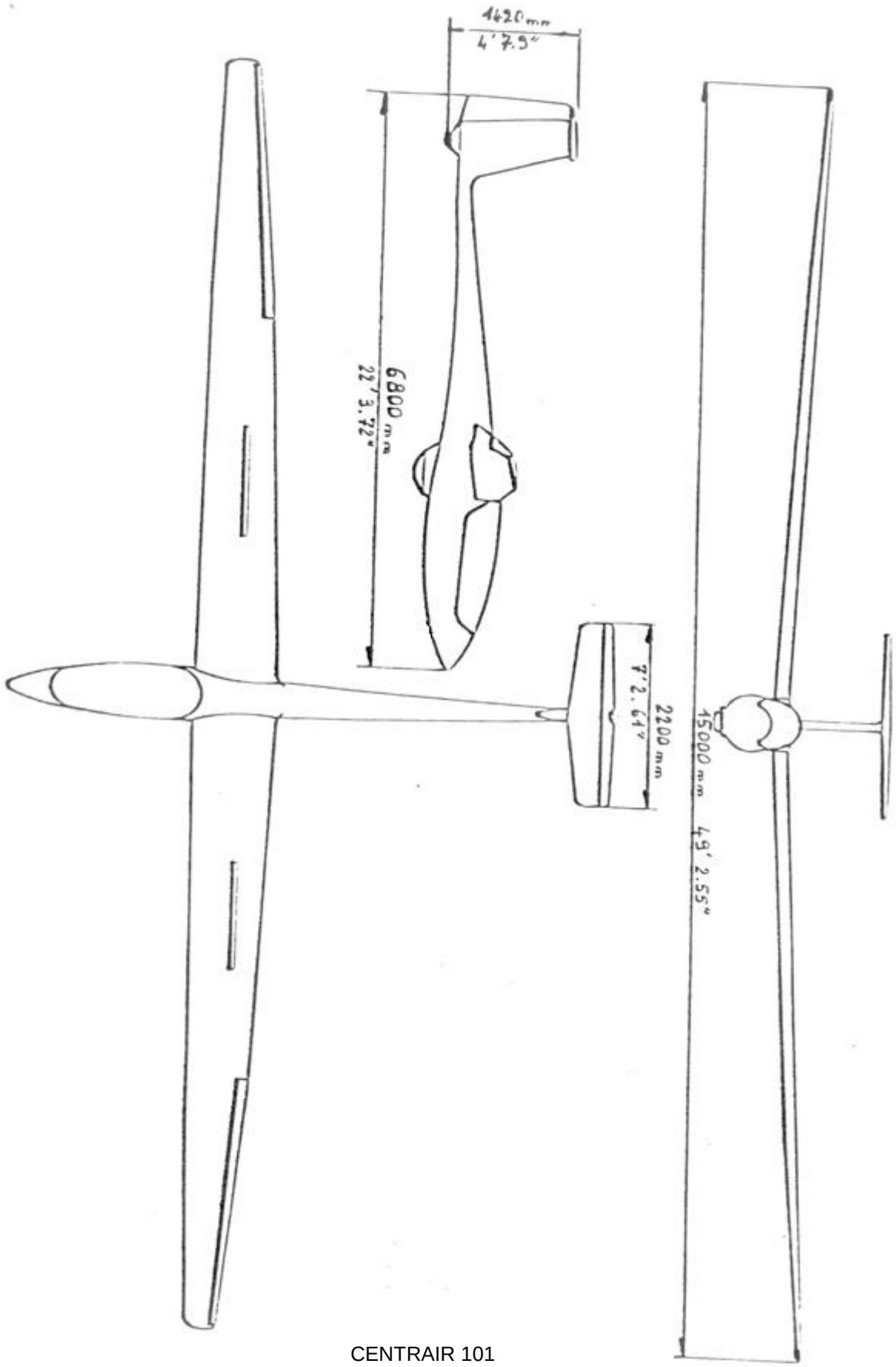
The CENTRAIR 101 – 101 P – 101 A – 101 AP gliders are standard class single-seaters.
There are four versions:

- CENTRAIR 101 Glider with fixed landing gear
- CENTRAIR 101 P Glider with fixed landing gear and removable wingtips
- CENTRAIR 101 A Glider with retractable landing gear
- CENTRAIR 101 AP Glider with retractable landing gear and removable wingtips

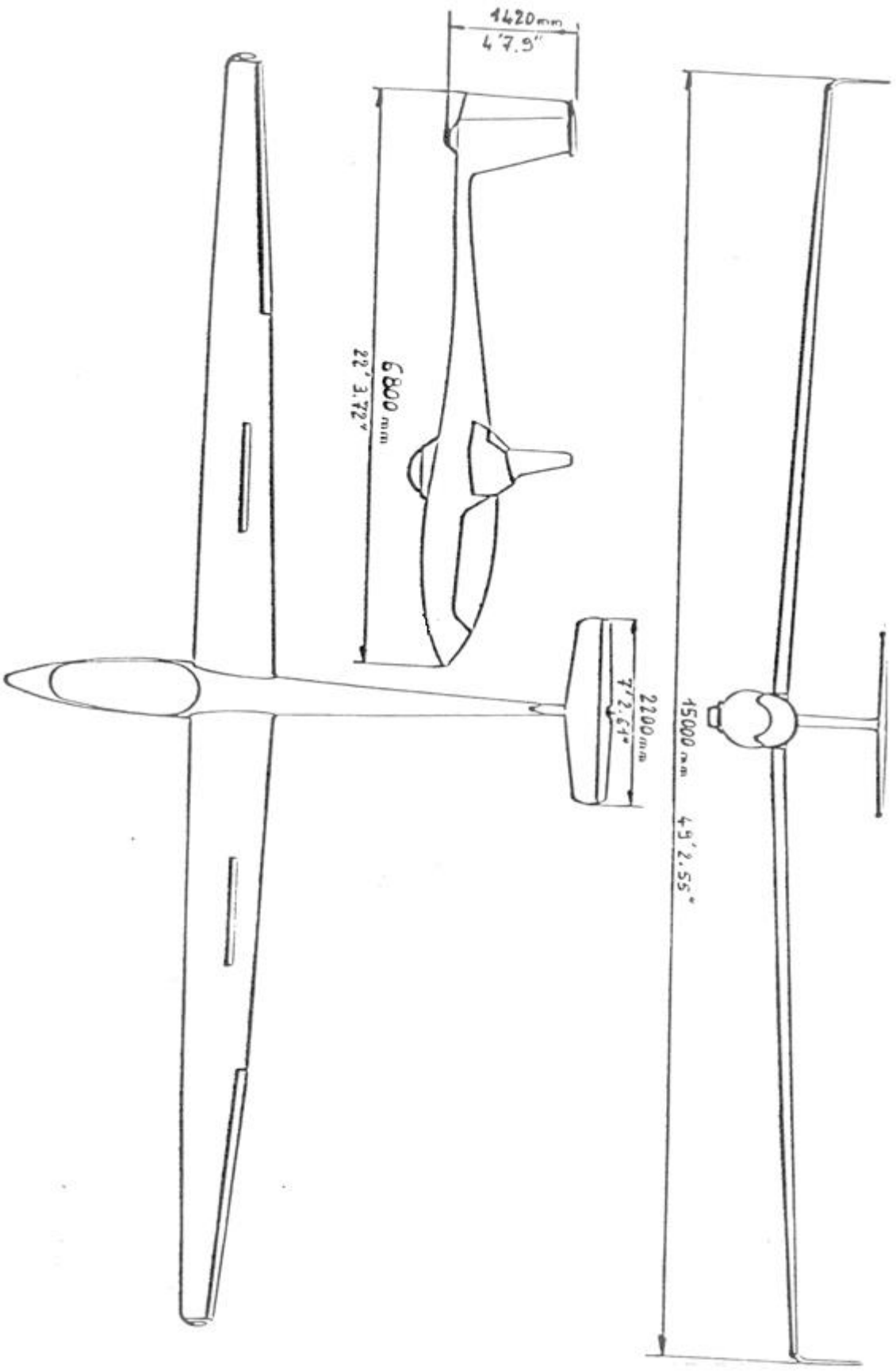
The structure is made of reinforced glassfibre plastic
The wing has an evolutive laminar profile
The air brakes are extended only at the upper surface
The stabilizer is of the T type
All external surfaces are protected with white gelcoat
Capacity of the water ballasts in the wing: 120 litres (26,4 UK gal.)

1.2 3-view drawing

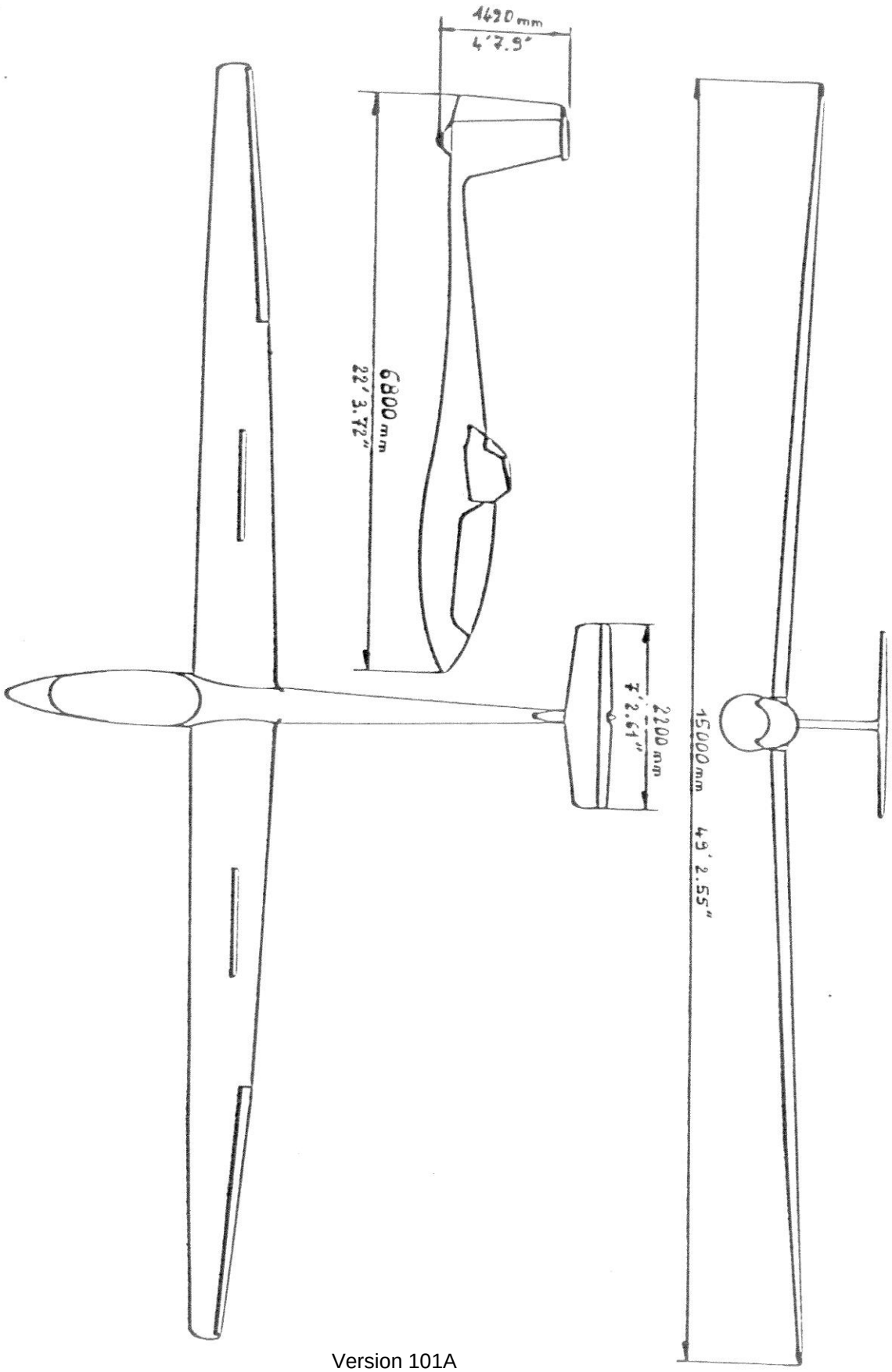
Refer to the four versions pages **1.2, 1.3, 1.4, 1.5**



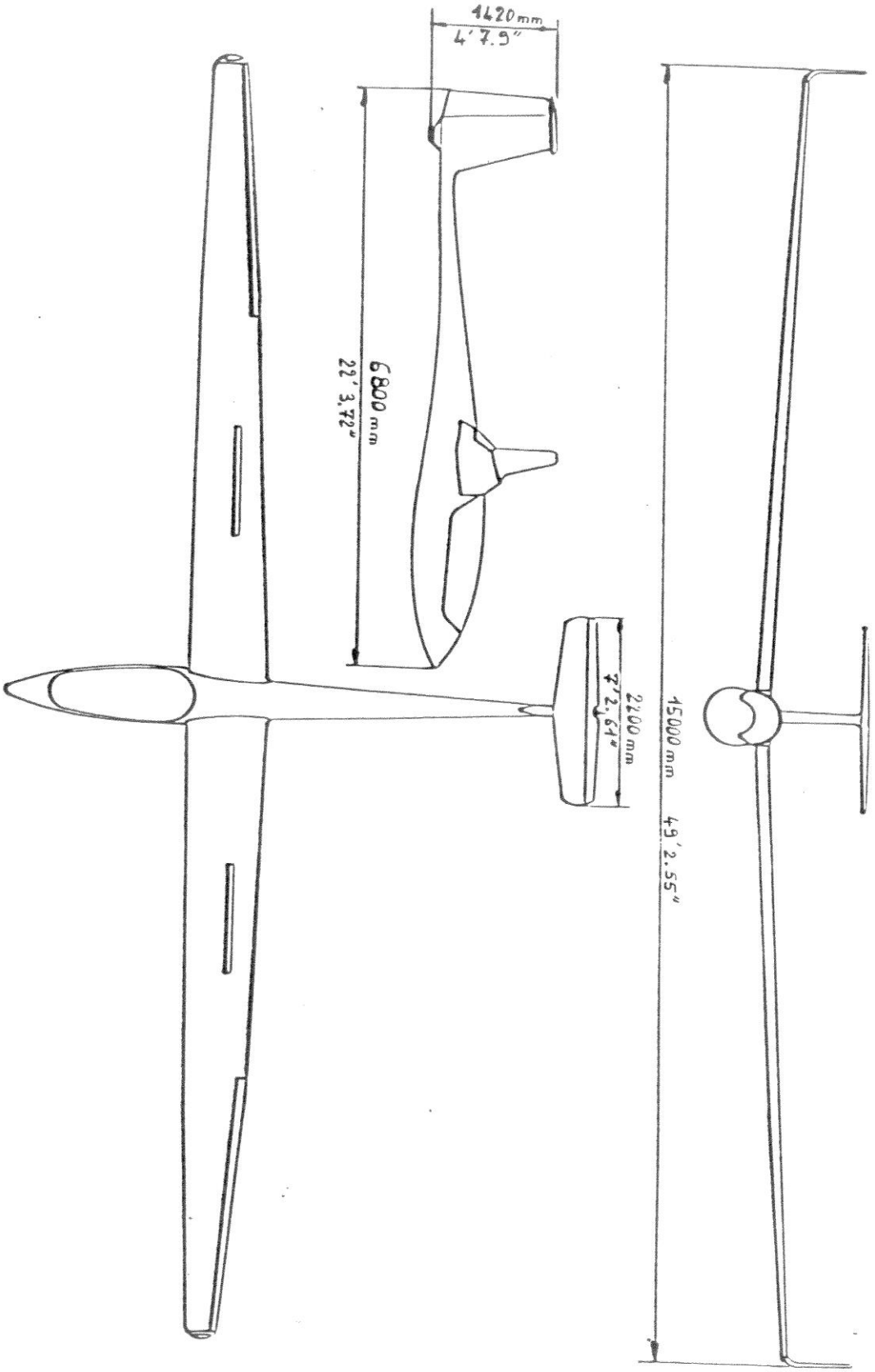
CENTRAIR 101



Version 101 P



Version 101A



Version 101AP

1.3 Overall dimensions

Wing span	15 m *(49 ft 2.55 in)*
Total length	6.80 m *(22 ft 3.72 in)*
Total height	1.42 m *(4ft 7.9 in)*
Aerofoil	10.50 m² *(113.02 sq ft)*

1.4 Wings

Evolutive profile COAP 01 to COAP 02	
Extension	21.43
Dihedral	2.3
Median geometrical chord	0.700m *(27.56 in)*
Individual aileron surface	38.1 dm² *(4.1 sq ft)*

1.5 Winglets (CENTRAIR 101 P – 101 AP)

Area in vertical projection	0.13 m² *(1.4 sq ft)*
Wing height / chord	0.80 m *(3.15 in)*
Wingtip end depth	9.5 cm *(3.74 in)*
Wingtip depth 65 cm from the tip	18 cm *(7.09 in)*

1.6 Airbrakes

Double trigger type with opening on upper surface, controlled by control rods.

1.7 Horizontal stabilizer

Area	0.997 m² (10.73 sq ft)

1.8 Vertical stabilizer

Area	1.0 m² *(10.76 sq ft)*
Aileron area	0.3 m² *(3.23 sq ft)*
Profile FX71 – L 150/30	

1.9 Lander

Type: retractable monoprint landing gear, drum brake
Tyre: 500 x 5
Control of main landing gear through rigid rods
Tail shoe in expanded foam with metal skid
Tyre inflating pressure:

- 2.5 to 2.7 bars for a weight of 350kg (772 lb)
- 3.2 to 3.4 bars for a weight of 455kg (1003 lb)

(see flight manual page 7.3)

2.1 Assembly

See flight manual **section 8**

2.2 Disassembly

See flight manual **section 8**

2.3 Airspeed connectors

See flight manual **section 7**

2.4 Lead discs

A threaded pin before the rudder bar is fitted with 7 lead discs of 1kg *(2.2 lbs)* each to ensure the centre of gravity is within its limits.

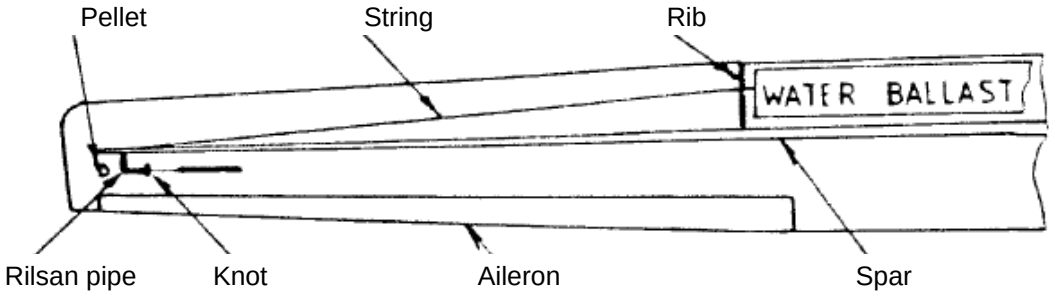
Locking is ensured by a butterfly nut and a safety pin.
(Refer to flight manual for use).

2.5 Removing the water ballasts

Manual connection water ballasts:

Remove the upper surface pellet near the fairing tip, pull the string and undo the knot to be able to freely pull the bag from the hole in the wing root rib.

Ensure the string does not disappear inside the wing.



Automatic connection water ballasts:

Unscrew the nut fastening the valve to the wingroot rib.
Unscrew the threaded section of the valve and remove the control rod *(do not lose the O-ring).*
Disengage the valve from the drain hole and unfasten the string from the wingroot rib.
Pull freely the bag through the hole in the wingroot rib while ensuring the bit of string does not escape inside the wing.

2.6 Refitting the water ballasts

Manual connection water ballasts:

Pull the bag with the string against the rib, run the rilsan hose up to the spar and tie a new locking knot. Loop the rest of the string, tape it into a set of 30 to 40 cm long strands (11.81 to 15.75 in.). Pass the set in the upper surface hole and refit the pellet.

Automatic connection water ballasts:

Install the bag back in place by pulling it with the string *(the string passes in a loop inside the wing)*. Refit the valve into the wing's drain hole. Refit the gasket, control rod and threaded section. Tighten the threaded part gently to ensure the rod can slide under the action of the spring contained in the valve. Fasten the valve by tightening the nut onto the threaded section *(ensure it does not turn when tightening*).

2.7 Control circuits

The control circuits are described in detail in the spare parts catalogue.

2.8 Indicating plates

See flight manual section 2

2.9 Pictographs

See flight manual section 2

3.1 Storage and maintenance

Mold is the enemy of laminated materials.
Always check all water is removed from inside the different sections of the glider. The airbrake cages are not drilled for performance purposes. Dry them using a sponge if necessary.

If you suspect water has penetrated a wing, place the latter in dry premises and store it upside down for one day.

Do not underestimate the importance of condensation inside the glider. This is why hangars and trailers must be ventilated properly. Remove the instruments if required before long storage periods.

Excess solar radiation is harmful for the finish; therefore avoid exposing the glider to sunlight more than necessary.

Maintaining the finish with a finish paste *(silicon-free if possible)* extends the life of the gelcoat and improves the surface condition.

3.2 Road transport

Always fasten the wings onto rigid brackets at the spar root or on the level of the wingroot rib.

The fuselage holding points are the tail crutch, the wheel, the bottom of the fuselage on an adapted cradle or the fastening pins of the wings.

If the glider is transported on a non covered trailer, water penetration can be avoided up to a certain point by applying adhesive tape to the aileron slots, the airbrakes, the canopy, the nose and static probes.

Covered trailers must be well ventilated at all times to avoid high temperatures and high relative humidity.

3.3 Greasing

* before each reassembly, clean and grease the following parts with general use grease:

- Main axles of the wings,
- Wing-fuselage connection pins,
- Horizontal stabilizer connection pins,
- Horizontal stabilizer locking screws,
- All L'Hôtellier swivels,
- Winglet connection pins and axles *(101 P and 101 AP)*

* At the Annual Inspection and General Inspection, in addition to the parts specified above also clean and grease all joints of mechanical parts accessible with neutral motor oil :

- Hinges of ailerons: grease upon removal *(General Inspection, etc.)*
- Airbrakes: grease the upper joints of the airbrake arms upon disassembly *(General Inspection)*
- Rudder pedals,
- Rudder slides,
- Controls,
- Canopy joint and locking,
- Hook*(s)*,
- Landing gear: grease when disassembling *(General Inspection, etc.)*
- Airbrake control arm for the fuselage.

3.4 Particular inspection

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

- Landing gear: state of the lower and upper forks and their links. Condition of the tyre and landing gear doors,
- Structure: no cracks, particularly on the fuselage at the base of the vertical stabilizer, at the wing roots, landing gear fasteners,
- Bracket: no abnormal play on the level of the connection brackets of the wings, wingtips, horizontal stabilizer.

Then check the operation of all elements of the glider.

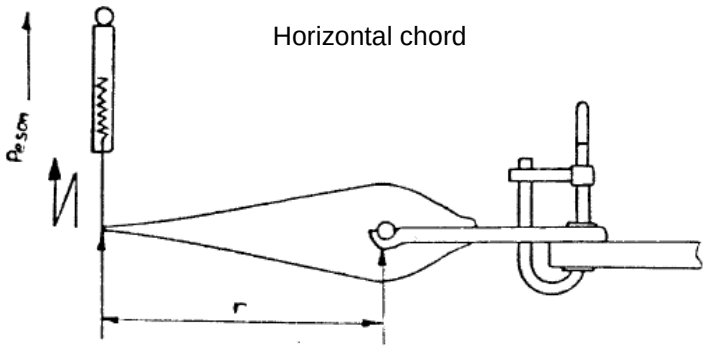
4.1 Balancing the ailerons

		BALANCING THE AILERONS							
		WEIGHTS			BALANCING				
		Tolerance on weight		Weight recorded	Lever arm	Balance at trailing edge	STATIC MOMENT		
							Tolerance		Recorded Mts
		kg	lb	M (kg/ lb)	r (cm / in)	P (kg / lb)	cm.kg	In.lb	(cm.kg / in.lb)
Rudder	(a)	2.988 to 3.652	6.59 to 8.05				8.58 to 10.53	7.45 to 9.14	
	(b)	3.942 to 4.818	8.69 to 10.62				5.46 to 6.69	4.74 to 5.81	
Elevator		2.16 to 2.64	4.76 to 5.82				6.60 to 8.10	5.73 to 7.03	
Left aileron	(c)	3.78 to 4.62	8.33 to 10.18				5.11 to 6.26	4.44 to 5.43	
	(d)	3.72 to 5.02	8.20 to 11.07				4.6 max	3.99 max	
Right aileron	(c)	3.78 to 4.62	8.33 to 10.18				5.11 to 6.26	4.44 to 5.43	
	(d)	3.72 to 5.02	8.20 to 11.07				4.6 max	3.99 max	

(a) : gliders 101 and 101A
(b) : gliders 101 P and 101 AP
(c): old balancing
(d): new balancing *(see § 4.2)*

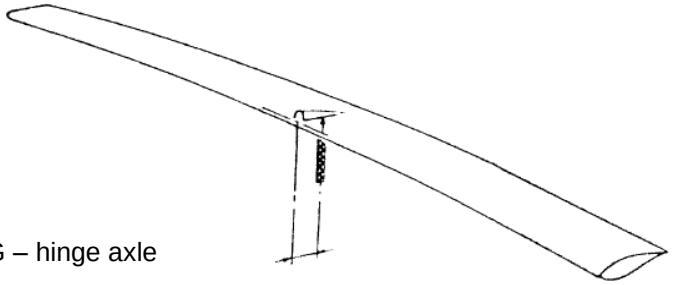
RUDDER, ELEVATOR and AILERONS with major modification 101 – 31:

Static moments Mts = r x P



AILERONS without major modification 101 – 31:

Static moments Mts = Mxr



r = distance CoG – hinge axle

4.2 Special balancing of the ailerons

In compliance with the flight manual, paragraph 3.5, special balancing which can be applied to the ailerons:

New tolerance:

Weight:

- Max weight possible 5.02 kg (11.07 lb)
- Min weight possible 3.72 kg (8.20 lb)

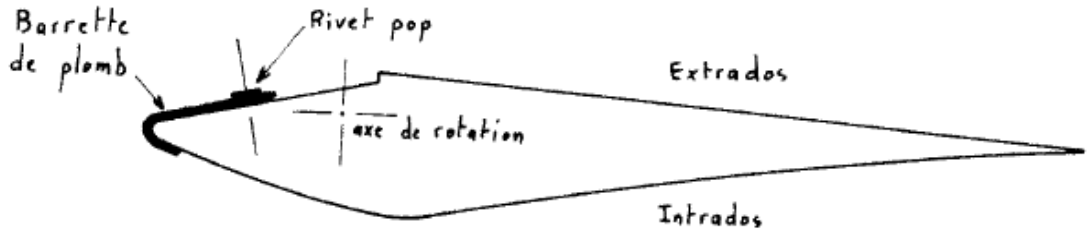
Static moment below 4.6 cm.kg (3.99 in.lb)

- Disassembly of the ailerons:

Disconnect the rod by removing the tube rivet with an outer diameter of 6mm (0.236in). Pop the rivet head with a 7mm (0.28in) drill bit, then drill the rivet over half its length using a 5mm (0.20in) drill bit. Then insert a 5mm (0.20in) drift punch and hit it to take the rivet out while applying a block at the end of a tube at the opposite surrounding the rivet. Remove the adhesive tape from the upper surface then remove the pop rivets locking the hinge pins (2.5mm / 0.10in drill bit). Punch the center of the rivets before drilling. Clean the ailerons and remove their axles.

- Procedure for rebalancing the ailerons:

Add lead to the leading edge as indicated in the following diagram to obtain a static moment below 4.6 cm.kg (3.95 in.lb)
Do not exceed the new weight tolerance.



The strips must have a max width of 15mm (0.59in) and a max thickness of 1.6mm (0.063in). They shall be positioned on the upper surface, as close to the aileron's leading edge as possible. Use as many strips as necessary, but distributed at best along the aileron's span.

Perform a test assembly of the ailerons, with strips being taped, and check deflection *(see § 4.3).*
If they cannot be obtained, contact the manufacturer.

If they are correct, refit the aileron. Glue the strips with resin (as thin a layer as possible) and fasten them with rivets ref. SN CENTRAIR 400160 (1 rivet every 8cm / 3.15in).

- Refitting the ailerons:

Reverse the disassembly procedure.
- Alu pop rivet fastening the hinge pins axles ref. SN CENTRAIR 400160
- Steel tube rivet on control rod ref. SN CENTRAIR 400197

Check and record the application of the Service Bulletin in the log book while mentioning the old and new aileron weight and the new static moment.

4.3 Control surfaces deflection and tolerances

		CONTROL SURFACES DEFLECTION AND TOLERANCES		
		Angular values	Values in mm (1)	Values in inch
Ailerons	Up	22° +/- 2°	57.1 +/- 5.1 mm	2,25 ± 0,2
	Down	14° +/- 2°	36.5 +/- 5.2 mm	1,44 ± 0,2
Elevator	Up	22° +/- 3.5°	60 +/- 10 mm	2,36 ± 0,39
	Down	18° +/- 2°	50 +/- 5 mm	1,97 ± 0,2
Rudder	Right	30° +/- 3°	160 +/- 15 mm	6,30 ± 0,59
	Left			
Airbrakes	Right and left: 180 +/- 10mm			7,09 ± 0,39
	Max gap between the right and left : 5mm (1)			0,2

(1) MEASURES OF THE VALUES :

Ailerons and elevator :

Measurement at the inside limit of the trailing edge
Radius of the aileron deflection circle: 150 mm (5,9 in)
Radius of the depth deflection circle: 160 mm (6,3 in)

Rudder :

Measurement at the lower limit of the trailing edge
Radius of the deflection circle: 310 mm (12,2 in)

Airbrakes:

Measurement between the wing upper surface and the upper section of the cap, on the leading edge side, about 50cm (19,7 in) from the edge on the root side of the airbrake well

4.4 Acceptable play

	ACCEPTABLE PLAY		
	Angular values	Millimetric values	Inch values
Ailerons	1.23°	2.9 mm	0,114
Elevator	1.27°	3.2 mm	0,126
Rudder	0.90°	4.4 mm	0,173
Airbrakes		3mm	0,118

5.1 Types of inspection and periodicity

- **Small maintenance inspection (S.M.I.) :**

The small maintenance inspection is to be applied after reassembling the glider or every 100 hours flight.

- **Annual Inspection :**

The annual inspection programme must be performed when the first of the following two limits is reached:

- annually,
- after 500 hours flight.

- **General Inspection** :

The general inspection programme must be performed when the first of the following two limits is reached:

- every 5 years,
- after 3000 hours flight.

5.2 Equipment and elements with particular maintenance

- Verification of instruments in compliance with manufacturer indications,
- Inspection of the tow hook(s) according to manufacturer (TOST) and maker instructions
- Replace the straps according to their condition and manufacturer indications.
- All external surfaces must be covered with gelcoat for composite elements or paint for metal elements. A tolerance is authorized for painting anti collision marks as per drawing 101 BE 08-13 available at SN CENTRAIR.
- All L'Hôtellier ball and swivel joints must be inspected as per the manufacturer's maintenance instructions.
  However, the mandatory replacement required by the L'Hôtellier company every 10 years or 3000h flight, at the first of the 2 deadlines reached, can be replaced with checking for cracks or incipient cracks on the 2 components (ball and swivel) at each annual check after this deadline. During the latter, apply the periodical inspection programme defined in the L'Hôtellier maintenance programme.
- Disassembly of the long aileron rods in the wings to check their wear beside the linkage rod guides (max acceptable wear depth: 0.1mm): Perform this check every 3000h flight from 6000h (when replacing the long rods with new ones, check them after 6000h flight after their replacement, then every 3000h).

5.3 Additional normal maintenance documents

Manufacturer book or instructions for the following equipment:

- Tost hooks
- Standard instruments
- Straps
- L'Hôtellier swivels

5.4 Inspection programme

	S.M.I.	ANNUAL INSPECTION	GENERAL INSPECTION
I. ON ASSEMBLED GLIDER, CONDITION OF THE JUNCTIONS, APPRECIATION OF MECHANICAL CLEARANCE			
Wings and empennages fastenings	x	x	x
Play of axles and of main fitting fixations (apply vertical and horizontal solicitations at the tips)		x	x
Control linkage for elevator, direction, lateral control, airbrakes (with the control surfaces held, apply manual solicitations to the controls in the cockpit)		x	x
Play in control linkage aileron - elevator : Play must not exceed the indications in paragraph 4.4. When the control surfaces are blocked and obvious play can be found exceeding the prescriptions of paragraph 4.4, a fault exists and repairing is required. Acceptable play corresponds to the sum of the various accumulated plays on the control chain. If effective play results only from a few points where it is obvious, an additional analysis must be led to check compliance of these points. The loads to be applied must not be too strong as this may be confused with elasticity in the controls. If major play is found in the control linkage of the ailerons, remove the seat and access doors, and repair. If play is found in the wings, openings must be made in the wing lower surface. In this case, this work must be performed according to the rules of the art and in compliance with regulatory requirements (see paragraph 7.1)		x	x

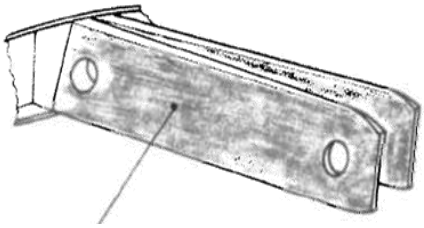
	S.M.I.	ANNUAL INSPECTION	GENERAL INSPECTION
Rudder control linkage play Play in the rudder control linkage (cables) is impossible because of the presence of a spring maintaining the cables under tension. When reaching the end of spring compression, a more important effort would allow to push the pedal further, because of the cable's elasticity : this must not be confused with the rudder play		x	x
II. COATING CONDITION			
2.1 Plastic construction:			
Condition of the skin (more particularly at the wing upper surface and horizontal stabilizer and under the fuselage)	x	x	x
Mechanical condition of stressed skin : (by visual and touch search, detect any holes, local depression, crack lines, zones grooved by delamination)		x	x
2.2 Condition of connection fairings: (wing and stabilizer root)			
Cracks, creeks, bumps, warping, faulty bonding		x	x
2.3 Condition of the draining or venting holes; unclogging if required:			
Under the fuselage	x	x	x
At the wing root ribs (trailing edge caissons)		x	x
On the control surfaces and the stabilizer when disassembling for General Inspection			x

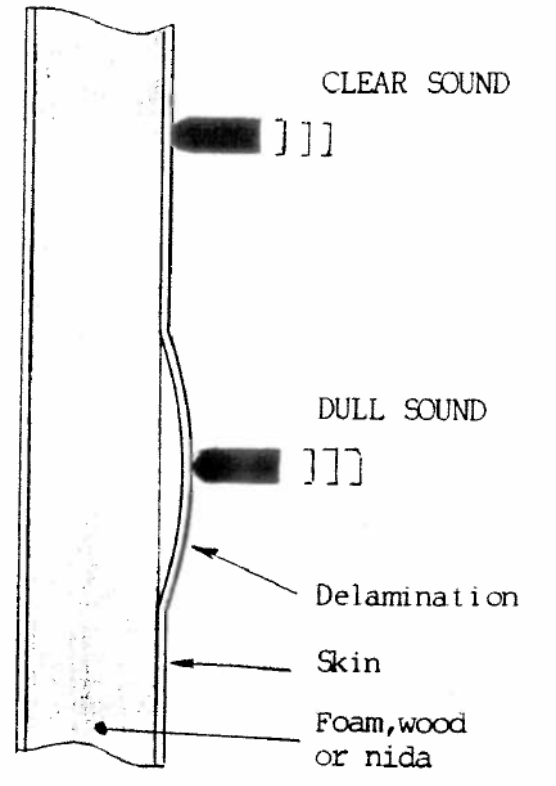
	S.M.I.	ANNUAL INSPECTION	GENERAL INSPECTION
III. CANOPY			
Condition of the plexiglass, cracks, loss of transparency	x	x	x
Condition of the window, good working condition		x	x
Condition of the frame, distortion attachment, adjusting pins		x	x
Check operation of the opening, closing and locking device	x	x	x
Check for leak the canopy being closed			x
Check the good working condition *(emergency)* through a simulated manoeuvre		x	x
IV. COCKPIT			
General cleanliness, floor and front section	x	x	x
Condition of the seat, its fasteners, and adjustment devices		x	x
Inspection of the harnesses, condition of the straps, *(cleanliness, tears, seams*) and attachment on the structure, good working condition of the buckle and sliding stretchers *(distortion, oxidation)*		x	x
Condition of the ventilation device and its control		x	x
Good working condition of rudder bar adjustment and greasing of the locking device and slide bar		x	x
Condition of the wheel brake cable and the control, adjustment	x	x	x
Good working condition of the tow release and water-ballast controls, condition of the cables		x	x
Condition of all control handles, compliance of the colours with the standard *(see flight manual section 2)*		x	x

	S.M.I.	ANNUAL INSPECTION	GENERAL INSPECTION
V. CONTROL SURFACES : (ailerons, elevator, rudder, airbrakes)			
Appreciation of free deflection, friction, hard spots, play. Check compliance with the table in paragraph 4.3 page 4.4	x	x	x
Airbrakes: appreciation of the locking and unlocking efforts, condition of push load bearings, distortion		x	x
Measurement of deflection of ailerons, elevators, rudders and airbrakes. Check compliance with the table in paragraph 4.3 page 4.4			x
Remove all control surfaces and airbrake plates. Inspect hinges, joints and control levers, attachment onto the structure, cleaning, greasing			x
Measurement of weights and balancing. Check compliance with the table page 4.1			x
Verification of the long aileron rod inside the wings, see §5.2			x
NOTE: In case of replacement, paint, repair, balancing of the ailerons must be checked. **Refer to the manufacturer certification criteria given in the table in page 4.1** After reassembling the ailerons or elevator, seal the hinges using Tesaband 4651 (or equivalent) woven reinforced adhesive tape, 38mm wide (ref. SN CENTRAIR 520074). Ensure the tape, once stuck, does not restrict deflection. To do this, first apply the tape to the fixed upper surface part, then, with the ailerons or elevator disconnected and pushed down completely, apply it in recess in inside the groove with your finger, and then on the control surface.			

	S.M.I.	ANNUAL INSPECTION	GENERAL INSPECTION
VI. CONTROL CIRCUIT INCLUDING: - the 3 main controls: aileron, elevator, rudder - the other controls: airbrakes, trim, hooks, etc.			
Visual inspection of the control stick and rudder bar *(cracks, warping, play)*	x	x	x
Inspection of the fixation of elevator and ailerons transmission brackets in the fuselage at the base of the control stick. If necessary, tighten the nuts carefully to avoid compacting the wood		x	x
Elevator trim: check notches and irreversibility of working	x	x	x
Inspection, cleaning, greasing, disassembly if necessary of transmissions, bell cranks, axles, supports, swivels, bearings, rods, sliding devices (piano wire, bowden), etc. *(See greasing plan §3.3)*		x	x
Cables: change any cables with traces of wear or corrosion; visual inspection		x	x
Replace rudder and tow release cables every 3000h flight or every 20 years, whichever occurs the first			x

	S.M.I.	ANNUAL INSPECTION	GENERAL INSPECTION
VII. TOW HOOK:			
Cleaning on glider	x		
Dismantling and checking : **according to manufacturer logbook**			
Appreciation of the release effort		x	x
NOTE: Hooks by "TOST" are to be revised periodically according to the indications of the manufacturer and by considering as imperative the periodical revision recommended by TOST.			
VIII. LANDING GEAR			
External check and cleaning of the wheel compartment	x	x	x
Greasing the landing gear		x	x
Pressure and wear of the tyre 2.5 to 2.7 bars (36.3 to 39.2 psi) for a weight of 350 kg (772 lb) and 3.2 to 3.4 bars (46.4 to 49.3 psi) for a weight of 455 kg (1003 lb)	x	x	x
Inspection of the rubber skid gluing		x	x
Check condition of the wheel holder, lifting device, high and low locking, return spring or jack, good operation check		x	x
Check condition of the landing gear doors, hinges or fairing of fixed landing gear		x	x
Check condition of the door closing rubber sandows	x	x	x
Check condition of the wheel brake, wear, effectiveness		x	x
Removal of the landing gear, inspection of welds, warping, corrosion, cracks, protection.			x
Removal and disassembly of the wheel, check for cracks, corrosion			x

	S.M.I.	ANNUAL INSPECTION	GENERAL INSPECTION
IX. STRUCTURE :			
Inspection of the glider's internal structure and more particularly the vital elements and parts locally subject to damages • Wing spar, particularly on the level of the interface between the root coil and the cores in beech plywood *(percussion check)*.  Area to inspect (shaded area) (2 sides on male spar, 4 sides on female spar) • Wing caissons • Wing attachment • Condition of the wing-tips and of winglets • Winglets attachment • Stabilizer spars and caissons • Stabilizer attachment • Rear and lower parts of the fuselage • Fuselage caisson supporting the wings • Structure set cockpit, seat, frame, canopy, plates		x	x
In glass plastic/resin structures: • Fixity of metal inserts • Zones grooved by delamination *(visual or touch)* • Adherence of internal reinforcements		x	x
In the mechanical parts *(fastener axles)* • Measure of play • Marking, hammering, corrosion		x	x

	S.M.I.	ANNUAL INSPECTION	GENERAL INSPECTION
Percussion check: This simple process requires no tooling but must be performed by skilled personnel - Tap the entire surface with a coin, a round-tipped metal rod, etc. - Analyse the sound returned by the shock. If the sound is clear, gluing is OK. If the sound is mat, muffled, gluing is faulty or non existent (the vibrations are not transmitted over the entire surface).  			
X. PARTICULAR DEVICES:			
Water ballast: general condition		x	x
Sealing test, do not fill under pressure, refer to the filling method described in the flight manual			x
Oxygen equipment: condition of bottle holders, piping, adapters…		x	x

	S.M.I.	ANNUAL INSPECTION	GENERAL INSPECTION
XI. INSTRUMENTS ON BOARD :			
Presence of indispensable instruments • Airspeed indicator (marking of limit speeds, see flight manual) • Altimeter • Magnetic compass • Side slip indicator • Variometer	x	x	x
Cleanliness of static ports and pitot tube	x	x	x
Condition of the piping and check for foreign materials inside (water, sand, dirt)		x	x
Check of the altimeter by displaying the QFE		x	x
Check all instruments as per manufacturer indications		x	x
XII. PLATES AND MARKS:			
Presence and legibility of the following in the cockpit: • Placards or pictographs • Operating limit placard	x	x	x
Presence and legibility of external marks: tyre pressure, registration		x	x
XIII. PARTICULAR POINTS TO BE MONITORED:			
Check: • the lack of excess friction of the control surfaces in their housing • the landing gear, • the condition of the structure, mainly the fastening points • play in attachment points of the wings, winglets, stabilizer • scaling of the gel-coat or paint (anti-collision marking or registration) • Check gluing and the condition of the frames and reinforcements in the fuselage		x	x

	S.M.I.	ANNUAL INSPECTION	GENERAL INSPECTION
Repeat this inspection in the following cases: • Landing with gear retracted or during which the gear retracts, • Ground loop at take-off or landing, • Landing obviously rough or during which apparent damage is found on the fuselage upper surface (notches or delamination of the gelcoat)			
XIV. REGULATIONS:			
Record the application of compulsory and/or optional modifications		x	x
Record of the application of service bulletins		x	x
Record of the application of airworthiness instruction *(always compulsory)*	x	x	x
NOTE: This paragraph must be updated along the issuing of applicable regulations			
XV. WEIGHING:			
See method in section 8 Perform a weighing at the General Inspection, or after a repair, or after an important modification Validity of weighing is 5 years			x
XVI. CHECK FLIGHT:			
A check flight must be performed: • After an important repair (class 1) or if a flight control, a control surface or another vital element has been changed, repaired or removed (except reassembling wings and stabilizer on fuselage) • When exiting the General Inspection see flight programme in section 6			x

6.1 Conditions

Weight:	---------- Kg / lb	QFE. TWR:	---------- mb	QAN:	---------- / ----- Kt
Centring:	---------- %	On board QFE:	---------- mb	QFU:	----------°
		Zi at QNH:	---------- m / feet		

6.2 Program

TO BE PERFORMED	TO BE OBTAINED	OBTAINED	COMMENTS
ALIGNED ON RUNWAY		DISCREPANCIES	
Magnetic compass	Matching with QFU + or – 5°		
Altimeter	Matching with QFE + or – 2mb		
Towing system	Satisfactory dropping tests		
TOW FLIGHT			
Climb up to Zp 1000m / 3280ft			Take-off: ---------- h
Anemometric setting	Matching with aircraft values		
Elevator trimming	Satisfactory balancing		
Evolutions behind the towing aircraft	Return possible to position after drifting		
Cable drop and gear retraction	Easy manoeuvre		
LOW SPEED			
Checking of efficiency of controls	Good at 3 axles till stalling speed		
STALLING			
All retracted configuration	About 69 km/h at 340 kg (37.3 kts at 750 lb) About 80 km/h at 455 kg (43.2 kts at 1003 lb)		
Landing configuration (airbrake, landing gear)	About 74 km/h at 340 kg (40 kt at 750 lb) About 85 km/h at 455 kg (45.9 kts at 1003 lb)		
LANDING GEAR MANOEUVRES			
	Good operation, normal efforts Locking "gear up" and "gear down" effective up to Vlo = 170 km/h (92 kts)		

TO BE PERFORMED	TO BE OBTAINED	OBTAINED	COMMENTS
HIGH SPEEDS			
In all retracted configuration : - Solicitation of control surfaces - Max deflection authorized till Va = 170 km/h (92 kts) - 1/3 max. deflection authorized till V_{NE} = 250 km/h (135 kts), (or 220 km/h / 119 kts with winglets)	Good dampening on the 3 axles No tendency for sustained oscillations or vibrations No suction of airbrakes covers Reach V_{NE} in calm air	Vi reached = -------- km/h = -------- kts	
AIRBRAKES EXTENDED			
from Va to V_{NE}, extend several aibrakes out, with entry 0.75 V_{NE}. Beware glider control when unlocking airbrakes	Possible retracting till 190 km/h (102.6 kts) Max strain 20 daN (45 lb)		
DURING FLIGHT			
Main instruments	Good qualitative operation, no misting under the windows, no effect of electric circuits (battery) on magnetic compass		
Particular optional instruments	Qualitative checks of the functions		
Canopy	Good sealing, no aerodynamic noise		
Cockpit ventilation	Proper dosage, efficiency and good distribution Well air-tight when closed		
Return to field:	Approach: Recommended Vi Airbrakes out = 97 km/h (52 kts)		
Landing	brake on wheel Good efficiency and well progressive		

7 REPAIRS

7.1 Regulatory environment

The repairs must be performed by personnel having the skills and qualifications necessary and using documentary data supplied by the manufacturer, in compliance with regulatory requirements enforced (EASA Part M and Part 21).
The repairs must be made using the appropriate materials. These materials must comply with the specifications defined by the manufacturer and be stored as per manufacturer indications (see paragraph 7.5.3).

7.2 Technical data

The basic principle of the repairs is to restore the initial damaged structure by an equivalent structure (same number of plies, same type and orientation for each ply as the original structure).

To avoid local concentration of constraints which are normally distributed homogeneously, it is best not to cause any brutal change in thickness. To this effect, any reparation must be performed so to ensure the fabrics are replaced by others cut with rounded shapes.

The replacement fabrics must have their surfaces enlarged from one layer to the other to ensure gradual transition between the fabrics once installed and glued.

The scarf joint for glassfibre is normally from 1/50 to 1/100 (max thickness / length). Thin glassfibre cannot be scarf-jointed. In this case, the ideal is an overlapping joint.

The length recommended for overlapping joints is the following.

- Dual direction fabric (strands equal in both directions) 10mm (0.39in) for every 100 g/m²) specific weight of fabric.
- Single direction fabric: 20 mm (0.79in) overlapping joint in the direction of the most numerous strands per 100 g/m² specific weight of fabric.

For min overlapping widths, refer to the table in paragraph 7.5.1 (in the min overlap column).

When sanding with sand paper, the water infiltrating the layers of fabric ultimately damages the latter. To this effect, no sanding with glass paper shall be performed with paper requiring water. After repair, any surface where works are made shall be covered in a water-sealed coating (gel-coat on composite external surfaces and paint or gel-coat on other surfaces).

7.3 Classification of repairs

The following elements are considered as being main parts of the structure :

- On the wings:
  - Main spar
  - Wing root rib
  - Small spar
  - Wing coating
  - Control surfaces

- On the fuselage:
  - Fuselage cone behind the wings and vertical stabilizer
  - Zone of wing fastening brackets
  - Horizontal stabilizer
  - Control surfaces

The following classification shows breakages per order of importance.

Class 1	Major breakage requiring partial replacement of an element or requiring an important repair. For example, damage of a part of the structure
Class 2	Small breakage or small holes having perforated a sandwich element and destroyed the glassfibre coats throughout
Class 3	Small breakages or small holes in the external coat without damaging the lower layer or central part
Class 4	Surfaces worn out by friction, scratches, bruises which are not associated with a breakage or perforation

7.4 Repair schematic diagrams

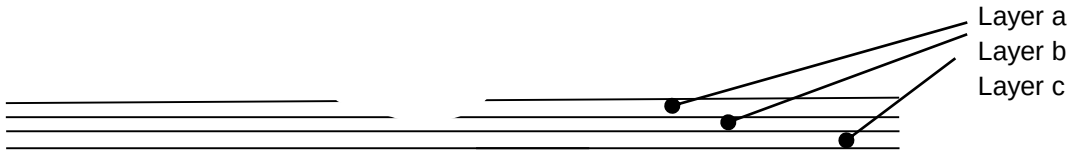
7.4.1 Principle of class 4 repair

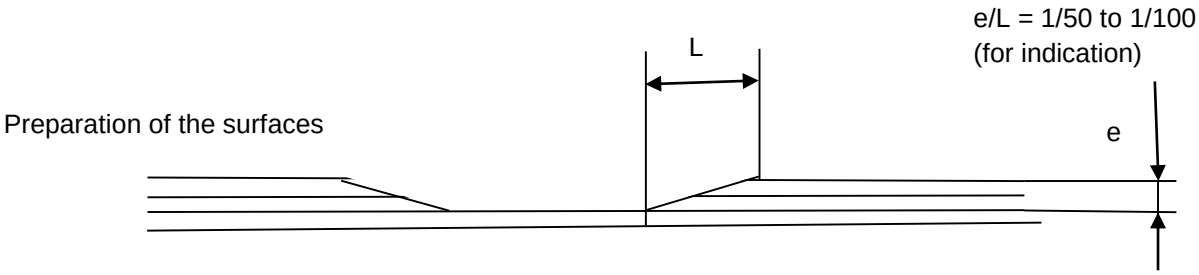
Surfaces damaged by any friction or scratches usually do not require more than a fresh coat of finish paint, considering the fact that the glassfibre structure is not damaged. To this effect, use gelcoat.

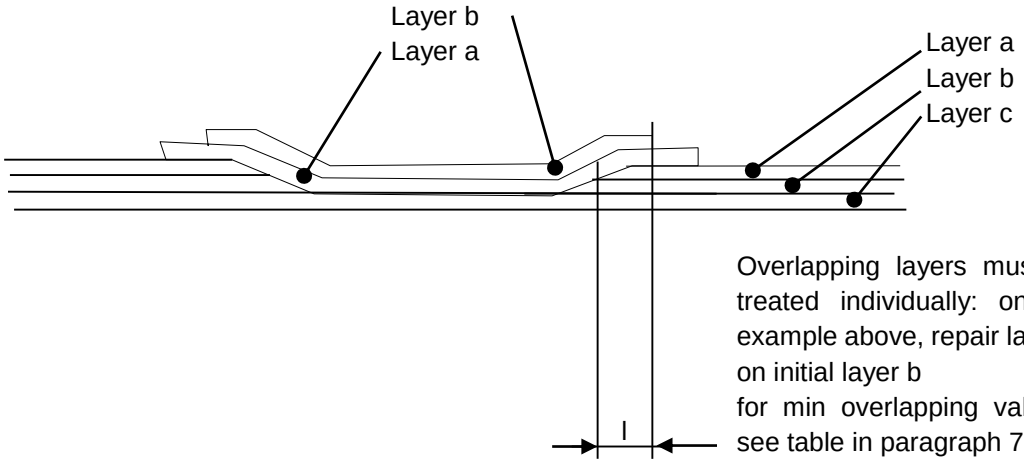
The deepest scratches can be filled using the gel-coat once it has started setting (about 30mn after mixing).
When one or several reinforcement glass fibre coats are damaged without perforating the outside coating, the surface must be cleaned and sanded with sand paper. The damaged layer(s) must be restored (see §7.2), then the entire repaired surface is covered with a very thin coat of gel-coat.

7.4.2 Principle of class 3 repair

Example of monolithic structure damage without perforation of the layer

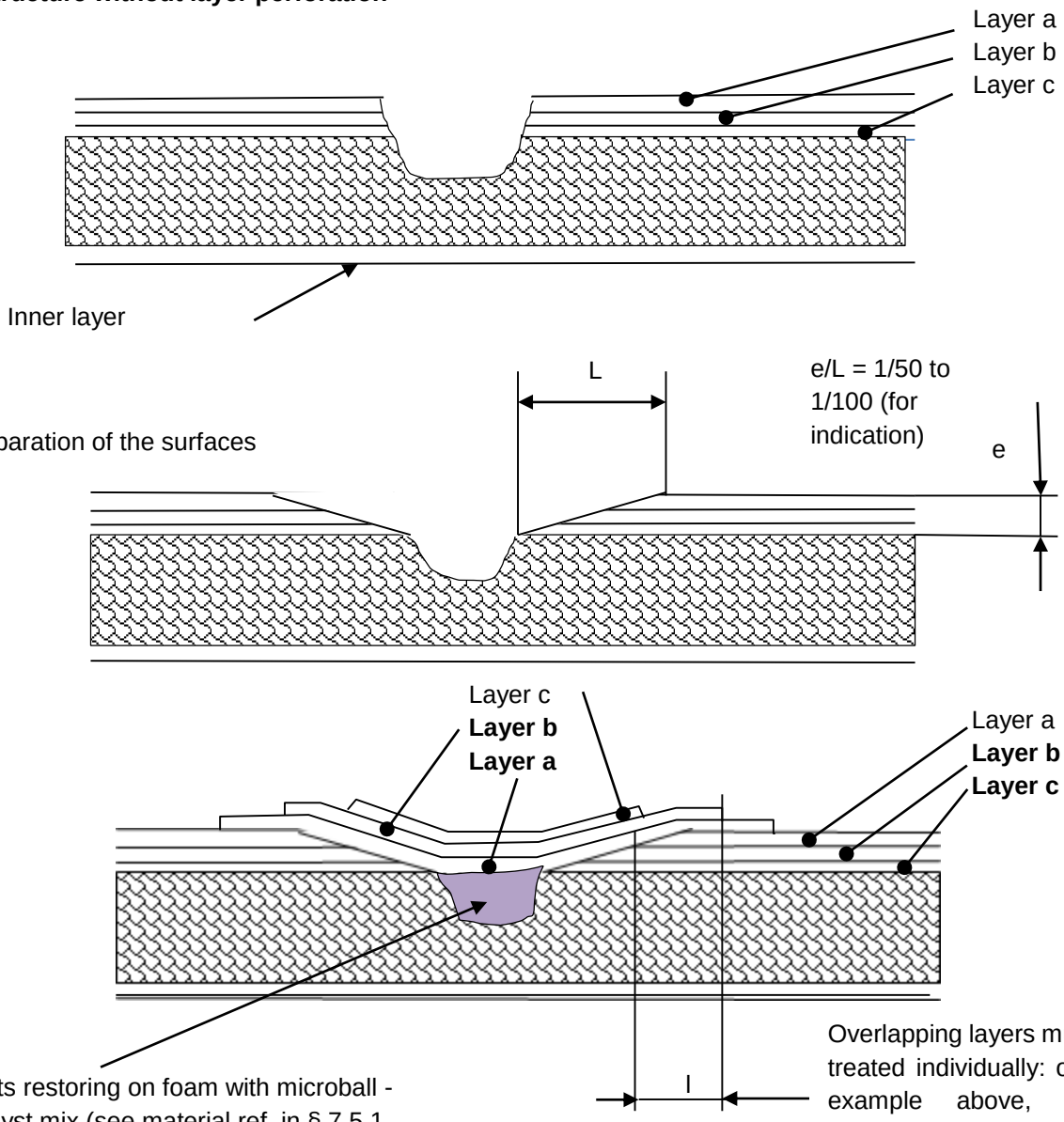






Overlapping layers must be treated individually: on the example above, repair layer b on initial layer b
for min overlapping value l, see table in paragraph 7.5.1

example of damage on sandwich structure without layer perforation



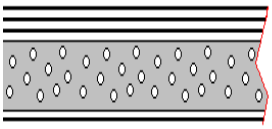
Small faults restoring on foam with microball - resin/catalyst mix (see material ref. in § 7.5.1 and 7.5.2).

Overlapping layers must be treated individually: on the example above, repair layer b on initial layer b **for min overlapping value l, see table in paragraph 7.5.1**

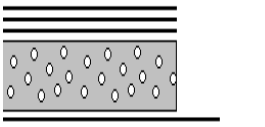
7.4.3 principle of class 2 repair

Example of damage with perforation of external and internal layers of the sandwich structure

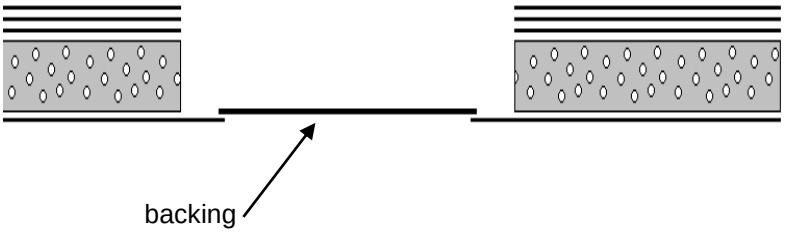
structure sandwich



Operating phases:
Hole enlarged and edges cleaned

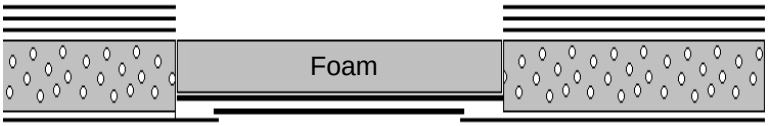


Internal skin scarf joint preparation



Gluing pre-moulded backing over about 2 mm (example of technical solution, can be replaced by a backing glued onto the external face of the inner layer). In both cases, if this backing is maintained in place after the repair, it must be as light as possible.

Stratification of internal skins:
Overlapping layers must be treated individually: on the example shown, repair layer (a) on initial layer (a).
For mini overlapping value, see paragraph 7.5.1



Gluing the piece of foam with microball and resin/catalyst mix (see § 7.5.1 and 7.5.2)
Note: maintain the foam under slight pressure to evacuate any bubbles

Profiling the foam and preparation of external skin scarf joint (see class 3 repair in previous page)

a
b
c

Stratification of external skins: ditto class 3 repair defined in the previous page.
Maintain by vacuum (recommended) or mechanical holding (by counterweight..)

7.4.4 Class 1 repair

The principles of class 1 repair are the same as those of class 2 or 3 repairs described previously.
According to the size of the structure degradation, it may be necessary to fabricate on a workbench a piece of structure to be applied to the structure to be repaired with principles identical to those described above.
Check that the geometry of these applied pieces perfectly matches the curve of the initial structure.

7.5 Repair materials

All repair materials can be supplied by SN CENTRAIR.

Before any repair, always determine the number of glassfibre layers, the weight in g/m² glassfibre used and the prevalent direction of the fibre strands.
This information can be obtained from the manufacturer.

The resin-catalyst mix must be made at ambient temperatures of about 20°C (18° to 25°C).

When the mix starts setting, or in other words, when it becomes particularly viscous, it is no longer usable. In this condition, the epoxy has lost its ability to penetrate and impregnate the glassfibre properly.

For class 1 and 2 repairs, as well as for class 3 repairs over large surfaces, the parts repaired must be polymerized in a stove *(12h at 55°C mini).*

The polymerization of other class 3 or class 4 repairs can be ensured with a hair dryer for example (not to close to the surface to avoid overheating).

7.5.1 Materials used

- **Fabrics:**
See table page 7.7

- **Resin**
Reference SN CENTRAIR 200001

- **Hardener:**
Reference SN CENTRAIR 200002

- **Charge:**
Silica powder ref SN CENTRAIR 260008
Phenolic microball ref. SN CENTRAIR 260004
Whitened cotton fibre ref. SN CENTRAIR 260005
Hollow glass microsphere ref. SN CENTRAIR 260019

- **Gelcoat:**
Reference SN CENTRAIR 240008 with catalyst 240010 (for external surfaces)

- **Foam for wing sandwich**
Foam reference SN CENTRAIR 280018

Fabrics used:

REFERENCES SN CENTRAIR	REFERENCES Interglass for info	TYPE	WEAVING	OVERLAP MIN	
				mm	in
220026	90070	GLASS E	BIDIRECTIONAL	10	0.39
220027	92110	GLASS E	BIDIRECTIONAL	17	0.67
220028	92125	GLASS E	BIDIRECTIONAL	28	1.1
220030	92140	GLASS E	BIDIRECTIONAL	39	1.54
220031	92145	GLASS E	SINGLE DIRECTION	44 or edge to edge	1.73 or edge to edge
220032	92146	GLASS E	SINGLE DIRECTION	44 or edge to edge	1.73 or edge to edge
220008	02902	CARBON	SINGLE DIRECTION	50 or edge to edge	1.97 or edge to edge

7.5.2 Conditions of use of the products

In all cases, mixes are made at ambient temperature.

- **Surface paint**

Gelcoat : 100 parts in weight
Hardening agent or catalyst 2 parts in weight
Diluter : 0 to 20 parts in weight

Mixing gelcoat, its catalyst and diluter is ensured by:
- Successive weighings
- Graded containers or pipettes for the catalyst and diluter.

Stirring is performed manually *(stick)* or using an electric mixer.

- **Resin**

The proportions are:
Resin : 100 + or – 1 parts in weight
Hardener : 38 + or – 0.5 parts in weight

- **Gluing pastes**

The gluing of the different parts together is ensuring by specific mixes adapted to the needs. These mixes must be requested from the manufacturer for each application.

7.5.3 Material storage

- Glass fabrics: Storage in a dry location at about 20°C. Leave the fabric roller horizontal to avoid compaction (warped or torn fabric).
- They may require stoving before use according to the storage conditions implemented. (the stoving conditions must be defined individually).

- Resin: storage in a dry location away from light and observe the storage temperature conditions (ambient temperature between 18 and 25°C).

- Check the expiry dates before use.

7.6 Conclusion

The determining factors for proper repairing are:

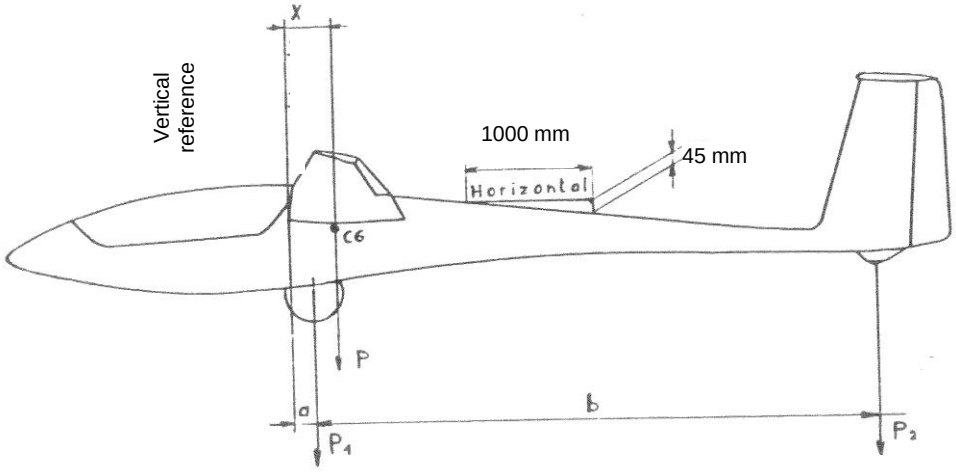
1. A well-lit room, with a regular temperature (20°C) and dry (60% max relative humidity).
2. Avoid any trace of grease or sweat from your hands
3. Use materials complying with manufacturer specifications.
4. Use glass fabric in good condition stored in a dry room.
5. Observe the expiry dates of the products as well as the expiry and use times.

After a major repair, weigh as indicated in page 8.1 and check that the idle centre of gravity is actually within the tolerances defined by the graph in page 8.2.

Then calculate balance in different loading cases as indicated in pages 8.3 and 8.4 **to determine, when necessary, a new** removable ballast table according to the pilot's weight.

8.1 Weighing

- Longitudinal reference : Wing leading edge at wing root
- Levelling means : On top surface of fuselage cone, level using a gradient wedge of 45/1000
- Center of gravity range when loaded :
  - Front: Ca = 0.230 m (9.06in)
  - Rear: Cr = 0.375 m (14.76in)



Support	Lever arm (m) (ft)	Weight (kg) (lbs)	Empty weight lever arm : Xo (B L V in m or feet)
Front P1	a = …….	…….	$Xo = P2 * \frac{b}{P1+P2}$ + a =……
Back P2	b = …….	…….	

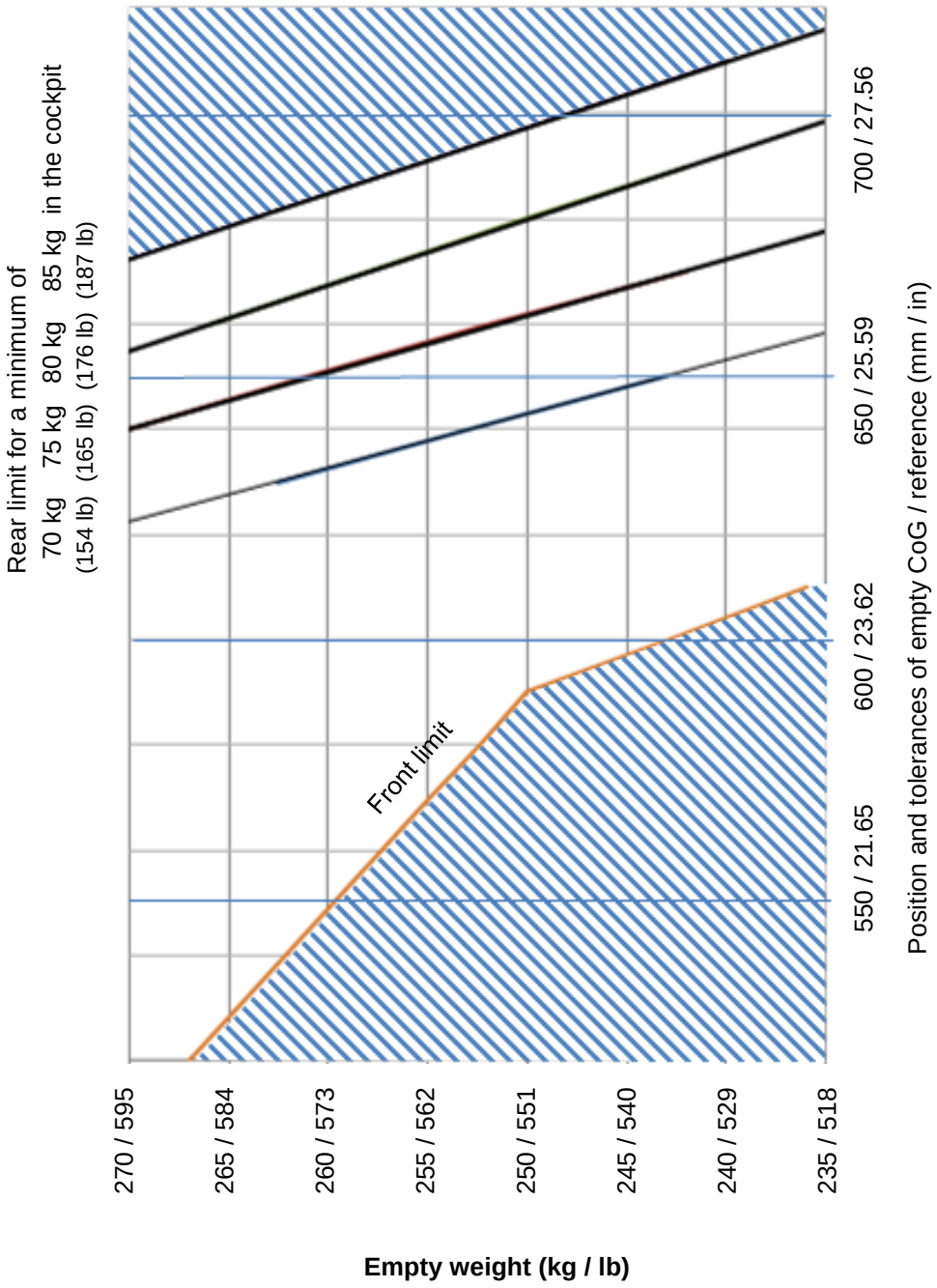
Mini pilot weight = $MVE * \frac{Xo-Cr}{L+Cr}$

Max pilot weight = $MVE * \frac{Xo-Ca}{L+Ca}$ or useful load minus optional equipment: **use the lowest value**

Xo = empty lever arm
Cr = rear centring limit
Ca = front centring limit
MVE = equipped empty weight

Median pilot lever arm: L = 0.65m (25.6in)

8.2 Balance graph when empty



8.3 CG position when loaded

By using the data in page 8.4, check that the balance of the loaded glider is still within the limits authorized (X from 0.230 to 0.375 m or 9.06 to 14.76 in) for the different pilot weights without and with lead discs. If the chart for balance recuperation by removable ballast, as provided in the flight manual and below mentioned, cannot be applied, then determine a new specific chart for the given glider.

NB: After an important repair in front of the fuselage, a fixed ballast can be added, if required, at the level of the tail skid to correct balance (use the manufacturer drawing).

Balance recuperation chart with removable ballast for a glider with standard equipment and not repaired

Number of ballasts	Equipped min pilot weight (kg / lb)
0	70 / 154.3
1	67 / 147.7
2	65 / 143.3
3	63 / 138.9
4	61 / 134.5
5	59 / 130.1
6	57 / 125.7
7	55 / 121.3

Weight of a ballast: 1 kg +/- 20g (2.2+/- 0.044 lb)

8.4 Arithmetic calculation of balance

Example of balance calculation:		
Glider serial number:	101 ……	
Registered:	……	
Glider lever arm empty (BLV) =	……. m	(……. in)
Equipped empty weight (MVE):	…… kg	(……. Lbs)
Lever arm of the removable elements:		
Lead discs	- 1.84 m (- 72.44 in)	
Dashboard	- 1.10 m (- 43.31 in)	
Pilot	- 0.65 m (- 25.59 in)	
Water-ballasts	+ 0.15 m (+ 5.91 in)	
Battery	+ 0.65 m (+ 25.59 in) or + 0.15 m (+ 5.91 in)	
Oxygen bottle	+ 0.20 m (+ 7.87 in)	

Example of balance calculation

Designation	Weights (kg)		Lever arm (m)		Moments
Equipped empty glider MVE	255	x	0.630 (BLV)	=	160.65
Pilot fitted with parachute	77	x	- 0.65	=	- 50.05
Lead discs	0	x	- 1.84	=	0
VHF radio	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	455 kg (1003 lb)				129.3 m.kg / 935 ft.lb

$X = \frac{129.3}{455}$ 0.284 m (11.2in)

Reference chord (root): c= 0.887 m (34.92 in) hence the position of the centre of gravity in % of chord:

0.284/0.887 = 0.32 i.e. 32%

Calculation table

Designation	Weights kg (lbs)	x	Lever arm m (in)	=	Moments m.kg (in.lbs)
Equipped empty glider MVE	…….	x	…….	=	…….
Pilot fitted with parachute	…….	x	…….	=	…….
Ballasts	…….	x	…….	=	…….
Additional instrument panel equipment	…….	x	…….	=	…….
Battery	…….	x	…….	=	…….
Water-ballasts	…….	x	…….	=	…….
Additional equipment	…….	x	…….	=	…….

Total weight = ……. Total moment =…….

Balance $X = \frac{Total\ moment}{Total\ weight}$ = ……. m (…….in)