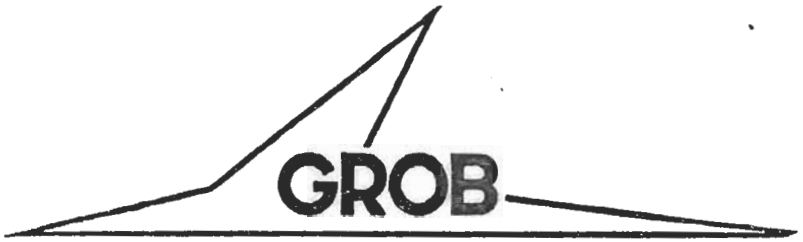

REPAIR INSTRUCTIONS

GROB G 102
CLUB ASTIR III
CLUB ASTIR III b
STANDARD ASTIR III

Manufactured by:
Burkhart Grob Flugzeugbau
8939 Mattsies
Flugplatz Mindelheim-Mattsies
West Germany
Telefon 08268/411
Telex 539 623

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1. Foreword

The Gliders are constructed from Glass-Fibre reinforced Plastic (GFK). The fuselage consist of GFK laminate, and is localy reinforced by carbon fibre ribbons at wings and tailplane the laminate is f oam supported. The rudder consists of GFK-Styropur-Sandwich.

2. Authorized materials and suppliers

Resin:	BASF Glycidäther 162 100 parts	or	Rütapox L 20 100 parts
Hardener:	BASF Laromin C 260 38 parts		Rütapox VE 2896 18 parts

Ratio by weight parts

Glass Fibre Cloth

Supplier: Interglas Textil GmbH. Söflinger Str. 246, 7900 Ulm

Use	Cloth	Weight g/qm	Interglas-Nr.
Fuselage	Double Twill	161	92 110
	Double Twill	390	92 140
	Chain Reinforced	433	92 146
	~~Cross Twill~~	~~106~~	~~91111~~
Wings	Double Twill	161	92 110
	Double Twill	276	92 125
	~~Cross Twill~~	~~106~~	~~91111~~
Elevator, Rudder and Ailerons	Double Twill	276	92 125
	Double Twill	161	92 110

All Glass-Fibre cloth is Alcholine free E-Glass with volan A-Finish or Finish I.550.

	Supplier:
Glass Fibre Rovings	
EC 10 -2400 K 43 or EC 9-756 K 43	Gevetex 4000 Düsseldorf Postfach 1205
Foam Material	
PVC-Hartschaum Conticell 60 6 and 8 mm large Spec. Weight 60 kg/m³	Continental AG 3000 Hannover

Styropor:

Thermopete 4 mm large Spec. Weight 15 kg/m³	Poron-Werke GmbH 6122 Erbach Brunnenstraße 5
Depron 3 mm large Spec. Weight 15 kg/m³	Firma Kalle 6202 Wiesbaden/Bibrich

Filling Material for Resin

Microballoons brown	Lackfabrik Bäder KG 7300 Eßlingen Schließfach 25
Cotton Flock Type FL 1 f	Schwarzwälder Textil-Werke 7623 Schenkenzell Postfach 12

Paint

PE-Schwabbellack White. No. 03-69066 UP-Hardener No. 07-20510 100 Schwabbellack Paint (Gel-Coat) 3 Hardener mix ratio by Weight. Thinner No. 06-30260	Lesonal-Werke 7000 Stuttgart 30 Postfach 30 07 09

Red Paint

Nitro-Cellulose-Kombilack Orange RAL 2004	Lackfabrik Bäder KG 7300 Eßlingen Schließfach 25

Carbon Fibre Cloth:

Sigratex KDU/NF 46-7,5 (6000 Filamente)	Fa. Sigri Elektrographit GmbH. D-8901 Meitingen

3. Simplified "Texture" plan

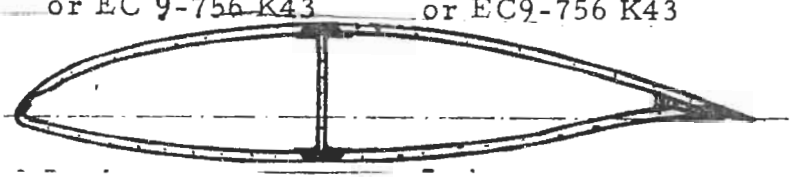
Reinforced regions for special loads and stress conducting are not shown.

1. Flügel

Außenlaminat
1 Lage 91111 längs
1 Lage 92 125 diagonal
Kern
Conticell 60, 8 mm
Innenlaminat
1 Lage 92 125 diagonal
Membrane des
ELASTIC Flap
2 Lagen 92 110 diagonal
1 Lage 92 110 längs
Holmgurt
Glasseidenroving
EC 10 -2400k43
or EC 9-756 K43

Wing

Outer laminate
1 Layer 91111 lengths
1 Layer 92 125 diagonal
Core
Conticell 60, 8 mm
Inner laminate
1 Layer 92 125 diagonal
Membrane of
Elastic Flap
2 Layer 92 110 diagonal
1 Layer 92 110 lengths
Spar
Glas fibre
EC 10 -2400k43
or EC9-756 K43



2. Rumpf

von außen nach innen
1 Lage 92 110 längs
1 Lage 92 146 längs
3 Lagen 92 140 diagonal

Fuselage

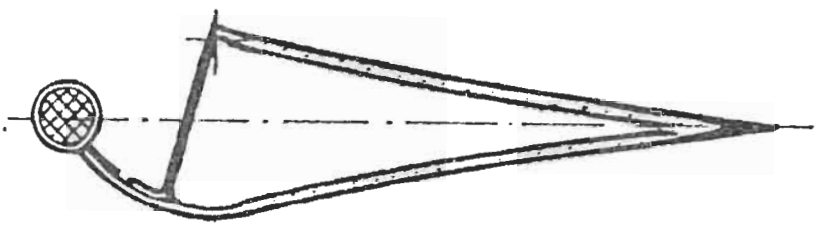
From outside to inside
1 Layer 92 110 lengths
1 Layer 92 146 lengths
3 Layers 92 140 diagonal

3. Ruder

Seitenruder rechts und links
2 Lagen 92 110 diagonal
Kern: Depron 4 mm
1 Lage 92 110 diagonal

Controls

Rudder left and right
2 Layers 92 110 diagonal
Core: Depron 4 mm
1 Layer 92 110 diagonal



Höhenruder oben und unten
1 Lage 91 111 längs
2 Lagen 92 110 diagonal
Kern Depron 4 mm
Querruder oben wie Flügel
Querruder unten
1 Lage 91 111 längs
1 Lage 92 110 diagonal
Kern: Depron 4 mm

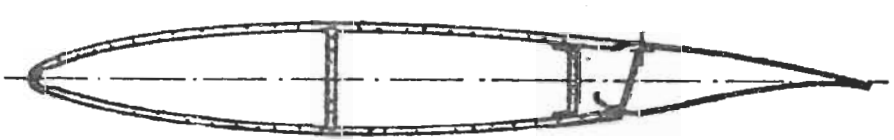
Elevator a bove and below
1 Layer 91 111 length
1 Layer 92 110 diagonal
Core Depron 4 mm
Aileron above like wing
Aileron below
1 Layer 91 111 length
1 Layer 92 110 diagonal
Core: Depron 4 mm

4. Höhenflosse

1 Lage 91 111 längs
1 Lage 92 110 diagonal
Kern: Conticell 60/6 mm
1 Lage 92 110 diagonal

Fin

1 Layer 91 111 length
1 Layer 92 110 diagonal
Core: Conticell 60/6 mm
1 Layer 92 110 diagonal



4. Repair of GFK material

If the glider is damaged, first examine the outer surface very carefully, frequently other structural parts are involved, fractures can run unseen under the outer surface.

Carry-out repairs with extreme care. As the outer surface of GFK gliders is stressed (loading bearing), failure of this skin can lead to structural failure.

Keep to the Resin-Hardening mixing ratio exactly (± 0.5%) using a clean mixing pot. The ratio of Glass fibre — to Resin mix is approximately 1 to 1. Grind or splice the repair, before laying damp laminate on it, so that dirt cannot penetrate and stop safe adhesion.

As in plywood, the direction of the fibre glass cloth lay (length or diagonal) is of extreme importance to its strength. It is necessary to know approximately how many fibre and their direction in the damaged part with reference to the simplified texture plan, so it may be restored to the correct wall strength. If a small piece of the damaged laminate is broken off and burnt, the remaining glass-fibres can be counted and identified.

Splicing and grinding are time consuming, to save trouble, grind only as much away as necessary, only to the size of the cloth patch. When it is necessary to shorten the repair time it may be done with a hot air blower to speed the resin hardening time.

Warning. A too high temperature will produce large air bubbles in the cloth. A tent can be built out of foil, through which hot air can be guided, and thereby avoiding local overheating. In making repairs to control surfaces, be careful not to increase their weight as there is danger of creating flutter conditions.

5. Damage to section GFK Foam-Sandwich
(GFK Hard-Foam-Sandwich)

It can appear that only the outer surface (the outside laminate) is damaged but it can also happen that the whole skin (outside and inside hard foam laminate) is destroyed.

a) Important (Figure 1, Page 9)

With a split or fracture, the laminate can become detached from the supporting foam. Start by removing loose laminate until firm laminate is reached. To remove the foam laminate use a grinding disk, grinding block or sharp knife. With a grinding block or sharp knife only remove the cloth around the damage. Splice ratio per cloth covering approximately 20 mm. Ratio laminate thicknes to splice: approximately 1:50.

After grinding out the splice, the repair must be thoroughly cleaned. Remove the dirt (also out of the foam pores) with compressed air. Wash the splice with carbon tetrachloride or Acetone, in case it has been contaminated with dirt or grease.

Fill up the pores of the foam with Resin and Microballoons until it is smooth. Then join the laminates with the correct cloth, laying it in the right direction.

Repairs must be dirt and grease free.

At room temperature the resin will harden in about 8 hours.

The repair can now be ground smooth and be painted.

Warning: Grind only to the edge of the repair.

b) Damage to the whole of the Sandwich (Figure 2, Page 9)

When the inner laminate is destroyed, so there is no binding with the foam, widen the hole so far as foam material is secure, then it is possible to repair the inner laminate. A edge of at least 20 mm must be obtained (retaining laminates thickness : splice ratio approximately 1:50).

The inner laminate must be carefully ground and cleaned.

The outer laminate is repaired as described in section a).

With „minor" damage a piece of thin plywood support can be glued with Pattex from within on the inner skin, the cloth patch of the inner laminate can then be layed in and the hole filled with resin and Microballons mixed with Styroporballs. When hardend (app. 8 hours room temperature) the outer surface can be ground smooth and the outer cloth put on.

The plywood support should remain as part of the repair. When the hole is of large or of long size the plywood support should be held in place with thin nails which can be removed later, by pushing them out from the top surface.

Warning: The plywood support must be well jointed to avoid wrinkles in the cloth. (Figure 3)

With large holes in the sandwich, the weight of the Microballoons filler must be considered. A piece of Conticell hard foam is made before-hand, which exactly fits into the existing hole. The inside pores are closed with resin and Microballoons and laid on the inner cloth to harden, until the foam is just bendable (hot air). Then the foam with thickened resin (cotton flock-Microballoons) can be glued in the hole. Microballoons are used to close the outside pores, the repair is then ground and the outside cloth is then laid on.

6. **Damage to section of GFK Styropor-Sandwich** (Figure 3, Page 9)

Repair of Styropor damage of section.

The Styropor has a closed upper surface, the cloth is held with pure or lightly thickened resin. Splits in the upper surface pores can be filled. With large damage put a patch inside and allow to harden first before working further. This will stop the structure wrinkling.

Warning: Do not use strong heat to speed up hardening time, or Styropor will develop blisters and the repair must be done again.

7. Damage to section of GFK laminate (Figure 4, Page 9)

Repairs to GFK laminate are simple. Splice the laminate around the hole, lay the cloth in layers on (largest patch first) and after 2–3 hours, when the resin has partially hardened smooth over with resin and Microballoons. Splice length pro cloth layer app. 20 mm. Retaining laminate thickness : Splice ratio 1:50. In case the splice is dirty it can be cleaned with Carbon Tetrochloride or Acetone.

With large damage an under laying support (plywood) should be used. Wet laminate should not bridge a gap of more than 20 mm unsupported. The plywood support can be held in place with Pattex glue and nails (e. g. metal fitting in fuselage) which can be removed afterwards.

1 Lage 91 111
1 Layer 91 111

1 Lage 92 125
1 Layer 92 125

Abb. 1
Fig. 1

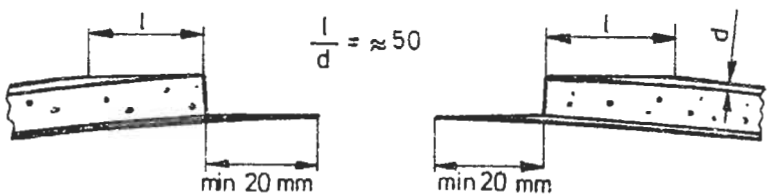


Abb. 2
Fig. 2

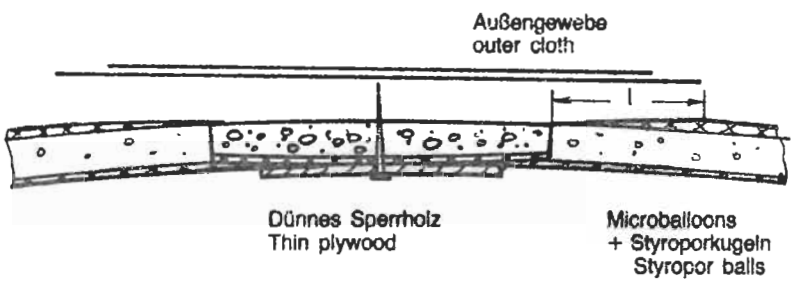


Abb. 3
Fig. 3

Rumpfschale
Fuselage skin

1 Lage 92 146
1 Layer 92146

1 Lage 92 110
1 Layer 92 110

3 Lagen 92 140
3 Layers 92 140

Abb. 4
Fig. 4

8. Damage to parts with Carbon Fibre reinforcement

The fuselage is reinfirced with Carbon fibre tape. Repairs are carried out as described in sections 7. Here too the depth to length ratio of the scarf must be 1 : 50.

9 Damage to Spar Caps

The spar caps are made of Glas rovings. In the outer wing (starting at 6 m spread area) they are made of Glas fibre tapes. Whenever a spar cap is broken it necessitates a major repair (See under section 12). Before repairs consult the manufacturer.

10. Paint-work

As soon as the laminate of the repaired section is hard, it can be rough ground with (80 grit) sandpaper. Large uneveness must be filled and smoothed with white polyester filler. Then with fine dry-grinding paper (150 grit) until a moderately smooth outer surface is produced. Before painting, the repaired section must be perfectly cleaned from grinding dust, separated mediums and other foreign bodies.

For successful painting, with Gel-Coat (Schwabbellack + hardener) a not too large brush should be used, putting on several thin coats, until the laminate can no longer be seen.

The first coat should be allowed to harden and then ground with (360 grit wet paper) additional coats should then be added and likewise ground.

The final finish should be carried out with 600 grit or 800 grit Wet and Dry grinding paper and then polished with a silicon-free car polish or with hard-wax, using a polishing machine.

11. Repair of Metal Fittings

a) Damage to Steel Fittings

Repair of damage to fittings made of steel should only be accomplished after approved procedures are obtained from the manufacturer.

Welded steel fitting (push rods) out of 1.7734.4 or 1.0308.1 (St. 35.4). Welding only to be carried out with WIG Welding method (Wolfram-Inert-Gasschmelzschweißung) and with welding material 1.7734.2 (for 1.7734.4) and 1.7324.0 (for 1.0308.0 or combination of 1.7734.4 and 1.0308.1)

b) Damage to Aluminium Castings

Repair of Aluminium castings 3.2374.6 (GALSi7 Mgwa) cannot be carried out. Fractured or bent Aluminium castings must be replaced by new ones.

Warning: Bent or chipped Aluminium castings are not under any circumstances to be straightened.

c) Main Wing and Fuselage fittings

The main fitting between wing and fuselage (4x in the fuselage) 6 steel balls (ø 6 mm) are contained in each fitting. The balls are forced by a sliding cover through the lock shell into a groove in the moveable lateral axis force bolts in the spar caps thus securing the wings.

Faults of one or more balls, the connecting fitting should be changed.

d) Control rods

The Control Rods are made from:

Aluminium tube 20x1 Type 3. 3214. 5 or ALMg Si 0, 5F20

Steeltube 16x1 Type 1. 7734. 4

Aluminium control rods that have been buckled, kinked or badly bent must not be straightened.

12 Major repairs

Major repairs are only to be carried out by the manufacturer or by an agent (who has the authorization of the manufacturer.).
Major repairs are:

— **Broken** off wing, fuselage, tailplane, control surface, spar stumps (spar caps)

— **Ripped or torn-out** - Main fittings (in fuselage ø 45 x 3, Fitting of the tailplane in fin. In the wing, aileron securing both ø 18 mm, joining bearing GE 20. Spar cap bolts ø 20 mm).

— Destruction of main rib (vertical frame)

— Damage to the GFK laminate (tear, splits, cracks immediately near the main fittings).

13. Construction details of extra equipment attachment fittings

The fittings for the oxygen bottles are built in as standard on the right side of the luggage compartment. Bearing stands and quick action lock can be obtained from the manufacturer.

Other fitting points can be installed by the owner. (Figure 5)

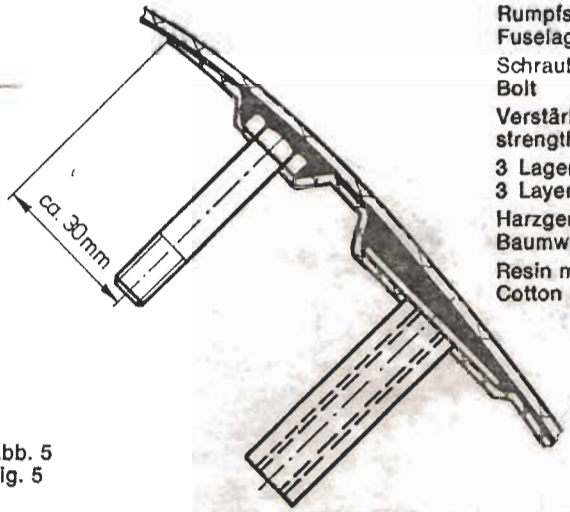


Abb. 5
Fig. 5

The fitting must be made as shown in the drawing so as to take the weight of the additional equipment. Fittings made in this manner must stand a load 10 g without failure.

When additional equipment is fitted the glider must be re-weighed to check if the C of G is within the permitted limits.

Blueprints for the installation of radio and oxygen equipment are obtainable from the manufacturer.