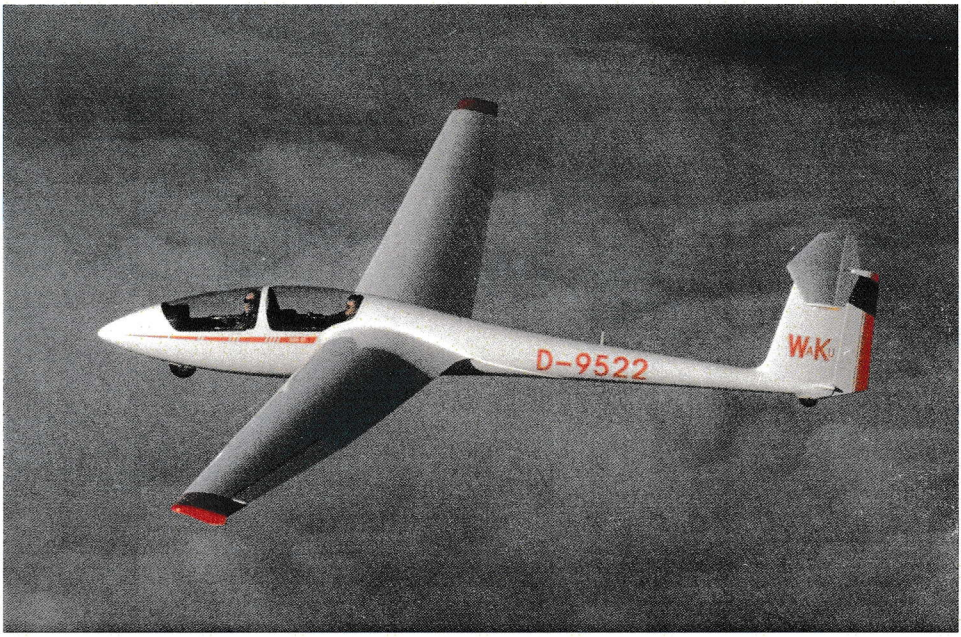
ASK 21



Flight Manual

Instructions For Continued Airworthiness

Repair Manual

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REPAIR MANUAL

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Translation into English has been done by best knowledge and judgement. In any case of doubt the original text in German language is controlling.

2. General Directions

Any material to be used for a repair must be suitable for the intended repair purpose, must fullfill the acceptance requirements of the competent Civil or Military Acceptance Authority, and must be stored according to the makers' prescriptions.
To ensure that these conditions are met, it is advisable to obtain a stock of fiber cloth, resin and hardener, as well as the manufacturer's main layer scheme drawings, already before the beginning of competitions and to store the materials (even the cloth) in airtight packs at about 20 °C. It is also advisable to make yourself familiar with the literature relevant to the subject on fiber composite repair methods.

We recommend -

in German: "Vorläufige Richtlinien für die Reparatur von GFK-Teilen (i.e. Provisional Guidelines for the Repair of GRP Components"); may be obtained from: DLR, Lilienthalplatz 7, 38108 BRAUNSCHWEIG.
or in English: MIL-HDBK-23 Part 1; may be obtained from: Government Printing Office, Washington 25 D.C., USA.

Abrupt change in thickness of laminate should be avoided in order to prevent stress concentration areas, and wherever possible the areas cut out should be oval and circular instead of rectangular. The transition between repair and undamaged area should be as gradual and smooth as possible.
The scarf or taper angles for fiber composite materials should be between 1 : 50 and to 1 : 100. Thin laminate layers cannot be scarfed; here the joints must overlap. In case of bi-directional cloth (equal number of fibers in warp and weft) the overlap lengths should be about 10 mm per 100 g/m^2 of cloth weight. With predominantly uni-directional cloth (reinforced warp) the overlap lengths of the warp should be ≈ 20 mm per 100 g/m^2. The weft fibers need not overlap. For exact values see diagram "Overlap Lengths".

Fiber composite materials are susceptible to water. Therefore, wet sanding of repaired areas must be avoided. For the same reason it is also important that all repaired areas be preserved by paint finish after the inspection - wherever necessary by a licensed inspector.

3. Repair Methods & Classification

The methods described hereafter apply only to smaller repairs. Major repairs must only be carried out by the manufacturer of the relevant part, or by an appropriately licensed aviation repair station; major repairs also require a new release inspection. Many references given hereafter apply to the repair of sandwich areas because they are particularly tricky for repair due to their structure. These described methods are analogously applicable to any simple fiber composite skin repair.

Repair Classification

Sometimes it may be necessary to do a temporary repair while the permanent repair over a larger area will then be carried out later by the manufacturer. Such provisional repairs are usually done mostly only superficially and are not the subject of these repair instructions.

Repairs are divided into the following classes, according to the extent to which the damage affects the airworthiness of the entire aircraft.

CLASS 1: Large area destructions requiring partial replacement of the component or a repair over a large area, i.e. damage to highly stressed components which impair the airworthiness, must only be repaired by the manufacturer of the relevant component, or by an appropriately licensed aviation repair station.

5. Preparing the parts for repair

Wherever possible all damaged components should be removed from the aircraft prior to their repair. They should then be cleaned with soap-suds and thoroughly dried. Now use a solvent (tri-chlor-ethylene, carbon tetra-chloride) to remove any wax and grease residues from the repair area. Finally the area is sanded using glass paper of grade 60 to 80. The surrounding areas are covered with stout paper or plastic foil to protect them from being soiled by resin drops.

6. Repair Classes

Class 4 Repair

Surface abrasions, scratches and grooves (provided the fiber glass laminate has not been damaged) usually ony require a new protective coat. Polyester paint is ideal for this (mixture of 100 parts UP gelcoat, white 03-69469, with 3 parts hardener 07-20500). To fill dee+er grooves, the paint can be allowed to gel slightly (about 30 min.). If the reinforcement layers have been damaged, the areas must be cleaned and, if necessary, smoothed down lightly with glass paper. Then one layer of fine glass cloth is applied over the area and covered with plastic foil. When the resin has hardened, use filler and re-paint.

Class 3 Repair

The damaged outer laminate skin is cut out over a sufficiently large area in rounded shapes. Be careful to remove any detached laminate layers from the core material. Then the edges of the damaged outer skin must be sanded down to a very flat taper. The laminate layers which become visible like contour lines, provide a good guide for the evenness of the taper. If the supporting core material has also been damaged, it must be removed, where necessary, right down to the inner laminate. Please note that the core material is repaired using Balsa wood of the specific weight 0.15 - 0.19 kg/dm^3. Scarf ratio is 1 : 5 in the direction of the fiber.

No scarf is made at right angles to the fiber direction. The foam core material - Conticell or Rohacell - is not scarfed (see Fig. 3a and 3b).
The cloth for the new outer laminate skin is now cut to size; where the largest cut piece should just cover the entire sanded area and the smallest cut piece should be the size of the removed core material area. All remaining layers should be graded in equal steps between these two extreme sizes.
A suitable technique is: a suitably larger piece of cloth is laid on a plastic foil and impregnated with resin, using a paint brush or a rubber smoother, then it is covered with a second plastic foil and all air bubbles and excess resin is squeezed out. Together with these foils the laminates are then cut to size.
Now first the new core material piece is impregnated and inserted in its place. Then the laminates are laid in, starting with the largest cut piece. To do this the bottom foil is torn off, the laminate inserted, and then the upper foil is peeled off, etc. All further repair steps are similar to those described under Class 4. For unsupported skin laminates proceed analogously. Perhaps it needs in this case first a piece of foam to be glued to the bottom surface to prevent the wet cloth laminate from sagging down (Fig.1.).

Class 2 Repairs

Damage which has penetrated both laminate skins, can be repaired as follows: all damaged areas in the skins and in the core material are cut out; the skins here again being cut in either oval or round shape. GRP laminate skins are sanded to a very flat taper (1 :50 up to 1 : 100) and the Balsa wood is scarfed in along the fiber direction (1 : 5). When the new core material has been inserted, the laminates are glued in as described under Class 3 repairs. First on one side only, and then after the first skin has cured completely, the laminate on the other side is glued on (Fig.2).

If there is no or only very difficult access to the inner skin of the sandwich, the repair area should be prepared as shown in Fig.3. Because the inner skins of the sandwiches (wing; tailplane) are very thin throughout, they cannot be scarfed, but only overlapped. However, this fact simplifies the repair somewhat as the lower laminate skin need not be scarfed.

The cloth layers of the upper laminate skin are prepared as described for Class 3 repairs. The lower skin layers are laminated onto the underside of the core material and then allowed to gel for 2 to 3 hours at 20 to 23 °C. Now fresh resin-hardener mixture is applied to the glue joints and the core piece with the lower laminate skin already glued on, is inserted and glued into place under light pressure. The upper laminate skin can then be repaired as described for Class 3 repairs.

If there is the risk (especially in the case of larger holes) that this thin, unsupported inner laminate skin will be displaced when the core material is glued in place, then it should be supported from the inside by some foam pieces beforehand. Styro-foam used with Uhu-por glue has proved useful here. If the inside area is inaccessible, the foam pieces can remain in these repaired areas permanently.

Class 1 Repairs

Such repairs should be reserved to the manufacturer or to an appropriately licensed aviation repair station. In any case the manufacturer and the competent Civil Aviation Authority must be contacted.

7. Summing up,

the following points are particulary important for successful repairs:

1. A bright, warm (20 °C), and dry room (50 % relative humidity).
2. Grease-free, cleanly sanded glue surfaces (watch hand sweat!).

3. Use of original materials; resin and hardener must not be older than 2 years.
4. Glass cloth treated with Volan A finish or I 550 finish, stored in dry condition. Observing pot life and curing time. A well mixed resin/hardener mixture (crystallized hardener can be regenerated by warming it up to 30 °C).

8. New Materials Carbon & Aramid

There are now in addition to the so far used standard glass fibers the late-technology carbon and aramid fibers (aramid is also known as Kevlar or PRD) which have alredy been used for main components in the series construction of the ASW 22. In composite with a resin system these materials are known as CFRP (Carbon Fiber Reinforced Plastics) and SFRP (S standing for the aramid fiber including Synthetic Fiber).

Components in various SCHLEICHER sailplanes are built from these new fibers, e.g. -

- Wing spar flanges	Carbon fiber rovings (ASW 22).
- Wing shells	CFRP-Conticell sandwich (ASW22)
- Fuselage tail boom	CFRP fabric strips (ASW 22)
- Control surfaces & flaps	SFRP and SFRP-Rohacell-sandwich (ASW 20 B/C and ASW 22)

The general repair instructions given here before for GRP fibers, are also applicable to the above new materials. Any differences for repairs with carbon and kevlar fibers are described hereafter.

Special Notes

Resin

When repairing CFRP and SFRP components it must be observed that these fibers require a different type of resin-hardener system than GRP repairs. In order to get the maximum use of the strength of carbon and kevlar fibers at higher temperatures, an epoxy resin must be used which provides still sufficient strength at 54 °C temperature.

For this reason the usual Epikote 162 cannot be used. SCHLEICHER uses for these components the resin L 160 with hardener 163 (100 parts resin : 28 parts hardener). The components must be cured at least 15 hours at above 55 °C.

Carbon fibers

Broken CFRP parts splinter badly so that there is increased risk of injury; gloves should always be worn when working on such fractures. A major disadvantage for such repairs is that the delaminations do not show distinctly by visible white areas - as in the case of glass repairs. To detect the extent of the damage, therefore, the areas surrounding a damaged region must be examined with the greatest care for hardly visible cracks, e.g. by loading or pressing them.

Even when only the paint appears to be damaged, you will find sometimes damage in a CFRP laminate where a GRP laminate would have been still undamaged underneath.

Basically cloth or rovings from carbon fibers can be worked up in the same way as glass fibers. If you have to repair laminates where the carbon fibers run into one direction only while glass fibers run in the other direction (e.g. Interglas 02902), such layers are treated as uni-directional or warp-reinforced layers and the glass need not be scarfed.

Overlap lengths of the different cloth weaves or rovings (mats) are given in the diagram. Note that the scarf length must only be half as long as the overlaps.

When wetting them with resin you will notice that the wetting through of the cloth is not visible. The solution here is to weigh the cut carbon piece which is to be used for the repair, and to work on it with the corresponding calculated resin-hardener amount. For a

CLASS 2: Holes and fractures which e.g. run through a sandwich structure destroying both laminate skins, but only over a smaller area.

CLASS 3: Small holes and fractures in the outer skin which have not resulted in any internal damage, neither to the core material (foam, Balsa, tubus) nor to the inner laminate skin.

CLASS 4: Abrasions, scratches and grooves which do not involve a fracture or break.

4. Repair materials and useful aids

For all repairs it is important to know the number of layers, the cloth weight per m^2, and the fiber direction of the laminated cloth. This information is detailed in the layer scheme drawing of the component in question or can be inquired of the manufacturer. In an emergency, it is possible to establish the composition of a laminate by burning out the resin (gas welding torch) on a broken piece from the area needing repair.

The glass cloth used must be treated with Volan A finish, or I-550, and be stored in dry conditions. If in doubt, the glass cloth should be dried briefly with a fan heater before being used.
For GRP repair work the resin mixture to be used should be 100 parts (by weight) of Epikote 162 and 38 parts by weight of Laromin C 260 (Epikure 113).
Clean containers and thorough mixing (approx. 2 min.) are a basic pre-requisite to success. The pot life of a 100 g resin mixture is about 25 min. at 23 °C. When the mixture has gelled, i.e. has become noticeably more viscous, it must no longer be used, as it cannot wet out the cloth sufficiently any more. We point out distinctly that the original strength of a component cannot be achieved without final heat treatment (curing for 12 hours at 60 °C).
But temperatures above 80 °C must be avoided.

CFRP laminate applied by hand the correct proportion of fiber weight is about 35 %; this means that the proportion of the resin used must be 65 % (exception: this does not apply to roving spars).

Aramid fibers

You will come across the first difficulty in working with Aramid right at the point when attempting to cut the cloth. This material can only be cleanly cut when using really sharp cutting tools (serrated cutters).
When sanding it, you will quickly realize that it is virtually impossible to obtain a sanded surface free from fiber fluff. It helps to rub it down wet with wet-and-dry paper. Of course. the sanded area must at once be dried thoroughly, using a fan heater, before further work is continued.

As the Kevlar fiber absorbs moisture, by which it will be deteriorated, it must be stored always in dry conditions or at least dried out before use.
Kevlar must be protected from UV light, both in its unprocessed and processed condition. A Kevlar repair area therefore must immediately be painted, using a paint with a UV-filter. The UP paints (former designation was PE paint) used by SCHLEICHER do contain this UV protection (titanium dioxide as white pigment).

Thin Kevlar skins as e.g. in the control surfaces and flaps of the ASW 22 cannot be scarfed and should be repaired by simple overlap. The resulting disalignment in height is corrected with filler and smoothed down. In view of aerodynamics this has no longer any influence for flaps or ailerons.

When repairing mass-balanced control surfaces their tailheavy moment must be checked in any case after the repair is done.

It may be useful to determine the tailheavy moment already prior to the repair. Thus it is possible to estimate whether it will at all be feasible to stay within the limits after a repair.
In case of large damage to these parts a replacement by new parts makes more sense anyhow.
Overlap lengths are given in the relevant diagram for Aramid. Scarf lengths are half as long as overlap lengths.

Dressings

Carbon and Aramid fibers are treated with a dressing to make it possible to weave cloths from the fibers. For carbon fiber cloths this dressing also provides for better working qualities. It is an Epoxy resin which is used as dressing for carbon fiber.
The Aramid fibers are even dressed with a substance (poly vinyl alcohol) which is also used as a release agent. For this reason it is absolutely essential to wash out the Aramid cloth very thoroughly (dressing residue < 0.05 %).

WARNING: Only such Aramid cloth qualities must be used where the manufacturer states explicitly that the dressing has been washed out.

Latest service life fatigue tests with carbon laminates have demonstrated that the type of Epoxy resin used as dressing must match the resin with which the laminate has been made.
Therefore, it is important to use only the original materials stated.

9. Tables and Diagrams

6 Tables, 3 Figures, 3 Diagrams.

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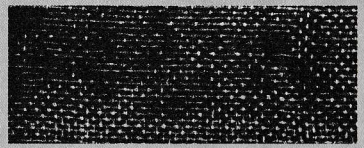
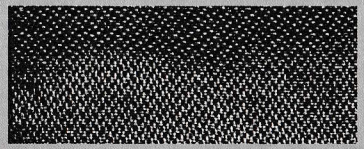
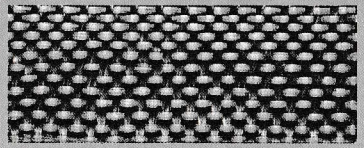
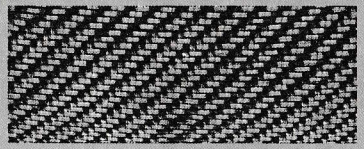
		Interglas	LN 9169	remarks
	63	90070	8.4505.6	1610* * US-Spezifikation
	106	91110	8.4545.6	
	163	92100		
	163	92110	8.4548.6	

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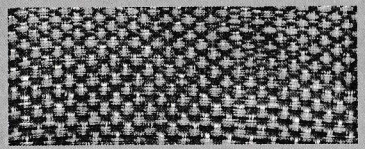
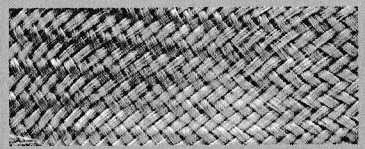
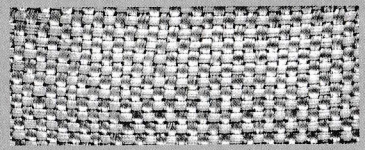
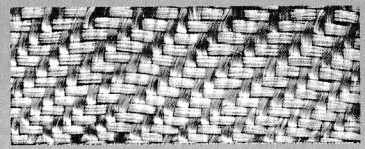
	280	92115		1510* * US-Spezifikation
	280	92125	8.4551.6	
	395	92130		
	395	92140	8.4554.6	

Rev.No./Date. Sig.

Author

Date July 1994

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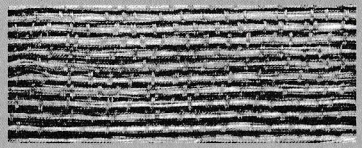
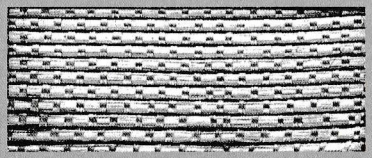
	220	92145	8.4520.6	
	430	92146	8.4525.6	

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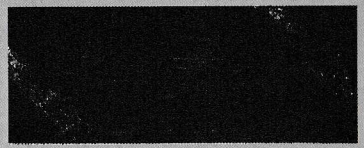	125	Rigilor AXT 125 Carbotex CX 12		DEUTSCHE CARBONE AG AEROTEX GMBH
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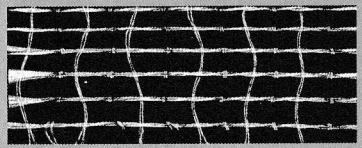
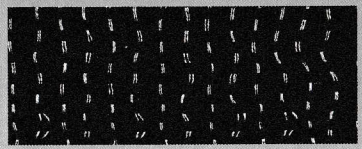
	293	Sigratex KDU - 1001		SIGRI ELEKTRO-GRAPHIT GMBH
	293	Sigratex KDU - 1009		SIGRI ELEKTRO-GRAPHIT GMBH

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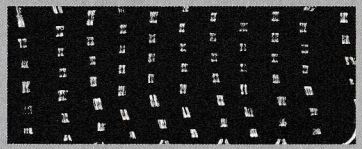
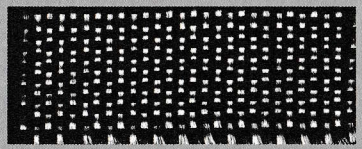
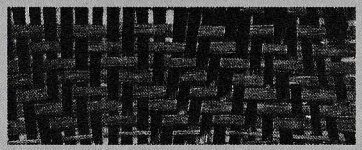
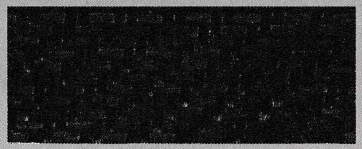
	318	Sigratex KDU - 1012		SIGRI ELEKTRO-GRAPHIT GMBH
	190	02902		INTERGLAS
	200	03040		INTERGLAS
	245	03056		INTERGLAS

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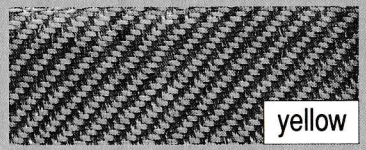 yellow	120	98608	5.2231.3	
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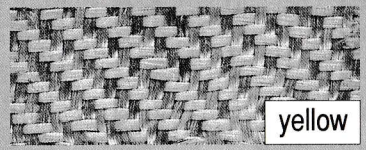
 yellow	225	98631	5.2235.3	

Fig.1 REPARATUR DER KLASSE 3 / REPAIR CLASS 3

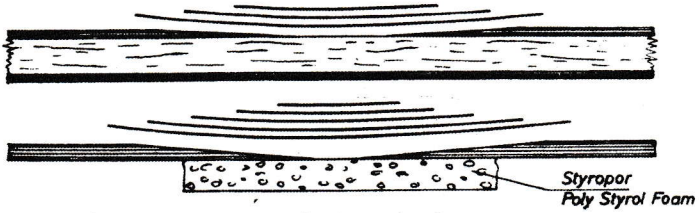


Fig.2 REPARATUR DER KLASSE 2/ REPAIR CLASS 2
(Innenseite zugänglich)/ (inside skin accessible)

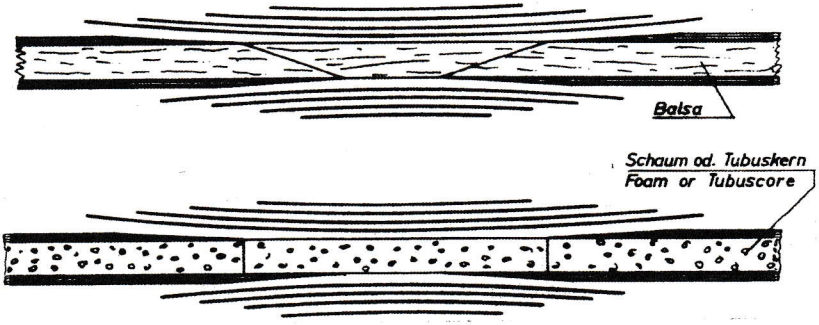


Fig.3a REPARATUR DER KLASSE 2 / REPAIR CLASS 2
(Innenseite unzugänglich)/ (inside skin inaccessible)
Vorbereitung der Reparaturstelle /Preparing the repair area

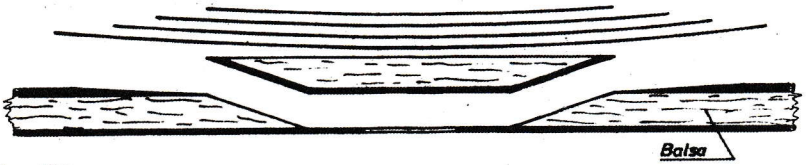
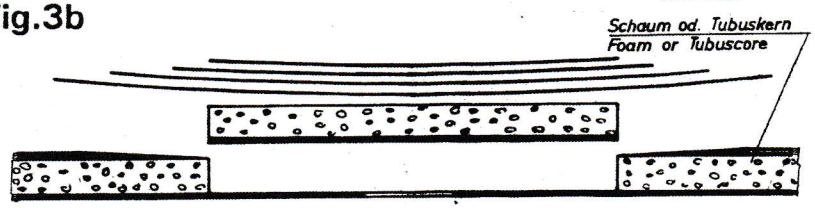
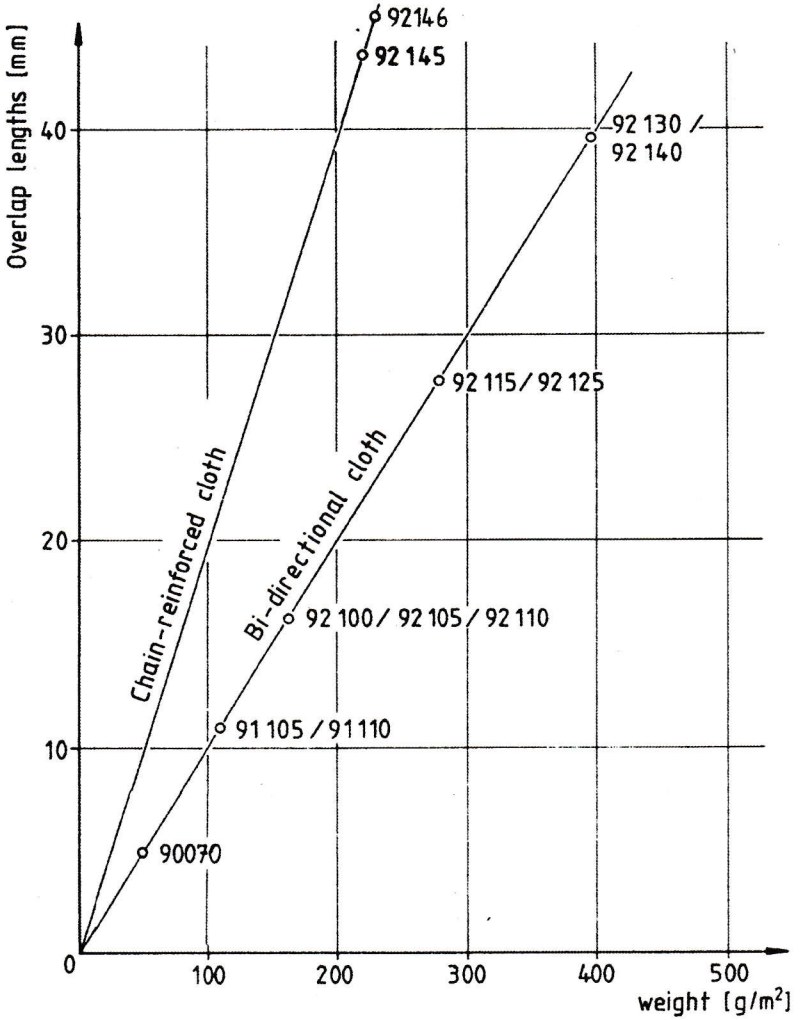


Fig.3b



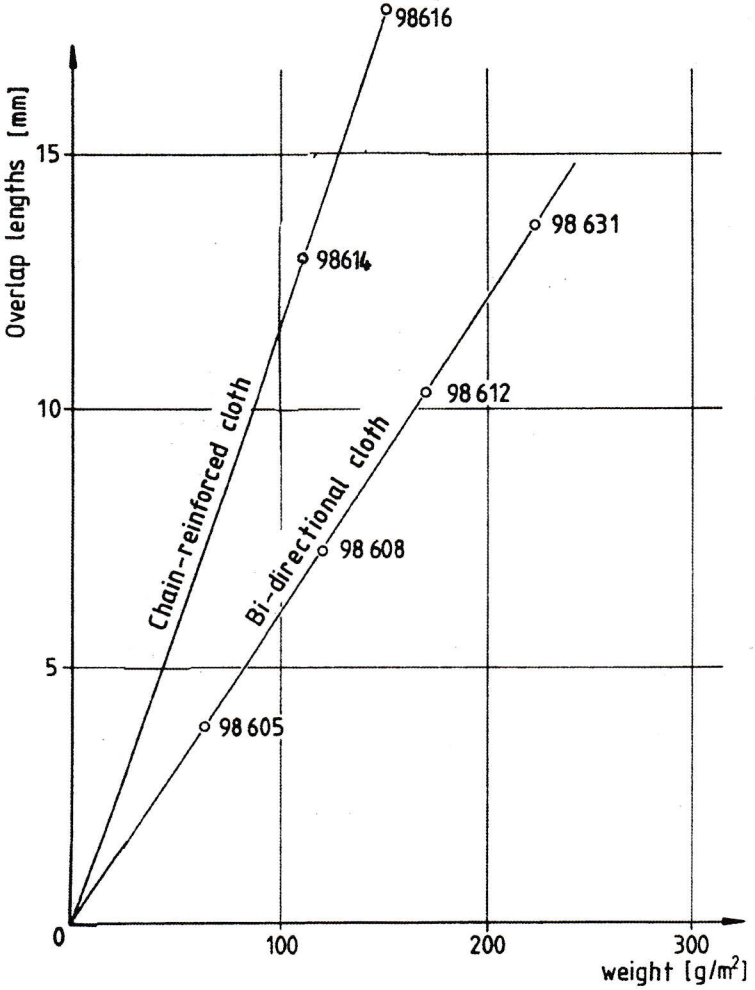
The taper of all scarf joints is shown greatly exaggerated.

Diagram: overlap length for glass fiber



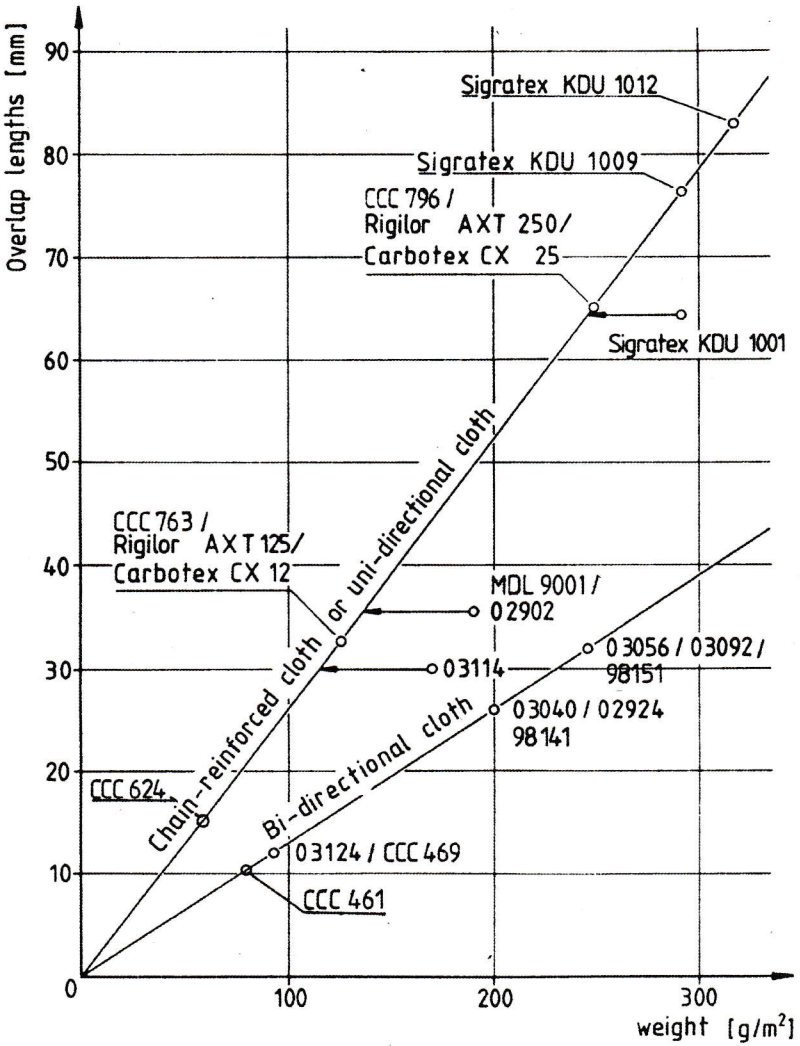
Scarf lengths are half as long as overlaps.

Diagram: overlap length for Aramid fiber



Scarf lengths are half as long as overlaps.

Diagram: overlap length for Carbon fiber



Scarf lengths are half as long as overlaps.

Materials used and supply reference: As per: 14.01.94

Any of the materials hereafter may be obtained by Messrs.ALEXANDER SCHLEICHER.

		formerly:	
Resin	Glycidäther 162	Epikote 162	Araldit LY 1525 BD
Hardener	Epikure 113	Laromin C 260	HY 2954
Manufacturer:		Manufacturer:	
Deutsche Shell Chemie GmbH		Ciba-Geigy AG	
Kölner Straße 6			
65760 Eschborn		Frankfurt/Main	

Resin	L 285	L 160
Hardener	H 285/286/287	H 163

Manufacturer: Martin G. Scheufler
Am Ostkai 21/22
70327 Stuttgart-Obertürkheim

Glass fiber cloth from E-Glass with Finish Volan-A or I 550	Carbon and Kevlar cloth
Manufacturer: CS-INTERGLAS AG	C. Cramer GmbH & Co. KG
Benzstraße 14	Weberstr. 21
89155 Erbach	48619 Heek-Nienborg

CARBON FIBER MATS

Carbotex CST 125, CST 250 / Rigilor AXT 125, AXT 250 with dressing for Epoxy resins.
To be supplied: from Messrs.ALEXANDER SCHLEICHER.

ROVINGS,

E-Glass: EC 9-756 K 43 (68) Manufacturer:
Vetrotex Deutschland GmbH
Bicherouxstraße 61
52134 Herzogenrath

Carbon fiber: KC 20 SDY LN 29 964 and CF-fabric strips (KDU)
Manufacturer: Sigri GmbH
Werner-von-Siemens-Straße 18
86405 Meitingen

FOAM MATERIALS — As per: 14.01.94

PVC hard foam 5.1360.2 according to DIN 29 898

	formerly:
Divinycell H 60	Conticell 60
Manufacturer:	Manufacturer:
Divinycell International GmbH	Continental AG
Max-von-Laue-Str. 7	
30966 Hemmingen	Hannover

PMI hard foam 5.1460.2 according to DIN 29 898 (Rohacell A71)
Manufacturer: Röhm GmbH
Chemische Fabrik
Kirschenallee 45
64293 Darmstadt

RESIN FILLERS:

Aerosil — Manufacturer: A+E Fischer
Postfach 13 02 45
65090 Wiesbaden

Cotton flocks, Type FB 1/035 (formerly Type FL 1f)
Manufacturer: Schwarzwälder Textilwerke
Postfach 4
77771 Schenkenzell

Micro balloon, white — Manufacturer: OMYA GmbH
Postfach 51 08 40
50944 Köln 51

PAINT

	formerly:
UP-gelcoat T 35 white	UP-gelcoat white 03-69 469
UP-hardener SF 2 / SF 10	UP-hardener No. 07-20 500
Thinner SF	Thinner No. 06-10 170
Manufacturer:	Manufacturer:
Martin G. Scheufler	AKZO Coatings GmbH
Am Ostkai 21/22	
70327 Stuttgart-Obertürkheim	Stuttgart

SHEET: 1 of 2	REPAIR INSTRUCTION for all Fiber Composite Aircraft Annex to the Repair Manual	Alexander Schleicher GmbH & Co. Segelflugzeugbau D-6416 Poppenhausen

new Post Code: D-36163

Subject: Repairs on fiber composite construction aircraft for which the original resin systems are no longer available in the market.

Serial number applicability: All serial no.s of SCHLEICHER aircraft made from fiber composite materials.

Reason: The first fiber composite aircraft types have been built almost 30 years ago and it becomes more and more difficult to obtain the original resin systems.
This repair instruction states which resin types can be used for which aircraft types on repairs.

Action: The following aircraft types made from glass fibers -

ASW 12 (all model variants and serial numbers)
ASW 15 (all model variants and serial numbers)
ASW 17 (all model variants and serial numbers; except for such fuselage built as per TN no.4, i.e. with carbon fiber)
ASW 19 (all model variants and serial numbers)
ASW 20 (all model variants and serial numbers; except for the control surfaces & flaps of ASW 20 B, BL and ASW 20 C, CL variants)
ASK 21 (all model variants and serial numbers)
ASK 23 (all model variants and serial numbers)

have been or are still built with the resin systems:
Epoxin 162 with hardener Laromin C260, subsequently renamed as:
Epikote 162 with hardener Epikure 113, subsequently renamed as:
Glycidether 162 with hardener Epikure 113.

In case that these original materials are no longer available, the following resin system can be used for the repair :
Scheufler L 285 with hardeners H 285 (rapid), or H 286 (medium) or H 287 (slow).

Primary structure components which have been built with the Scheufler resin system L 285, CANNOT be repaired with Epikote 162 / Epikure 113!

The carbon fiber reinforced ASW 17 fuselages as per TN no.4a were built with the resin system: Bakelite L 20 & hardener SL.

The ASW 22 (all model variants and serial numbers) was built with the resin system: CIBA XB 3052A & hardener XB 3052B; subsequently renamed as: LY 5053 & hardener HY 5052;
and with Scheufler resin L 160 and hardener H 161, H 162, H 162B or H 163, which was replaced after 1985 by the Scheufler resin L 285 with hardeners H 285, H 286 or H 287.

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
XXXXX D-6416 Poppenhausen

new Post Code: D-36163

The same resin systems as on the ASW 22 were also used for the control surfaces & flaps of ASW 20 B, BL and ASW 20 C, CL variants.

The aircraft types ASW 24, ASH 25 and ASH 26 E (all model variants and serial numbers respectively) were built only with the resin system: Scheufler L 285 with hardeners H 285, H 286 or H 287 - except for such heat-resistant engine parts which require explicitly other material.

For all before-mentioned aircraft types repairs can be done using either the original resin systems or Scheufler L 285 with hardeners H 285, H 286 or H 287 (depending on the desired pot life and curing conditions).

Any repair using Scheufler resin L 285 requires a post curing for about 12 hours at 58 - 62°C!

Notes:

Fuel Tanks:
ASK 14 and ASK 16 fuel tanks were built using the resin system: Epikote 162/Laromin C260.

Since the use of low-grade-benzole fuels (MOGAS-Eurosuper and Super Plus) these tanks have become blind and soft.

The fuel tanks for ASW 22 M, ASW 22 BE, ASW 24 E, ASH 25 E, and ASH 26 E, as well as new built tanks for ASK 14 and ASK 16 were built with: Bakelite L 20 & hardener H 91.

They must be repaired only with said Bakelite L 20 & H 91.

Poppenhausen, July 4, 1994

ALEXANDER SCHLEICHER
GmbH & Co.

Gerhard Waibel

The translation into English has been done by best knowledge and judgement; in any case of doubt the German original is controlling.

Sheet 1 of 1	REPAIR INSTRUCTION CARBON FIBER CLOTH FOR ALL FIBER COMPOSITE AIRCRAFT Annex to the Repair Manual	**Alexander Schleicher** GmbH & Co. Segelflugzeugbau D - 36163 Poppenhausen

Subject: Repair and production of fiber composite aircraft for which the types of fabrics or roving layers as stated in the layer scheme drawings are no longer used.

Applicability: All AS aircraft, sailplanes and powered sailplanes, made from fiber composite reinforced plastics (FRP).

Reason: The designations of fabrics or roving layers have changed in the course of the years or are no longer in use and /or have been replaced by other types. This repair instruction states which types of fabrics or roving layers may be used as substitute.

Action: The materials Carbotex CX 12 or CST 125 (fabric weight 125 g/m², C-fiber percentage 120 g/m²) and Carbotex CX 25 or CST 250 (fabric weight 250 g/m², C-fiber percentage 240 g/m²) are no longer used.
For repair and production of FRP aircraft or FRP structural components the following substitute fabrics or layer styles may be used and the layer scheme drawings amended correspondingly.

Substitute for Carbotex CX 12 and CST 125, respectively:

Designation	Fabric weight	C-fiber percentage	Supplier	
ITG 98320 (03 340)	132 g/m²	121 g/m²	Interglas	
MDL 9001	140 g/m²	120 g/m²	Sigri	
CCC - Style 763	140 g/m²	120 g/m²	Kramer	X)

Substitute for Carbotex CX 25 and CST 250, respectively:

Designation	Fabric weight	C- fiber percentage	Supplier	
Sigratex KDU - 1001 (75 mm wide)	293 g/m²	248.4 g/m²	Sigri	
Sigratex KDU - 1009 (75 mm wide)	293 g/m²	282.4 g/m²	Sigri	X)
Sigratex KDU - 1012 (150 mm wide)	319 g/m²	300.4 g/m²	Sigri	X)
2 layers ITG 98320	132 g/m²	121 g/m²	Interglas	
2 layers CCC - Style 763	140 g/m²	120 g/m²	Kramer	
CCC - Style 796	280 g/m²	247 g/m²	Kramer	X)

X) Currently available ex stock from SCHLEICHER!

This Repair Instruction must be inserted as Annex into the Repair Manual !

Notes: All fabric or roving layer materials can be ordered from

Alexander Schleicher GmbH & Co.
PO Box 60
D-36161 Poppenhausen
Tel +49 6658 890 or Fax +49 6658 8940

Poppenhausen, July 7, 1998

Alexander Schleicher
GmbH & Co.

By order
(Lutz-W. Jumtow)

Sheet 1 of 1	**Technical Note No. 01-99** for all aircraft types of Glass Fiber & Fiber Composite Construction	**Alexander Schleicher** GmbH & Co. Segelflugzeugbau D - 36163 Poppenhausen

Subject: New resin system for laminating glass, carbon, and Aramid fiber cloth

Applicability: All AS aircraft - sailplane and powered sailplane types - for which resin laminating systems are used.

Compliance: None.

Reason: The resin manufacturer Martin G. Scheufler has developed a laminating resin L 335 with the hardeners H 335, H 335 - 340 and H 340 which can be used instead of the resin system Epikote 162 with hardeners Epikure 113 or Laromin C 260 respectively. Production of the resin system Epikote / Epikure will be discontinued.

This laminating resin system is qualified by the tests as prescribed by the Luftfahrt-Bundesamt (LBA) in the Guidelines for Resin Fiber Composite Structures (German: RHV) and has been certified by the LBA for the aviation industry.

Action: For all fiber composite components which were built using the resin system Epikote 162 with hardeners Epikure 113 or Laromin C 260 respectively, now the laminating resin L 335 with the hardeners H 335, H 335 - 340 and H 340 can be used when the components are new built or repaired.

Spars **must not** be repaired nor new built with the laminating resin L 335 and the hardeners H 335, H 335 - 340 and H 340. In case of doubt it is required to contact the company Alexander Schleicher.

Components which have been repaired or new built with the resin L 335 must be cured for 15 h at a temperature of 55 - 60 C°.

This TN must be inserted as annex into the AS Repair Manual.

Notes: The resin system L 335 can be obtained from :
Alexander Schleicher GmbH & Co.
P.O. Box 60
D-36161 Poppenhausen/Wasserkuppe
Tel 06658 - 890 or Fax 06658 - 8940 or email AS-sailplanes@Fulda.net

Poppenhausen, March 12, 1999

Alexander Schleicher
GmbH & Co.

by order Lutz-W. Jumtow

(Lutz-W. Jumtow)

The German original of this Technical Note has been approved by the LBA under the date of March 16, 1999, (signature: JUNG). The translation into English has been done by best knowledge and judgement; in any case of doubt the German original is controlling.

Sheet 1 of 1	**Technical Note No. 02-99** for all aircraft types of Glass Fiber & Fiber Composite Construction	**Alexander Schleicher** GmbH & Co. Segelflugzeugbau D - 36163 Poppenhausen

Subject: New finish for glass fiber cloth

Applicability: All AS aircraft - sailplane and powered sailplane types - which use glass fiber cloth for their construction.

Compliance: None.

Reason: CS-INTERGLAS AG, the manufacturer of glass fibers, has developed a new finish for Polyester resin (UP), Vinyl ester resin (VE), Epoxy resin (EP), and Polyamid systems (PA); this new finish replaces the previous finish types.

The new finish FK 800 made on the basis of Amino-Silan, offers the following advantages:
- lower Chloride values
- faster wetting of the cloth
- improved adhesion between cloth and resin system
- Chrome contents 0%
- excellent mechanical properties.

This finish is qualified by the tests as prescribed by the Luftfahrt-Bundesamt (LBA) in the Guidelines for Resin Fiber Composite Structures (German: RHV) and has been certified by the LBA for the aviation industry.

Action: Glass fiber cloth with the new finish FK 800 can be used for all fiber composite components, either for new built parts or for repairs, instead of the previously used glass cloth types.

This TN must be inserted as annex into the AS Repair Manual.

Poppenhausen, March 15, 1999

Alexander Schleicher
GmbH & Co.

by order Lutz-W. Jumtow

(Lutz-W. Jumtow)

The German original of this Technical Note has been approved by the LBA under the date of April 6, 1999, (signature: JUNG). The translation into English has been done by best knowledge and judgement; in any case of doubt the German original is controlling.

Sheet 1 of 1	**Technical Note No. 03-99** for all aircraft of the production series ASH, ASK & ASW	**Alexander Schleicher** GmbH & Co. Segelflugzeugbau D - 36163 Poppenhausen

Subject: New material specifications for copper-zinc alloys (formerly brass).

Applicability: All AS aircraft - sailplane and powered sailplane types - currently in production as well as manufacture of spare parts for those formerly in production.

Compliance: None.

Reason: DIN 17 660 and 17 661 standards contain partly changed specifications, material abridged signs or numbers respectively, for copper-zinc alloys (formerly brass). The brass as originally stated in the drawings is no longer available in economical quantities.

Action: This TN supersedes the material specifications for copper-zinc alloys (formerly brass) on the respective existing drawings and must be inserted as annex into the AS Repair Manual.

Material: Instead of the brass material specifications which were so far stated in the drawings now the following material abridged signs and numbers can be used as substitute:

Material Abridged Sign	Material Number	Tensile Strength N/mm²	DIN
Cu Zn39 Pb2, hard F43 H120 (Ms 58)	2.0380.26	min. 430	17 660 / 17 670
Cu Zn39 Pb3, hard F43 H120 (Ms 58)	2.0401.26	min. 430	17 660 / 17 661
Cu Zn40 Pb2, hard F44 H125 (Ms 58)	2.0402.26	min. 440	17 660 / 17 661
Cu Zn37, hard F44 H140 (Ms 63)	2.0321.30	min. 440	17 660 / 17 661
Cu Zn37, hard F54 H170 (Ms 63)	2.0321.32	min. 540	17 660 / 17 661
Cu Zn37, hard F61 H200 (Ms 63)	2.0321.34	min. 610	17 660 / 17 661
Cu Zn40 Al2 *) (So MS 58 Al2)	WL 2.0564.0+8	min. 550	17 661

*) To be used as first choice, where possible!
Former abridged sign in brackets! (Ms = brass)

Drawings: The brass material specifications which were so far stated in the drawings are herewith replaced by the material abridged signs and numbers respectively in this TN. The respective drawings need not be changed.

Poppenhausen, March 26, 1999

Alexander Schleicher
GmbH & Co.

by order Lutz-W. Jumtow
(Lutz-W. Jumtow)

The German original of this Technical Note has been approved by the LBA under the date of April 6, 1999, (signature: JUNG). The translation into English has been done by best knowledge and judgement; in any case of doubt the German original is controlling.

Page 1 of 1	**Technical Note** **No. 03-2008** Spar cap fibres EC9 756 P109	**Alexander Schleicher** GmbH & Co. Segelflugzeugbau D - 36163 Poppenhausen

Subject: Fibres of the type EC9 756 P109 replace the fibres previously used for glass fibre spar caps.

Applicability: All AS-aircraft with glass fibre reinforced spar caps

Classification: Minor Change

Urgency: None

Reason: The manufacturer of glass fibres Saint-Gobain Vetrotex replaces the finish of their 9µm glass fibres.

Denomination of the previous glass fibres type: **EC9 756 K43**

Denomination of the new glass fibres type: **EC9 756 P109**

The new material was tested statically and dynamically in comparison to the previous material.

Action: For all spar caps made from glass fibre reinforced plastic, the new type of fibres EC9 756 P109 may be used for production or repair instead of the fibres that were used before.

This TN is to be attached to the AS-repair manual as an appendix.

Note: In the meantime, the supplier *Saint-Gobain Vetrotex* has been acquired and has become part of the company *OCV Reinforcements*.

Poppenhausen, 12.02.2008

Alexander Schleicher
GmbH & Co.

i.A. M Greiner

(M. Greiner)

The German original has been approved by the EASA on the 18 March 2008 with change number EASA.A.C.09208

Page 1 of 1	**Technical Note No. 01-2013** Replacement U-PICA-MAT	**Alexander Schleicher** GmbH & Co. Segelflugzeugbau D - 36163 Poppenhausen

Subject: Replacement of sandwich-core U-PICAMAT through Lantor LRC Soric

Applicability: Sailplanes and powered sailplanes:

ASH 26	Type Certificate LBA 383
ASH 26 E	Type Certificate LBA 883
ASW 27	TCDS EASA A.220
ASW 28	TCDS EASA A.017
ASW 28-18	TCDS EASA A.017
ASW 28-18 E	TCDS EASA A.034
ASW 27-18 (ASG 29)	TCDS EASA A.220
ASW 27-18 E (ASG 29E)	TCDS EASA A.220
ASH 31 Mi	TCDS EASA A.538

all variants

Urgency: None

Reason: The product U-PICA MAT was used to create wall thickness between load carrying layers. The product is no longer available.

U-PICA MAT was used in nominal thickness of 1mm. In impregnated condition this corresponds in respect of weight and thickness to the product Lantor LRC Soric 2mm.

Action: When U-PICA MAT is specified in drawings, alternatively Lantor LRC Soric may be used, according to the following table:

Specified in drawing	Replaced by
U-PICA MAT 1mm	LANTOR SORIC LRC 2mm

Poppenhausen, 1. May 2013

Alexander Schleicher
GmbH & Co.

i.A. M. Grei

(M. Greiner)

This modification has been approved by the EASA at the date of the 07.06.2013 with the Major Change Approval 10045216.

Page 1 of 1	**Technical Note No. 02-2013** Usage of Pyrofil TR30S- 3K	**Alexander Schleicher** GmbH & Co. Segelflugzeugbau D - 36163 Poppenhausen

Subject: Carbon fibre cloth with fibre type Pyrofil TR30S 3K

Applicability: Sailplanes and powered sailplanes:

ASW 17	Type Certificate LBA 282
ASW 20	Type Certificate LBA 314
ASK 21	TCDS EASA A.221
ASW 22	Type Certificate LBA 351
ASW 22 BE	Type Certificate LBA 834
ASW 24	Type Certificate LBA 366
ASW 24 E	Type Certificate LBA 859
ASH 25	Type Certificate LBA 364
ASH 25 E	Type Certificate LBA 858
ASH 26	Type Certificate LBA 383
ASH 26 E	Type Certificate LBA 883
ASW 27	TCDS EASA A.220
ASW 28	TCDS EASA A.017
ASW 28-18 E	TCDS EASA A.034
ASH 31 Mi	TCDS EASA A.538

all variants

Urgency: None

Reason: The company SGL proved the suitability of their carbon fabric with the carbon fibre Pyrofil TR30S 3K. This fibre may be used in fabric and UD-reinforcements besides the other carbon fibres used hitherto (Toho Tenax HTA, Toray FT300B-3000).

Action: All carbon fabrics supplied by SGL may completely or partially be made from the carbon fibre Pyrofil TR30S 3K.

Poppenhausen, 1. May 2013

Alexander Schleicher
GmbH & Co.

i.A. M. Grei

(M. Greiner)

This modification has been approved by the EASA at the date of the 07.06.2013 with the Major Change Approval 10045216.