0 General

0.1 Amendments

No.	Page	Description	Date
1	all	Combination of the initial repair manuals of the Variants DG-1000S and DG-1000T, inclusion of variant DG-1000M, new standardized format	December 2000
2	2.1, 4.1 – 4.3, 5.1, 5.3, 6.3	Miscellaneous changes to the contents of the latest amendments of the initial repair manuals	December 2010
3	0.1, 0.2, 1.1, 2.1, 3.1, 4.1, 5.1	Manual revision	October 2012

0.2 List of effective pages

Section	page	issued	replaced /	replaced /	replaced /
0	0.0	December 10			
	0.1	"	See list of amemdments		
	0.2	"	See list of amemdments		
	0.3	"			
1	1.1	December 10	October 2012		
2	2.1	December 10	October 2012		
3	3.1	December 10	October 2012		
4	4.1	December 10	October 2012		
	4.2	"			
	4.3	"			
5	5.1	December 10	October 2012		
	5.2	"			
	5.3	"			
6	6.1	December 10			
	6.2	"			
	6.3	"			

1 Preface

The purpose of this repair manual is to provide basic repair instructions for minor damage to GFRP and CFRP gliders. (Glass and Carbon fibre reinforced plastics). Detailed information regarding all the processing of GFRP and CFRP is not given in this manual assuming that all repair work will only be carried out by people with practical knowledge in the use of these materials.

The repair of gliders should not be used to learn FRP laminating techniques.

Before beginning any repair work carefully determine what materials, tools, jigs and repair methods are to be used. The required information can be found in this manual. To insure that the aircraft performance is maintained, the surface finish of the repair work should be of the same quality as the original finish.

When doubts arise as to the repairability of damage DG Flugzeugbau should be contacted for further information.

The information in this manual refers only to repairs of minor damage like holes in the underside of the fuselage resulting from a wheel up landing, or damage from hangar accidents etc, see section 2.

Major damage which is outside the scope of the list of secton 2 of this manual should only be repaired by a certified repair station or by an approved mechanic rated for composite aircraft structure work.

Note: For repair- and servicing work on parts of the equipment and for motorgliders on the power plant, the instructions in the maintenance manual of the aircraft and the manuals belonging to the equipment parts are to be followed.

3 Tools and facilities required

Tools

- Accurate weighing scales for the correct mixing of resin and hardener
- Containers and wood mixing sticks
- Brushes (short hair) to apply the resin
- Metal roller to press down the glass cloth and to force the air out to reduce the formation of bubbles
- Scissors to cut the fabric
- Adhesive tape
- Plastic film for a tempering tent
- Hot air blower
- Abrasive paper - various grades
- Knife
- Saw to cut tough plastic
- Rubber hand gloves
- Accurate thermometer up to 60°C (140° F)

Facilities

To insure proper curing, the room temperature during repair work and at least 12 hours afterwards should be maintained at minimum 21°C (70° F). After that the repaired parts are to be post-cured. Therefore you may construct a heating tent, using plastic film or Styrofoam plates.

4 Material list for FRP repairs

4.1 Resinsystems for repairs

Resin	with Hardener	mixing ratio by weight
Momentive EPIKOTE ™ Resin MGS LR 160 (L 160)	EPIKURE ™ Curing Agent MGS LH 160	100:28
or		
Momentive EPIKOTE ™ Resin MGS LR 285	EPIKURE ™ Curing Agent MGS LH 286	100:40 ±2

The repaired areas must be post-cured for 20 hours at a min. of 54°C (129°F) before the next take-off.

Caution for variant DG-1000M: The engine bay walls shall be repaired only with LR 160/LH 160.

4.2 Fibre glass fabric

Interglas No.	US-No.	Weave	Weight (g/m²)
90 070	1610	Linen	80
92 110	-.-	Twill	163
92 125	-.-	Twill	280
92 130	-.-	Linen	390
92 140	-.-	Twill	390
92 145	180-150	unidirectional	220

All fabrics - finish I 550 or FK 144

4.3 Fibre Glass Rovings

Gevetex EC-10-2400 K 92 with Silan finish

4.4 Carbonfibre UD-tape

Made from Carbon fibre rovings 200 g/m² e.g.:
Sigri KDU 1009 7.5 cm (3 in) wide

4.5 Carbonfibre rovings

TOHO or TENAX HTA 24000 or TENAX HTS 24000

4.6 Diolen fabric

C. Cramer style 14 K (158 g/m²)
(as core in the ailerons of the outboard wings and in the trailing edges of the stabilizer and the wings in the aileron region)

5 Instructions for FRP repairs

5.1 General

See also section 2 and 3.

Only materials listed in section 4 should be used.

Only damage defined in section 2 should be repaired.

Cut out damaged area, roughen the surrounding area for the overlap required (see section 6).

Repairs should be made such that bonding is **wet over dry**.

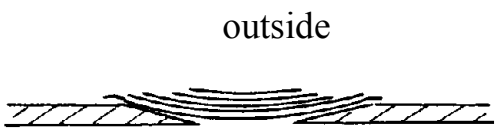
The use of Carbonfibre is the same as for glasfibre, except that the Carbonfibres should not be kinked.

All repairs should be postcured for 20 hours at minimum 54°C (129°F) before the next take off.

5.2 Repairs of a FRP shell

Prepare the repair area as specified above. Scarf the shell so that the individual layers of fabric can be seen like plywood layers. Remove the gelcoat for at least 20 mm (.8 in.) around the damaged area.

New lay-up as shown on the sketch.



5.3 Repairing the outer skin of a foam sandwich panel

Cut out the damaged area, remove the gelcoat over the overlap area +10 mm (0.4 in.) around the damaged area. Fill the damaged foam area with resin thickened with Microballoons (Microballoons-resin), let harden. Sand down.
Heat the area around the hole to approx. 60°C (140°F). Then tap the outer skin with a round headed hammer so that the foam is somewhat compressed. Apply the new cloth (Scarfing such thin layers makes no sense).