ALEXANDER SCHLEICHER SEGELFLUGZEUGBAU

ASK 21 B

Maintenance Manual

Repair Manual

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Maintenance Manual

for the sailplane

ASK 21 B

Model:	ASK 21 B
Serial Number:	21953
Registration:	VH-GTY
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The translation has been done by best knowledge and judgment. In any case the original text in German is authoritative.

Section 0

0.1 Record of Revisions

Any revision of the present manual, except actual weighing data, must be recorded in the following table "Record of Revisions".

The new or amended text in the revised page will be indicated by a black vertical line in the left hand margin, and the Revision No. and the date will be shown on the bottom of the page.

Record of Revisions

Rev No.	Section & Pages Affected	Date of Issue	Date of Insertion	Ref. / Signature
TN 6	2.2.4 Rudder, 2.4	4/11/20	5/6/23	GG,22990
TN 9	7.1 Periodic Inspections, 7.5	5/5/22	5/6/23	GG,22990

Record of Revisions

Rev No.	Section & Pages Affected	Date of Issue	Date of Insertion	Ref. / Signature

0.2 List of Effective Pages

Section	Page	Date	Section	Page	Date
title page	---	15.06.2018		2.23	15.06.2018
				2.24	15.06.2018
0	0.1	15.06.2018		2.25	15.06.2018
	0.2	15.06.2018		2.26	15.06.2018
	0.3	15.06.2018		2.27	15.06.2018
	0.4	15.06.2018		2.28	15.06.2018
	0.5	15.06.2018		2.29	15.06.2018
	0.6	15.06.2018		2.30	15.06.2018
				2.31	15.06.2018
1	1.1	15.06.2018			
	1.2	15.06.2018	3	3.1	15.06.2018
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	1.5	15.06.2018		3.4	15.06.2018
				3.5	15.06.2018
2	2.1	15.06.2018			
	2.2	15.06.2018	4	4.1	15.06.2018
	2.3	15.06.2018		4.2	15.06.2018
	2.4	15.06.2018		4.3	15.06.2018
	2.5	15.06.2018		4.4	15.06.2018
	2.6	15.06.2018		4.5	15.06.2018
	2.7	15.06.2018		4.6	15.06.2018
	2.8	15.06.2018		4.7	15.06.2018
	2.9	15.06.2018			
	2.10	15.06.2018	5	5.1	15.06.2018
	2.11	15.06.2018		5.2	15.06.2018
	2.12	15.06.2018		5.3	15.06.2018
	2.13	15.06.2018		5.4	15.06.2018
	2.14	15.06.2018		5.5	15.06.2018
	2.15	15.06.2018			
	2.16	15.06.2018	6	6.1	15.06.2018
	2.17	15.06.2018		6.2	15.06.2018
	2.18	15.06.2018		6.3	15.06.2018
	2.19	15.06.2018		6.4	15.06.2018
	2.20	15.06.2018		6.5	15.06.2018
	2.21	15.06.2018		6.6	15.06.2018
	2.22	15.06.2018		6.7	15.06.2018

0.3 Table of Contents

Section

Section 1

1 Description and Specifications

1.1 Introduction

This Maintenance Manual was produced because the safety and airworthiness of an aircraft depends on the careful maintenance of all its components. The airworthiness of the ASK 21 B can only be assured, if the glider is maintained and operated according to the manuals. The maintenance and inspection requirements issued by the Civil Aviation Authority of the country, in which the aircraft is registered, must be observed.

Metric units of measurement are used for this manual, while for the English issue imperial units are shown in parenthesis.

1.2 Description of the Sailplane

The ASK 21 B is a mid-wing two-seater glider with damped T-tail, sprung landing gear with hydraulic disc brake and nose wheel. The wing is equipped with air brakes on the upper surface.

The aircraft is built in GRP-sandwich-monocoque construction.

It may be used for school and performance flights as well as for aerobatics of the airworthiness category "A".

1.2.1 Wings

The glider has a 2-part wing with GRP/hard foam sandwich surface. The I-section-spar consists of glass fiber caps wit GRP/hard foam web. The wings are assembled in the fuselage by means of a tongue-and-fork joint and two cylindrical main pins. The fuselage and wing connection uses four drag pins at the fuselage-side. The rear drag pins are connected to the wings by means of socket pins so they are also able to take up tension loads.

1.2.2 Fuselage

The fuselage and fin sandwich shell employs GRP with a honeycomb core. This provides a light and rigid structure capable of protecting the pilot even in the case of an accident. Additionally the canopy frame is enforced. The VHF radio aerial is located in the fin.

1.2.3 Tail Unit and Aileron

The stabilizer of the horizontal T-tail unit, the elevator, the rudder and the ailerons consist of a GRP/hard foam sandwich construction.

1.3 Primary and Secondary Structures

Primary structure includes:

- wing spars and root ribs
- wing shells
- fuselage tail boom from wing mounting area to fin
- fin and horizontal stabilizer
- all rigging fittings and control linkage parts

Secondary structure includes:

- control surfaces and airbrakes
- fuselage in the cockpit area
- all fairings and engine bay doors

1.4 Technical Specifications

Wing

Span	17 m	(55.77 ft)
Wing area	17.95 m^2	(193.21 ft^2)
Aspect ratio	16.1	
Dihedral (wing center line)	4°	
Sweepback (inner wing leading edge)	0°	
Airfoils	FX SO2 196 / FX 60-196	

Fuselage

Length	8.35 m	(27.39 ft)
Height at the T-tail incl. tail wheel	1.527 m	(5.01 ft)
Cockpit width (outer)	0.7 m	(2.30 ft)
Cockpit height (outer)	1.04 m	(3.41 ft)

Vertical tail

Height above tail boom center line	1.37 m	(4.49 ft)
Area	1.357 m^2	(14.61 ft^2)
Aspect ratio	1.383	
Chord (bottom / top)	1.17 m / 0.8 m	

	3.84 ft / 2.62 ft	
Airfoil	FX 71-L-150/30	

Rudder

Chord ratio	31 %	
Area	0.42 m^2	(4.52 ft^2)

Horizontal tail

Span	3.1 m	(10.17 ft)
Area	1.92 m^2	(20.67 ft^2)
Aspect ratio	5.005	
Airfoil	FX 71-L-150/30	

Elevator

Chord ratio	30 %	
Area	0.576 m^2	(6.20 ft^2)

Airbrakes (Schempp-Hirth, only upper surface)

Length	1.36 m	(4.46 ft)
Area (both sides)	approx. 0.326 m^2	(3.51 ft^2)

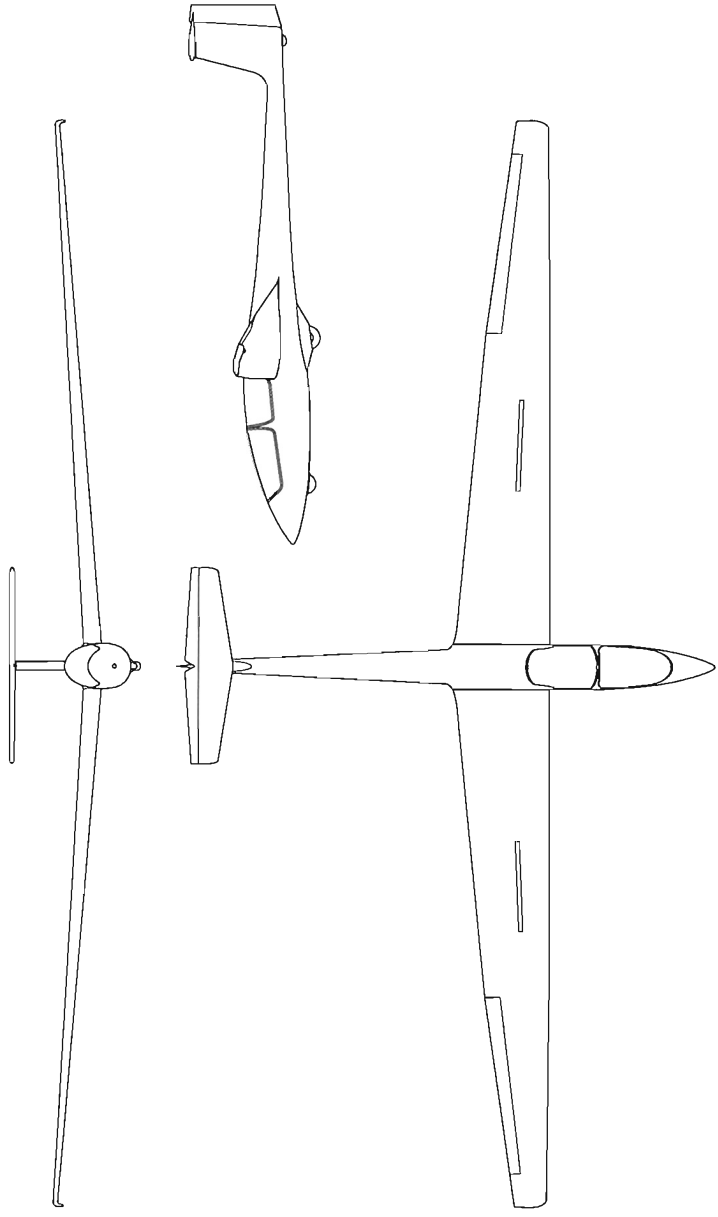
Masses (Weight)

Empty mass (minimum equipment)	approx. 375 kg	(827 lbs)
max. mass non-lifting parts	410 kg	(904 lbs)
max. mass in a seat	130 kg	(286 lbs)
max. mass in baggage compartment	10 kg	(22 lbs)
max. take-off mass	600 kg	(1323 lbs)
max. wing loading	33.4 kg/m^2	(6.84 lbs/ft^2)
min. wing loading (single seated)	ca. 26 kg/m^2	(5.33 lbs/ft^2)

See also Flight Manual section 2.

Authoritative information about empty mass and useful load are documented in the latest weighing record or in the mass and balance form in chapter 6.2 of the flight manual.

1.5 Three View Drawing



Section 2

2 Description of Control Systems and Equipment

2.1 Introduction

Except for the rudder, all other control surfaces and flaps are actuated by means of push rods. Some of the bell cranks and the short push rods are of welded steel construction. The long push rods are made of aluminium tube, with steel fittings riveted into the ends. These aluminium push rods are corrosion resistant and, therefore, they are not surface treated. The remaining bell cranks are milled from sheet aluminium. All push rods are supported in linear ball race guides. Where required, rubber bellows are fitted to form a seal where push rods pass through wing ribs.

NOTE
Additional sealing to the wing root ribs is not allowed, as the wing will be no more ventilated!

2.2 Control Systems

2.2.1 Elevator Control System

The control columns are two-arm levers and each mounted on a universal joint. A steel torsion tube (control tube) connects both control columns at their lower ends. This control tube provides the adjustable stops for the elevator control system on its front and rear end. A second, stepped control tube leads from the rear control column above the main wheel to a vertical rocker lever, mounted on a universal joint. A push rod extends from the vertical rocker lever to drive a 180° Dural bell crank, located at a platform at the fuselage bottom behind the wing intersection.

An aluminium push rod leads on the left fuselage side from the 180° Dural bell crank to the fin and is supported by 4 ball bearing longitudinal guides. Via a 90° Dural bell crank and a FRP plastic rod the movements are transmitted to the top of the fin. There another push rod is connected via a 180° Dural bell crank, the upper end of this push rod forms the elevator actuator.

2.2.2 Elevator Trim System

The spring trimmer consists of 2 trim levers, a connection rod and the two trim springs with adjusting plate. The trim levers are mounted coaxial to the control columns. A friction brake is tightened by using a knurled nut onto the control column mounting screw.

The brake force should be adjusted nearly equally for the front and rear brake. The brakes have to be tightened so much, that even in case of extreme opposite deflections of control column and trim lever the trim lever does not move.

The stops for the trim levers are incorporated in the universal joints of the control columns. An adjusting plate to adjust the spring trimmer is mounted on the connection rod of the trim levers. The springs for the trimmer are mounted between this adjusting plate and the control tube between the control columns.

The trim indicator is located near the right cockpit wall. The front and rear trim indicator are linked via a connection rod. The trim setting is transferred via a Bowden cable from the rear trim lever to the rear trim indicator.

2.2.3 Aileron Control System

The connection between the two control columns has already been described under 2.2.1 above. At the rear end of the rear stepped control tube the vertical rocker is connected. From the sides of the vertical rocker short pushrods lead in vertical direction and connect the vertical rocker with the automatic hook ups of the fuselage.

In the wing, push rods lead from the automatic hook-up to a 90° bell crank. The bell crank is connected via a short push rod with the aileron actuator.

The aileron stops are located in the fuselage at the universal joint of the rear control column. Further stops are located in the wing at the 90° bell crank.

2.2.4 Rudder

The rudder is operated by (Ø 3.2 mm LN 9374) cables anchored to the outside of the front cross tube of the adjustable rudder pedals. From these fix points, the cables run through the swan-neck guide tubes and from their upper ends through Nylon tubes, which guide them to the area of the rear seat pedal positions. They are connected with an adjusting plate there. This plate allows to even out minor inaccuracies of cable length and of pedal rake angle.

The cables of the rear pedals are connected to the central structure of the cockpit. From there they run through the swan-neck guide tubes and are attached to the adjusting plate, too.

All way back into the fin nylon tubes guide the control cables. There they are attached to the lower rudder fitting.

Cable tension is maintained by springs at the rudder pedals. The rudder stops are located at the lower rudder fitting in the fin.

2.2.5 Airbrake Control System

Both airbrake handles at the left-hand cockpit wall are mounted on a steel push rod, which leads to a swivel crank in front of the main bulkhead (this swivel crank also actuates the main brake master cylinder). From there a pushrod leads to a bell crank, which transmit the movement in transverse direction. A pushrod leads to the fuselage centre. A second bell crank transmits the movement of this pushrod via short pushrods to the automatic hook ups of the fuselage.

In the wing an aluminium push rod leads direct from the automatic hook-up to the toggle crank in the airbrake box. From this toggle crank, a short push rod drives the two airbrake swivel levers via a connecting rod. The airbrake paddle itself is mounted on these swivel levers.

The master cylinder of the wheel brake system serves at the same time as the airbrake stop. The adjustment of the airbrake control system and the wheel brake is described in section 2.3.3.

Fig. 2.2-1 Elevator Control System, Cockpit

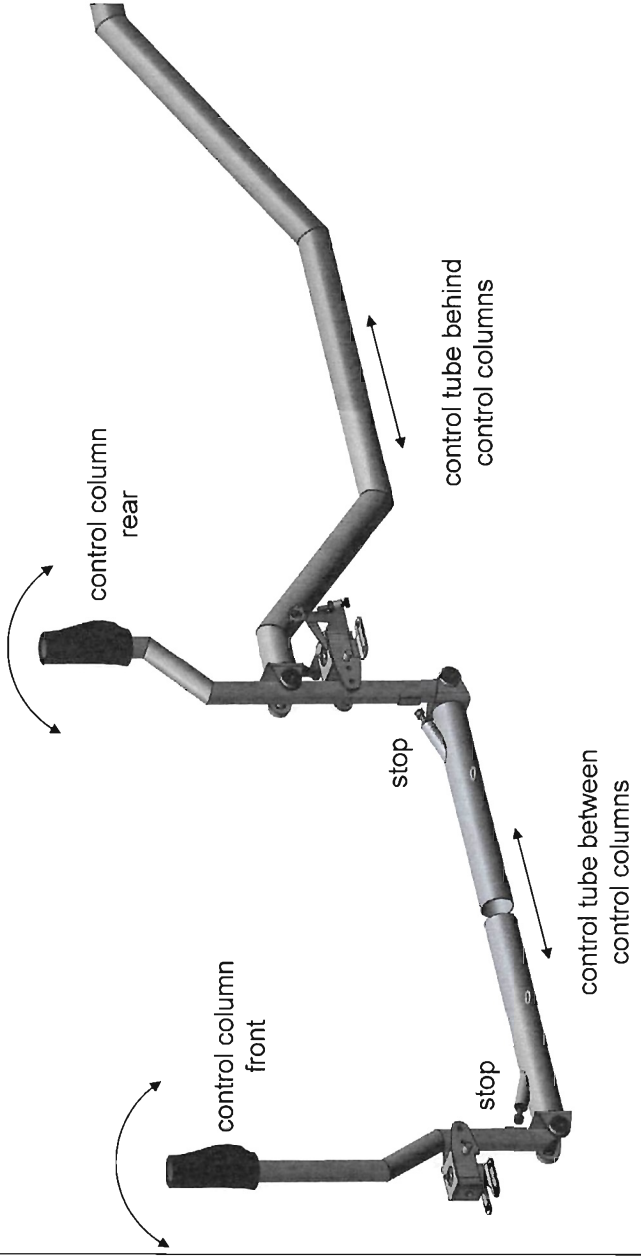


Fig. 2.2-2 Elevator Control System, Fin

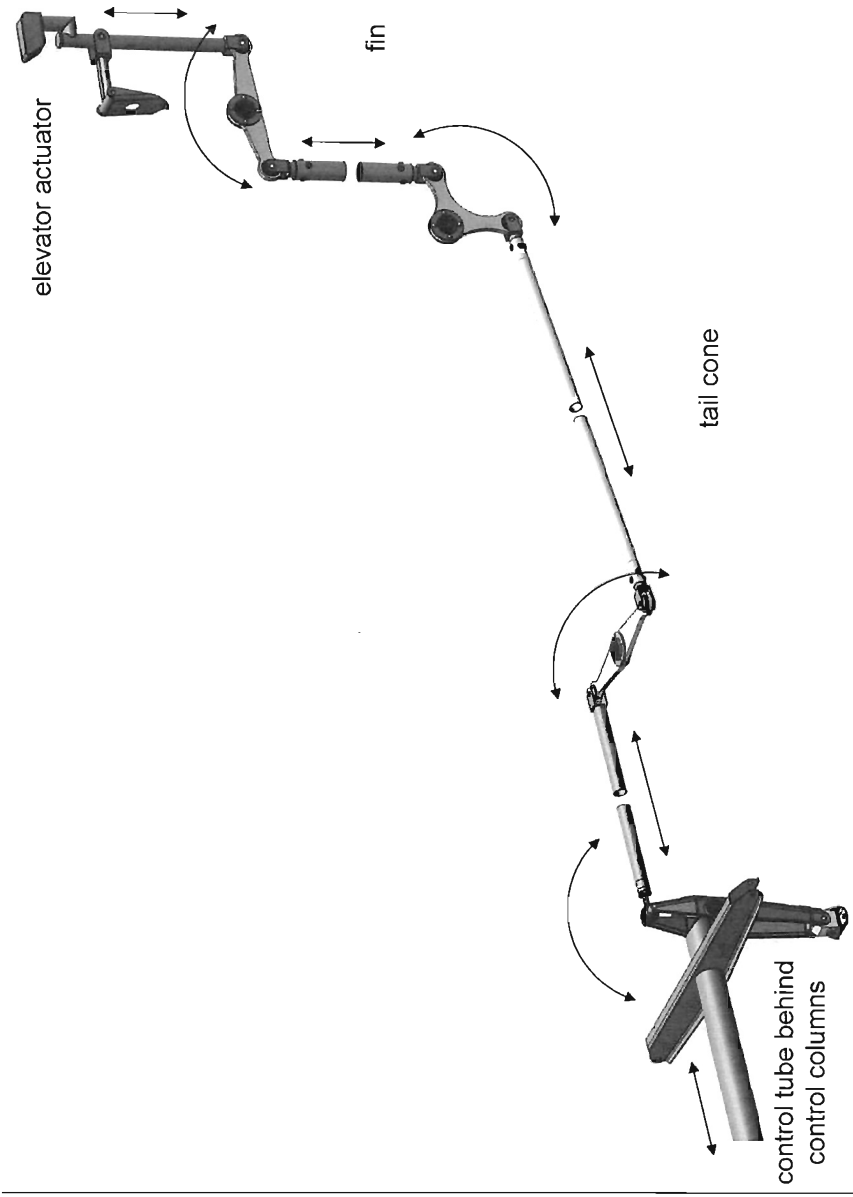


Fig. 2.2-3 Elevator Trim System

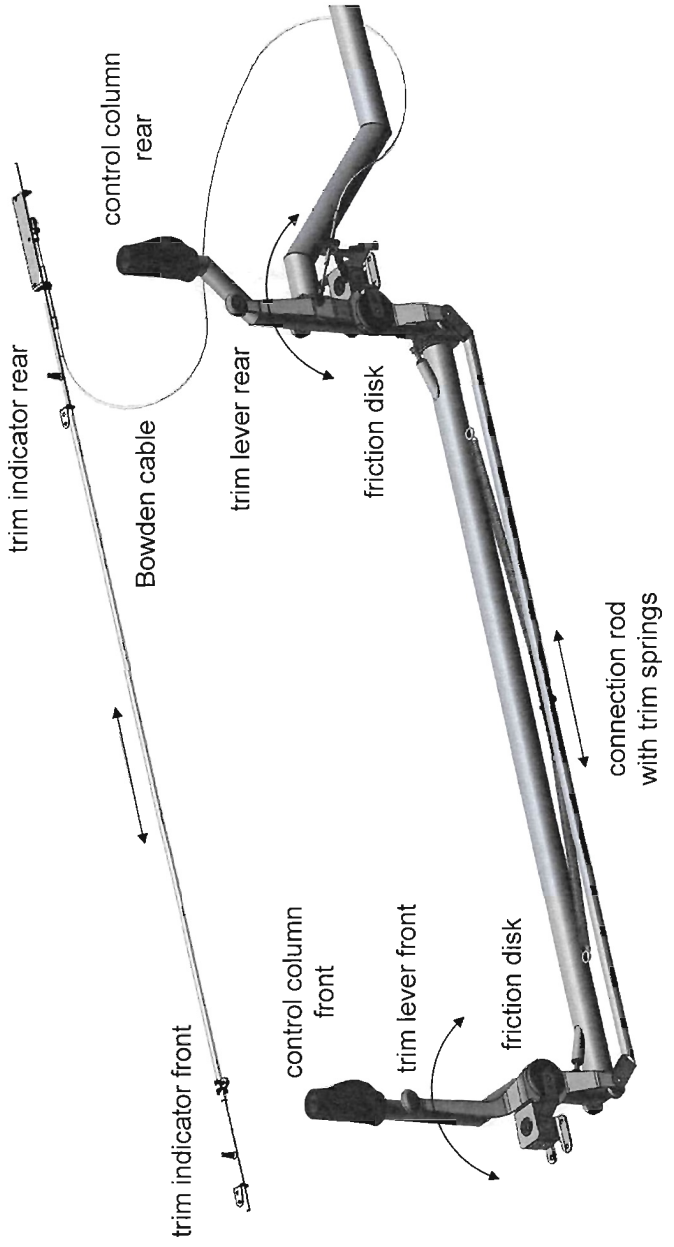


Fig. 2.2-4 Aileron Control System, Fuselage

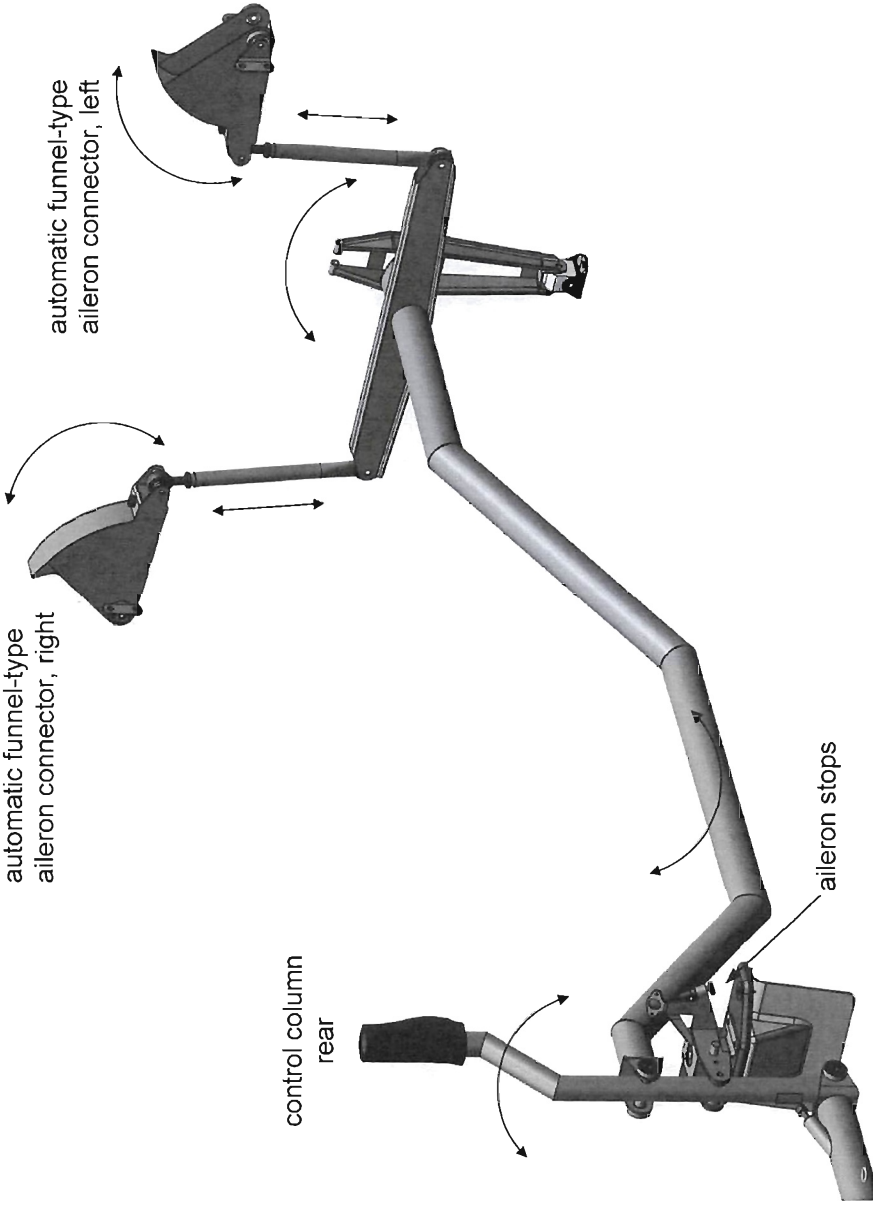


Fig. 2.2-5 Aileron Control System, Wing

Fig. 2.2-6 Airbrake Control System, Fuselage

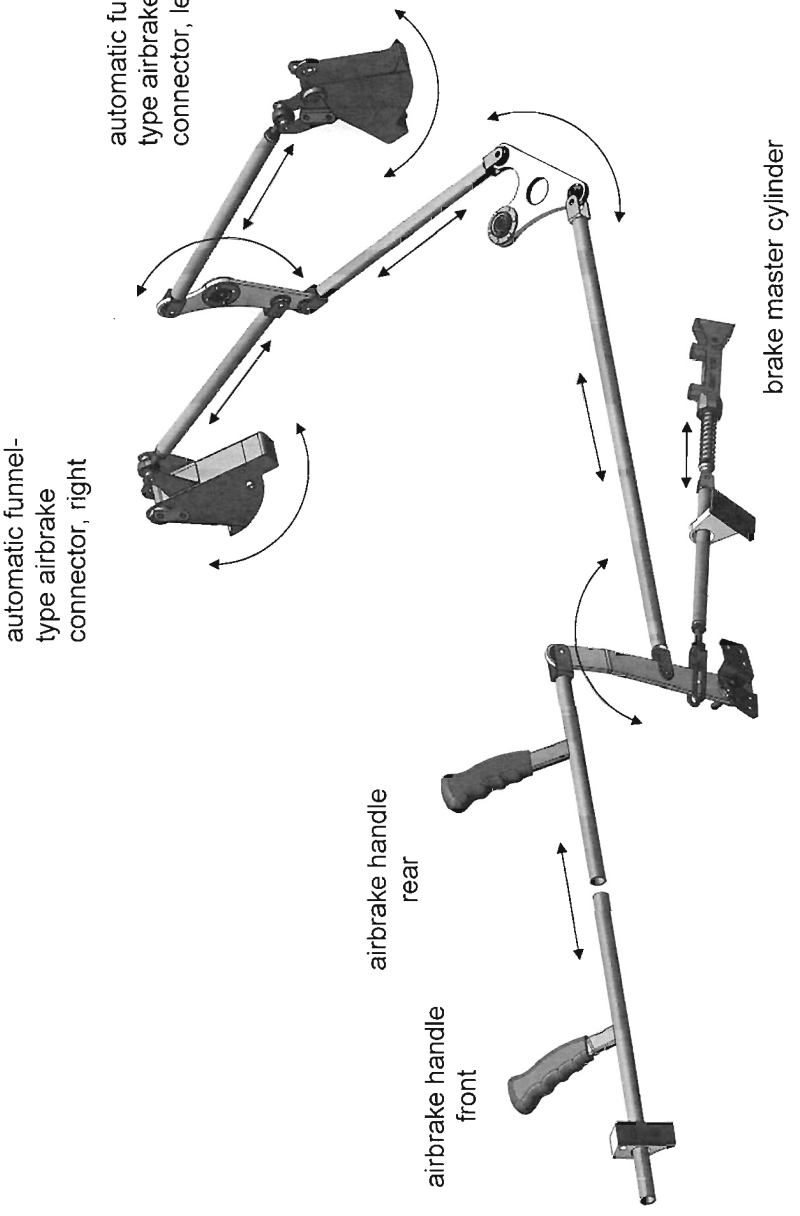


Fig. 2.2-7 Airbrake Control System, Wing

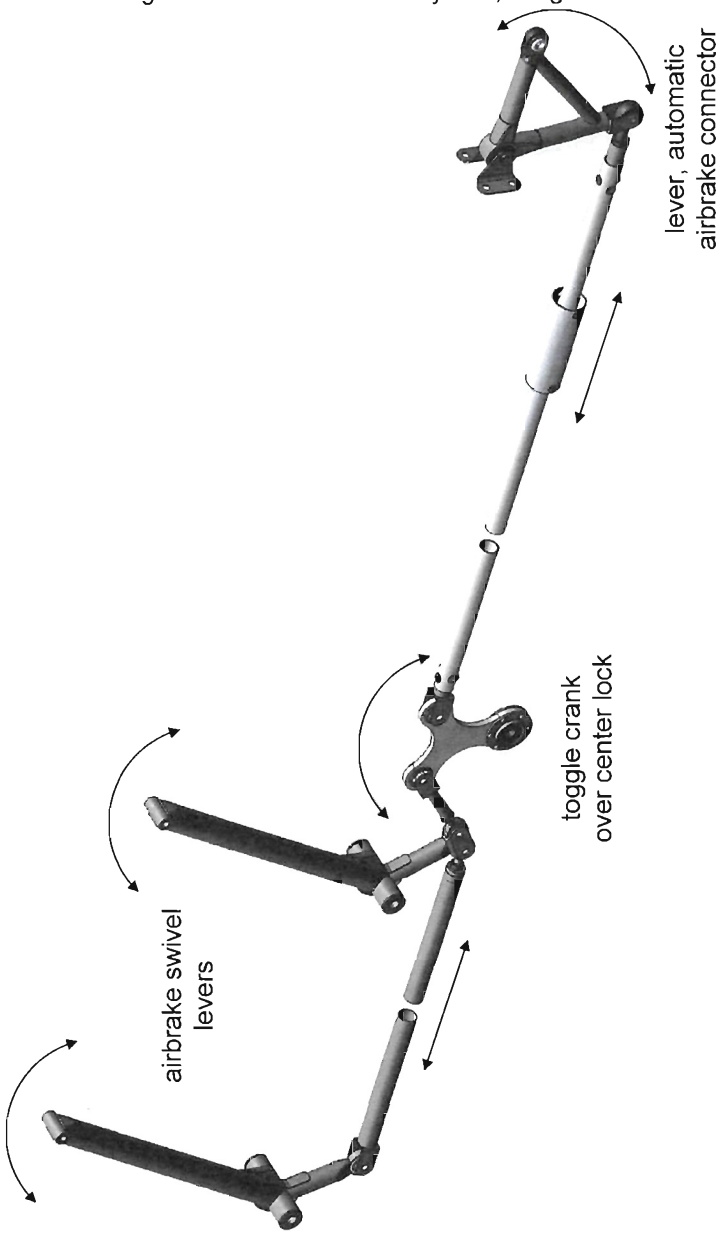


Fig. 2.2-8 Control Systems, Wing

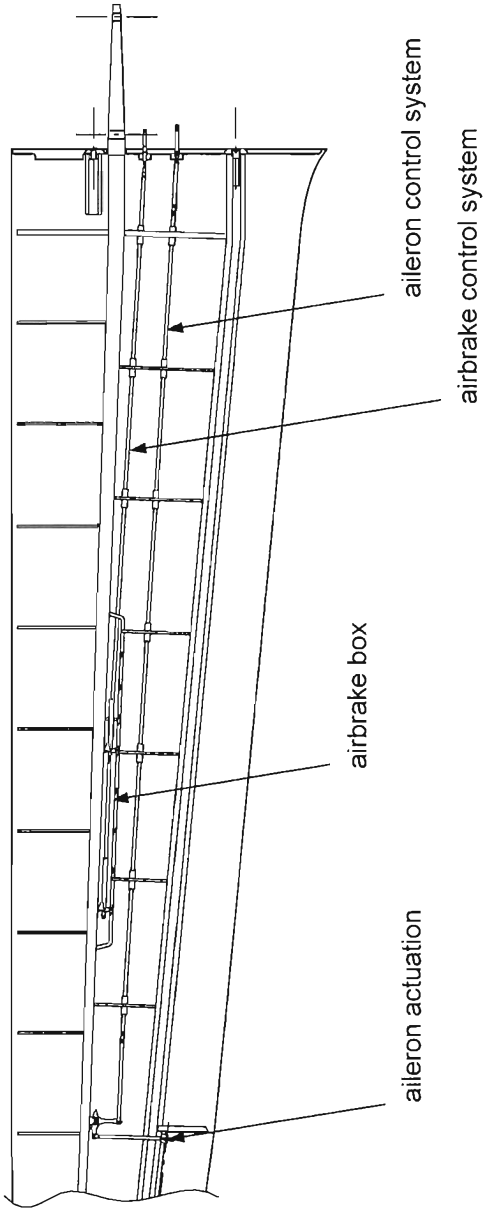
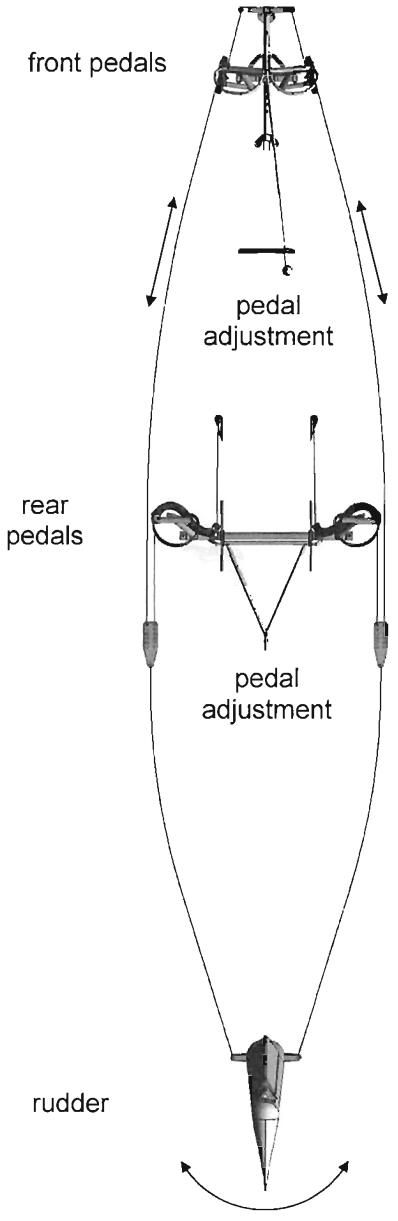


Fig. 2.2-9 Rudder Control System



2.3 Landing Gear

2.3.1 Wheels and Tires

Main Landing Gear

Rim:	5" Disc brake wheel Penta 125-77-1 ¼" P/N TOST: 055572
	alternatively: Cleveland 40-78B
Tire:	380x150 - 5 6 PR Goodyear P/N Goodyear: 385M61-1
	Alternatively comparable but certified tires 380x150 - 5 min. 6 PR can be fitted as long as they match the tolerances in terms of shape and size and fit into the wheel attachment fork.
Tube:	5.00 - 5 Wvtl. TR87, short 90° valve (28 mm) P/N TOST: 065995
Brake Disc:	162-36.3-5 preferably without ventilation P/N TOST: 057272
Brake:	TOST wheel brake cylinder 080233 and/or TOST master cylinder 050305
	alternatively
	Cleveland wheel brake cylinder 30-9 and Master cylinder 10-20
Spring / Damper:	two hollow-type rubber springs (type KE 120/95, core A with mounting member, quality RTK 55)

Tail Wheel

Rim:	"Moritz" or "Moritz II", for Ø 12 mm axle (Tost) or Tail wheel 210 x 65 (Streifeneder)
Tire / tube:	210 x 65 min. 2PR

NOTE

By replacing the steerable tail wheel, the different masses of the two possible versions must be noted. The influence on the in flight C.G. must be considered by calculation or weighing.

Nose Wheel

Rim:	Tost 4 inch 100-17 P/N Tost: 034100
Tire / tube:	4.00-4 min. 4 PR

2.3.2 Wheel Brake System

The master cylinder of the hydraulic disc brake system is connected to the airbrake control linkage. When the airbrake paddles are fully extended, the wheel brake is also actuated.

A flexible brake fluid hose leads from the main brake cylinder in front of the main bulkhead to the wheel brake cylinder. The brake fluid reservoir is located next to the main brake cylinder.

WARNING
Only use hydraulic fluid compatible with the MIL-H-5606 / MIL-H-83282 system (red fluids).

For example:
Mobil UNIVIS HVI 13
ESSO UNIVIS I-13
Aeroshell Fluid 4 or Aeroshell Fluid 41

Brake fluids based on ester - as used in motor vehicles - will quickly destroy gaskets and hoses.

2.3.3 Maintenance of Landing Gear and Wheel Brake

Main Landing Gear

The maintenance of the main wheel is confined to visual inspection of the tire, wheel rim, disc brake and shock absorber element. If badly soiled, the landing gear should be cleaned immediately. Also: Do not forget to clean and lubricate the wheel bearings.

Brake disc minimum thickness: 4.3 mm / 0.17 in

Tires

Tire pressure should be checked frequently. When the tread is worn, the tire must be replaced.

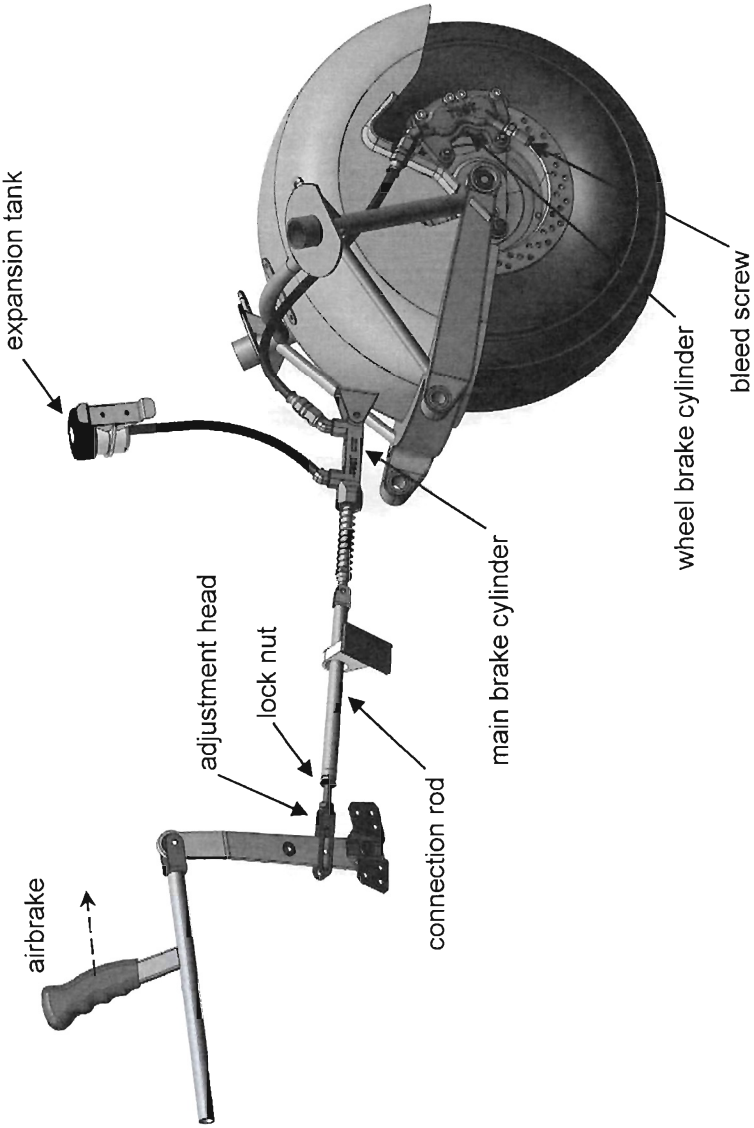
The tire must be protected from all kinds of grease and oil, as these will attack and damage the rubber.

Tire Pressures:

Main Wheel:	2.7 bar ± 0.1 bar	(39.5 ± 1.5 psi)
Tail Wheel:	2.5 bar ± 0.1 bar	(36.5 ± 1.5 psi)
Nose Wheel:	2.0 bar ± 0.1 bar	(29.5 ± 1.5 psi)

Wheel Brake System

Fig. 2.3-1 Wheel Brake System and Bleeding of the Brake Line



The hydraulic wheel brake is actuated by full extension of the airbrake lever in the cockpit. Consequently, the main brake cylinder is also the stop for the airbrake control. Therefore, it is necessary to adjust both systems properly in relation to each other.

The brake master cylinder and the brake fluid reservoir are easy accessible after removing the rear seat pan for maintenance and adjustment purposes.

The adjustment of the wheel brake activation on using the airbrake is achieved by loosening the lock nut and either screwing in or out of the connection rod (see Fig. 2.3-1) on the adjustment head.

Screwing out of adjustment head:	brake is activated earlier!
Screwing in of adjustment head:	brake is activated later!

If there is little or no braking action, the following may be the reason:

1. The brake pads are worn and must be replaced.
2. Air has entered the system and a bleeding of the brake is required.
3. There is no brake fluid in the system. Check for tightness of the system, re-fill with brake fluid and bleed the system.

Adjusting the Brake

If the sailplane is rigged, the gap between lower edge of airbrake paddle and wing top surface should be 25 – 35 mm / 0.98 – 1.38 during full braking action.

When the airbrakes are fully retracted and locked (over centre toggle), the handle should still have at least 10 mm / 0.4 in forward travel left.

> ***NOTE***
> *Eventual unequal extension of the airbrakes is not a problem and is intentional, since the airbrake mechanism has been adjusted to decrease the toggle strut locking forces.*

Bleeding of the Brake, Changing or Replenishing Brake Fluid

The brake system has been fitted in such a way that the connection between wheel brake cylinder to the master cylinder and the reservoir forms a consistently rising line (see Fig. 2.3-1). This allows the brake system to be filled and bled without difficulty in the manner described below.

> ***WARNING***
> *Use only brake fluids based on mineral oils (see also 2.3.2)! Do not spill any - the fluid is toxic!*

> ***NOTE***
> *It is recommended to use a filling pump or vacuum filling device (e.g. TOST P/N 059300 / 059330) for an easier filling or bleeding.*

Disassemble the reservoir (expansion tank) from its mounting and hold it upright. Open the filler cap and remove the diaphragm.

In order to avoid the entry of air, the fluid is poured from the bottom upwards. A bleed screw is fitted to the base of the wheel brake cylinder. Fit the end of the filling device hose on the bleed screw, which should then be rotated to open it.

Fill in the brake fluid with pressure. It is essential to ensure that the brake fluid is free from bubbles to avoid including air in the system. Fill the expansion tank nearly up to full capacity. Then the bleed screw should be closed tight and the hose removed. Do not forget to replace the dust cap! Insert the diaphragm in the expansion tank in a way that no air remains underneath it. Collect the waste brake fluid with a wipe. Finally close the filler cap and remount the expansion tank.

Check the brake system for leaks, function and effective brake operation!

Changing Brake Linings

The wheel brake cylinder is located at the left-hand side of the main gear. There are four socket screws located at the rear end of the cylinder, which are secured with threadlocker. Remove these screws. (In case of the alternative Cleveland-brake this are two 1/4" screws secured with locking wire.)

You can now remove the inner brake shoe and the wheel brake cylinder can be pulled off the hub. The brake hose must be left attached throughout, as otherwise the system will have to be bled.

While the brake is removed the brake lever (airbrakes) must not be operated!

As both brake shoe plates can be completely removed from the brake cylinder, this may be left hanging on the end of the hose.

The linings must be renewed before they have been worn down to the **minimum residual lining thickness**:

TOST brake:	0.5 mm / 0.02 in
Cleveland brake:	3.0 mm / 0.12 in

CAUTION
Dropping below the minimum residual lining thickness results in damages at the brake disc and heavily decreased braking effectiveness.

The linings have to be replaced including their base plate. In case of the alternative Cleveland-brake it is also possible to rivet new linings on the old base plate.

Insert the new brake linings and reassemble the wheel brake cylinder. Secure the four socket screws with threadlocker, respectively in case of the Cleveland-brake the two 1/4" screws with locking wire.

All spare parts can be obtained from manufacturer Schleicher indicating the used type of brake.

2.4 Radio Installation

There is provision in the instrument panel for fitting a radio. The fitting components and cable harness supplied by the radio manufacturer should be used. When planning its location in the instrument panel, remember that the instrument must be easily reached.

Various types of radio are suitable for installation. See also the list of accessories and equipment in Chapter 12.

Flight instruments should be given priority within the pilot's field of view.

The loudspeaker is installed on the rear instrument panel cover. In case a compass has been installed in the rear instrument panel, the speaker must be installed in a different location sufficiently distant from the compass, for example, in the front seat on the rear, near the sidewall. Of course, make sure that the speaker is still fully audible from both seats.

The swan neck microphones are mounted on each right-hand cockpit wall.

The VHF antenna is located in the fin.

2.5 Electrical System

Details of the electrical installation are shown in the circuit diagram Fig. 2.5-1.

The on-board avionic system is supplied with power from a battery in the left baggage compartment (wing root). Optionally, a second battery mount can be installed in the left baggage compartment.

Batteries which have a high level of out-gassing or must operate in a vertical position (e.g. lead-acid batteries) cannot be used. Maintenance free batteries such as dry lead gel based system are permissible. Newer battery types, e.g. $LIFEPO_4$, might be suitable under certain conditions. The installation can be done according to CS-STAN, SC034a.

NOTE
In section "2.5 Electrical System" the normally applicable ASK 21 B electrical arrangement is described. However, according to AS maintenance instruction "Installation of Equipment" customers can request modifications which could diverge from this description.

NOTE
"Overload protection must be provided for each electrical equipment. No protective device may protect more than one circuit essential to flight safety." (CS 22.1365).

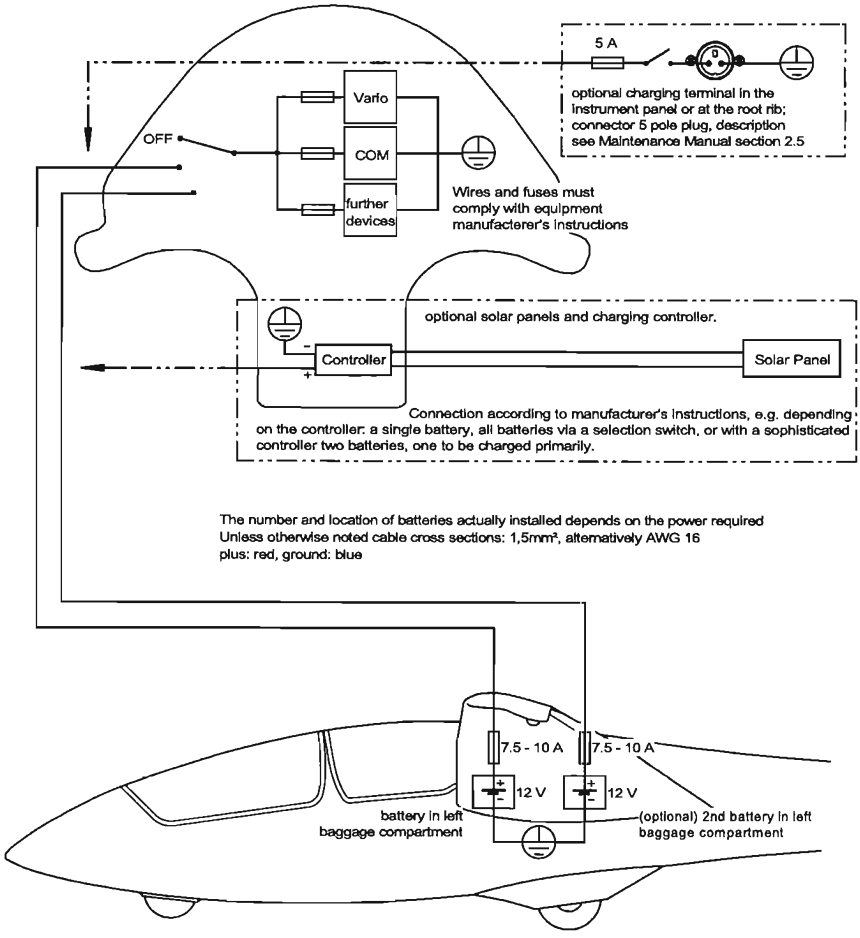
Battery Types

Soaring Avionics:

a) Battery / batteries in the left baggage compartment (lead gel):
1 x Panasonic LC-R127R2PG 12V, 7,2Ah
or similar batteries, preferably for cyclic use with suitable dimensions.

b) Battery / batteries in the left baggage compartment (LiFePO4):
2 x AIRBATT Energiepower LiFePO4 12V, 10Ah

Fig. 2.5-1 Circuit Diagram, Soaring Avionics



Avionic Battery Selection Switch (Avionic Main Switch)

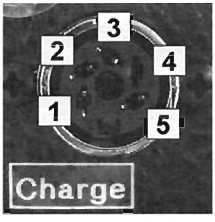
The avionic power supply is switched on by means of a selection switch. Unused switch settings are disabled.

In case only one battery mount is provided, it is also possible to use only a single main switch.

Battery Charging

Generally, the batteries do not need to be removed from the glider for charging if it has been clearly established that they do not overheat during charging.

All the batteries shown here can be charged with a normal lead battery charger. However, this is not the case for NiMH-batteries which require a special charger.



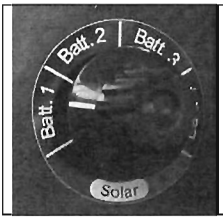
All batteries can be charged through a 5 pole charging socket located in the instrument panel. The numbering of the poles parallels the battery numbering:

1 = Avionic battery in baggage compartment
2 - 4 = optional avionic batteries
5 = common ground

For connecting a charger to the charging socket, Schleicher offers a corresponding adapter cable. It is marked so that the charger connector matches the poles of the charging socket.

adapter cable

Solar Installation



If the sailplane is equipped with a solar system, normally it is possible to decide which battery is to be charged with a selector switch.

All batteries shown here can be charged by an on-board solar system. However, the charging current from a solar system is not sufficient to completely charge and fully utilize the capacity of NiMH batteries.

2.6 Oxygen Installation

Two 3-litre oxygen bottles can be accommodated in the baggage compartment above the spar. The required fuselage fittings can be installed as an option by the factory or subsequently. The neck of the oxygen bottle must be securely screwed into the fitting. For a rear installation, a bottle receptacle is located in the rear wall of the baggage compartment.

Only use approved oxygen systems. It must be free from hazard in itself, in its method of operation, and its effect upon other components. Take care of fuel, oil and grease!

It must be possible to determine during the flight the quantity of oxygen available in the bottle and to determine whether oxygen is being delivered to the dispensing equipment.

2.7 Pitot and Static Pressure System and Instrument Connections

See also Fig. 2.7-1.

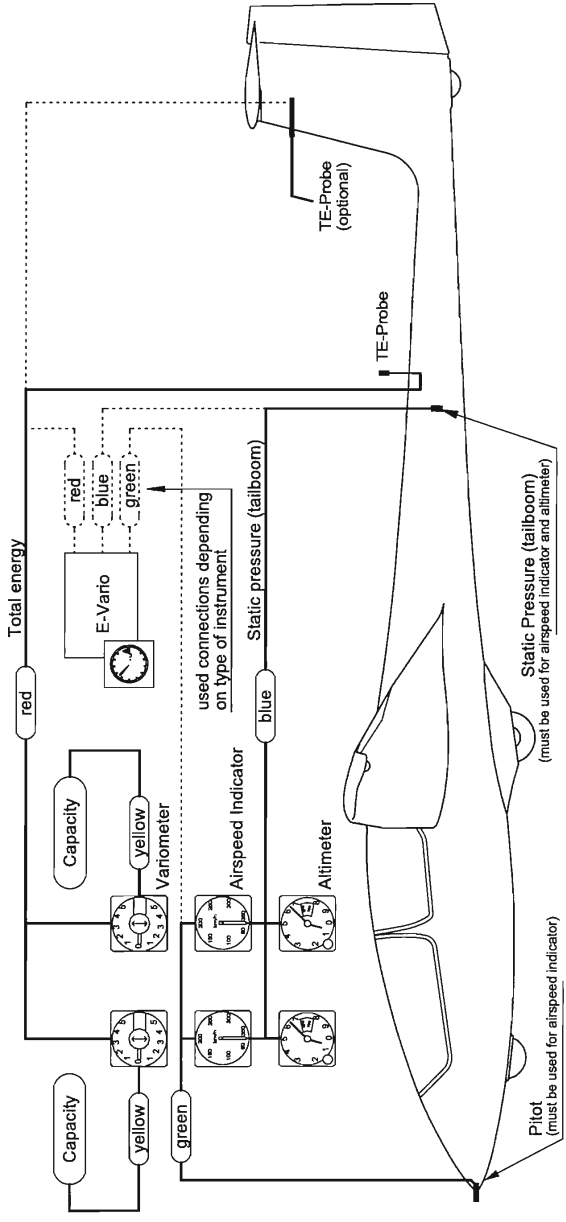
The colouring scheme for pneumatic lines is:

Type	Colour of hose
Static pressure	Transparent
Total pressure (pitot)	Green
Total energy compensated pressure	Red
Variometer capacity	Yellow

The adapter on the fuselage tail boom as serial standard can hold a TE-Probe (total energy compensation). Optional the TE-Probe can be also mounted in the vertical fin. Other probes (e.g. Multi-Probe, Prandtl-Tube, ESA-Systems, ILEC, Brötzel), possibly with a separate pitot probe may also be installed.

CAUTION
Because of the airspeed calibration, the ***airspeed indicator*** *must be connected to the static ports in the fuselage tail boom and to the total pressure in the fuselage nose.*

Fig. 2.7-1 Pitot and Static Pressure System and Instrument Connections



2.8 Jacking Points and Ground Transport

Jacking Points

The wings may be supported on trestles positioned in the area of the root ribs and near the wing tip. The trestles should be padded, or cushioned with foam rubber or similar resilient underlay. When jacking up wings, avoid stress or damage to ailerons and control linkages.

The fuselage may be supported in the cockpit region (underneath the canopy arch) by means of suitable supports. If required, the fuselage may also be supported in the area in front of the tail wheel by means of a console.

Jacking points are also illustrated in Fig. 3.2-1 in chapter 3.

If it is intended to invert the fuselage, watch the following points carefully:

- Remove the front canopy and lock the rear canopy. The front instrument panel should be either fixed in place or hinged up to its fullest extent.
- The elevator actuator must be protected by placing a suitable block underneath the front part of the fin.

Ground Transport

The wings may be carried at the spar stubs, root ribs and wing tips.

NOTE
Do not carry the wings by the protruding ends of control rods!

2.9 Tow Releases

For the C. G. tow release
TOST "Europa G 88" (Data Sheet No. 60.230/2) is used.

For the aero-tow release
TOST "Europa E 85" (Data Sheet No. 60.230/1) is used.

For mounting the tow releases bolts of strength grade 10.9 or 12.9 as well as nuts of strength grade 6 have to be used. If replacement of a tow release coupling is required, replace also bolts and nuts.

When replacing the tow release couplings, pay attention to instructions in the currently valid Operations Manual of the corresponding model.

If both releases (C of G and Nose) have been installed they are to be adjusted as follows:

Both tow releases must simultaneously open fully when the release knob/cable has been fully pulled. To allow adjustment, a turnbuckle has been installed near the nose release in the connecting cable between the C of G and nose releases. This cable must not be under tension when not being operated.

2.10 Additional Equipment and Installations

For the installation of further equipment as for example ELT, logger etc. airworthiness requirement CS 22.597 is applicable.

According to this requirement at least the following load factors (accelerations) must be demonstrated (if necessary load tests must be performed with these loads):

forwards	15.0 g
backwards	2.5 g
upwards / downwards	10.5 g
sideways	6.0 g

These load factors already include a safety factor of j = 1.5! Exceeding this requirement, Schleicher recommends to fix subjects which may hurt the pilot during a severe crash, for a forward load factor of 25 g minimum.

Emergency Transmitter (ELT)

The place that suffers the least damage by accidents is the fuselage between both root ribs. Therefore, the ELT should be affixed in this area with a corresponding mounting. Ensure that the instrument can be turned on and off and that installation and removal are possible.

Schleicher cannot provide installation diagrams and instructions since there are too many different ELTs on the market. The installation instructions of the device have to be regarded for installation.

Air Safety Equipment

The installed ATC equipment and its aerials may neither in themselves nor by their mode of operation or by their effect upon the operating characteristics of the sailplane and its equipment constitute a hazard to safe operation.

The equipment and its control and monitoring devices must be arranged so as to be easily controllable. Their installation must be such that they are sufficiently ventilated to prevent overheating. (CS 22.1431).

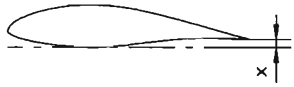
External Lights

External lights must be approved (CS 22.1385).

Section 3

3 Rigging Angles and Deflection of Control Surfaces

3.1 Rigging Angles

Wing Incidence at spanwise position y	Trailing Edge above the horizontal line (tangential to the lower wing surface in design attitude) 
0.52 m / 20.5 in	50 ± 5 mm / 1.97 ± 0.20 in
5.2 m / 204.7 in	37 ± 5 mm / 1.46 ± 0.20 in
8.0 m / 315.0 in	16 ± 5 mm / 0.63 ± 0.20 in

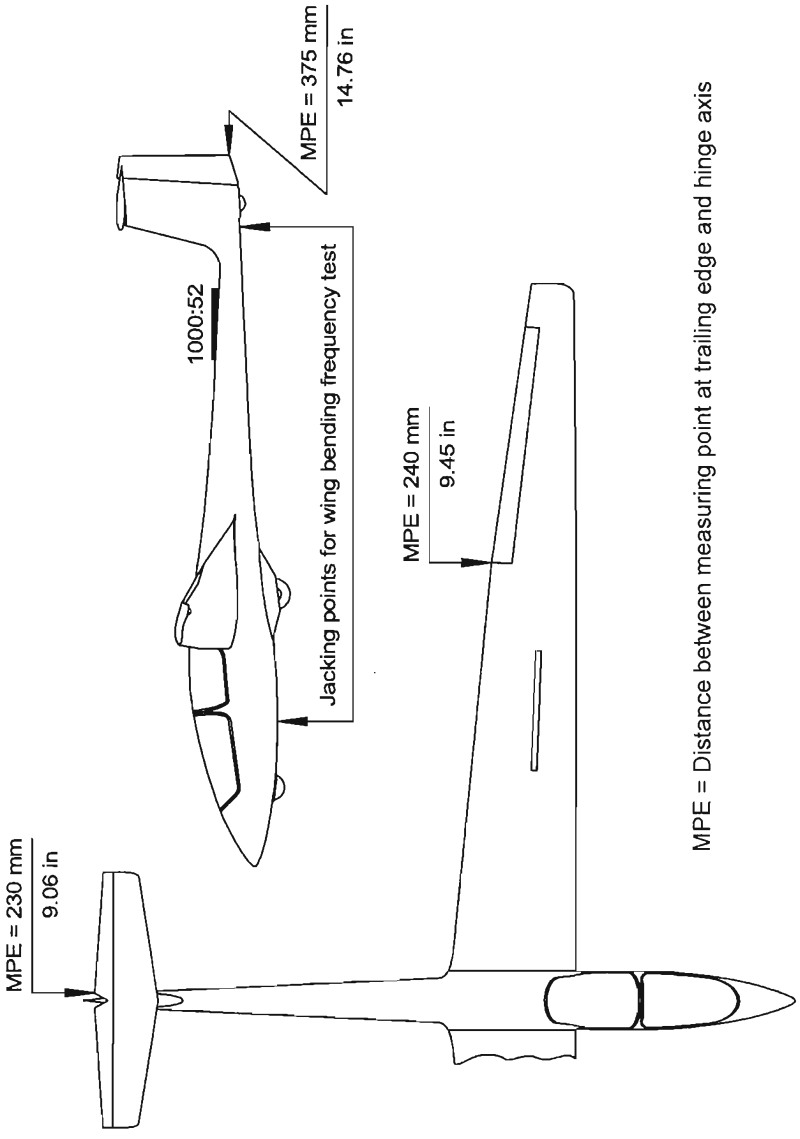
Horizontal Tail plane	
0°	relative to the horizontal with the glider in design attitude

To bring the glider into design attitude, place a wedge 1000:52 on the fuselage tail boom in front of the fin and level its upper face horizontally (see also fig. 3.2-1).

3.2 Deflections of Control Surfaces

	Distance from Measuring Point to Hinge Centreline (MPE)	**Deflection**		**Tolerance**
Rudder	375 mm 14.76 in	right & left	± 180 mm ± 7.09 in ± 27.8°	± 20 mm ± 0.79 in ± 3.1°
Elevator	230 mm 9.06 in	up down	– 90 mm – 3.54 in – 22.6° + 65 mm + 2.56 in + 16.2°	± 5 mm ± 0.20 in ± 1.2°
Aileron	240 mm 9.45 in	up down	– 140 mm – 5.51 in – 33.9° + 52 mm + 2.05 in + 12.4°	± 10 mm ± 0.39 in ± 2.4° ± 5 mm ± 0.20 in ± 1.2°
Air-brakes	Gap between lower edge of airbrake paddle and wing top surface: 25 – 35 mm / 0.98 – 1.38 in			

Fig. 3.2.-1 Control surface deflections and jacking points for the wing bending frequency test



3.3 Maximum Permissible Control Surface Play

The maximum permissible tolerance of control surface play may be measured from the same measuring points used for measuring control surface deflections. The cockpit controls should be immobilised for this purpose.

	MPE		Max. Permissible Play	
	mm	inch	mm	inch
Rudder *	375	14.76	3.8	0.15
Elevator	230	9.06	2.8	0.11
Aileron	240	9.45	3.0	0.12

*) If the actuating crank is screwed on tightly to the rudder, play in the cable-actuated rudder is normally not measurable, because of the pedal springs

3.4 Spanwise Gap at Aileron

The aileron must have a distance of minimum 1.5 mm (0.06 in.) on their narrow sides to the fixed part of the wing.

Section 4

4 Airworthiness Limitations

The airworthiness limitations section is approved and variations must also be approved.

The following statement is applicable only in case this ICA is used on the basis of a TC issued by the FAA following the validation of the respective EASA TC approval:
The Airworthiness Limitations section is FAA approved and specifies maintenance required under Secs. 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

4.1 Inspection Program to extend Service Life

4.1.1 Non-US-registered Aircraft

Introduction

Fatigue tests on GRP wings and GRP wing spars have shown that a service life expectancy of 12000 hours may be achieved for these components without problems. However, as this test program did not examine an entire aircraft made of GRP, this service life span of 12000 hours can be achieved only if the long-term airworthiness of each glider is demonstrated in a special multistage inspection program (over and above the mandatory annual C of A inspection).

Further investigations showed that under certain circumstances the service life of the ASK 21 B could be extended beyond 12000 hours up to 18000 hours.

Time Intervals

Up to 12000 hours

When the glider has reached a service time of 3000, 6000 and 9000 hours, an inspection must be done in accordance with the inspection program mentioned below. If the results of this inspection are positive or if any defects found have duly been repaired, the service time of the glider is extended by 3000 hours.

The service time extension adds to the time the glider has flown before the inspection. In other words: The glider may only be operated, when within the last 3000 operational hours the glider was either built or its service time was successfully extended.

If service time was illegally exceeded, the service time extension adds to the recent permissible service time.

Beyond 12000 and up to 18000 hours

When reaching 12000 hours the latest issue of the "Inspection Program to Extend Service Life" must be obtained from the manufacturer. This program will list all necessary inspection and maintenance works, which must be accomplished. If the accomplishment of the inspection program reveals repair areas in the high-loaded primary structure, the service life must not be extended and the respective components must be replaced. The high-loaded primary structure of the ASK 21 includes: the spar stubs, the wing root, the main spar in the wing between root and air brakes, as well as the horizontal stabilizer.

'The aircraft can be operated beyond 12000 h if the following requirements are meet:

- percentage of aerobatics flown below 12.5% of the total flight time
- complete and comprehensive records of the aircraft (service / maintenance record filer, reports of all repairs, logbooks) for judging the condition
- Exchange of the following parts:
  - both wing main pins, P/N 210.51.0002 [1)]
  - both drag lift pins, front, P/N 210.11.0002 [2)]
  - both flanged pins in the T-fitting of the horizontal tail, P/N 99.332.0092 [2)]

[1)] It is recommended to replace also the main pin bushings if these are worn.
[2)] For these items oversize pins are available and permissible; the relevant bushes must be reamed accordingly.

The report of findings of the 12000 hours inspection program must be submitted to Messrs. Schleicher for evaluation. Considering the results of this inspection and the service life history of the individual aircraft the exchange of the metal fittings is done and the aircraft approved within the prescribed intervals for the service life of 18000 hours.

Beyond 12000 hours again the 3000 hours inspection interval according to the inspection program applies. This means at 15000 hours a further inspection according inspection program is necessary to extend the service life to 18000 hours.

Inspection Program

The latest issue of the inspection program is provided by the manufacturer.

Qualification

The inspection must be done by an appropriately rated person or repair station.

Inspection Test Report

The results of the inspections have to be recorded in an inspection test report wherein comments are required for each inspection instruction. If the inspections are done outside the manufacturer's facilities, a copy of the report must be sent to the manufacturer for his evaluation and information. Upon receipt and chargeable review of the report, AS will certificate the receipt and send this to the owner immediately. Subsequently, the inspector can certificate the extension of service time according to the inspection program in the flight log and in the inspection records.

Annual inspections

This inspection program does not affect the annual inspection.

4.1.2 US-registered Aircraft

Introduction

Fatigue tests on GRP wings and GRP wing spars have shown that a service life expectancy of 12000 hours may be achieved for these components without problems. However, as this test program did not examine an entire aircraft made of GRP, this service life span of 12000 hours can be achieved only if the long-term airworthiness of each glider is demonstrated in a special multistage inspection program (over and above the mandatory annual C of A inspection).

Further investigations showed that under certain circumstances the service life of the ASK 21 B could be extended beyond 12000 hours up to 18000 hours.

Time Intervals

The initial service life of the glider is 3000 flight hours.

Up to 12000 hours

Extension of the service life to 12000 flight hours can only be achieved by implementing a comprehensive inspection program for the glider to be carried out in accordance with data that has been approved by an applicable aviation authority.

When the glider has reached a service time of 3000, 6000 and 9000 hours, an inspection must be done in accordance with the inspection program mentioned below. If the results of this inspection are positive or if any defects found have duly been repaired, the service time of the glider is extended by 3000 hours.

The service time extension adds to the time the glider has flown before the inspection. In other words: The glider may only be operated, when within the last 3000 operational hours the glider was either built or its service time was successfully extended.

If service time was illegally exceeded, the service time extension adds to the recent permissible service time.

Beyond 12000 and up to 18000 hours

When reaching 12000 hours the latest issue of the "Inspection Program to Extend Service Life" must be obtained from the manufacturer. This program will list all necessary inspection and maintenance works, which must be accomplished. If the accomplishment of the inspection program reveals repair areas in the high-loaded primary structure, the service life must not be extended and the respective components must be replaced. The high-loaded primary structure of the ASK 21 includes: the spar stubs, the wing root, the main spar in the wing between root and air brakes, as well as the horizontal stabilizer.

The aircraft can be operated beyond 12000 h if the following requirements are meet:

- percentage of aerobatics flown below 12.5% of the total flight time
- complete and comprehensive records of the aircraft (service / maintenance record filer, reports of all repairs, logbooks) for judging the condition
- Exchange of the following parts:
  - both wing main pins, P/N 210.51.0002 [1)]
  - both drag lift pins, front, P/N 210.11.0002 [2)]
  - both flanged pins in the T-fitting of the horizontal tail, P/N 99.332.0092 [2)]

[1)] It is recommended to replace also the main pin bushings if these are worn.
[2)] For these items oversize pins are available and permissible; the relevant bushes must be reamed accordingly.

The report of findings of the 12000 hours inspection program must be submitted to Messrs. Schleicher for evaluation. Considering the results of this inspection and the service life history of the individual aircraft the exchange of the metal fittings is done and the aircraft approved within the prescribed intervals for the service life of 18000 hours.

Beyond 12000 hours again the 3000 hours inspection interval according to the inspection program applies. This means at 15000 hours a further inspection according inspection program is necessary to extend the service life to 18000 hours.

Inspection Program

Alexander Schleicher will develop an inspection program for the 3000, 6000, 9000, 12000 and 15000 flight hour intervals. This program will be approved by the aviation authority and will be available for purchase from Alexander Schleicher.

Qualification

The inspection must be done by an appropriately rated person or repair station.

Inspection Test Report

The results of the inspections have to be recorded in an inspection test report wherein comments are required for each inspection instruction. If the inspections are done outside the manufacturer's facilities, a copy of the report must be sent to the manufacturer for his evaluation and information. Upon receipt and chargeable review of the report, AS will certificate the receipt and send this to the owner immediately. Subsequently, the inspector can certificate the extension of service time according to the inspection program in the flight log and in the inspection records.

Annual inspections

This inspection program does not affect the annual inspection.

Section 5

5 Control Surface Masses and Tail-heavy Moments

5.1 Introduction

If control surfaces have been repaired or re-finished, it is essential to check whether their mass and tail-heavy moments are still within the permissible limits. If it is found that these limits are exceeded, contact Schleicher for further directions.

If, in cases of repair, changes of the local static moment result, an additional mass balance must be installed **at the same location** in order to restore the same static moment as in the original state.

Take care to reduce friction as much as possible, when measuring the tail-heavy moments.

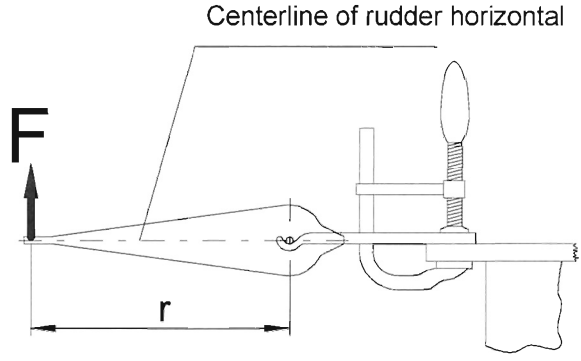
Longer control surfaces, like ailerons, can warp forwards or backwards depending on temperature, when dismantled from the aircraft. Naturally, this will distort the measurement. The suspension points for these control surfaces must be chosen to minimize this distortion. For example, if a control surface is warped forward, the suspension points should be chosen in such a way, that the leading edge mass balances being too much forward and backward approximately compensate each other. See also fig. 5.2-1 and 5.2-2.

5.2 Control Surface Masses and Tail-heavy Moments

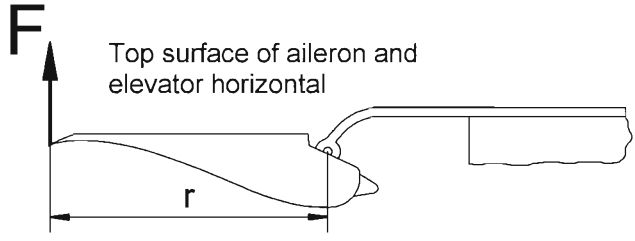
ASK 21 B – Control Surface Masses and Tail-heavy Moments

Date: Serial-No.:	Mass [kg / lbs]	permissible Mass	Distance from Hinge Line [cm / in]	Trailing Edge Load [kp / lbf]	Moment [kp·cm / lbf·in]	permissible Moment
Rudder		1.75 to 2.59 kg 3.86 to 5.71 lbs				17.1 to 22.3 kp·cm 14.9 to 19.3 lbf·in
Elevator		3.15 to 4.1 kg 6.94 to 9.04 lbs				13.9 to 18.4 kp·cm 12.1 to 15.9 lbf·in
Aileron left		2.85 to 3.75 kg 6.28 to 8.27 lbs				17.4 to 22.9 kp·cm 15.1 to 19.8 lbf·in
Aileron right		2.85 to 3.75 kg 6.28 to 8.27 lbs				17.4 to 22.9 kp·cm 15.1 to 19.8 lbf·in

Fig. 5.2-1 Measurement of Tailheavy (residual Mass) Moments



$M = F \cdot r \ [kp \cdot cm]$ Weight F with letter balance or spring balance of known accuracy & calibration



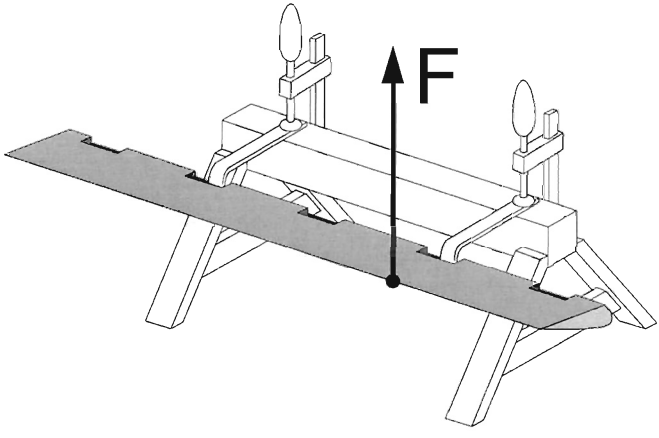
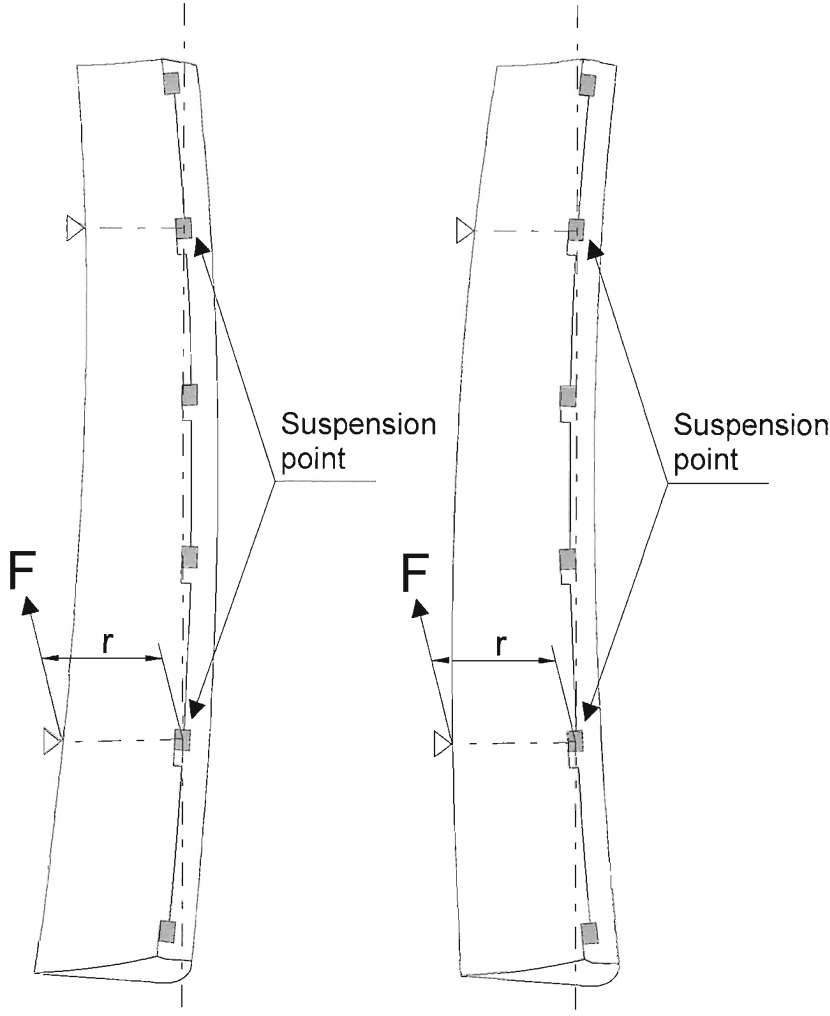


Fig. 5.2-2 Warped Control Surfaces



By sighting along the pivot axes, determine which two bearings are suitable for support points.

(The degree of warp illustrated in the sketch is greatly exaggerated!).

Section 6

6 Mass (Weight) and Balance

6.1 Introduction

This section describes the procedures for establishing the empty mass and the empty mass moment of the aircraft. Procedures for calculating the mass and moment are also provided.

A list of equipment installed is part of the currently valid inspection and weighing record.

As the C.G. position is of vital importance for a safe flight, the limits laid down must on no account be exceeded.

It is especially important after repairs, re-finishing and the fitting of additional equipment to ensure that the empty mass C.G. remains within permissible limits. If this cannot be proved by calculation, the aircraft must be re-weighed.

Unit Conversions

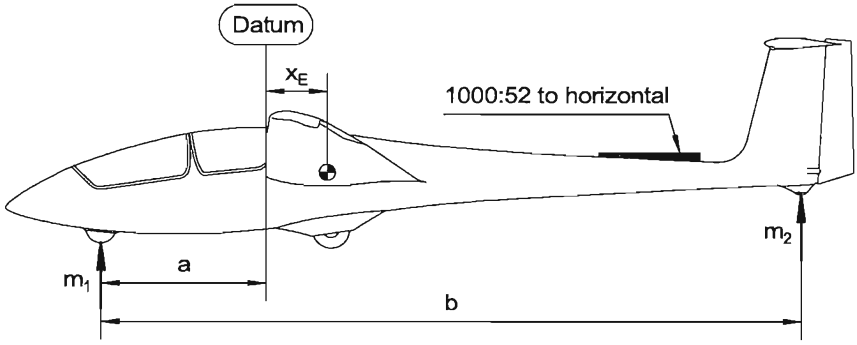
25.4 mm = 1 in
0.4536 kg = 1 lb

6.2 Weighing Procedures

The Datum (Reference) Point for weighing and calculation of the C.G. is the **wing leading edge** at the root rib.

Prior to weighing, level the sailplane, so that a wedge 1000:52 on the tail boom in front of the fin is horizontal (see fig. 6.2-1). The weighing is best done on two scales (accurate to 0.1 kg).

Fig. 6.2-1 Attitude for Weighing



Position of empty mass C.G. x_E: $x_E = \frac{m_2 \cdot b}{m_E} - a$ aft of Datum

Empty mass m_E: $m_E = m_1 + m_2$

The plane must be in the following condition:

1. flight instruments fitted and canopies closed
2. seat cushions or equivalent in place
3. backrest of front seat and headrest in place
4. with aircraft log book and Flight Manual in place
5. without spin ballast in the fin, if supplied
6. without removable trim ballast in the front cockpit, if supplied
7. without parachutes
8. without oxygen bottles, if supplied

6.3 Weighing Record

The weighing results must be stated in a weighing record which includes a list of equipment fitted at the time, and which must be incorporated in the aircraft service record.

Aircraft equipped with spin ballast (optional)

With every new weighing of the aircraft an updated spin ballast table must be requested from the manufacturer. For this purpose a copy of the weighing report (signed and stamped by the licensed inspector) with a list of the equipment fitted must be sent to the manufacturer. The new spin ballast-table must be inserted into the Flight Manual as page A.1 (Annex).

6.4 Basic Empty Mass and Moment

The empty mass and the empty mass moment can be established by weighing as described under 6.2 or may be taken from the currently valid inspection report.

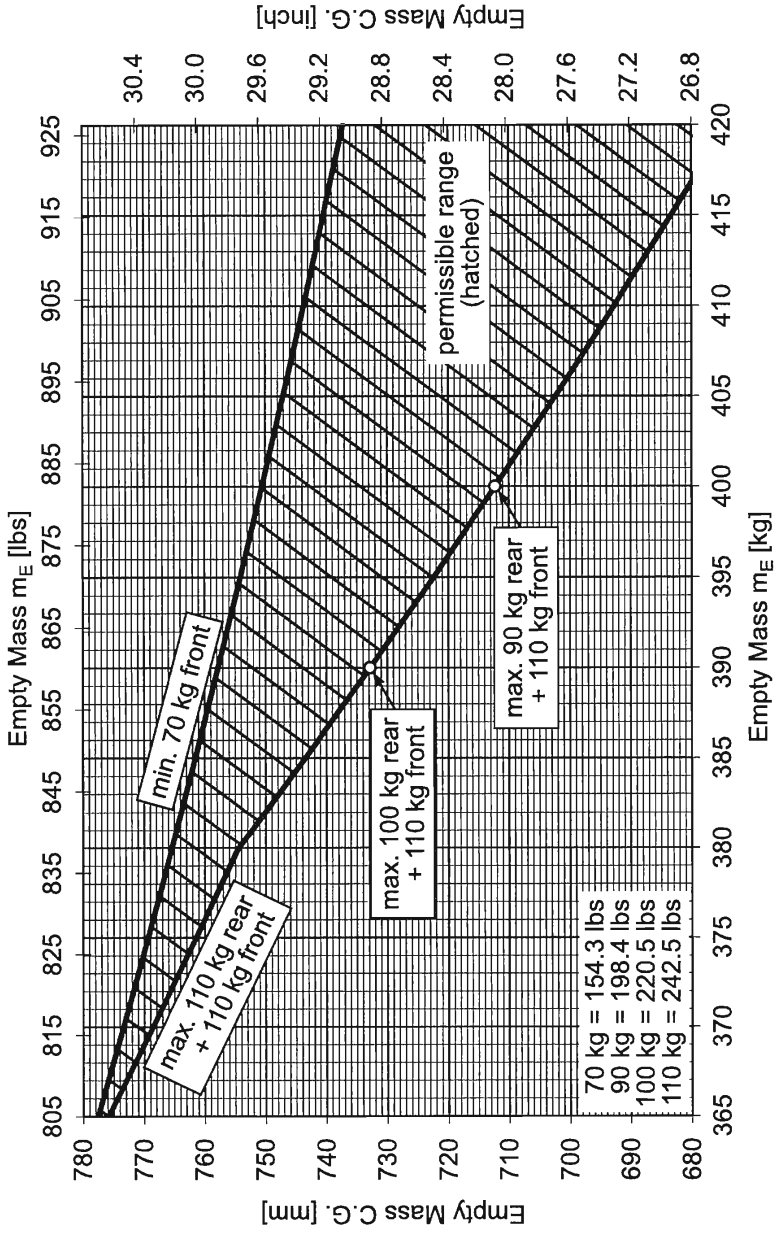
Whether a combination of empty mass and empty mass moment is permissible or not and the maximum and minimum possible cockpit load in the pilot seat can be determined with the diagram overleaf (6.4-1). A more detailed approach for the loading limits taking further limits into account (e.g. max. mass non-lifting parts) is given in section 6.6 Mass and Balance Form.

The minimum load is valid for a single pilot in the front seat.

A maximum load single seated of 130 kg (286 lbs) applies under consideration of the foremost in-flight c.g. limit. Double seated the maximum load of 110 kg (242 lbs) per seat can be exceeded under some circumstances, refer to flight manual chapter 6.

Only the hatched area of the diagram is the permissible empty weight c.g. range. If necessary, **permanently fixed ballast** has to be fitted to bring the glider into the permissible range of the diagram.

Fig. 6.4-1 Diagram of Empty Mass C.G. Position



6.5 Mass of Non-Lifting Parts

The maximum permissible mass of non-lifting parts is **410 kg** (904 lbs). These non-lifting parts include:

- Fuselage, horizontal and vertical tail
- Equipment fitted in fuselage as listed under 6.2
- Pilot and parachute (each max. 130 kg / 286 lbs)
- Baggage
- Equipment carried on board in flight but NOT weighed as under 6.2 (e.g. O_2)

6.6 Mass and Balance Form

The Mass and Balance Form is included in Section 6 of the **Flight Manual**. After weighing the aircraft, the maximum and minimum permissible loads in the cockpit and the total useful load in the fuselage are entered in this form.

Section 6.7 provides necessary data on useful loads so that the "Mass and Balance Form" can be filled in correctly; and the diagram Fig. 6.4-1 gives the necessary information to comply with the C.G. limits.

This ensures that, as long as the Mass and Balance Form in the Flight Manual is regarded, the in-flight C.G. and mass will always remain within safe and approved limits.

Completion of the Mass and Balance Form:

Columns 1 – 3 (Date of Weighing, Empty mass, Empty mass C.G.) are copied from the weighing record.

Values of the permissible pilot masses result as described in the following:

where:

m_P	pilot's mass
m_E	empty mass
x_E	empty mass c.g.
m_{nl}	mass of non lifting components

Front seat, single seated, min (column 4):

The single seated minimum load is 70 kg / 155 lbs as long as the empty mass c.g. is in the permitted range from diagram 6.4-1. In case of aircraft with a relative forward c.g. this value is slightly lower and can be exactly calculated where necessary from the following formula:

$$m_P = \frac{m_E\,(x_E - 469\text{ mm})}{1140\text{ mm} + 469\text{ mm}}$$

$$m_P = \frac{m_E\,(x_E - 18.46\text{ in})}{44.88\text{ in} + 18.46\text{ in}}$$

Front seat, single seated, max (column 5):

The smallest of the following values applies:

- 130 kg / 286 lbs
- $\dfrac{m_E\,(x_E - 234\text{ mm})}{1240\text{ mm} + 234\text{ mm}}$

  $\dfrac{m_E\,(x_E - 9.21\text{ in})}{48.82\text{ in} + 9.21\text{ in}}$
- 410 kg – m_{nl}

  904 lbs – m_{nl}

Rear seat, two-seated, max (column 6):

The smallest of the following values applies:

- 130 kg / 286 lbs
- $\dfrac{m_E\,(x_E - 234\text{ mm}) - 110\text{ kg}\,(1240\text{ mm} + 234\text{ mm})}{90\text{ mm} + 234\text{ mm}}$

  $\dfrac{m_E\,(x_E - 9.21\text{ in}) - 242\text{ lbs}\,(48.82\text{ in} + 9.21\text{ in})}{3.54\text{ in} + 9.21\text{ in}}$
- 600 kg – m_E – 110 kg

  1323 lbs – m_E – 242 lbs
- 410 kg – m_{nl} – 110 kg

  904 lbs – m_{nl} – 242 lbs

max useful load in the fuselage (column 7):

This value amounts: 410 kg – m_{nl}

904 lbs – m_{nl}

6.7 Useful Load

Whether a load is permissible depends on:

- C.G. limits

  Permissible C.G. range aft of Datum:

Foremost in flight C.G.	234 mm / 9.21 in
Rearmost in flight C.G.	469 mm / 18.46 in

- Maximum take-off mass of 600 kg (1323 lbs)
- Maximum weight of non-lifting parts of 410 kg (904 lbs)

In addition you must consider:

Maximum pilot weight in each seat must not exceed 130 kg (286 lbs)

Maximum load in the baggage compartment is 10 kg (22 lbs) (only soft items).

6.8 In Flight C.G. Positions and Pilot Moment Arms

Calculation of In-Flight C.G.

The in-flight c.g. is calculated with the following formula:

$$x_{CG} = \frac{x_e \cdot m_e + x_{fP} \cdot m_{fP} + x_{rP} \cdot m_{rP} + x_{i1} \cdot m_{i1} + x_{i2} \cdot m_{i2} + \ldots}{m_e + m_{fP} + m_{rP} + m_{i1} + m_{i2} + \ldots}$$

where:

x_{CG}	in-flight c.g.
m_E, x_E	empty mass and empty mass c.g.
m_{fP}, x_{fP}	mass and c.g. of the front pilot
m_{rP}, x_{rP}	mass and c.g. of the rear pilot
m_{i1}, m_{i2}, ..	mass of all further loaded items, not yet regarded
x_{i1}, x_{i2}, ..	c.g. positions of these items

Pilot Moment Arms

For the pilot moment arm the least favourable value must be used, unless the moment arm was established by weighing (the position of the back rest must be recorded). Masses in front of Datum have negative moment arms.

Designation	Moment arm referring to Datum	Remark
front pilot	–1140 mm to –1240 mm –44.88 in to –48.82 in	The less favorable value must be used
rear pilot	–30 mm to –90 mm –1.18 in to –3.54 in	The less favorable value must be used

Table of established Arms and Masses:

Denomination	c.g. position x	
Trim ballast in front of pedals	–1640 mm	–64.57 in
O_2-bottle	+800 mm	+31.50 in
Baggage in wing root	+250 mm	+9.84 in
Instruments in the rear instrument panel	–480 mm	–18.90 in
Instruments in the front instrument panel	–1680 mm	–66.14 in
Tail wheel	+5243 mm	+205.67 in

Some items refer to equipment, which is not serial standard.

6.9 Examples

1. Example of an empty mass C.G. weighing

$$x_E = \frac{m_2 \cdot b}{m_E} - a$$

m_1	=	249.0 kg	548.95 lbs
m_2	=	132.0 kg	291.01 lbs
m_E	=	381.0 kg	839.96 lbs
b	=	6861 mm	270.118 in
a	=	1618 mm	63.701 in

For weighing and measuring, the aircraft was levelled correctly.

$$x_E = \frac{132.0\ \text{kg} \cdot 6861\ \text{mm}}{381.0\ \text{kg}} - 1618\ \text{mm}$$

$$x_E = \frac{291.01\ \text{lbs} \cdot 270.118\ \text{in}}{839.96\ \text{lbs}} - 63.701\ \text{in}$$

x_E = 759 mm behind datum

x_E = 29.88 in behind datum

2. Example for the Completion of the Mass and Balance Form

A weighing to Section 6.2 resulted in following values:

m_E	=	381 kg	(839.96 lbs)	(empty mass)
x_E	=	759 mm	(29.88 in)	(empty mass c.g.)
m_{nl}	=	183 kg	(403.45 lbs)	(mass of non lifting components)

With Fig. 6.4-1, this results in:

This combination of empty mass and empty mass c.g. is within the hatched area, means it is permissible.

Consequently the single seated minimum load is 70 kg / 155 lbs (column 4).

Two limits apply for the single seated maximum weight (column 5):
- 130 kg / 286 lbs (maximum load per seat)
- 136 kg / 299.8 lbs (foremost in flight c.g. limit)

The following limits apply for the rear seat maximum load with 110 kg (242 lbs) in the front seat (column 6):
- 130 kg / 286 lbs (maximum load per seat)
- 117 kg / 257.9 lbs (foremost in flight c.g. limit)
- 109 kg / 240.3 lbs (maximum take-off mass)
- 117 kg / 257.9 lbs (maximum mass of non-lifting parts)

The maximum useful load in the fuselage (column 7) results from the maximum mass of the non-lifting parts minus the weighted mass of the non-lifting parts, 410 kg – 183 kg = 227 kg / 904 lbs – 403 lbs = 501 lbs.

In the Flight Manual, Section 6.2 the **Mass and Balance Form** is completed according to the following example:

			Permissible pilot mass incl. parachute			
			Front seat single seated		Rear seat, with 110kg (242lbs) in the front seat	
Date	Empty mass	Empty mass C.G. aft of RP	min	max	max	max useful load in the fuselage
xx.xx.xx	381 kg 840.0 lbs	759 mm 29.9 inch	70 kg 155 lbs	130 kg 286 lbs	109 kg 240.3 lbs	227 kg 501 lbs

3. Example of a change of empty mass and empty mass C.G.

In the ASK 21 B from to example 1 showing the weight and balance data m_E = 381 kg and x_E = 759 mm, a pneumatic variometer (m_{l1} = 0.3 kg) is exchanged for an electric one (m_{l2} = 1.3 kg); the capacities will not be changed.

How do the data of the ASK 21 B change?

Before the varios were exchanged the mass of the non-lifting parts was m_{nl} = 183 kg. As the max. mass of the non-lifting parts is 410 kg, the fuselage could be loaded with 227 kg.

Because of the change of instruments, the mass of the non-lifting parts increases by:

$$m_{l2} - m_{l1} = 1.3\ kg - 0.3\ kg = 1.0\ kg$$

up to m_{nl} = 184 kg. Now, the max useful load in the fuselage is only any more:

$$410\ kg - 184\ kg = 226\ kg$$

The c. g. changes accordingly:

$$m_{E,new} = m_{E,old} + m_{l2} - m_{l1} = 381\ kg + 1.3\ kg - 0.3\ kg = 382\ kg.$$

$$x_{E,new} = \frac{(m_{E,old} \cdot x_{E,old} + (m_{l2} - m_{l1}) \cdot x_l}{m_{e,new}}$$

$$= \frac{381\ kg \cdot 759\ mm + 1\ kg \cdot (-1680\ mm)}{381\ kg + 1\ kg}$$

$$= 752.6\ mm$$

The new values are entered into the Mass and Balance Form, Flight Manual section 6, as described in section 6.6. This entry has to be done by a licensed inspector.

4. Examples for in-flight mass C.G. calculation

A crew (85 kg in the front, 105 kg in the rear, both incl. parachute) intent to fly with the ASK 21 B from example 2 with an empty mass of m_E = 381 kg and an empty mass c.g. of x_E = 759 mm. They take 5 kg baggage in the compartment (tie down equipment, canopy cover etc.) with them.

Is this a permissible loading? What is the in-flight C.G. position?

In the above-mentioned case, the load in the fuselage adds up to:

85 kg + 105 kg + 5 kg = 195 kg

This is within the permissible range, because the Mass and Balance Form shows a max useful load in the fuselage of 227 kg.

The take-off mass is: 381 kg + 85 kg + 105 kg + 5 kg = 576 kg

According to the formula given in section 6.8, the in-flight c.g. calculates as:

$$x_{CG} = \frac{381kg \cdot 759mm + 85kg \cdot (-1140mm) + 105kg \cdot (-30mm) + 5kg \cdot 250mm}{381kg + 85kg + 105kg + 5kg}$$

$$= 330.5\,mm$$

This in-flight c.g. lies in the permitted range (234 mm – 469 mm).

Section 7

7 Periodic Inspections and Service Life Limitations

7.1 Periodic Inspections of the Airframe

Foreword

(Inspection Program to Increase Service Life: see Section 4.1)

Most countries have legal rules, regulations or acts to cover the re-inspections of aeronautical products, which sailplanes must also comply with.

For ASK 21 B registered in the sphere of influence of the European Aviation Safety Authority (EASA) national regulations apply, which implement the European Commission Regulation (EC) No 1321/2014 on the continuing airworthiness.

For US-registered sailplanes Appendix D to 14CFR, Part 43 applies.

The following program is focused to the needs of the ASK 21 B but will not necessarily cover all national rules.

Whereas the conventional components of the ASK 21 B like instruments, equipment, control circuits, hydraulic brake system and landing gear are covered by the experience of an airworthiness inspector this must not apply for Fiber Reinforced Plastic (FRP) components.

It is however, the operational experience with FRP sailplanes, that FRP is not very sensitive to fatigue and FRP has proven to be quite damage tolerant. This is contrary to the behavior of metal structures. So inspectors experienced in metal examinations are sensitive to find cracks and will therefore detect those in the FRP. The inspector has to investigate and classify them for repair, which has to be done according to the repair classes given in the Repair Manual.

Delaminating of FRP and glue joints, which have failed, can be detected by knocking the structure in question with a suitable light metal piece (maximum weight 50 grams or 1.76 ounces). From the noise produced, one can learn whether the structure is still well bonded or delaminated.

The white gel coat on the outside surfaces of the FRP is intentionally made not too tough so that it acts as a crack indicator. Aged gel coats get however so brittle that they may crack without overstress of the FRP below.

When transparent fiberglass gets "blind" or "white" areas caused by crackling of the resin matrix it must be repaired.

Inspection program

In the **course of the annual C of A inspection** the following inspections must be carried out:

1. The whole aircraft must be examined for cracks in the surface finish, holes and buckles, which must be attended to if necessary.
2. The whole aircraft must be examined for foreign bodies, for which purpose the seat pans must be removed.
3. Are all fittings in a satisfactory condition? No play, cracks, scratches or corrosion?
4. Are all other metal parts free from corrosion? If necessary, re-paint. For this job, a two-component-primer should be used.
5. There must not be any significant play in the fuselage-to-wing, wing-to-wing or fin-to-horizontal tail junctions.
6. The condition of all guides and bearings, fittings, swivel joints and cables of the control runs and linkages must be examined even where access is difficult. The control cables for the rudder and the cables for the tow release mechanism must be checked in all accessible areas. In the mainly used pedal positions, a special attention is to be given to the ends of the S-shaped cable guides. In this areas the control cable are bent during operation.

NOTE
The control cables for the rudder can be checked in the area of the S-shaped cable guides by temporarily disconnecting the wires and by shifting the rudder pedal assembly.

Where the rudder control cables are running inside the Tecalan tubes there is hardly any additional loads which means that contrary to other areas no unusual wear occurs and no special checks are required during the annual inspection.

While checking the tow release cables special attention is to be given to corrosion due to sweaty hands or ingress of moisture into the transparent Tecalan tubing.

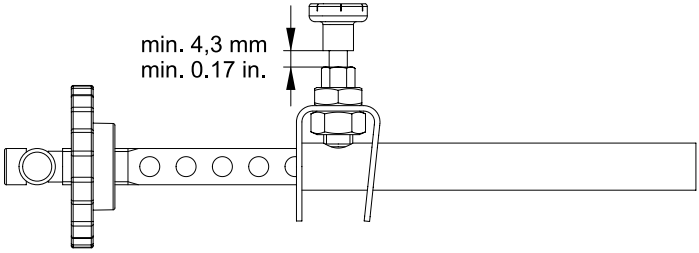
Notes for inspection of control cables are given in the manual „AIRCRAFT INSPECTION AND REPAIR" FAA AC 43.13-1A Chapter 4, point 198.

NOTE

The enclosed structures like the inner of the wings, fuselage tailcone, in and stabilizer are usually not affected by dirt and corrosion. In case of doubt use an endoscope (boroscope) for inspection.

7. All controls including the air brakes must be checked for satisfactory operation, and their deflections measured. Control surface play is to be checked according to section 3 of the maintenance manual.
8. If any control linkage does not move freely over the whole range of its movement, investigate and remedy the cause.
9. The condition of the main landing gear, nose wheel and tail wheel including tires, brake linings and brake disc must be checked (refer to section 2.5.4).
10. Examine the pitot and static ports in the fuselage and fin for blockages and leaks.
11. Check condition and proper functioning - and, if appropriate, permitted service life /TBO - of all instruments and VHF transceiver.

12. The condition and proper functioning of the TOST tow release coupling(s) fitted should be checked. The release actuating cable must have free movement and some play when the tow release coupling is closed and locked, so that they are not under any tension.
13. The canopy jettison release must be operated and examined for corrosion etc., if necessary, rectified and in any case freshly lubricated!
14. Compare equipment and instrumentation with that shown in the equipment list.
15. After repairs, changes in equipment, or at least after four years, the empty mass and C.G. position should be re-determined by calculation or weighing and recorded in the Mass and Balance Form, in Section 6.2 of the Flight Manual.
16. Check all control surface gaps for correct sealing accpording to maintenance instruction C. Airflow through the control surface gaps can initiate flutter.
17. All elastic fairing strips must have a good, lightly tensioned seating on the control surfaces. Strips sticking out impair performance.
18. For version with optional spin ballast in the fin, the security and locking mechanism on the backside of the cover must be checked for function and ease of operation. The lateral guides of the spin ballast box must hold the spin ballast weights safely.
19. The latching function of the trim ballast mounting support in front of the front seat must be checked. Unlock the guide rod and turn it, so that the snap-in holes are on the side. In this state, the locking bolt must be in following position:



Furthermore, all components must to be checked for wear. See also section 7.10 in the Flight Manual.

7.2 Special inspection procedures of the airframe

After Hard Landings

1. Check landing gear mountings at the front main bulkhead.
2. Check landing gear wheel fork, as well as all struts for distortion.
3. Check rubber buffers in the landing gear suspension.
4. Check mountings of nose and tail wheel.
5. Inspect spar fork and tongue for white areas.
6. Inspect wing mounting drag pins on fuselage.
7. Check drag spar cross tubes and bulkheads in the fuselage.
8. Inspect wing root ribs and check for play in the wing joints.
9. Re-establish wing-bending frequency and compare with the value of the TC inspection. If they differ by more than 5 %, contact Messrs. Schleicher. For correct fuselage support, positions see Fig. 3.2-1.

After Ground loops

1. Inspect the tail boom at the fuselage-to-fin junction and the horizontal tail mountings at the fin.
2. Check wing mounting drag pins on fuselage.
3. Inspect drag spar cross tubes and bulkheads in fuselage.
4. Examine horizontal floor in fuselage between front and rear main bulkhead.
5. Inspect wing root ribs and check for play in the wing joint.
6. In the unrigged condition: check spar stubs, spar tunnel and root ribs for delaminating or cracks and damages to their fittings!
7. Inspect the aileron of the side, to which the glider turned. Especially take care of damages at the outer end as well as cracks around the hinge fittings protruding out of the aileron.

After landings in high crops or high grass

1. Check control circuit. Check control deflections for ailerons, as bell cranks inside fuselage or wings may have been bent.
2. Check ailerons for damages.
3. Clean launching hooks and landing gear.

7.3 Special Servicing Procedures and Equipment Subject to Service Life Limitations

Special Servicing Procedures

none

Equipment subject to Service Life Limitations

Tow Releases

The glider comes optional with **tow release** TOST type "Europa G 88" **fitted at the C.G**. On request a **nose release** type "Europa E 85" is fitted. For all of these tow release couplings service life limitations are valid, which are documented in their corresponding authorized release certificates. The relevant "Operations and maintenance instructions" issued by the manufacturer TOST must be complied with.

Instruments

The flight monitoring instruments are normally not subject to service life limitations. Generally, the manufacturers instruction must be observed.

Oxygen Installation

Oxygen equipment must be approved

For oxygen systems fitted, the relevant section of the appertaining Inspection Release Certificate states the overhaul time limit. Over and beyond this, the oxygen bottles may have to be re-inspected by a technical inspection institute at other intervals in accordance with pressure vessel regulations existing in the country of operation.

Safety Harness

For the safety harness installed the life time limitation according to the appropriate maintenance instructions given by the harness manufacturer apply.

Section 8

8 Lubrication Scheme

8 Lubrication Scheme

CAUTION
*Grease and oil based on MoS_2 (Molybdenum Sulphide) are **not** suitable for bearings incorporating brass, bronze or copper parts, but are very good for steel/steel bearings and roller bearings.*

Ball Bearings

Grooved ball bearings with sealings are permanently grease packed; no further lubrication is required. These grooved ball bearings are typically used in the rotation axis of the dural bell cranks. Open ball or roller bearings however need to be lubricated.

Self-aligning ball bearings (14 C 6) are pre-greased and protected by seals made of felt. These are also maintenance-free over a long period. Typically they can be found at the joint of push rods and in dural bell cranks, as well as in the automatic hook ups at the fuselage root ribs. Experience shows that re-lubrication is necessary after 10 years.

Rod Ends (with spherical plain bearings)

Rod ends typically connect push rods with each other, or push rods with bell cranks made from steel. In the controls systems, only maintenance free rod ends are used. They should not be lubricated. The ball revolves on a PTFE liner incorporated in the housing. Oiling of these bearings can only be conditionally recommended.

Hinges with brass bushings

Simple hinges are usually fitted with brass bushings. They are greased when they are fitted. Annual greasing or oiling protects the steel counterparts from rusting. Typical application is the bearing of steel levers, for example, the toggle struts at the landing gear, the canopy hinges or the pedal hinges.

Canopy Locking and Jettison

The canopy locks, especially the emergency canopy jettison release, must be kept well greased.

Control Surface Hinges

All **controls surface hinges of the aileron and elevator** consist of self-lubricating, maintenance-free, plain bearings. As series production standard the glider is equipped with elastic fairing strips and teflon tape seals at the control surface gaps. Consequently, the control surface hinges are not exposed to substantial soiling and need no special maintenance. In addition they are greased when they are fitted. Nevertheless, whenever elastic fairing strips are replaced, do not forget to check the free movement of all hinges. See also Section 10 "Removal and Re-assembly of Control Surfaces".

If cleaning or maintenance of the control surface hinges is necessary, the elastic fairing strips and the teflon tape must be removed.

> ***CAUTION***
> *The flutter calculation regards the sealing of the control surfaces. Therefore, without the sealing according to maintenance instruction C the ASK 21 B is not airworthy!*

> ***NOTE***
> *Early serial numbers of the ASK 21 B have needle bearings installed in the controls surface hinges of the aileron and elevator. As series production standard the glider is equipped with elastic fairing strips and teflon tape seals at the control surface gaps. Consequently, the control surface hinges are not exposed to substantial soiling. The experience so far shows that re-lubrication in 10 years intervals is sufficient.*

Linear guides of the pedals

The linear guides of the pedals should be cleaned and greased at least once per year.

Tow Releases

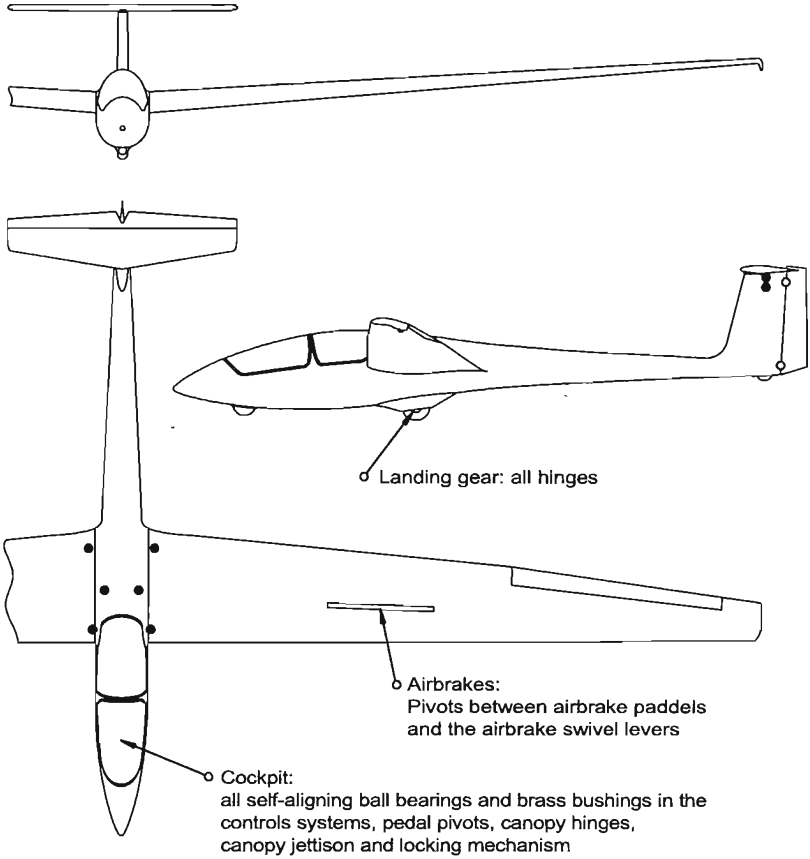
Dirty tow releases are best cleaned with compressed air and paintbrush while repeatedly moving their mechanisms; they may then be re-lubricated with aerosol oil or similar.

The replacing of tow release hooks is described in Section 10.3.

Fig. 8-1 Lubrication Chart

● = These joints to be cleaned and greased every time the glider is rigged.
o = Lubricate these points in the course of the annual C. of A. inspection.

Do **not** use MoS_2 based lubricants for brass bearings!
Do **not** use grease for plain bearings at control surface hinges!



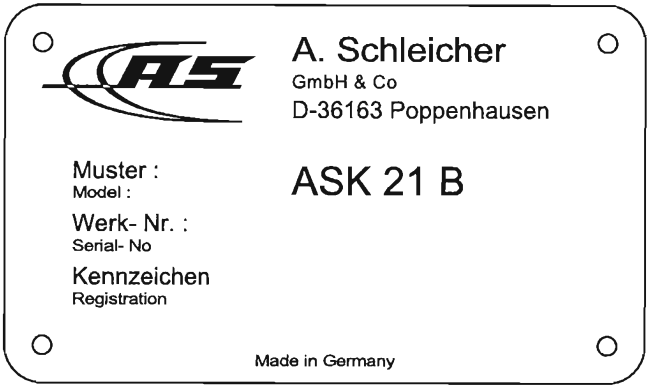
Section 9

9 Placards, Labels and Markings

9 Placards, Labels and Markings

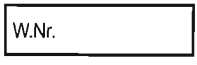
The marking scheme is listed and explained in Sections 2 and 7 of the **Flight Manual.**

The consecutive numbers given with the labels refer to their location in the aircraft and match the numbers shown in the views of the cockpit (Fig. 9-1 and -2).



This placard is located in the rear cockpit on the right wall in front of the cross tube between the lift pins.

Only for US-registered aircraft: Underneath the registration the type certificate number has to be added.



This placard is affixed to every component.

Fig. 9-1 View of the front cockpit

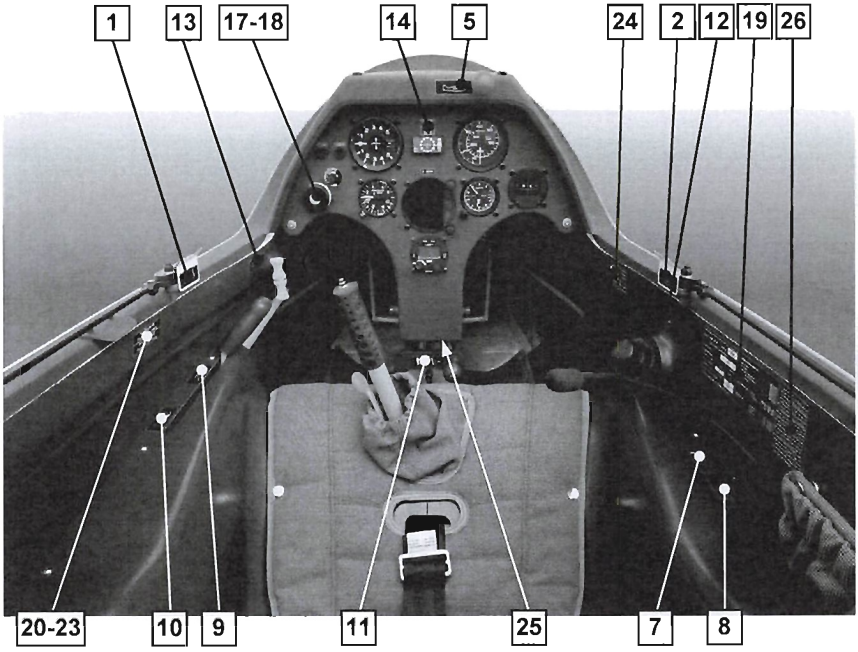
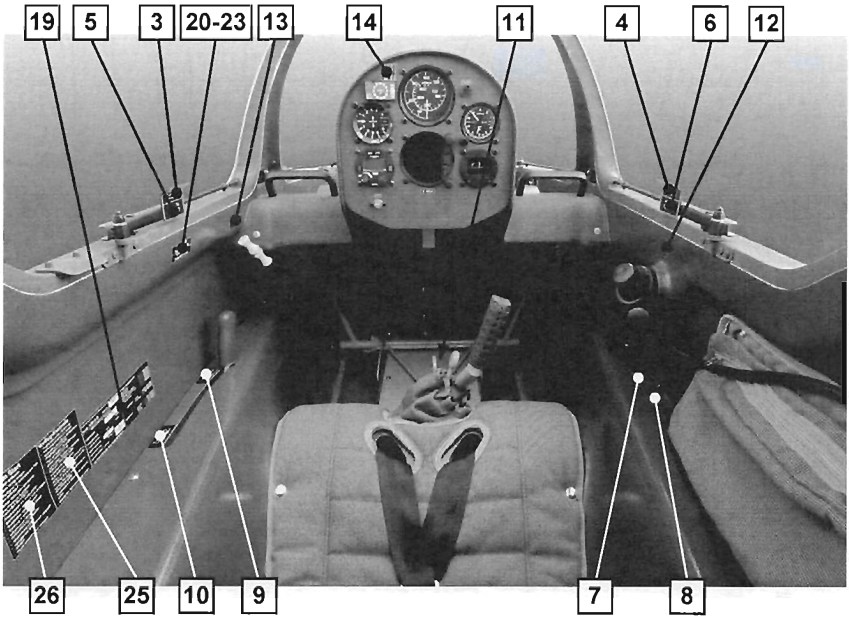


Fig. 9-2 View of the rear cockpit



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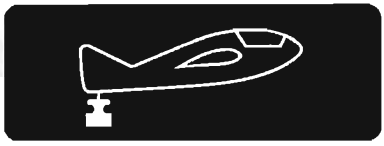

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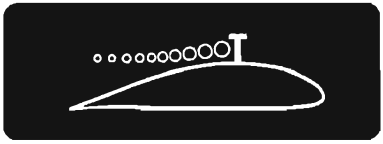

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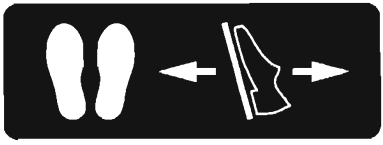

12

13

14

V_{NE} Speed Limit for high altitude	
Altitude MSL [m]	V_{NE} IAS [km/h]
0 - 2000	280
< 3000	267
< 4000	255
< 5000	239
< 6000	226

ASK21B

V_{NE} Speed Limit for high altitude	
Altitude MSL [ft]	V_{NE} IAS [mph]
0 - 6500	174
< 9800	166
< 13100	158
< 16400	148
< 19600	140

ASK21B

V_{NE} Speed Limit for high altitude	
Altitude MSL [ft]	V_{NE} IAS [kts]
0 - 6500	151
< 9800	144
< 13100	137
< 16400	129
< 19600	122

ASK21B

The appropriate of these placards is affixed close to the airspeed indicator.

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Deviation-Table			
for	steer	for	steer
0		180	
30		210	
60		240	
90		270	
120		300	
150		330	
Date:			

If necessary, this table has to be affixed next to the compass.

16

Baggage compartment load **max. 10 kg (22 lbs)**

This placard is affixed on each of the baggage compartment openings.

17

Attention
Check spin ballast!

Only use spin ballast for flights with two pilots!

This placard (red) is affixed at the mount for the black knob of the safety mechanism in the front instrument panel (only in case of optional spin ballast).

18

Knob for spin ballast

This placard is affixed at the black knob of the spin ballast safety mechanism in the front instrument panel (only in case of optional spin ballast).

Segelflugzeugbau Alexander Schleicher GmbH & Co. Poppenhausen

Model: **ASK 21 B** Serial-No.: 21

DATA and LOADING PLACARD

Empty Mass (Weight)		lbs	kg
Max. Mass (Weight)		1323 lbs	600 kg
Seat Load	Front		Rear
Min. Seat Load	lbs kg		--
Max. Seat Load	242 lbs 110 kg *)		lbs kg
Max. Total Load in Fuselage		lbs	kg

*) For higher Seat Loads refer to Flight Manual Ch. 6

Max. Permissible Speeds:

Calm Air	151 kts	174 mph	280 km/h
Rough Air	108 kts	124 mph	200 km/h
Manoeuvering Speed	97 kts	111 mph	180 km/h
Winch Launch W/L	81 kts	93 mph	150 km/h
Aerotow A/T	97 kts	111 mph	180 km/h

Weak Link	Winch	900 to 1100 daN
	Aerotow	max. 660 daN

Tire pressure	Main Wheel	38 - 41 psi	2.6 - 2.8 bar
	Nose Wheel	28 - 31 psi	1.9 - 2.1 bar
	Tail Wheel	35 - 38 psi	2.4 - 2.6 bar

20	Aerobatics are not permitted!	This placard is affixed close to the Data and Loading placard (17).
21	Aerobatics permitted as per flight manual	If applicable *) this placard is affixed instead of placard 18 close to the Data and Loading placard (17).
22	Cloud flying is not permitted!	This placard is affixed close to the Data and Loading placard (17).
23	Cloud flying permitted as per flight manual	If applicable *) this placard is affixed instead of placard 20 close to the Data and Loading placard (17).
24	Prior to take-off, check weight of the trim plates and their secure fixing 1 Plate (1 kg; 2.2 lbs) **in front of the seat** equals a pilot mass of 1.25 kg (2.75 lbs)	This placard is affixed at the right side of the front seat at the cockpit wall.

*) These placards are only affixed, if the corresponding minimum equipment (refer to flight manual chapter 2) is installed.

25

Pre Flight Check

- Check main pins (secured)
- Check for foreign matter in the cockpit
- Check comtrols (positive connections, freedom of movement and play)
- Check pitot and static pressure openings (dry and unobstructed)
- Check for visible damage on towing hooks, landing gear and surfce
- Test tow release
- Check tyre pressure and wheel brake
- Check TEC-Probe mounted and inserted until stop
- Check correct mounting and securing of the tailplane
- Check spin ballast in vertical tail (optional)
- Check mass and balance

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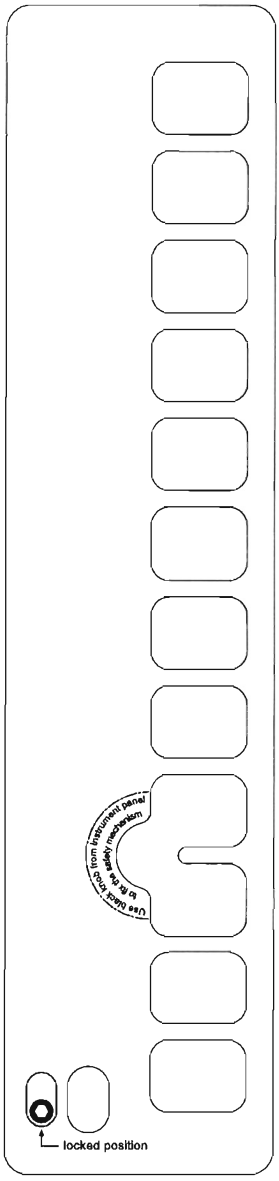
Pre Take-off Check

- Remove tail dolly
- Fasten parachute
- If applicable connect rip-chord for automatic parachute
- Take a correct seat position
- Fasten safety harness (especially tighten lap straps)
- Check free movement of the controls
- Close airbrakes and lock them
- Check spin ballast (optional)
- Set trim in take-off position
- Set altimeter
- Check radio transmission
- Check wind direction
- Recap the take-off interruption procedure
- Close and lock canopy

27



This placard is affixed on the cover of the (optional) spin ballast compartment.

This placard must be enlarged by 250%.

Section 10

10 Repairs, Removal and Re-assembly of components, Tightening Torques

10.1 Repairs

Damage to wings, fuselage, tail units and controls must be repaired before the aircraft is flown again.

Repair instructions will be found in the **REPAIR MANUAL** issued by manufacturer Schleicher for all fibre composite materials sailplanes made by them. Further suitable documents are listed in the latest issue of the general Technical Note No. 2-2005 from the manufacturer Alexander Schleicher.

Beyond the instruction given in the Repair Manual the following items have to be observed:

In case of major damage, it is advisable to contact SCHLEICHER, who will supply repair and maintenance instructions, which are constantly amended based on their accumulated experience.

It has always been very helpful to add photographs and/or sketches (e.g. marking the location of the damage on copies of the illustrations in Section 2 of this Maintenance Manual or of the three-view drawing included in the Flight Manual) to the damage report.

It should be borne in mind that major repairs beyond certain limits may be carried out only by a Part 145 or a Part-M Subpart F certified establishment. A classification of degrees of damage is contained in the **REPAIR MANUAL**.

Spare parts, identified by the exact sailplane model and serial-number, can be ordered directly from SCHLEICHER or from their foreign representatives.

Contact of Alexander Schleicher GmbH & Co.:

Phone: ++49 (0) 6658 / 89-0
Fax: ++49 (0) 6658 / 8940
E-Mail: info@alexander-schleicher.de

Further contacts are also published on the website of Schleicher company in the column "Contact":

www.alexander-schleicher.de

There is also given an up-to-date list of the **Foreign Representatives**. Partly they have also common spare parts in stock.

10.2 Removal and Re-assembly of Control Surfaces

When an aileron or elevator must be removed, first remove the sealing (maintenance instruction C).

Aileron and Elevator

The hinge pins are cylindrical dowel pins, which are grooved on one end (AS P/N 99.000.4260). A flat head blind rivet Ø 2.4 x 5 mm DIN 7337 A engages into this groove, thus securing the hinge.

The blind rivets are carefully removed, using a drill of 2.4 mm diameter. The hinge pins must then be pushed out sideways of the hinge using a suitable steel wire.

For re-installation of the control surfaces, the hinge pins must be re-greased and pushed in so that the groove is below the hole for the rivet. Secure the hinge pins with new rivets.

> ***CAUTION***
> *After riveting, it should be tested that the rivet sits correctly in the groove of the hinge pin, and neither the pin nor the rivet can be pulled out.*

The aileron actuator is connected by means of a new self-locking nut The control surface gaps between wing and aileron and between stabilizer and elevator respectively must be sealed according to Maintenance Instruction C.

> ***WARNING***
> *If a sealing is missing, damaged or wrong, this may lead to flutter!*

For re-installation of the control surfaces follow also the instructions of section 8 "Lubrication Scheme".

Rudder

To remove the rudder, the rudder cables are dismounted from the actuating crank and the bolt serving as the pivot axis is unscrewed. Now the rudder can be taken off its upper hinge.

For re-installation always use a new locknut DIN M6 DIN 985.

10.3 Removal and Re-assembly of Tow Releases

Tow release fitted at the C.G.

1. Remove the rear seat pan.
2. Remove the cover above the tow release.
3. Undo the cable of the tow release actuator.
4. Unscrew the tow release and pull out the tow release upwards.

Tow release fitted at the nose

1. Undo the cable of the tow release actuator.
2. Remove the cover above the tow release.
3. Unscrew the tow release and pull out the tow release downwards.

Installing the tow releases is done in the reverse order.

When installing use only new split pins and self-locking nuts. Do not forget to screw on the ground line on one of the mounting screws.

When re-fitting tow releases, care should be taken to always use bolts of strength grade 10.9 or even 12.9 and nuts of the strength grade 6. See also "Operating Manuals for tow release couplings" from Messrs. Tost.

When the tow releases are exchanged, new bolts and nuts must be used for re-installation.

10.4 Tightening Torques

Table of maximum permissible torques for bolts in standard bolted connections.

Thread size	Nm	ft·lb
M4	1.8	1.3
M5	3.6	2.7
M6	6.4	4.7
M8	16.0	12.0
M10	32.0	23.5
M12	57.0	42.0
M14	92.0	68.0

Section 11

11 Modifications of the Sailplane

11 Modifications of the Sailplane

Modifications according to this Maintenance Manual

A modification of the aircraft which is covered by this Maintenance Manual (e.g. change of equipment) can be carried out, when it is accomplished by means of usual working methods. It must be checked by a licensed inspector.

Modifications beyond the range of this Maintenance Manual, which are certified

If a modification is certified or accepted by the responsible Aviation Authority, it must be conducted according to the working rules, which were certified with the modification (what is to do, who may carry it out, who may inspect it).

Under EASA rules a modification may be laid down as Minor Change, Major Change or Supplementary Type Certificate. When Technical Notes released by AS based on such an approval, they include a reference on the approval.

Not yet certified modifications

For a modification not yet certified, the responsible Aviation Authority must be contacted. It makes sense to contact the Authority before the modification is carried out.

Section 12

12 Appendix

12 Appendix

12.1 List of Equipment

This List of Equipment specifies instruments, which are suitable for installation into the ASK 21 B.

Other instruments may be fitted as part of the Minimum Equipment provided, if they are TSO, JTSO or ETSO certified for their intended use. In addition, the following must apply:

- The airspeed indicator scale range must read at least to 1.05 V_{NE}. It must marked according to section 12.4. The units of measurement used to indicate airspeeds on placards must be the same as those used on the indicator (km/h, kts, mph).
- If the magnetic direction indicator (compass) is part of the Minimum Equipment, it must be installed so that it can be compensated in level flight to ± 10°, and to ± 15° when the radio is in use. A deviation table (in at least 30° increments) must be affixed near the instrument, if the compass cannot be adjusted more exactly than ± 5° (deviation table see Section 9).
- The safety harness must be designed by the manufacturer for installation at such belt anchoring points as provided in the ASK 21 B.

For the installation of other equipment, which is not listed, the Maintenance Instruction Installation of Equipment is applicable (see section 13.4).

Minimum Equipment:

see **Flight Manual,** Section 2.12

Manufacturer	Type	Data Sheet Spec.-No.	Measuring Range	Ref.-No.
Air Speed Indicator				
Winter	6 FMS 421	TS 10.210/15	40-300km/h	AS-4-21
	6 FMS 441	TS 10.210/15	40-350km/h	AS-4-21
	6 FMS 521	TS 10.210/16	50-350km/h	AS-4-21
	7 FMS 421	TS 10.210/19	0-300km/h	AS-4-21
	7 FMS 422	TS 10.210/19	0-180mph	AS-5-21
	7 FMS 423	TS 10.210/19	0-160kts	AS-6-21
	7 FMS 511	TS 10.210/20	50-300km/h	AS-4-21
Altimeter				
Winter	4 HM 6	TS 10.220/44	0-10000 m	-
	4 FGH 10	TS 10.220/46	0-10000 m	-
	4 FGH 20	TS 10.220/47	0-10000 m	-
	4 FGH 20	TS 10.220/47	0-30000 ft	-
Four-Part Safety Harness				
Gadringer	Bagu 5200*	40.070/32	-	-
	Schugu 2700*	40.071/05	-	-
*(Bagu = Lap Strap; Schugu = Shoulder Strap)				
Additional Bottom Straps for the Safety Harness (only aerobatics)				
Gadringer	Bodengurt 1402 (front)	40.072/04	-	-
	Bodengurt 1301 (rear)	40.072/04	-	-
G-Meter (only aerobatics)				
Falcon Gauge	GM510-2	MIL-A-5885C	-	-
Compass / Magnetic Direction Indicator (only cloud flying)				
Air path	C 2300	-	-	-
Büscher	KP.010	-	-	-
	KP.013	-	-	-
Precision Aviation	PAI-700-14	-	-	-

Turn and Bank Indicator (only cloud flying)

Apparatebau Gauting	WZ-402	10.241/8	-	-

Variometer (only cloud flying)

Winter	5 STV 5	TS 10.230/13	± 5 m/s	5251
	5 STVM 5	TS 10.230/14	± 5 m/s	5451
	5 STVLM 10	TS 10.230/12	± 10 m/s	5561
	5 STVL 10	TS 10.230/11	± 10 m/s	5361
Badin	T 100	-	± 10 m/s	-
	T 901	-	± 6 m/s	-
Sage	CVA	-	± 5 m/s	-
	CV	-	± 5 m/s	-
	SV 2.25	-	± 5 m/s	-
	SV	-	± 5 m/s	-

VHF Transceiver / ATC / COM (only cloud flying)

Dittel Avionik	KRT2	EASA.21O. 10038036	-	-
Becker Avionics	AR 6201	EASA.21O. 1249	-	-
f.u.n.k.e. Avionics	ATR 833	EASA.21O.193	-	-
	FSG2T	EASA.21O.1305	-	-
TRIG	TY 91	EASA.21O. 10042695	-	-

Other Equipment:

Manufacturer	Type	Data Sheet Spec.-No.	Measuring Range	Ref.-No.

Slip Indicator

Winter	QM I	-	-	-
	QM II	-	-	-

Collision Warning Device

Flarm	FLARM	-	-	-

Manufacturer	Type	Data Sheet Spec.-No.	Measuring Range	Ref.-No.
Transponder				
Becker	BXP 6401 ATC 4401-1	EASA.21O.322 LBA.O.10.930/0 62 JTSO	- -	- -
f.u.n.k.e. Avionics	TRT800H	ETSO-2C112a	-	-
TRIG	TT21 TT22	EASA.21O. 10034900 EASA.21O. 10034899	- -	- -
Encoded Altimeter				
ACK	A30	10.221/4	-	-
IEI	E 9001	10.221/5	-	-
Ameri King	AK-350	10.221/6	-	-
ELT				
Kannad	406 AF Compact 406 AF Integra	ETSO-2C91a ETSO-2C126	- -	- -

12.2 Special Tools

For rigging the wings:

a) Handle for rear locking pin, AS P/N 210.51.0010

For rigging the tail plane:

b) Allen wrench (key for hexagon socket head screws for rigging the tail plane, AS P/N 99.000.3396

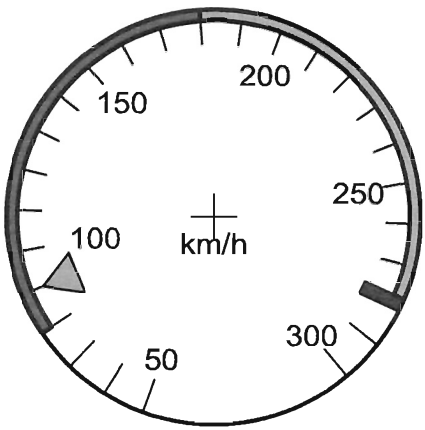
12.3 Supply Sources for Special Tools

Special tools with AS-part number can only be obtained through Messrs. Alexander Schleicher.

12.4 Air Speed Indicator Markings

If the markings are on the cover glass of the instrument, there must be means to maintain the correct alignment of the glass cover with the face of the dial (JAR 22.1543 a).

Each arc and line must be wide enough, located to be clearly visible to the pilot, and must not mask any portion of the dial (JAR 22.1543 b).



	km/h	kts	mph
Red radial line	280	151	174
Yellow arc	180 – 280	97 - 151	111 – 174
Green arc	80 – 180	43 – 97	50 – 111
Yellow triangle	90	49	56

Section 13

13 Supplements

13.1 Introduction

This Section contains appropriate supplements necessary to safely operate the aircraft when equipped with various optional systems and equipment, which do not come as standard.

The following miscellaneous equipment has already been described in the Flight Manual Section 7.11:

(1) Removable Trim Ballast

(2) Oxygen

(3) Emergency Location Transmitter

13.2 List of Inserted Supplements

Date of insertion	Document No.	Number Pages	Title of the inserted supplement

13.3 List of Maintenance Documents for fitted Equipment

- Operating Manual for **C. G. Tow Release Hook** "Europa G 88" in its currently valid issue.
- Operating Manual for **Nose Tow Release Hook** "Europa E 85" in its currently valid issue.
- Operating Manual for **TOST wheel brake**: "Component Maintenance Manual CMM 013".
- Operating Manual for **Cleveland Wheels and Brakes**

  "Cleveland Wheels & Brakes"

  Maintenance Manual

  Appendix A – Wear Limits and Torque Values

  A1. Brake Lining Wear Limits

  A2. Brake Disc Minimum Thickness

  A3. Brake Assembly Back Plate Tie Bolt Torques

  by Parker Hannifin Corporation, Avon, Ohio, USA

  www.parker.com

13.4 Maintenance Instructions

The following Maintenance Instructions are established from time to time as required, in accordance with experience accumulated in operating the ASK 21 B. The Maintenance Manual is to be supplemented in case of new issues of Maintenance Instructions. The following maintenance instructions are applicable in the respective latest issues:

- **Maintenance Instruction "Installation of Equipment"** according to Technical Note 02-2008.
- **Maintenance Instruction "ALL FRP GLIDER MODELS"** (general Maintenance Instruction) describes the removing of play between the sockets (= bushings) and bolts (= pins) of the wing-to-fuselage connection.
- **Maintenance Instruction "PAINT CRACKS"** (general Maintenance Instruction) describes how to inspect, preserve, and repair the paint surface.
- **Maintenance Instruction A** of the ASK 21 B describes the adjustment of the airbrake locking.
- **Maintenance Instruction B** of the ASK 21 B describes the installation of oversize drag-pins at the wing-fuselage junction.
- **Maintenance Instruction C** of the ASK 21 B describes how to replace the sealing at the control surface gaps.

Maintenance Instruction
Installation of Equipment
Issue I

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
D - 36163 Poppenhausen

Subject: Installation of Equipment not listed in the Equipment List of the Maintenance Manual

Applicability: All sailplanes and powered sailplanes, whose TC is hold by AS

Reason: Installation of Equipment not listed in the Equipment List of the Maintenance Manual

Action: There are general requirements concerning the installation of equipment, requirements connected with the minimum equipment, and requirements connected with other equipment.

1. General

- The instructions in the Maintenance Manual concerning the **electrical system** have to be regarded. The electrical system must be able to cope with the additional load. This regards the capacity of the batteries, the cross sections of the wires and the fuses. In powered sailplanes with battery ignition system, the capacity of the batteries and generators must be large enough to meet the simultaneous demands of the engine ignition system and the greatest demands of any other electrical system components that draw from the same source.
  Overload protection must be provided for each electrical equipment. No protective device may protect more than one circuit essential to flight safety.
  Each electric connecting cable must be routed, attached and connected adequately so as to minimize the probability of short circuits and fire hazards.

- Maintenance Manual instructions concerning the pneumatic lines and ports have to be regarded. After work on the **pneumatic installation**, the system has to be checked for tightness.

- The equipment must **securely be attached** in the sailplane, must neither endanger the pilot, nor hinder bailing out, nor weaken the structure. The attachment of every item of mass that could injure an occupant, if it came loose in a minor crash landing, must bear the following loads – unless higher loads are specified in the Maintenance Manual:

Load direction	Load
upward	4,5
forward	9
sideward	3
downward	4,5

  Suitable places for attaching equipment are all parts of the main structure (particularly bulkheads, baggage compartment floors, struts, glass fibre or carbon fibre fuselage skin, etc.). The attachment may not weaken the structure. Therefore, when there are no holes for screws present, an attachment with clamps or with a correct glue joint is adequate (see below: notes).
  If no attachment certified for the load is present and can be used, load tests must be made – a load test for every direction, to which the equipment can get loose.
  For the load test, the weight of the equipment (and if applicable, the weight of other parts attached to the same structural member) must be multiplied with the load factor given above. The load is applied for 3 seconds. After load relieve no permanent deformations may remain. The test may be performed at room temperature.

- **Instruments in the instrument panel** weighing more than 1kg must be supported with more than only the four screws in the instrument panel.

2. Parts of the Minimum Equipment

The Equipment List, as far as it is present in the Maintenance Manual, lists the devices that are suitable for installation in the specific model. **Other devices may be installed as part of the minimum equipment, when they are certified for the designated application (TSO, JTSO, ETSO).** Furthermore the following applies:

- The scale range of the **airspeed indicator** must read at least to 1.05 VNE. The scale must be marked according to the Maintenance Manual. To ensure the airspeed indicator calibration, the total energy port and static port specified in the Maintenance Manual must be used.

- The **altimeter** must be connected to the static port specified in the Maintenance Manual.

- **Accelerometers** (g-meters), when they are part of the Minimum Equipment, must be capable of retaining maximum and minimum values of acceleration for any selected period of flight. Their scale must be marked according to the Maintenance Manual.
  At present, no accelerometers with civil certification are known to us that are suitable for gliders. Therefore also accelerometers with military certification are permissible (e.g. Falcon Gauge GM510-2).

- If the **magnetic direction indicator (compass)** is part of the Minimum Equipment, it must be installed so, that in level flight it can be compensated to ± 10°. Additionally, it must be compensated to ± 15°, when the radio is transmitting, or where applicable, when the engine is running. A deviation table (in at least 30° increments) must be placarded near the instrument, if the compass cannot be adjusted more exactly than ± 5°.

- The **safety harness** must be designed for the type of mounting that is present in the cockpit.

- A replacement is not possible on basis of this Maintenance Instruction for those parts of the Minimum Equipment, which were certified together with the sailplane (i.e. to which the Manuals refers in detail, such as digital engine control instruments).

3. Parts not belonging to the Minimum Equipment

Further equipment, which is not listed in the Equipment List and does not belong to the Minimum Equipment, may be installed under the following conditions:

- **Additionally installed equipment** must not affect the instruments belonging to the Minimum Equipment. Flight and navigation instruments must be clearly arranged and plainly visible to the pilot. This means, that the airspeed indicator and the altimeter must be located at a prominent place on the instrument panel.

- **Electric equipment and its aerials** may neither in themselves nor by their mode of operation or by their effect upon the operating characteristics of the sailplane and its equipment constitute a hazard to safe operation.
  Every electric equipment has to be checked for reciprocal influence by systematically turning off and on and operating all other instruments.
  The equipment and its control and monitoring devices must be arranged so as to be easily controllable. Their installation must be such that they are sufficiently ventilated to prevent overheating

- **Radios and ATC airborne equipment (e.g. Transponders)** may be installed, when they are TSO, JTSO or ETSO certified. The mounting parts and cable harnesses provided by the manufacturer have to be used.
  Those instructions have to be regarded, which are supplied in the Maintenance Manual and in separate Technical Notes concerning transponder installation.
  When ATC airborne equipment has been installed, or is being installed, inspections related to this equipment always have to be done by inspectors licensed for avionic.

- As far as the Maintenance Manual does not offer more specific instructions: **Emergency Location Transmitters (ELT)** should be installed in a protected area (e.g. between the wings). The aerials must be placed on a location, where it is not shielded by carbon fibre laminate. The cable between ELT and aerial should not be routed over an unduly long distance, due to the risk of rupture in a crash.

- **Oxygen equipment** must be approved. Oxygen equipment must be free from hazards in itself, in its method of operation, and its effect upon other components. Concerning the installation of oxygen bottles refer to the Maintenance Manual. There must be a means to allow the crew to readily determine during the flight: First, whether oxygen is being delivered to the dispensing equipment. Second, the quantity of oxygen available in each source of supply.

- **Anti collision lights (ACL)** must be approved (TSO, JTSO oder ETSO). Night flight equipment is not intended to be installed.

Mass and C.G.: When the mass or position of equipment is changed, it becomes necessary to re-determine the C.G data by weighing or calculation.

The useful load has to be redetermined with regard to maximum take-off weight, maximum weight of non-lifting components and permissible in-flight c.g.-range.

Notes: Subsequently, the Equipment List in the inspection records, the Mass and Balance Forms in the manuals, and the placards in the cockpit have to be readapted.

Helpful information may also be found in the Repair Manual issued by Alexander Schleicher, and in the Technical Note 02-2005.

In case that the maximum take-off weight restricts the useful load and the maximum weight of non-lifting components is not yet exploited, the LBA circular letter RS-01-38/99-1 offers further information. But this applies only to gliders, which where certified according to the airworthiness requirements BVS, and probably only to those, which are subject to LBA control (registered in Germany and subject to Annex II of Commission Regulation (EC) Nr. 1592/2002)

This Maintenance Instruction goes into all essential aspects of the installation of equipment. But it cannot impart the skills of an educated aircraft worker or workshop manager (e.g. concerning making glue joints with epoxy resin, securing of connections, laying electric wires, etc.).

The measures may be accomplished by a competent person or by a technical aviation repair station.

The accomplishment of all actions must be examined and certified in the aircraft's inspection documents by a licensed aviation inspector.

Poppenhausen, 16th January 08

Alexander Schleicher
GmbH & Co.

i.A. M Greiner

(M. Greiner)

All FRP glider models
Maintenance Instruction

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
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Removing play between the sockets and bolts of the wing-fuselage transition

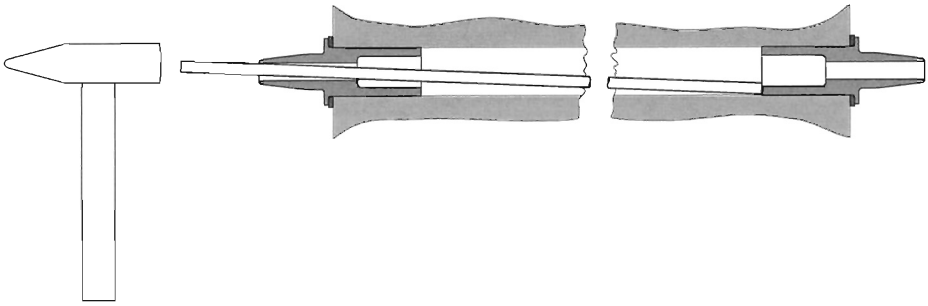
1. Longitudinal play between the four sockets in the wings and the bolts on the fuselage (Note: for the ASK 21, only the socket/bolt connection front in the wing nose/fuselage transition) leads to disturbing click-click noises when the rudder is operated, and can result in unpleasant tail oscillations at high speeds.

2. The play is eliminated by fitting metal washers of Ø22.5/32 - thickness according to the extent of the play. By testing, the play must be reduced such that the wings can be assembled still properly - this applies to a normal temperature of 20°C.

   Depending on the extent of the play, the metal washers can be fitted under one or more bolts.

3. The bolts are slid out of the fuselage cross tubes by fitting a steel rod through the hole in the opposite bolt, and driving the bolt out from the inside with a hammer (see sketch below).

4. After fitting the metal washer(s), it should be possible to drive the bolt back in place, using only a 500 g (≈ 1 lb) hammer and a few blows. If it returns too easily, then knurl the seating area slightly until a tight fit is obtained again.



Poppenhausen, June 19, 1986

Alexander Schleicher
GmbH & Co.

(L.-W. Jumtow)

Maintenance Instruction
PAINT CRACKS

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
D-36163 Poppenhausen

Subject: Paint cracks on fiber composite gliders.

Types affected: ASW 12, ASW 15, ASW 17, ASW 19, ASW 20, ASK 21, ASW 22, ASK 23, ASW 24, ASH 25; ALL variants and all serial no.s.

Compliance:

1. If deep cracks which go down to the fiber composite structure, are found on the glider, the glider must be presented each year to the manufacturer or any other licensed aviation station, who upon examination of the glider decides whether the glider can be continued in service for 1 year more or whether the repair must be done at once (see point "Action A.").
2. If hairline cracks which run only in the paint surface, are found on the glider, the glider shall be presented at the latest after three years annually to the manufacturer or any other licensed aviation station, who upon examination of the glider decides whether the glider can be continued in service for 1 year more or whether the repair must be done at once (see point "Action B."). The 3 years extension applies only on the condition that the maintenance and care of the aircraft is no longer neglected during this period of time and that the gliders are no longer stored outside;

Reason:

The Flight and Maintenance Manuals for SCHLEICHER-gliders contain insistent notes concerning the detrimental influence of moisture and sun radiation on the aerodynamic paint surface quality standard. Herewith we point out emphatically once again that every owner is obliged to observe the flight and maintenance or operations manuals of his glider in all points, and this refers also to the relevant notes on the care and maintenance of the glider.

If these notes are contravened, the result will be sooner or later - depending on the climate - damage to the paint surface quality.

Influence of the two factors
moisture and UV-radiation:

To begin with, generally an enlargement of the waviness of the finish develops - mainly on the wing and tail unit skins - caused by penetration of moisture. On the occasion of performance measurements (accomplished by P.Bickle, R.Johnson and the German DFVLR/Idaflieg) it has been demonstrated repeatedly that the larger waviness leads already to considerable performance loss which is all distinctly noticed in competitions.

A competition pilot will always be anxious to preserve or restore the performance of his glider to its full extent, but unfortunately owners of training and instruction gliders are generally of the opinion that they may accept such a performance loss with those gliders. This is regrettable in the view of the manufacturer because he makes all efforts to build and supply also these gliders with a clean aerodynamic surface. The valuable production time used to this end is then possibly uselessly provided.

Owing to the UV-radiation the gel coat of the paint surfaces grows brittle and shrinks; at the same time the UV-light destroys paint ingredients. So moisture (rain, dew) working in on long term will wash the decomposed paint ingredients out off the paint. The paint starts chalking and gets hairline cracks owing to the concurrence of embrittlement and shrinkage. Furthermore, these hairline cracks gather dirt which through its aggressive effect and its stronger heating-up from sun radiation further precipitates the degradation of the paint. Owing to this the intended protective effect for the fiber composite structure against moisture and UV-radiation is no longer granted.

Certainly a good care with hard wax can slow down the above process distinctly, but it cannot be stopped completely. For this reason a repainting of the aircraft will always become necessary at some point of time.

However, we point out explicitly that paint cracks - even deep cracks - do not represent damages to the aircraft structure if as of their first appearance immediate correct maintenance and care is given furthermore to the aircraft.

As all the outside skin of the aircraft is dimensioned for stiffness, there are no critical mechanical strength problems, even if some cracks have gone down into the fiber composite structure and have already attacked the resin matrix base.

The unknown ageing effects caused by the influence of moisture and UV on the unprotected fiber composite structure are more dangerous.

Those paint cracks as reported from customers in USA and Australia do not appear here in Europe or they develop so much more slowly that a paint crack repair has never yet been carried out here at our works. Accordingly we have no experience of our own with such repairs.

In this connection we point out expressly that for the mentioned cases in the USA or Australia an absolute "zero" care of the gliders in question added to the "climate" factor; besides these gliders were exposed to the weather almost continuously and without any particular protection - very often day and night.

Action:

To repair the paint cracks, these have to be removed generally by sanding them down to their ground. But in doing so, the fiber composite structure lieing under the gel coat should not be sanded on. Thus the sanding job is difficult and, therefore, relatively expensive.

A. If deep cracks are concerned which go down to or into the fiber composite structure (it is assumed that they result from large and rapid temperature changes as found e.g. with wave flights !), and if a repair is decided to be necessary, the paint material has to be sanded down to the fiber composite structure carefully and the area affected must be repaired.
In case that the resin matrix base of the fiber composite structure is already damaged, one should consider peeling off and replacing the damaged fiber composite layer. This work is possibly easier than the careful sanding job.

B. If hairline cracks are concerned which run only in the paint surface (and which presumably result from bad maintenance together with continuous UV-radiation - i.e. gliders left outside without any protection for a long period of time), we recommend to remove the paint material from all areas attacked by sanding on them down their end and to repaint these areas. The sooner this measure is taken, the less the work expenditure.

On the subject of rebuilding the paint system with materials available in the USA as well as on the subject of how to rebuild the profile (which is a must for high performance gliders which are to be flown in competitions) R.H.Johnson, Dallas Soaring Association, has written several articles published in SOARING magazine. We advise to consider in any case the repair experience accumulated in the USA.

For Europe we suggest to spray the sanded surfaces first with polyester fillers, to sand them again, and to re-spray them finally thinly with a white paint system on a Polyurethane basis which should be aircraft-approved.

Material and drawings:

See chapter „Action".

Weight (Mass) and Balance:

It is necessary to redetermine the mass and C.G. data after repaintings.
After repainting of control surfaces and flaps special attention must be paid to their tailheavy balance moments; these data are given in the respective Maintenance (or Operations) Manuals of the gliders.

If in the case of older glider models such data are not contained in the manuals, then the mass of the control surfaces and their tailheavy static balance moment must be determined prior to the paint job and must be readjusted after the repainting by ± 5 %.

Notes:

1. The action as per this Maintenance Instruction must only by accomplished by the manufacturer or by a technical aviation service station holding an appropriate license.
2. The present Maintenance Instruction PAINT CRACKS dated June 26, 1989, supersedes the previous Maintenance Instruction dated 15.07.87.

Poppenhausen, June 26, 1989

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	**ASK 21 B** Maintenance Instruction A	**Alexander Schleicher** GmbH & Co. Segelflugzeugbau D - 36163 Poppenhausen

Subject: Re-adjusting the airbrakes

Applicability: All ASK 21 B, Data Sheet No. EASA.A.221

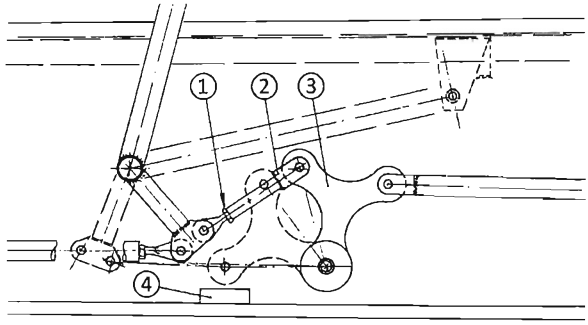
Urgency: If required

Reason: If it is noted that the air brake locking is too weak, the over center lock of the control system in the airbrake box of the wing can be adjusted.

Action:

1. First of all the stop block (4) can be peeled off a little by removing some layers carefully with a punch, but it should be not more than 1.5 mm [0.06"].

2. If the action 1.) did not produce the desired results, the joint head of the short pushrod (2) can be screwed out by 1/2 to 1 turn. For this the pushrod (2) is to be disconnected from the toggle lever (3) and the lock nut must be loosened. Re-connect in the reverse order.



Note:
This action should be done on both wings. Subsequently it must be checked in rigged condition, that the airbrakes on both wings are moving parallel.

If the over center lock is too strong, the hand forces for locking and unlocking the airbrakes can be increased markedly. A max. hand force of 20 da/N is permissible according to the airworthiness requirements.

Material: New safety nut M 6, DIN 982 - 6, if needed

Poppenhausen, 15.06.18

ALEXANDER SCHLEICHER
GmbH & Co.

(M. Münch)

ASK 21 B
Maintenance Instruction B

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
D - 36163 Poppenhausen

Subject: Installation of oversize drag pins on the rear wing connection

Applicability: All ASK 21 B, Data Sheet No. EASA.A.221

Urgency: If required

Action:

1. Derig the glider.
2. To be able to safely ream the new holes, the safety clips have to be removed at the root ribs.
3. Then rig the glider as usual and support the wings by use of wing stands or equivalent (saw horses, trailer dollies) such that the drag pins can be easily removed and inserted.
4. Take one drag pin out, ream the oversize hole and insert new drag pin.
5. Do the same on the other side.
6. Derig the glider.
7. Fix the safety clips again.

Note: The following pin diameters are available at the manufacturer Alexander Schleicher: Ø11.95 / 12.0 / 12.1 / 12.2 and 12.3 mm.

Poppenhausen, 15.06.18

ALEXANDER SCHLEICHER
GmbH & Co.

(M. Münch)

ASK 21 B
Maintenance Instruction C

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
D - 36163 Poppenhausen

Subject: Installing or replacing the elastic fairing tape at the control surface gaps of aileron and elevator and optional on the rudder.

Affected: All ASK 21 B, Data Sheet No. EASA.A.221

Reason: Performance measurements with various gliders have shown that drag can be considerably reduced by a continuous transition between wing and aileron and between stabilizer and elevator respectively.

This continuous transition is achieved by means of an elastic lip seal which is applied to the wing and the stabilizer in order to bridge the actual gap between wing & aileron and stabilizer & elevator. Its curvature into which it is pre-formed ensures tight seating on the control surfaces.

It's important to ensure that the seal underneath this bridging lip seal is 100 % airtight. The control surface gaps are sealed in addition by means of a sealing/slip tape, which at the same time serves to reduce the friction of the elastic fairing tape on the aileron and elevator surfaces.

A damaged or missing sealing may cause flutter!

The additional aileron and elevator control friction generated is minimal and acceptable.

Action:

If the elastic fairing tape needs to be removed only for maintenance or repair of the control surfaces, please observe the following:

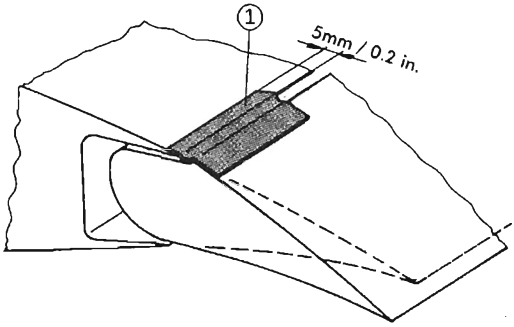
Carefully remove the old elastic fairing tape in order to avoid any delamination of the layers in this area. Remove any adhesive residue from the recessed step by means of synthetic resin thinners. With careful handling a rubber eraser pad can be very helpful.

Accomplish any required inspection, maintenance or repair work at the control surfaces themselves and / or their hinges.

All surfaces must be completely clean, dry and free from dust and grease before installing the sealing!

Cut the new elastic fairing tape and the sealing/slip tape into appropriate lengths (refer to the table under point "Material").

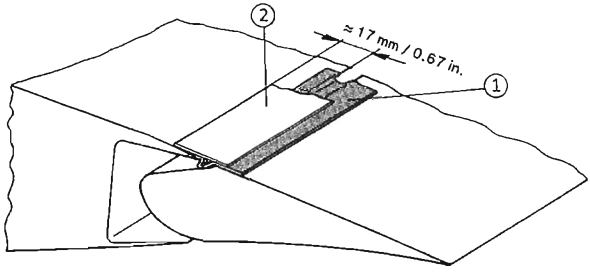
Wing and horizontal tail upper side



The sealing/slip tape (1) [3M Scotch Teflon Tape 30 mm wide] is stuck on over the gap with an overlap of 5 mm (0.2 in.) on the trailing edge of the wing respectively the stabilizer. Be careful that the sealing/slip tape lies slack over the gap. Set the aileron / elevator to maximum positive deflection, so that later the sealing/slip tape is not stretched during normal full control deflections!

The sealing/slip tape (1) must be firmly rubbed down on to the surface! Apply full deflections several times so that the sealing/slip tape (1) fits well into the gap.

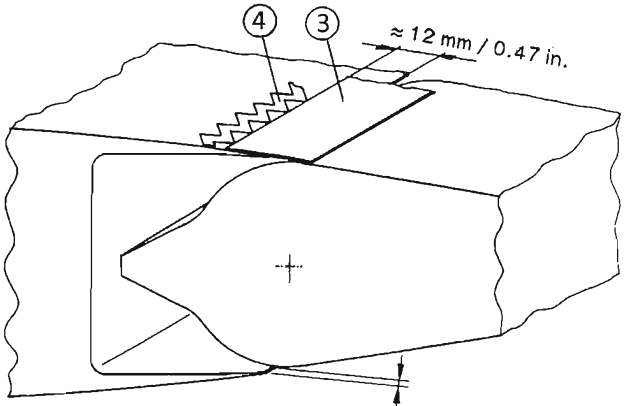
Remove the protective backing from the elastic fairing tape (2) [Mylar foil, 30-12 mm wide] and firmly stick it on at a distance of 17 mm (0.67 in.) to the trailing edge.



Press the adhesive zones of the elastic fairing tape (2) firmly down on the surface using a soft wooden block (e.g.: Balsa) or a hard rubber roller!

Vertical tail

The elastic fairing tape on the vertical tail are optional, but it can only be done in conjunction with zig-zag-tape, positioned in front of the elastic fairing tape. Installation of elastic fairing tapes has to be done, if the gap between fin and rudder is larger than 3 mm (0.12 in.). No sealing/slip tape is applied.



Gap between fin and rudder max. 3 mm (0.12 in.)

Remove the protective backing from the elastic fairing tape (3) [Mylar foil, 22-15 mm wide] and firmly stick it on at a distance of 12 mm (0.47 in.) to the trailing edge.

Press the adhesive zones of the elastic fairing tape (3) firmly down on the surface using a soft wooden block (e.g.: Balsa) or a hard rubber roller!

Along the leading edge of the elastic fairing tape (3), a zig-zag-tape [4] is stuck.

Instead of the plastic fairing strip (3) and the zig-zag-tape (4), a combined zig-zag and elastic fairing tape (5) may be applied.

Material:

	Wing	Horizontal Tail	Vertical Tail
(1) Sealing/slip tape 3M Scotch Teflon tape, 30 mm / 1.2" wide	2 x 2.85 m 9.35 ft	1 x 3.1 m 10.2 ft	
(2) Elastic fairing tape Mylar foil, 30-12	2 x 2.85 m 9.35 ft	1 x 3.1 m 10.2 ft	
(3) Elastic fairing tape Mylar foil, 22-15			2 x 1.25 m 4.1 ft
(4) Zig-zag-tape Mylar foil, 0.5 mm thickness, 12 mm wide			2 x 1.25 m 4.1 ft
Optionally for (3) and (4): (5) Combined tape 38-20			2 x 1.25 m 4.1 ft

The elastic fairing tapes are described with their width and the width of the adhesive film attached to it (e.g. 38 mm / 20 mm). But it is also possible that the elastic fairing tape and the adhesive film are delivered as separate items.

The material can be ordered from Alexander Schleicher.

Notes:

1. This action can be accomplished by a competent person.
2. Ensure that the elastic fairing tape is in tight contact with the surfaces of the controls even when they are fully deflected. Protruding elastic fairing tapes increase the drag significantly!

   Check the secure and firm adhesion of the elastic fairing tapes.

Poppenhausen, 15.06.18

ALEXANDER SCHLEICHER
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REPAIR MANUAL

REPAIR MANUAL

Issue February 1983

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Published by the author ALEXANDER SCHLEICHER with the assistance of Martin Heide.
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.

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.

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

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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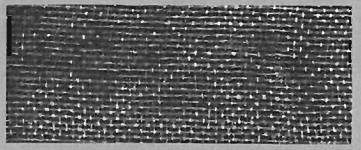
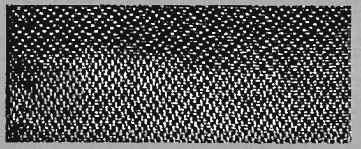
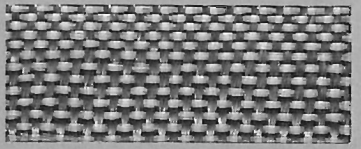
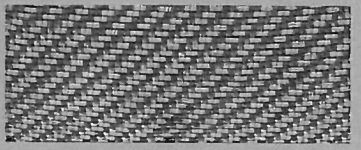
	63	90070	8.4505.6	1610* * US-Spezifikation
	106	91110	8.4545.6	
	163	92100		
	163	92110	8.4548.6	

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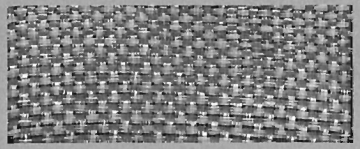
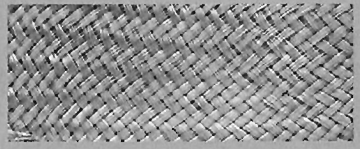
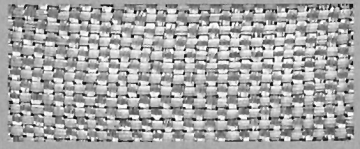
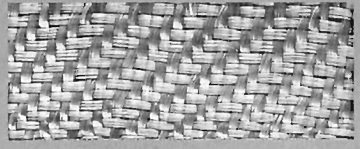
	280	92115		1510* * US-Spezifikation
	280	92125	8.4551.6	
	395	92130		
	395	92140	8.4554.6	

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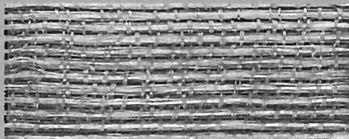
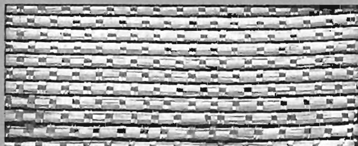
	220	92145	8.4520.6	
	430	92146	8.4525.6	

Rev.No./Date. Sig.

Author

Date July 1994

Muster / sample	weight g/m²	Gewebe - Bezeichnung (code) f. Kohlefasern (carbonfibre) producer	LN	remarks
	125	Rigilor AXT 125 Carbotex CX 12		DEUTSCHE CARBONE AG AEROTEX GMBH
	250	Rigilor AXT 250 Carbotex CX 25		DEUTSCHE CARBONE AG AEROTEX GMBH
	293	Sigratex KDU - 1001		SIGRI ELEKTRO-GRAPHIT GMBH
	293	Sigratex KDU - 1009		SIGRI ELEKTRO-GRAPHIT GMBH

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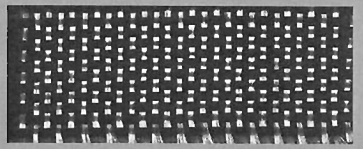
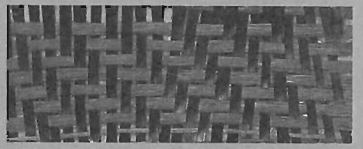
Author

Date July 1994

Muster / sample	weight g/m²	Gewebe - Bezeichnung (code) f. Kohlefasern (carbonfibre) producer	LN	remarks
	318	Sigratex KDU - 1012		SIGRI ELEKTRO-GRAPHIT GMBH
	190	02902		INTERGLAS
	200	03040		INTERGLAS
	245	03056		INTERGLAS

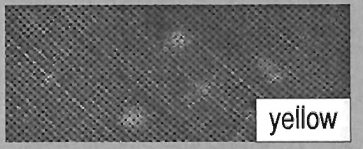
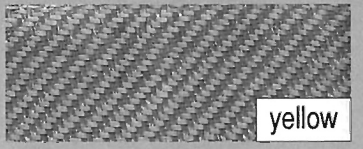
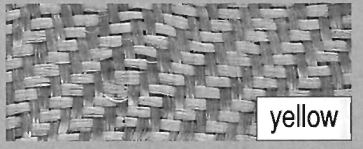
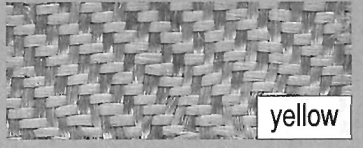
Muster / sample	weight g/m²	Gewebe - Bezeichnung (code) f. Aramid-Fasern (-fibre)		
		Interglas	DIN 65 427	remarks
 yellow	63	98605	5.2230.3	120* * Mil-y 83370 A
 yellow	120	98608	5.2231.3	
 yellow	170	98612	5.2234.3	
 yellow	225	98631	5.2235.3	

Fig.1 REPARATUR DER KLASSE 3 / REPAIR CLASS 3

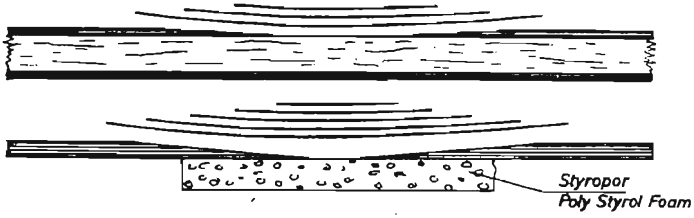


Fig.2 REPARATUR DER KLASSE 2/ REPAIR CLASS 2
(Innenseite zugänglich)/ (inside skin accessible)

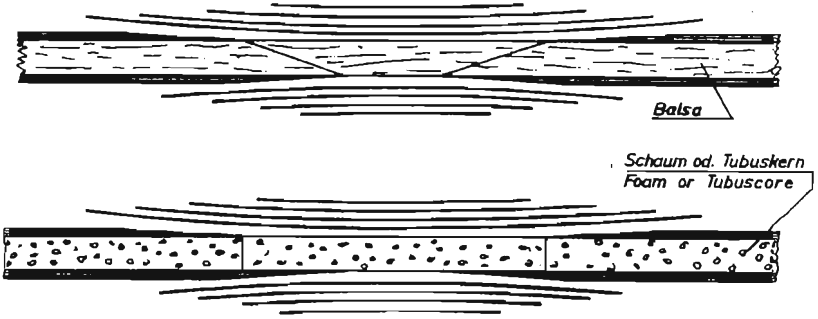
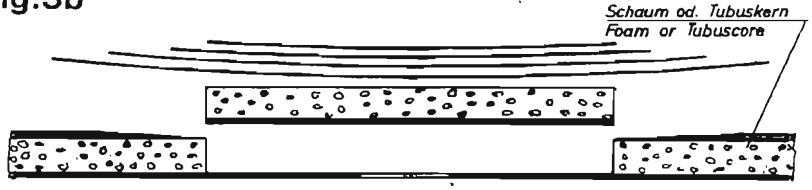


Fig.3a REPARATUR DER KLASSE 2 / REPAIR CLASS 2
(Innenseite unzugänglich)/ (inside skin inaccessible)

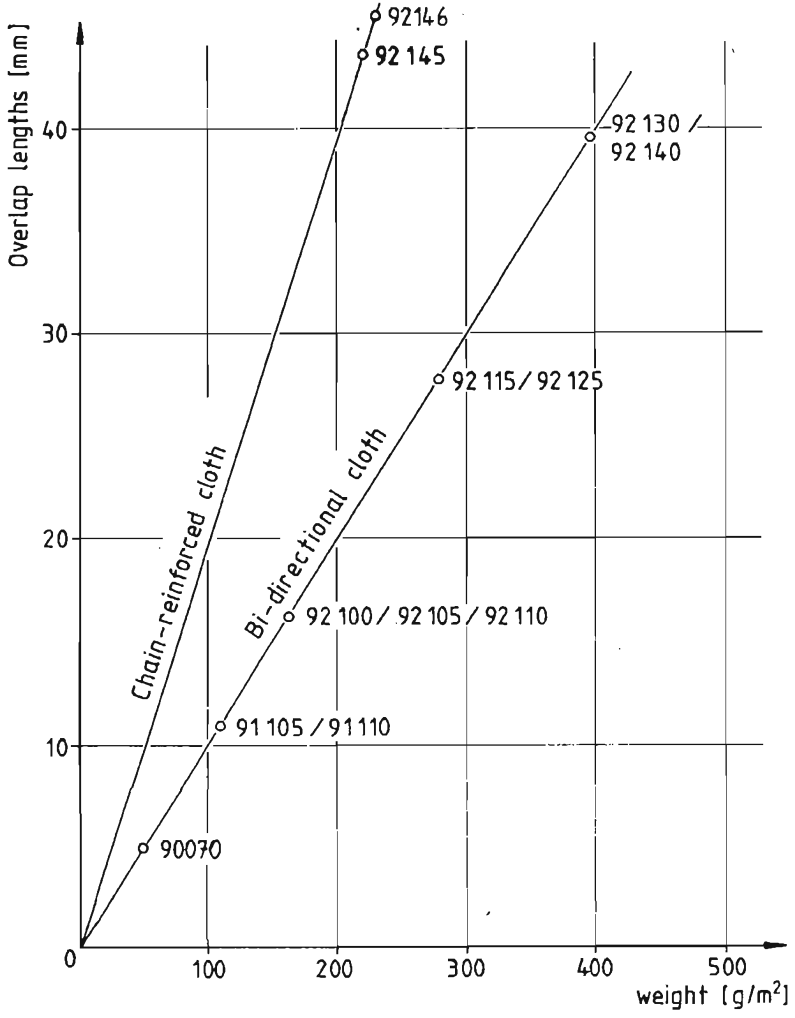
Vorbereitung der Reparaturstelle /Preparing the repair area

Fig.3b



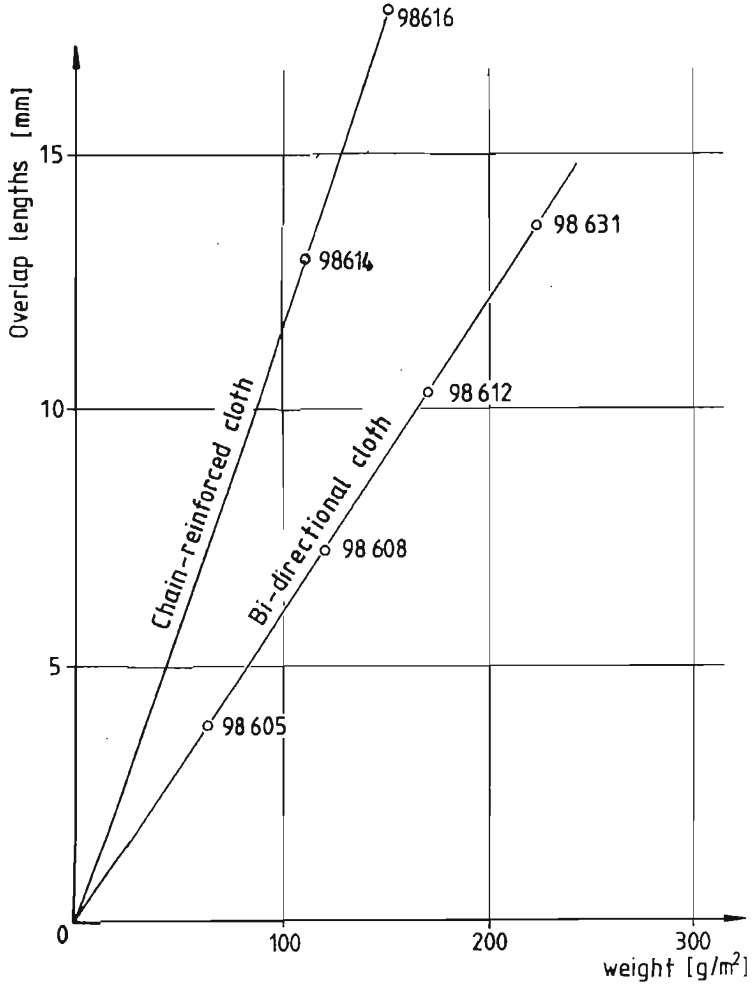
The taper of all scarf joints is shown greatly exaggerated.

Diagram: overlap length for glass fiber



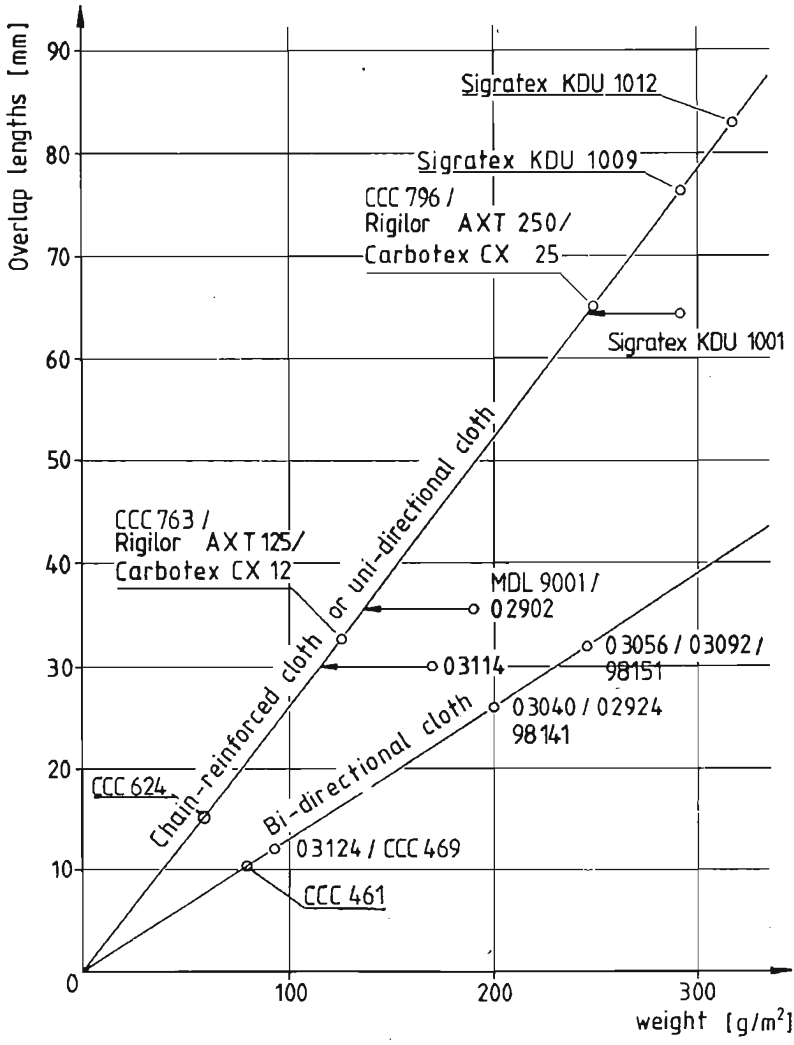
Scarf lengths are half as long as overlaps.

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

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 COM-POSITE 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)

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

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.

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.