

SCHEIBE FLUGZEUGBAU GMBH  
August-Pfaltz-Str.23

D - 8060 Dachau  
Tel. (08131) 72083 and 72084



# REPAIR INSTRUCTIONS

for the  
**SF 34**  
Sailplane

This Repair Instructions is for U.S. registered gliders.

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Approval of translation has been done by best knowledge and judgement - in any case the original text in German language is authoritative.

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### 1. Foreword

The SF 34 glider is made of glass-re-inforced plastic (GFK). The fuselage consists of a GFK skin (laminate), GFK bulkheads and GFK stringers. A solid foam coating supports the GFK monocoque in the wings and in the tailplane and fin (GFK-foam sandwich).

## 2. Materials and Suppliers

### Resin system

Obtainable from: Bakelite, 4100 Duisburg 12,  
West Germany.

Resin: Rutapox-Epoxydharz L 20

Mix-ratio: 100 parts resin-18 parts hardener	VE
	2696
100 parts resin-19 parts hardener	VE
	2776
100 parts resin-27 parts hardener	H 91

### Glass silk fabric

Obtainable from Interglas Textil, 7900 Ulm,  
Söflingerstr.246  
W. Germany<sup>2</sup>

No.92110 (body compound; weight  $161/m^2$ ) and  
No. 92125 (body compound; weight  $276/m^2$ ).

Both fabrics consist of alkali-free E-Glass with  
Volan-A-Finish of Finish I 550.

### Rovings

Obtainable from Gevetex Textilglas, 5100 Aachen,  
West-Germany.

VETROTEX - glass silk roving EC10-2400-K43 (80),<sup>α</sup>

VETROTEX - glass silk roving EC 9-756-K43 (68).

### Foam

Wing monocoque, fin and tailplane:

"Contical 60", PVC-solid foam, 8mm thick (speci-  
fic gravity of  $60kg/m^3$ ) obtainable from Continen-  
tal, 3000 Hannover, West Germany.

Wing spar

"Rohacell 71", PMI - solid foam, 8mm thick, (specific gravity of 70kg/m<sup>3</sup>) obtainable from Roehm, 1100 Darmstadt, West Germany.

Control surfaces

"Rohacel 31", solid-foam 3mm thick obtainable from Rhoem, 6100 Darmstadt, West Germany.

Resin filler

White cotton flakes "FL1", obtainable from Schwartzwaelder Textilwerke, 7623 Schenkenzell, West Germany.

Microballoons BJO-0930 (brown) obtainable from Brenntag, 4300 Mülheim, West Germany.

Filler

"Ferro Elastic weiss M.H." obtainable from Geier und Voss, 8201 Kolbermoor, West Germany.

Cover Resin

Obtainable from Lesonal, 7000 Stuttgart 30, West Germany.

"UP-Vorgelat 03-69100", white

"Hardener 07-20510"

"Thinners 06-30260"

Lacquer for the registration sign

"Acrylatlack K1. 50 RAL 7036", grey, obtainable from Lesonal, 7000 Stuttgart 30, West Germany.

Warning lacquer

"Acrylatlack K1. 50 RAL 2004", orange, obtainable from Lesonal, 7000 Stuttgart 30, West Germany.

3. Simplified fabric covering chart SF 34

Reinforcements for the heavy duty areas and for the face intakes are not listed.

## 1. Wings

Outside laminate

1 layer 92 110 diagonal

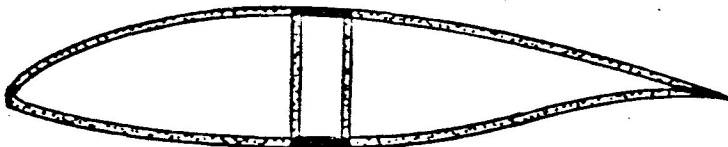
1 layer 92 125 diagonal

Core

"Conticell 60", 8mm

Inside laminate

1 layer 92 125 diagonal



## 2. Fuselage

From outside to inside

1 layer 92 110 diagonal

2 layers 92 125 diagonal

## 3. Control surfaces

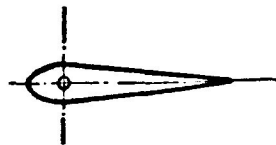
Outside laminate

2 layers 92 110 diagonal

Core: "Rohacell 31", 3mm

Inside laminate:

1 layer 92 110 diagonal



## 4. Tailplane and fin

Outside laminate:

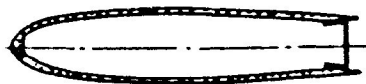
1 layer 92 110 diagonal

1 layer 92 125 diagonal

Core: "Conticell 60", 8mm

Inside laminate:

1 layer 92 125 diagonal



#### 4. Repair of GFK components

If you discover any damage to the glider asses its gravity. Often other components are affected as well and sometimes the crack continues beneath the skin.

Exercise the greatest care when repairing. The outside skin of GFK gliders is exposed to force - failure of this stress compound may lead to a crash.

The ration of glass weight to resin-mix weight should be approx. 50:50. Abrade the damaged part just shortly before applying the wet laminate in order to avoid dirt contamination which would otherwise prevent safe contact.

Ensure that the exact proportions of ingredients are used ( $\pm$  0.5%) when mixing.

As with plywood, the alignment of the fabric fibres (longitudinal or diagonal) is crucial. Refer to the simplified fabric chart to determine how many fabric layers are approximately needed to restore the strength of the damaged component.

Always measure the wall thickness of the damaged laminate. If you break out a piece and burn it, the resin evaporates and you are left with the glass silk fabric. Thus you can identify type, number of layers and alignment.

Producing a tapered overlap is a tedious matter. However, make the effort and abrade as much as is needed so that the fabric patches do not rise above the contour. Do not abrade them completely because of aesthetic considerations. If you are in a hurry and wish to shorten the hardening time either use a "faster" hardener (VE 2778 or H 91) or increase the ambient temperature with a heater.

Warning: too high a temperature causes big bubbles in the fabric. You may want to construct a foil tent through which to channel the heat to avoid local overheating.

Please be careful to ensure that the repair does not result in an increase in weight of a control surface. Otherwise there is the danger of flutter.

#### 5. Damage to section of GFK foam-sandwich

Either the skin only (outside laminate) or the whole monocoque (outside and inside laminate as well as solid foam) may be destroyed.

##### a) Simple skin damage (see diagram No.1)

The laminate around a crack might have separated from the foam support. Determine that region by tapping. After that remove the separated laminate (abrasive wheel, grinding block, sharp knife). Splice the fabric around the damaged area with a grinding block so as to produce a tapered overlap. The length of the tapered overlap per layer should be approx. 20mm; and the ratio of laminate thickness to length of tapered overlap is approx. 1:50. Clean the damaged area thoroughly after splicing:

- Remove grinding dust (from the foam pores, too) with air pressure
- wash the tapered overlay with carbon tetrachloride or acetone, if dirt or grease has settled on it during splicing.

Now fill any recesses and the foam pores with resin and microballoons. Afterwards apply the required fabric layers, making sure that you align them properly.

Important: Biggest patch first. Avoid any dust and grease.

At room temperature the resin needs approx. 8 hours to harden. The repaired area can now be sanded, smoothed out and a new laquer finish can be applied.

Warning: abrade the edges of the fabric patches only.

b) Damage to the whole sandwich (diagram no.2)

If the inside laminate is destroyed first remove the outside laminate which has no firm contact with the foam. Now enlarge the hole until the inside laminate also sticks to the foam. In order to repair the inside laminate you have to remove as much support foam as is needed to leave an overhang of at least 20 mm (ratio of laminate thickness to overhang approx. 1:50).

Proceed with splicing the outside laminate as described under heading (a). Clean the foam off the laminate and abrade carefully. If the damage is small glue thin plywood on to the monocoque from the inside, inlay the fabric patches of the inside laminate and fill the hole with resin and microballoons mixed with polystyrene balls. After hardening (approx. 8 hours at room temperature) smoothen out the surface and apply the outside fabric.

The plywood support can be inserted through the monocoque if the hole is oblong.

If you put one or more tacks through the plywood you can pull it against the monocoque from the outside.

**Important:** the plywood support has to be built well everywhere.  
Avoid steps in the fabric.

Use solid foam instead of the microballoon filler for bigger holes in a sandwich because of weight considerations. Prepare a foam piece which exactly fits into the hole, cover the pores on the inside with resin and microballoons and put the inside fabric (which has to harden) on top. You can bend this foam, coated on one side, even after it has hardened (use heater if necessary). You can now glue the foam into the hole using thickened resin (cotton flakes, microballoons). Abrade the top side and cover the pores with microballoons. Apply the outside fabric.



6. Damage to components made of pure GFK(diagram no.3)

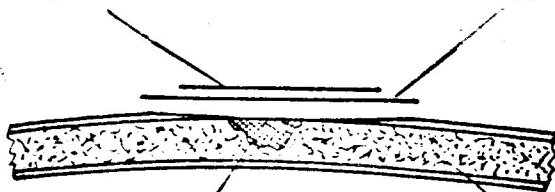
This is easy: produce a tapered overlap around the hole, apply the fabric patches (biggest patch first) and after 2 to 3 hours, when the resin has already caught, you can make the area smooth with resin and microballoons. Length of tapered overlap per fabric layer approx. 20 mm, ratio of laminate to length of tapered overlap approx 1:50. Clean the tapered overlap with acetone or carbon tetrachloride if it is contaminated.

Use a support (plywood) for larger damage as wet laminate should not freely span more than 20 mm. Attach the plywood inside and (e.g. if the fuselage tube is damaged) pull it outwards using nails.

Diagram 1

1 layer 92110

1 layer 92125



Microballoons

core made of Copticell