ASK 21

Flight Manual

Instructions For Continued Airworthiness

Repair Manual

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FLIGHT MANUAL

SCHLEICHER ASK 21

This Manual must be carried on board at all times.

Registration : N.2.2.1.C.W.

Factory serial number : 21931

Owner : .....
.....
.....
.....

This Flight Manual is FAA approved for U.S. registered gliders in accordance with the provisions of 14 CFR Section 21.29 and is required by FAA Type Certificate Data Sheet No. G 47 EU 1.10.83

German edition of this Manual is approved under § 12(1)2 LuftGerPO.

Published **March 9, 1983**

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

- 9. März 1983

Record of Revisions

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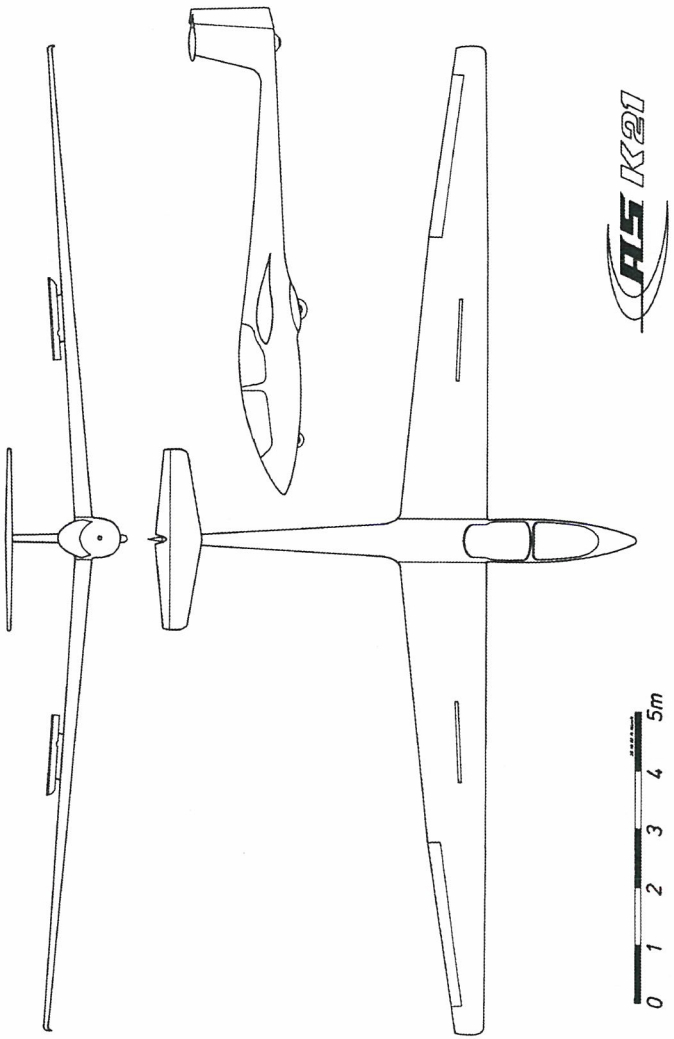
TN 13	13	16.02.84	28.02.84	Juw
TN 13a	2, 13	04.06.84	18.06.84	Juw
TN 14	2, 21	16.05.84	08.06.84	Juw
TN 15	2, 25, 26, 26a, 27	25.05.84	10.06.84	Juw
TN 20	2, 3, 4, 30, 31, 42, 42a, 43	16.10.87	06.11.87	Juw
TN 21	annex (new tow release coupling)	17.01.90	18.03.90	Juw
TN 22	2, 42a, 43a, 43b	04.12.90	20.12.90	Juw
TN 23	2, 22, 24, 33, 34	29.01.91	18.02.91	Juw
AD 93-001/2/3	annex (L'Hotellier instructions for the maintenance)	27.04.98	15.05.98	Juw
TN 28	annex (nose bolt)	14.03.00	16.04.00	Juw
TN 32	17c	01.06.10	23.08.10	mg

I.2 PAGES INCLUDED

I.3 Contents

I.4 THREE-SIDE-VIEW



I.5 DESCRIPTION

The ASK 21 is designed to meet the needs of modern gliding training. It has an all fiberglass sandwich structure.
Midwing with T-tail, tandem seat arrangement, airbrakes on upper wing only.
The glider is stressed for aerobatics (inverted flight included).

Technical Data

Span	17,00 m	=	55,74	ft
Length	8,35 m	=	27,4	ft
Height	1,53 m	=	5,02	ft
Aspect ratio	16,1			
Wing area	17,95 m^2	=	192,96	sqft
Max. all up weight	600 daN	=	1320	lbs
Max. wing loading	33,4 daN/m^2	=	6,84	lbs/sqft

Airfoil: Wortmann FX SO2 196 (inner wing)
Wortmann FX 60 -126 (wing tip)

Winch Tow: Weak Link 1000 daN
Aero Tow : Weak Link 600 daN

II. OPERATING LIMITATIONS

II.1 Airworthiness Category

A (Aerobatics) according to LFSM.

Certification basis: Airworthiness Requirements for Sailplanes and Powered Sailplanes dated 1.11.1975.

II.2 Permitted Operations

The glider is certified for VFR flights during daytime (VFR day).

The approved operation class is indicated by a data placard on the instrument panel. Depending on the respective equipment the glider may be licensed for traffic for the following categories:

1. Airworthiness Category U (Utility), according to VFR with equipment as under 11.3 a)

2. Airworthiness Category A (aerobatics), with equipment as under 11.3 a) and 11.3 b) for the following aerobatics:

   Loop, Stall Turn, Split 'S',
   Immelmann, Slow Roll, Inverted Flights,
   Spin, Steep Climbing Turn, Lazy Eight,
   Chandelle.

   With spin ballast attached, aerobatics are prohibited (except spinning).

II.3 MINIMUM EQUIPMENT

a) 2 airspeed indicators;
2 altimeters;
2 four-point safety harnesses;
2 seat cushions, at least 10 cm thick when loaded, or parachutes (automatic or manual);
Weight & balance data placard for both seats;
Data plate;
Flight Manual.

b) Additional equipment for aerobatics

Bottom straps for safety harnesses in both seats;
1 G-meter for front seat;
Foot loops on rudder pedals;
Parachute (automatic or manual).

II.4 AIRSPEED LIMITATIONS AND LOAD FACTOR LIMITS

Max. permissible speed (calm air):

V_{NE} = 151,2 kts = 174,00 mph = 280 km/h

Max. permissible speed (rough air):

V_B = 108,0 kts = 124,3 mph = 200 km/h

Max. maneuvering speed:

V_M = 97,2 kts = 112,0 mph = 180 km/h

Max. speed with airbrakes extended:

V_{LE} = 151,2 kts = 174,00 mph = 280 km/h

Stall speed with airbrakes extended:

V_{S1} = 37,0 kts = 42,3 mph = 68 km/h

Stall speed with airbrakes retracted:

V_{SO} = 35,0 kts = 40,4 mph = 65 km/h

The following safe load factors must not be exceeded (airbrakes retracted, symmetrical maneuvers):

At max. maneuvering speed V_M $n = \begin{matrix}+6,5\\-4,0\end{matrix}$

At max.permissible speed V_{NE} $n = \begin{matrix}+5,3\\-3,0\end{matrix}$

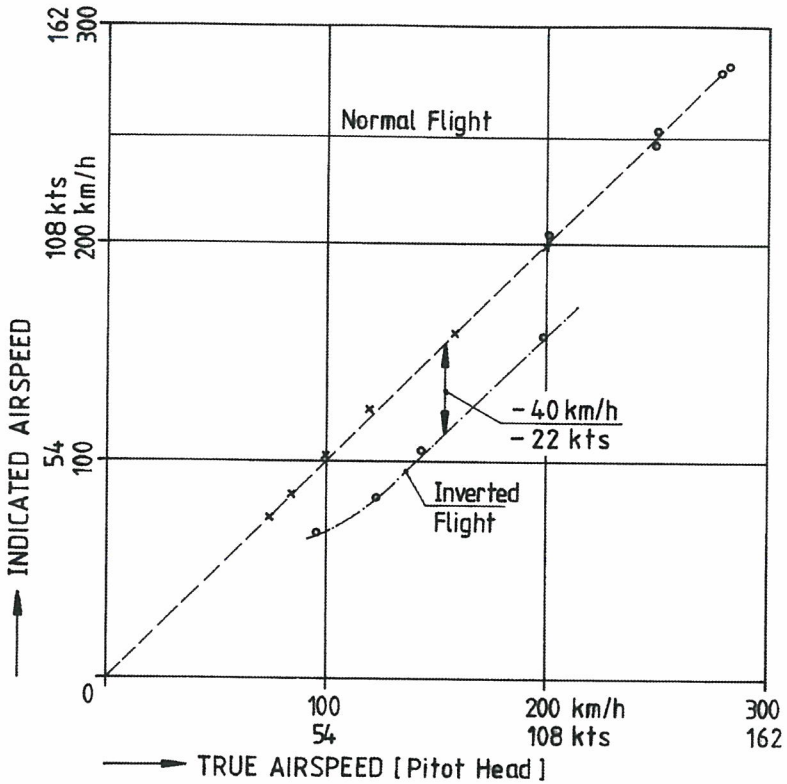
Rough air is defined as turbulence that can be expected in wave rotors, thunderstorms, whirlwinds, and when crossing mountain ridges.
Maneuvering speed is the highest speed at which full deflections of the control surfaces are still permitted.
With max. permissible speed V_{NE} only 1/3 of the possible deflections are permitted.

True airspeed (TAS) is, however, relevant for safety against flutter. Therefore, one must take into account that with increasing altitude the true airspeed is higher than the reading of the airspeed indicator because of the decreasing air density.

$$V_{NE} = 151 \text{ kts} \quad n = \begin{matrix} +5,3 \\ -3,0 \end{matrix}$$

V_{NE} at various altitudes

Altitude ft	V_{NE} knots	mph
5000	151	174
10000	144	165
15000	132	152
20000	121	139



POSITION ERROR

With normal flights the position error of the airspeed indicator is negligible within the whole range up to 280 km/h (151 kts).

With inverted flights the airspeed indicator reads too low, i.e. up to -40 km/h (22 kts).

By attaching an extension tube this error may be eliminated. (see also pages 27/28).

The extension tube must project at least 70 mm (2,75 in) past the fuselage nose.

Airspeed indicator markings (IAS)

Red line (max. permissible airspeed):
151,2 kts = 174,0 mph = 280 km/h

Yellow arc (caution range):
97,2 - 151 kts = 112 - 174 mph = 180 - 280 km/h

Green arc (normal range):
43,0 - 97 kts = 50 - 112 mph = 80 - 180 km/h

Yellow triangle (approach speed):
49,0 kts = 56,0 mph = 90 km/h

II.5 CREW : 2 persons

Minimum crew : 1 person (min.weight 70 daN = 154 lbs)

Caution: Solo flights may only be conducted from the front seat !

II.6 WEIGHTS

Empty weight	approx.	792 lbs	= 360 daN
Max. all up weight		1320 lbs	= 600 daN
Max. weight of non lift producing members		902 lbs	= 410 daN.

II.7 IN FLIGHT CENTER OF GRAVITY RANGE

The approved in flight C.G. range is from 9,21 (234 mm) - 18,46 inches (469 mm) behind the datum line; equivalent to 20 % - 41,1 % of the MAC = 44,13 inches (1121 mm). With a 0,31 inches (8 mm) behind leading edge center part of the wing.

II.8 WEIGHT & BALANCE INFORMATION

Max. payload front seat (pilot incl. parachute):
242 lbs = 110 daN.

Min. payload front seat (pilot incl. parachute):
154 lbs = 70 daN.

Caution: Short weight in the front seat must be compensated by ballast (installation of lead discs in the nose; 1 lead disc = 2,76 lbs pilot weight).

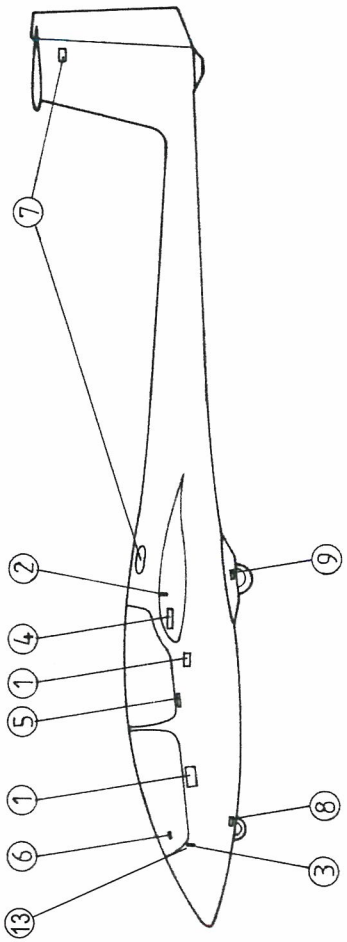
Number of lead discs	Min. payload front seat daN ≙ kg	lbs
0	70,0	154,32
1	68,75	151,57
2	67,5	148,81
3	66,25	146,06
4	65,0	143,30
5	63,75	140,54
6	62,5	137,79
7	61,25	135,03
8	60,0	132,28
9	58,75	129,52
10	57,5	126,77
11	56,25	124,01
12	55,0	121,25

Max. payload rear seat (pilot incl. parachute) :
242 lbs = 110 daN.

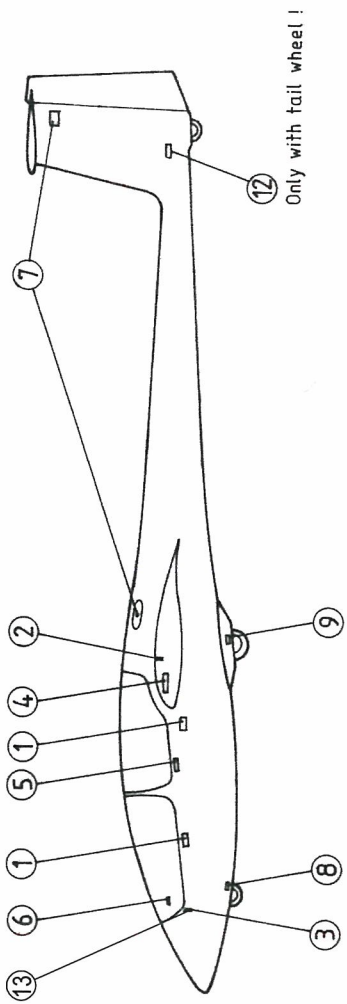
1 kg = 2,2046223 lbs

Settings of placards

II.9



Settings of placards [Only with tail wheel]



Segelflugzeugbau A. Schleicher Poppenhausen

Model *Serial no.*

DATA PLACARD

Approved for:

Max. speed for calm air		*280 km/h*
Max. speed for rough air		*200 km/h*
Max. maneuvering speed	V_M	*180 km/h*
Max. aero tow speed	V_F	*180 km/h*
Max. winch launch speed	V_W	*150 km/h*

WEIGHT AND BALANCE

Min. payload front seat	*kg*
Max. payload front seat	*kg*
Max. payload rear seat	*kg*
Baggage in wingroots	*max. 2 x 10 kg*
Max. permissible all-up weight	*kg*

(1) 2 off

Loading of baggage compartment: max. 10 kg

(4) 2 off

Pre Take Off Check:

1. *Tail dolly removed – ballast checked?*
2. *Parachute properly fastened – raise line?*
3. *Safety harness properly fastened – all operating elements within reach?*
4. *Put your toes under the toe-straps! Do not flatten the straps! Danger of jamming the pedals!*
5. *Airbrakes retracted and locked?*
6. *Placard for spin ballast?*
7. *Altimeter adjusted?*
8. *Radio on – frequency and volume checked?*
9. *Trim adjusted?*
10. *Control circuit check – Controls easy to operate?*
11. *Airspace for start and release clear?*
12. *Check wind*
13. *Prepared for take-off interruption?*
14. *Both canopies closed and locked? – Emergency jettisoning procedure in mind?*

(6) 1 off

(5) 1 off Rear

Attention! Emergency bailout!

a) Pull back both canopy side-locks and push canopy upwards.
b) Undo safety harness.
c) Get up and bail out.
d) With manual chute seize release grip and pull out entirely after 1–3 sec.

(2)

A. Schleicher
6416 Poppenhausen

Model: ASK 21
Serial no: 21 XXX
Registration letters :
Made in West Germany

(3) 1 off

Aerobatics prohibited!
Equipment as under airworthiness category "U" (Utility)

For equipment without g-meter and bottom strap.

(3) 1 off

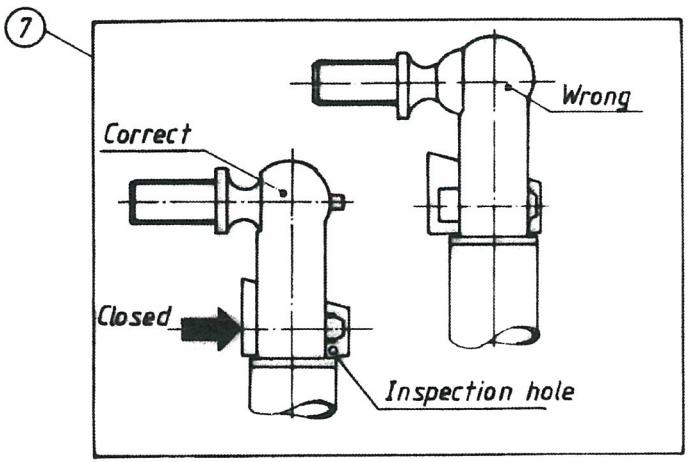
Aerobatics as per Flight Manual
Equipment as under airworthiness category "A" (Acrobatic)

For epuipment with g-meter and bottom strap.

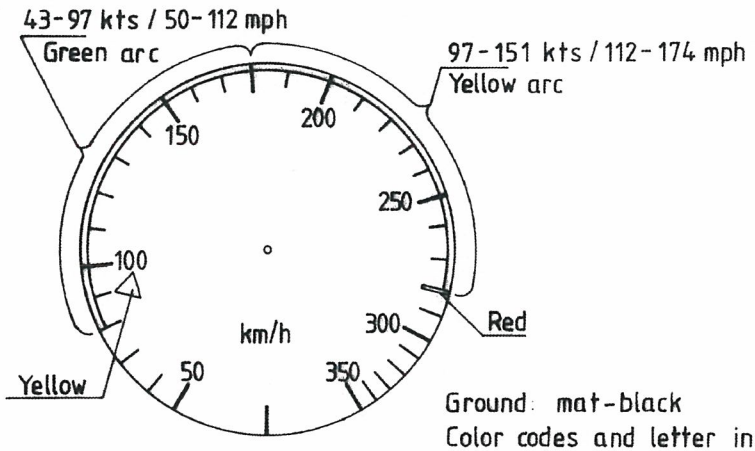
Adjustable Headrest:

On the front seat there is an adjustable headrest. When the backrest is used, the headrest is inserted into the base part at the backrest. The headrest is secured in the correct height with the locking pin. Without backrest, the headrest is inserted through the cutout in the instrument cover of the rear instrument panel. A ball catch must lock in noticeable.

The headrest is adjusted correctly, when the head can touch the headrest on eyelevel.


7
Wrong
Correct
Closed
Inspection hole

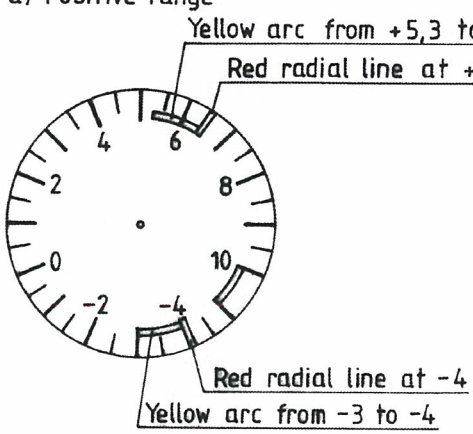
Airspeed indicator color codes



Ground: mat-black
Color codes and letter in luminous paint.

G-meter color codes

a) Positive range

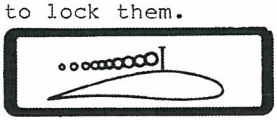


b) Negative range

II.11 DESCRIPTION OF SYMBOLIC PLACARDS

Rudder pedals adjustment: grey knob on RH side of the console.

To adjust pedals backwards:
Take your feet off the pedals and pull pedals backwards; then let go the grey knob and load the pedals in order to lock them.
To adjust pedals forwards:
Pull grey knob and push pedals forwards with your heels; then let go the grey knob and load the pedals in order to lock them.

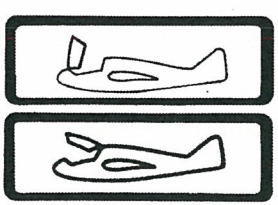


Airbrakes: blue lever in the LH arm rest; pull to extend airbrakes.

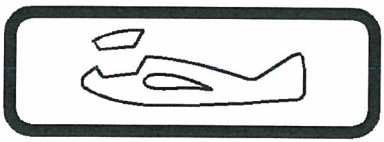
Trim: noseheavy.

Trim: tailheavy.

Tow release: yellow knob LH below canopy frame.



To open canopy: pull back the white levers LH and RH on the canopy frame.



Canopy emergency jettisoning: push to the left the red flat knob above the instrument panel

Ventilation

Prior to take off, check proper engagement of the canopy locks!

This placard must be fitted in the front and rear cockpit in full view of the pilot.

When the plane is equipped with an attachment for spin ballast (TN4b)

Placard at the front instrument panel, informing about mounted spin ballast.

Attention

Check spin ballast!

Only use spin ballast for flights with two pilots!

A M8-screw must be mounted through the placard from the back. The placard is visible, when spin ballast is mounted on the tail (= DANGER). When spin ballast is removed, the placard is covered by the nut that otherwise holds the spin ballast.

III. EMERGENCY PROCEDURES

III.1 RECOVERY FROM SPIN

According to the standard procedure spinning is terminated as follows:

a) Apply opposite rudder (i.e. apply rudder against the direction of rotation of the spin).

b) Short pause (hold control inputs for about 1/2 spin turn).

Warning: Disregarding the pause will result in slower recovery!

c) Ease the control column forward (i.e. give in to the pressure of the stick) until the rotation ceases and sound airflow is established again.

Warning: Full forward stick may retard or even prevent the recovery!

d) Centralise rudder and allow glider to dive out.

The altitude loss from the beginning of the recovery until the normal flight attitude is regained is about 80 meter (260 feet).

Note: During spins the ASK 21 oscillates in pitch. From a steep nose down spin recovery according to the standard procedure is up to 1 turn, from a flat spin less than 1 turn.

III.2 CANOPY JETTISONING AND EMERGENCY BAIL OUT

Front canopy:

a) Move lever with the red knob above the instrument panel to the left and push canopy upwards.
b) Open safety harness.
c) Get up and bail out.
d) With manual chute seize release grip and pull out entirely after 1 to 3 seconds.

Rear canopy

a) Pull back both canopy side locks and push canopy upwards.
b) Open safety harness.
c) Get up and bail out.
d) With manual chute seize release grip and pull out entirely after 1-3 seconds.

If circumstances allow, the front pilot should allow the rear pilot to bail out first.

III.3 FLIGHTS THROUGH PRECIPITATION

With wet or slightly iced wings or with insect accumulation there will be no deterioration in flight characteristics.
However, one has to reckon with a rather considerable deterioration in flight performance. This must be taken into account especially on landing final approach.

Add a safety margin of 5 knots = 10 km/h for approach speed !

III.4 WING DROPPING

The glider stalls extremely benign. Nevertheless one always has to face the possibility of wing dropping because of turbulence. In that case push stick forward immediately and apply opposite rudder against a noticeable turn at the same time to regain a normal flight attitude. If the rudder deflection against the turn is forgotten, a spin may occur even if the stick pressure is released.

III.5 GROUND LOOPING

For normal conditions, smooth runway, short grass, one may take off with the wing on the ground without having to fear a change in the direction.

High grass and rough ground, however, may cause ground looping. In that case release the tow rope immediately.

IV. NORMAL OPERATING PROCEDURES

IV.1. COCKPIT LAYOUT AND CONTROLS

Front seat:

No.1: Stick.

No.2: Trim; flat lever with green knob LH of stick.

No.3: Rudder pedal adjustment; grey knob at the console.

No.4: Airbrakes with wheelbrake; blue lever in the left arm rest.

No.5: Release cable; yellow knob on left cockpit wall below the canopy frame.

No.6: Canopy emergency jettisoning; horizontal lever with red flat grip above the instrument panel cover; to the left = OPEN.

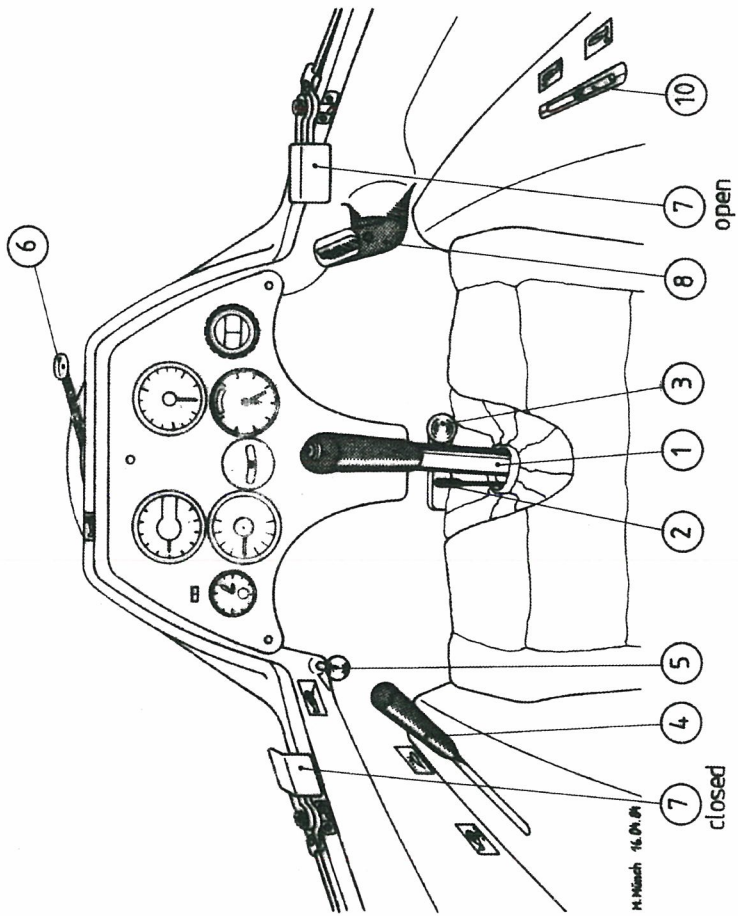
No.7: Front canopy locking:
White swivel levers on left and right canopy frame.
To open canopy: pull back both levers.
To lock canopy: push both levers forwards, parallel to the canopy frame.

No.8: Ventilation nozzle; on right cockpitwall below the canopy frame; revolving and lockable.

No.9: Back rest; the back rest is adjustable by tilting it from the bottom upwards and forwards (see sketch); in normal flight attitudes the back rest cannot shift by itself.
Very tall pilots may fly without the back rest.

No.10: Trim indicator; in the right arm rest behind the ventilation nozzle.

Front seat



Rear seat:

No.1: Stick.

No.2: Trim; flat lever with green knob LH of stick.

No.3: Rudder pedal adjustment with circular grip in front of stick.

No.4: Airbrakes with wheelbrake; blue lever in the left arm rest.

No.5: Release cable; yellow knob on left cockpit wall below the canopy frame.

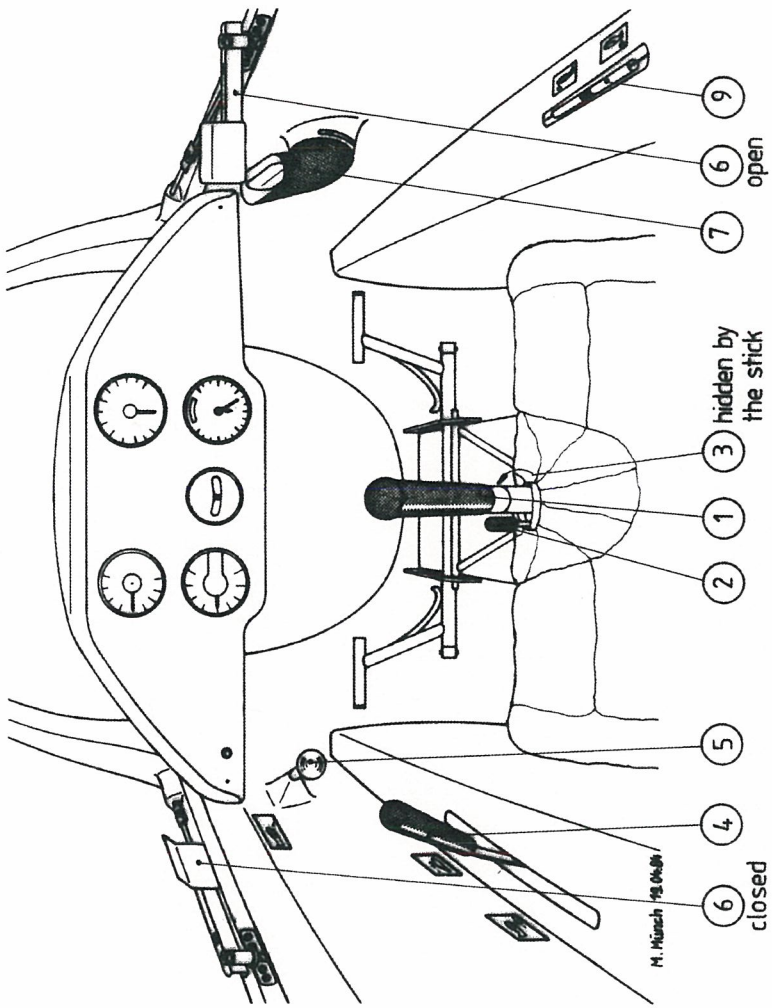
No.6: Rear canopy locking = Canopy emergency jettisoning; red swivel levers on left and right canopy frame.
To open canopy: pull back both levers.
To lock canopy: push both levers forwards, parallel to the canopy frame.

No.7: Ventilation nozzle; on right cockpit wall below the canopy frame; revolving and lockable.

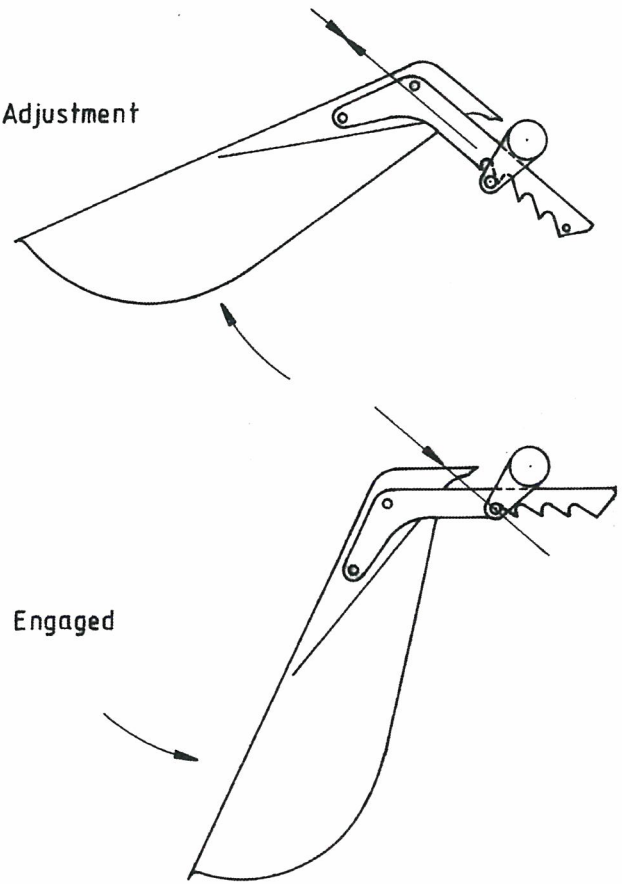
No.8: Back rest; the back rest is adjustable by tilting it from the bottom upwards and forwards (see sketch); in normal flight attitudes the back rest cannot shift by itself.
Very tall pilots may fly without the back rest.

No.9: Trim indicator; in the right arm rest behind the ventilation nozzle.

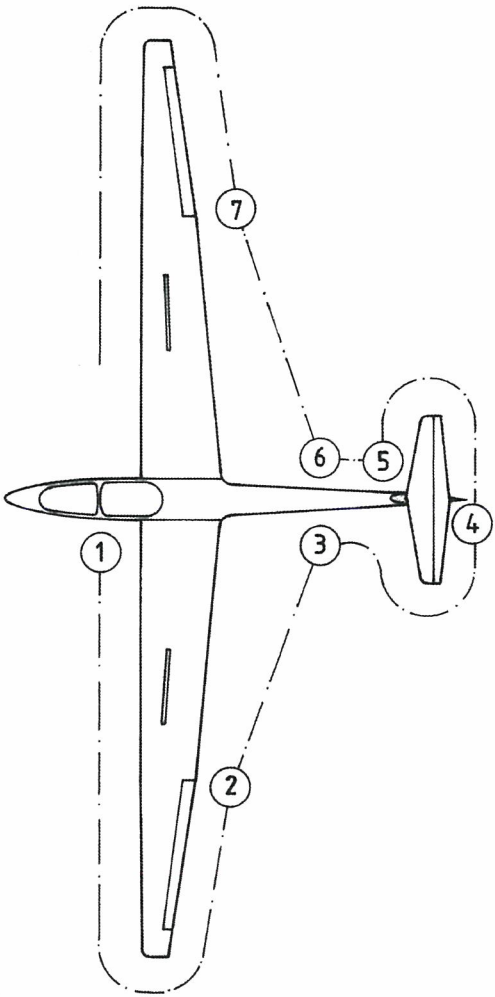
Rear seat



BACK REST ADJUSTMENT



DAILY CHECKS [see page 30 FM]



IV.2 DAILY INSPECTIONS

Prior to flight operations the following checks must be accomplished:

1.a. Open canopy! Check that the main pins are properly secured.

b. Check the proper connection of the ailerons and airbrakes through the access hole on the left side above the wing. Are the quick-release connectors secured with spring clips ?

c. Check for foreign bodies !

d. Check the control circuits force and that all controls are free-moving. Apply full deflections and load the control circuits with fixed controls and airbrakes.
Check the plastic tubes inside the S-shaped rudder pedal tubes for proper and tight fit.

e. Check tire pressure:
Nose wheel 2,0 bar (28 psi)
Main wheel 2,7 bar (38 psi)
Tail wheel (If installed) 2,5 bar (35,6 psi).

f. The condition and function of the tow release mechanism is to be checked. Actuate the tow release: does it snap back freely ? Engage and disengage the ring pair. Check the automatic release of the C.G. towing hook with the ring pair which must release auto matically backwards.

g. Check the wheel brake. Pull the airbrake lever; at the end of its travel an elastic resistance must be felt.

2.a. Check upper and lower wing surface for damages !

b. Aileron: its condition, free-movingness and play is to be check ed ! Check also the pushrod connection.

c. Airbrake: its condition, fit and locking is to be checked.

3. Check the fuselage for damages, in particular also the bottom side.

4. Check that the tailplane is properly assembled and secured. Check also the pushrod connection ! Secured with spring clips ?

LUFTFAHRT-BUNDESAMT BRAUNSCHWEIG

- 3. NOV. 1987

5. Check condition of tailskid, pitot tube and venturi tube.

6. Check static vents for cleanness !

7. After rough landings or excessive flight stress the whole sailplane must be checked with the wings and the tail unit being removed (see also point 2.)!). If any damage is found, a technical aviation inspector must be called in. On no account one must take off again before such damage has been repaired.
See also the Instructions For Continued Airworthiness !!

IV.3. CHECKS PRIOR TO TAKE OFF

See the Check Lists in Section VII., p.43, of the Instructions For Continued Airworthiness !

LUFTFAHRT-BUNDESAMT BRAUNSCHWEIG

- 3. NOV. 1987

IV.4 TAKE OFF

Winch tow

Trim neutral.

Max. tow speed: 81 kts = 93 mph = 150 km/h.

The glider features a tow release for winch tow in front of the main wheel.

The most favorable tow speed is 50-60 kts = 56-58 mph = 90-110 km/h.

There is little pitch up tendency during initial tow.

In the upper third of the tow additional altitude may be gained by slight back pressure.

Tow release: pull the release knob several times to the stop.

Aero tow

Aero tows only at the nose release in front of the nose wheel. Recommended tow rope length: 100-200 ft.

Trim neutral.

Max. tow speed: 97 kts = 112 mph = 180 km/h.

The most favorable tow speed during climb is 50-75 kts = 56-87 mph = 90-140 km/h.

Take off may be done with the wingtip on the ground. Getting the wings level is no problem. However, the pilot is advised to be careful with high grass and very rough ground.

Lift off takes place at about 40 kts = 47 mph = 75 km/h.

IV.5 FREE FLIGHT

The glider may be flown up to V_{NE} = 151 kts = 174 mph = 280 km/h.
Up to manoeuvring speed of 97 kts = 112 mph = 180 km/h full control deflections can be applied. At higher speeds the controls must be applied more carefully.
At V_{NE} only 1/3 of the max. possible deflections must be applied.

IV.6 LOW SPEED FLIGHT, WING DROPPING AND SPINS

With the stick back a distinct tail buffet is felt.
The glider is very benign in low speed flight. By use of normal aileron deflections the wings may be kept level down to minimum speed, even with aft C.G. positions.
With normal rudder deflections no wing dropping is found. Yaw angles of up to 5° have no significant influence on the wing dropping attitude.
Also rapid pulling up into 30° pitch does not cause wing dropping, but only a gentle nose drop. The same applies for stalling out of a 45° turn.
But one has to point out that even the most benign glider needs speed in order to be controllable.
In turbulence this is especially important when also a wing dropping may occur.
Spin developement from wing dropping strongly depends on the C.G. position and also to some extent from the pilot reaction.

For C.G. positions forward of 315 mm aft of datum the ASK 21 does not spin at all. This configuration applies to 2 heavy pilots.

For C.G. positions from 320 mm through 385 mm aft of datum more incipient spin turns are possible followed by self recovery after 4 1/2 turns at most. Such C.G. positions are possible in dual flight with a lightweight pilot in the front seat.

For C.G. positions aft of 400 mm behind datum controlable sustained spins are possible. Such a C.G. position is usually only possible with one lightweight pilot in the front seat.

NOTE: *During spins the ASK 21 oscillates in pitch. From a steep nose down spin recovery according to the standard procedure is up to 1 turn, from a flat spin less than 1 turn.*

The speed at which the stall takes place depends on the payload. The following standard values are applicable:

	without airbrakes	with airbrakes
Single, all up weight 1043 lbs = 470 daN	65 km/h 35 kts IAS	68 km/h 37 kts IAS
Dual, all up weight 1320lbs = 600daN	74 km/h 40 kts IAS	77 km/h 42 kts IAS

Spinning with spin ballast

Mounting of spin ballast see pages 47a and 47b. Spinning with spin ballast is only allowed by dual flights. With spin ballast other aerobatic manoeuvres are not permissible.

Entry procedure:

The best entry speed is 2 km/h (1.1 kts) above the speed, at which the stall warning sets in. This must be checked before in flight.

Step hard on the rudder in the intended spin direction. Then, fully pull the stick. The aileron stays neutral. The rudder must stay in this position as long as the spin is supposed to continue.

WARNING: *If a spiral dive sets in, it must be stopped immediately, to prevent overstressing the structure.*

Recovery procedure:

Recovery according to the standard procedure, see chapter III.1.

Further information can be found in the appendix to the Flight Manual, titled "Spin training with the ASK 21: Summary of important information and further recommendations".

IV.7 High Speed Flight

The sailplane shows no flutter tendency within the permissible speed range.

With airbrakes extended in a 45° dive the speed remains below V_{NE} = 280 km/h (151 kts); it goes up to 232 km/h (125 kts) at G = 600 kg (1323 lbs).

IV.8 Approach and Landing

The most favorable approach speed is 49 kts = 56 mph = 90 km/h. With turbulence it may be advisable to increase slightly the approach speed.

Even steep approaches may be slowed down efficiently with the air-brakes at the beginning of the landing final approach.

NOTE: The airbrakes increase the stalling speed by about 1,6 kts = 3km/h.

Sideslipping is also suitable as an approach control. With full rudder during the sideslip the rudder pressure decreases to zero; the rudder must be pushed back.

During sideslip the airspeed indication goes to zero reading.

IV.9 AEROBATICS

Warning : Even a glider which is approved for full aerobatics does not have infinite strength capacities. Most hazardous are aerobatics which get out of control or are badly executed, as they result in high loads.

Therefore, it is urgently recommended to have oneself guided by an experienced flight instructor. The ASK 21 being an approved two-seater for full aerobatics offers this possibility.
Such guidance is even prescribed according to § 69 (4) of the German LuftPersPO (Aviation Personnel Test Regulations) dated January 9, 1976. Following § 96 (3) of the said LuftPersPO an adequate experience is required from flight instructors.

Note : the normal airspeed indicator system shows a large pressure error in inverted flight during which the airspeed indicator reads 40 km/h = 22 kts too low. When extending the pitot head by attaching a brass tube - 12 Ø x 1; 5,5 in = 140 mm in length - this error disappears. The tube must project in the front at least 2,75 in = 70 mm. For normal flights this is not necessary. In order to avoid damage when parking the glider in the hangar, this tube should not be left on any longer than necessary.

Permissible indicated speeds

Inverted flight without pitot head extension:

V_{NE}:	Single	35-130kts	=	65-240km/h.
	Dual	38-130kts	=	70-240km/h.
Indicated maneuvering speed		75kts	=	140km/h
Indicated max. speed		130kts	=	240km/h.

Inverted flight with pitot head extension:

Indicated maneuvering speed	97kts	=	180km/h
Indicated max. speed	151kts	=	280km/h
Indicated stall speed	47kts	=	87km/h
	With two occupants		

ATTENTION: *never release stick and rudder pedals when flying aerobatics.*

For aerobatics instruction a reliable agreement must be made between instructor and student flyer with regard to the communication system for the mutual taking over of the controls.

Airbrakes must be extended as soon as the pilot loses the control of the glider or as the speed increases involuntarily too fast.

Exception: "Tail sliding"!!!

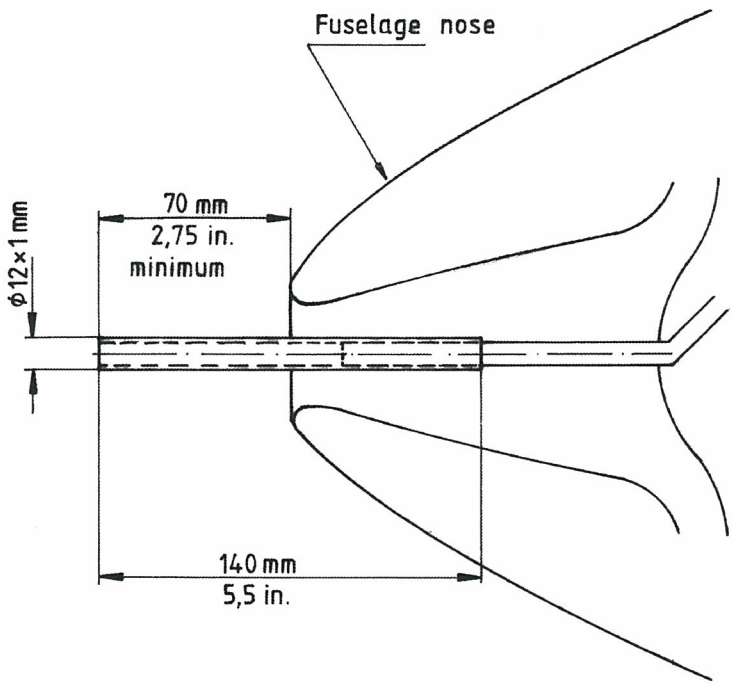
The trim remains in the center position for aerobatic maneuvres. Do not ever change the trim when flying aerobatics!!

With spin ballast is attached, aerobatics are prohibited (except spinning).

PROHIBITED AEROBATICS:

All abrupt aerobatic maneuvers
Loop forward
Tail sliding.

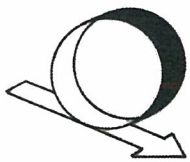
Extension tube for total pressure head with inverted flights



Brass tube 5,5 in = 140 mm in length (12 Ø x 1). One may also use a suitable plastic tube provided that it is sufficiently stiff and straight.

Recommended entrance speeds for the following aerobatics

	Indicated entrance speed	Max.acceleration
Loop upward	Single: 84 kts = 155 km/h	2-3 g
	Dual: 92 kts = 170 km/h	
Stall Turn	Single: 89 kts = 165 km/h	3 g
	Dual: 97 kts = 180 km/h	
Split 'S'	Single: 92 kts = 170 km/h	2-3 g
	Dual: 97 kts = 180 km/h	
Immelmann	Single: 89 kts = 165 km/h	2,5-3,5 g
	Dual: 97 kts = 180 KM/h	
Slow Roll	Single: 81 kts = 150 km/h	
	Dual: 89 kts = 165 km/h	
Steep Climbing Turns & Lazy Eight	Single: 76 kts = 140 km/h	
	Dual: 81 kts = 150 km/h	
Chandelle	Single: 86 kts = 160 km/h	
	Dual: 95 kts = 175 km/h	

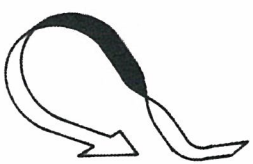


L O O P

Entrance speed:
Single 84 kts = 155 km/h
Dual 92 kts = 170 km/h
Max. g = 2-3.

S T A L L T U R N

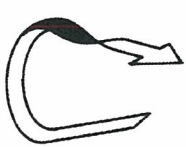
Entrance speed:
Single 89 kts = 165 km/h
Dual 97 kts = 180 km/h
Max. g = 3.



S P L I T 'S'

Pull up at least 30°!
Altitude loss approx. 328 ft = 100 m.

Entrance speed:
Single 92 kts = 170 km/h
Dual 97 kts = 180 km/h
Max. g = 2-3.

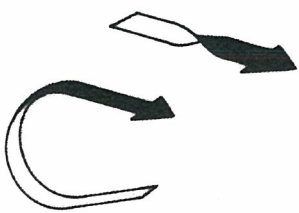


I M M E L M A N N

Entrance speed:
Single 89 kts = 165 km/h
Dual 97 kts = 180 km/h
Max. g = 2,5-3,5.

S L O W R O L L

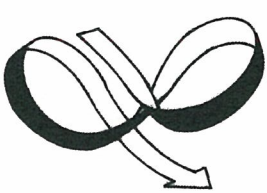
Entrance speed:
Single 81 kts = 150 km/h
Dual 89 kts = 165 km/h.



I N V E R T E D F L I G H T

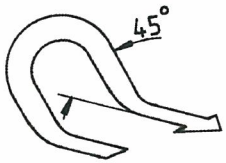
Note: with the inverted flight the fuselage nose will be unexpectedly high above the horizon.

S P I N



L A Z Y E I G H T

Entrance speed:
Single 76 kts = 140 km/h
Dual 81 kts = 150 km/h.



S T E E P C L I M B I N G
T U R N

Entrance speed:
Single 76 kts = 140 km/h
Dual 81 kts = 150 km/h.

C H A N D E L L E

Entrance speed:
Single 86 kts = 160 km/h
Dual 95 kts = 175 km/h.

V. RIGGING AND DE-RIGGING

V.1 RIGGING

Rigging the ASK 21 can be carried out by four persons without mechanical assistance, and by three persons with the use of a fuselage stand or a wing support.

Prior to rigging, clean and grease all pins, bolts, bushings and control system connections.

1. Set up the fuselage and hold it horizontal.
2. Plug the spar fork of the left wing into the fuselage and - if available - place a wing support under the wing end.
3. Offer up the right wing and align the main pin fittings.
4. Press in the main pins and secure. **Never** insert the rear wing attachment pins prior to the main pins !
5. Press in the rear wing attachment pins; unscrew the T-tool and check whether the safety lock is engaged.
6. Connect and lock the aileron control linkages in the fuselage behind the spar tunnel.You must be able to touch the ball pivot by feeling through the slot in the socket. Also check the proper engagement of the safety lock by pushing it on to close ! Secure them with spring clips!
7. Connect and lock the airbrake control linkages in the fuselage behind the spar tunnel. Secure them with spring clips!

8. The tailplane is fitted onto the fin from the front. (see Fig. V.2-1 and V.2-2).
   Now the Allan bolt at the leading edge is screwed in; this should be screwed in tightly until the spring-loaded safety pin snaps out over the screw head as far as the socket.

9. Connect the elevator and safety with a spring clip !

Note, if your glider uses an automatic elevator connection: after cleaning and lightly greasing the plug-in elevator connections, the tailplane is fitted onto the fin from the front; both elevator panels must be fitted into their connectors simultaneously. Then the tailplane is pushed back until the Allan bolt at the leading edge can be screwed in; this should be screwed in tightly until the spring-loaded safety pin snaps out over the screw head as far as the socket.

10. Carry out a pre-flight check referring to the Check List (see Section VII, p.43, of the Instructions For Continued Airworthiness !

11. The control circuits must be subjected to an operational test.

12. Check condition and function of the wheel brake; check the tire pressure.
    See also Section IV.2 **DAILY INSPECTIONS** in this Manual.

V.2 DE-RIGGING

De-rigging is carried out in the reverse sequence to that of rigging. It must be taken care that the rear wing attachment pins have to be removed prior to the main pins.

WARNING: For derigging the horizontal tail from the fin it has to be regarded hat only the method according to Fig. V.2-2 is used.

Fig. V.2-1
WRONG: Twist movement

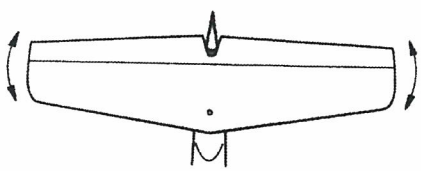


Fig. V.2-2
RIGHT: Pitch movement

V.3 PARKING

When parking the glider, the canopies have to be closed !
When an ASK 21 is parked on an airfield in the sunshine (this must also be observed during the waiting time until take-off when the pilots are already on board) the canopies must not be left open for some time.

Depending on the position of the sun and the intensity of the radiation, the burning-glass effect of the canopies can cause a slow fire in the area of the instrument panel or the headrest respectively.

Therefore, if you have to store the glider outside, it is absolutely necessary always to close the canopies and to cover them with a white cloth.

V.4 ROAD TRANSPORT

The design of a glider trailer is another subject and cannot be discussed in all details here. Of course, a closed trailer is preferable. But also an open trailer may serve the purpose, the latter is generally simpler and lighter. It is important that all components are well fixed and have a large support surface.

A structural components survey drawing which can be used for the building of a trailer, can be obtained from ALEXANDER SCHLEICHER.

WARNING: In no case must the elevator actuator fitting be loaded. This fitting trades out of the upper end of the fin. Not even soft foam cushions are allowed.
For the construction of the trailer for road transport the full freedone from any load must be carefully regarded.

V.5 PREVENTIVE MAINTENANCE

The whole surface of the glider is painted with a weather resisting, white polyester coat. Impurities may be washed off with a mild cleansing agent. Heavy impurities may be removed with a polish. For the paint maintenance only silicone-free agents must be used (e.g. 1 Z-special cleansing agent-D2 from W.SAUER & CO., 5060 Bensberg, West Germany, - or the cleansing polish from LESONAL).
Though the glider is rather insensitive, it should be protected as much as possible against moisture and humidity. If water has soaked into any components, these have to be stored in a dry room and must be turned over frequently;
The canopy is best cleaned with a special plexiglass cleansing agent; in an emergency lukewarm water will do. Rewipe only with pure, soft leather or with glove cloth. Never wipe on dry plexiglass.
The safety harnesses must be regularly checked for damage and tears. The metal parts of the harnesses must be checked for corrosion.

VI. CENTER OF GRAVITY (CG)

VI.1 WEIGHING PROCEDURE OF CG AT EMTY WEIGHT

Prior to determining the CG in flight the CG at empty weight has to be established by weighing the glider. For this procedure the glider must be put on two pair of scales (one at the nose wheel and one at the tail skid).

NOTE: the glider must be set on the two pairs of scales very carefully in order to prevent that the scales get misaligned; (this could lead to erroneous results).

The Datum Line (DL) is situated at the wing leading edge of the straight center part of the wing.

Levelling means: wedge on rear top edge of fuselage 1000 : 52 horizontal.

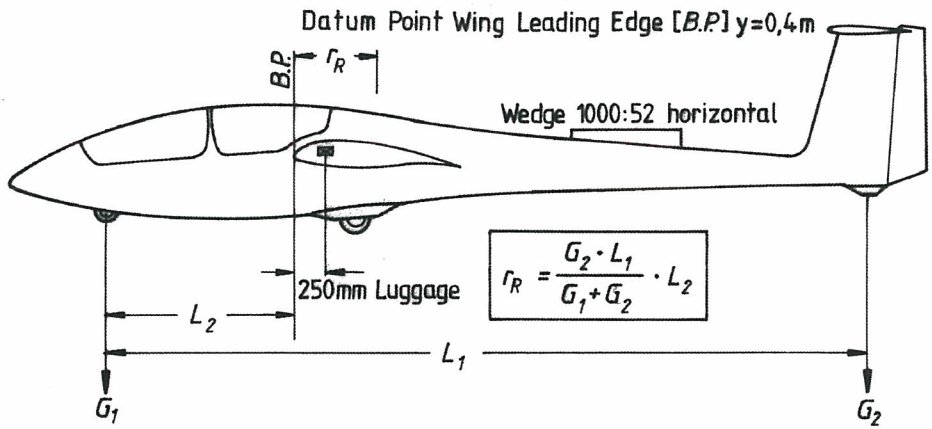
Empty weight CG :

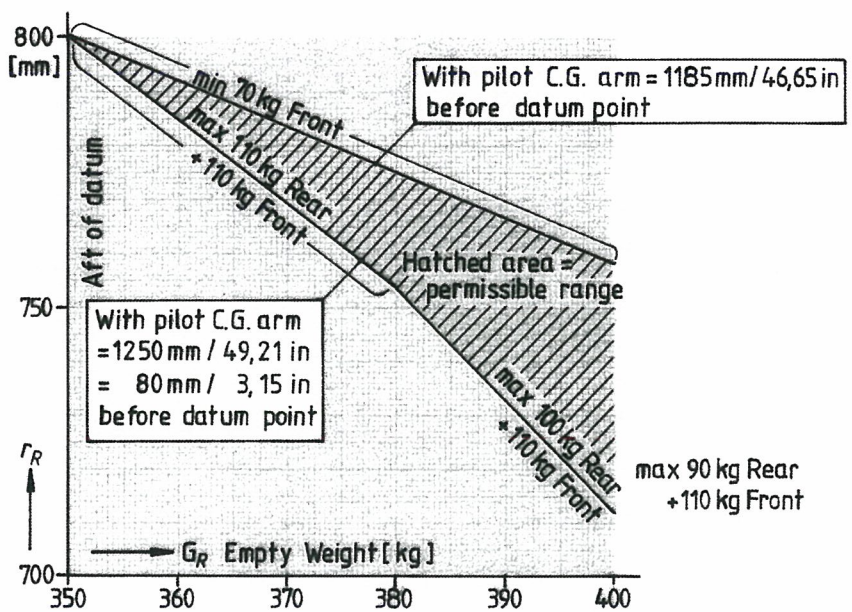
Weight at the nose wheel:	lbs
Weight at the tailskid:	lbs
Support point nose wheel:	in
Support point tailskid:	in

NOTE: determination of empty weight and empty weight CG must be done without any additional balance weights (e.g. trim cushion).

Be careful not to exceed the maximum weight of non lift producing parts when using maximum payload. The total weight of non lift producing parts contains the individual weights of fuselage, elevator and maximum payload and must not exceed 410 daN = 920 lbs (the payload must be reduced accordingly).

Weight and Balance Sheet





The CG should be recalculated after repair, repainting or installation of additional equipment, but not later than 4 years after the last weighing.
The empty weight, empty weight CG position and maximum load should be recorded after each weighing on page of the Flight Manual by a competent person.

VI.2 EMPTY WEIGHT CG POSITION

With the empty weight CG according to the below-mentioned limits and the pilot weights according to the load table, the in flight CG will be within the approved range.

Empty Weight		CG forward		CG aft	
daN	lbs	mm	in	mm	in
350	770	800	31,50	800	31,50
360	792	784	30,87	792	31,18
370	814	769	30,28	783	30,83
380	836	754	29,69	774	30,47
390	858	732	28,82	766	30,16
400	880	712	28,03	758	29,84

Weight and balance information with spin ballast

Without valid spin ballast-table (Flight Manual page 47b), spin ballast at the tail may not be used. The validity period is specified on each spin ballast-table. A valid spin ballast table can be obtained from the manufacturer (procedure, refer to Maintenance Manual page 36).

Before every flight with spin ballast the pilots must be weighed with the equipment worn in flight (clothes, parachute ...).

When the load in the front seat is below 70kg (154lbs), compensate missing load by attaching trim ballast in the front fitting, so that the load in the front seat equals 70kg (154lbs). For this purpose, follow the instructions on page 13. During the further procedure, the front pilot and the front trim ballast count together as a pilot of 70kg (154lbs).

The amount of spin ballast is specified in the current spin ballast-table. The mass of the pilot in the front seat defines the line of the table; the mass of the pilot in the rear seat defines the column of the table. At the intersection, the number of ballast plates (1 kg = 2.2 lbs), which are to be attached, is noted.

Up to a maximum of 12 spin ballast plates are permissible. The plates have to be distributed evenly to the left and right side of the fin and have to be fixed with the provided screw.

CAUTION: *The washer and nut fixed at the cockpit placard (see below)* ***must*** *be used. After removal of the spin ballast the washer and the nut must be fixed again on the placard.*

Serial No: 21931
Registration: N221CW
Date: 29.10.15

Empty mass: 836 lbs
Empty mass Centre of Gravity: 30,3 inch
Weigh and Balance report dated: 21.10.15

Max. permissible payload: 486 lbs
Equipment list dated: 21.10.15

This table gives the number of weights to be mounted at the tail for spin training (section IV.6)

pilot mass incl. parachute in front seat (lbs) \ pilot mass incl. parachute in rear seat (lbs)	154	159	163	168	172	176	181	185	190	194	198	203	207	212	216	220	225	229	234	238	243
154	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6
159	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7
163	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7
168	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8
172	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9
176	5	6	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9
181	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10
185	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11
190	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11
194	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12
198	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	12
203	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	12	12	12	12
207	10	10	10	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12
212	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
216	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
220	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
225	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12		
229	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12			
234	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12				
238	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12					
243	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12						

■ = invalid loading

Note: This table becomes invalid when the aircraft is modified or with the date of: 21.10.2019

Mod. No	Date	Sig.
TN 4b	12.Dec.1	JN/MG
2		

drawn up by:

This table gives the number of weights to be mounted at the tail for spin training (section IV

Serial No: 21931
Registration: N221CW
Date: 29.10.15

Empty mass: 379 kg
Empty mass Centre of Gravity: 769 mm
Weigh and Balance report dated: 21.10.15

Max. permissible payload: 221 kg
Equipment list dated: 21.10.15

pilot mass incl. parachute in front seat (kg) \ pilot mass incl. parachute in rear seat (kg)	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
70	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6
72	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7
74	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7
76	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8
78	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9
80	5	6	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9
82	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10
84	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11
86	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11
88	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12
90	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	12
92	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	12	12	12	12
94	10	10	10	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12
96	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
98	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
100	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
102	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12		
104	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12			
106	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12				
108	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12					
110	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12						

■ = invalid loading

Note: This table becomes invalid when the aircraft is modified or with the date of: 21.10.2019

Mod. No	Date	Sig.	drawn up by:
TN 4b	12.Dec.12	JN/MG	P. [signature]

VI.3 Weighing Record

Date of weighing, carried out by	Equipment list used for weighing (date)	Empty weight kg (lbs)	Empty CG behind datum mm (in)	Empty weight momentum max	Max pay-load kg (lbs) max	Old spin ballast table* removed (check off)	Signature
21.10.15	21.10.15	836.4	30,29		485	✓	[signature, stamp]

* Flight Manual Page 47b

The empty weight momentum is necessary to calculate the in flight cg. (load table).

CAUTION : Incorrect loading can deteriorate glider handling qualities and can cause hazardous flight conditions. The pilot in command is responsable for correct loading.

Never fly the glider from the rear seat only !!

	Weight [lbs]	×	arm [inch]	=	Momentum [lbs × inch]
Empty weight		× +		=	
Front pilot		× —	{46,65 / 49,21} *	=	
Rear pilot		× —		=	
Baggage		× +		=	
Sum of weight →			Sum of momentum →		

Position of flight CG = $\frac{\text{Sum of momentum}}{\text{Sum of weight}}$ = ____ ← CG Flight [inches]

* Note: Tall persons shall use the shorter value and set the backrest on the rear position.

Small persons shall use the longer value and set the backrest at the forward position.

VI . 4 Calculation of CG at flight weight [metric system]

	Weight [kg]	×	arm [mm]	=	Momentum [kg × mm]
Empty weight		× +		=	
Front pilot		× −	{1185 / 1250}*	=	
Rear pilot		× −		=	
Baggage		× +		=	
Sum of weight →			Sum of momentum →		

$$\text{Position of flight CG} = \frac{\text{Sum of momentum}}{\text{Sum of weight}} = \boxed{\quad} \leftarrow \text{CG Flight [mm]}$$

* Note: Tall persons shall use the shorter value and set the backrest on the rear position.

Small persons shall use the longer value and set the backrest at the forward position.

VI .4 Calculation of CG at flight weight

EXAMPLE !

	Weight [lbs]	×	arm [inch]	=	Momentum [lbs × inch]
Empty weight	814	× +	30,55	=	+ 24 869
Front pilot	187	× −	{46,65 / 49,21} 47,24 *	=	− 8833,88
Rear pilot	165	× −	3,15	=	− 519,75
Baggage	22	× +	9,84	=	+ 216,48
Sum of weight →	1188		Sum of momentum →		15730,85

Position of flight CG = $\frac{\text{Sum of momentum}}{\text{Sum of weight}}$ = 13,24 ← CG Flight [inches]

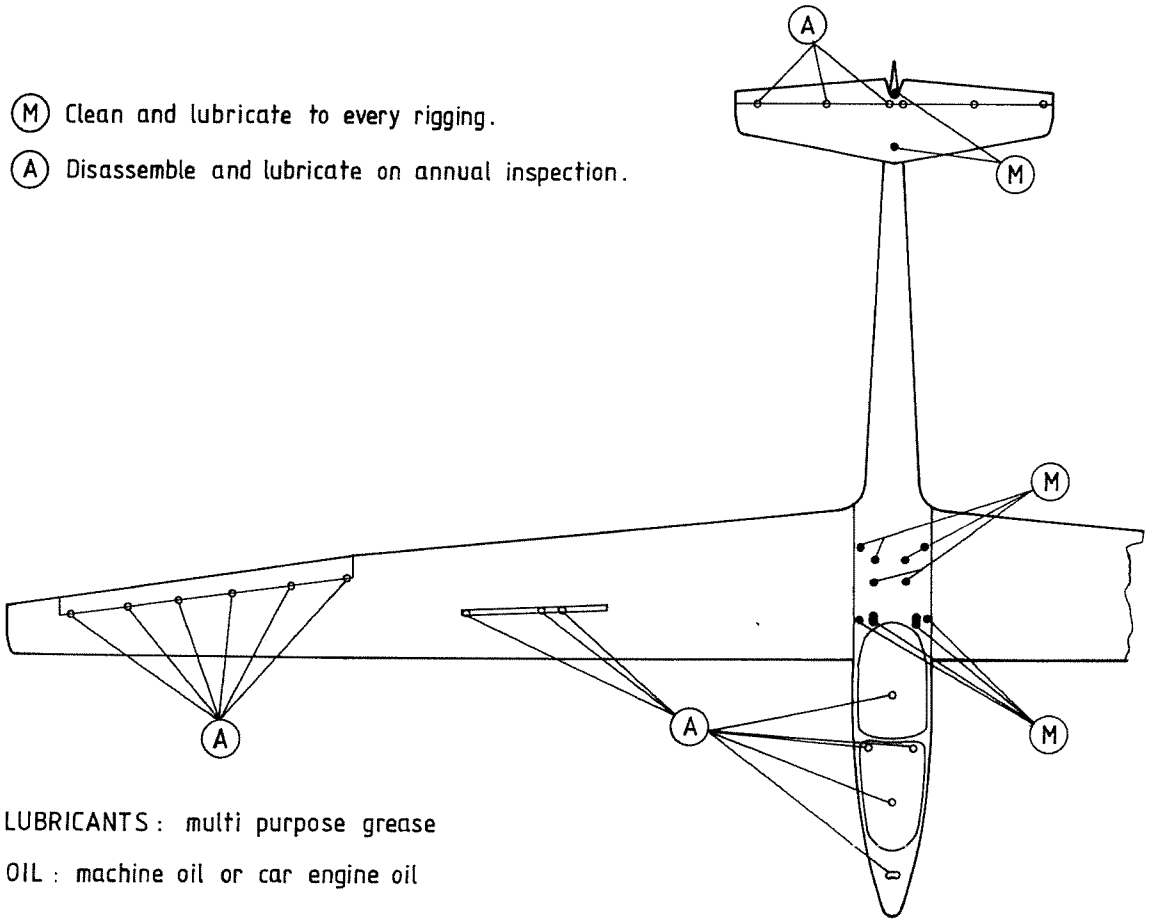
* Note: Tall persons shall use the shorter value and set the backrest on the rear position.

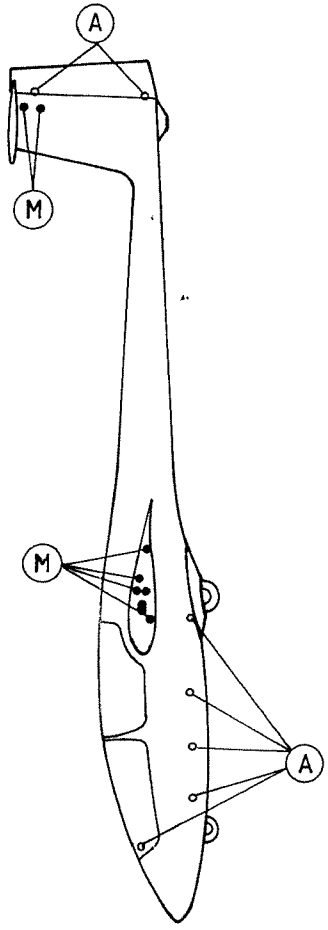
Small persons shall use the longer value and set the backrest at the forward position.

LUBRICATION SCHEME

(M) Clean and lubricate to every rigging.

(A) Disassemble and lubricate on annual inspection.

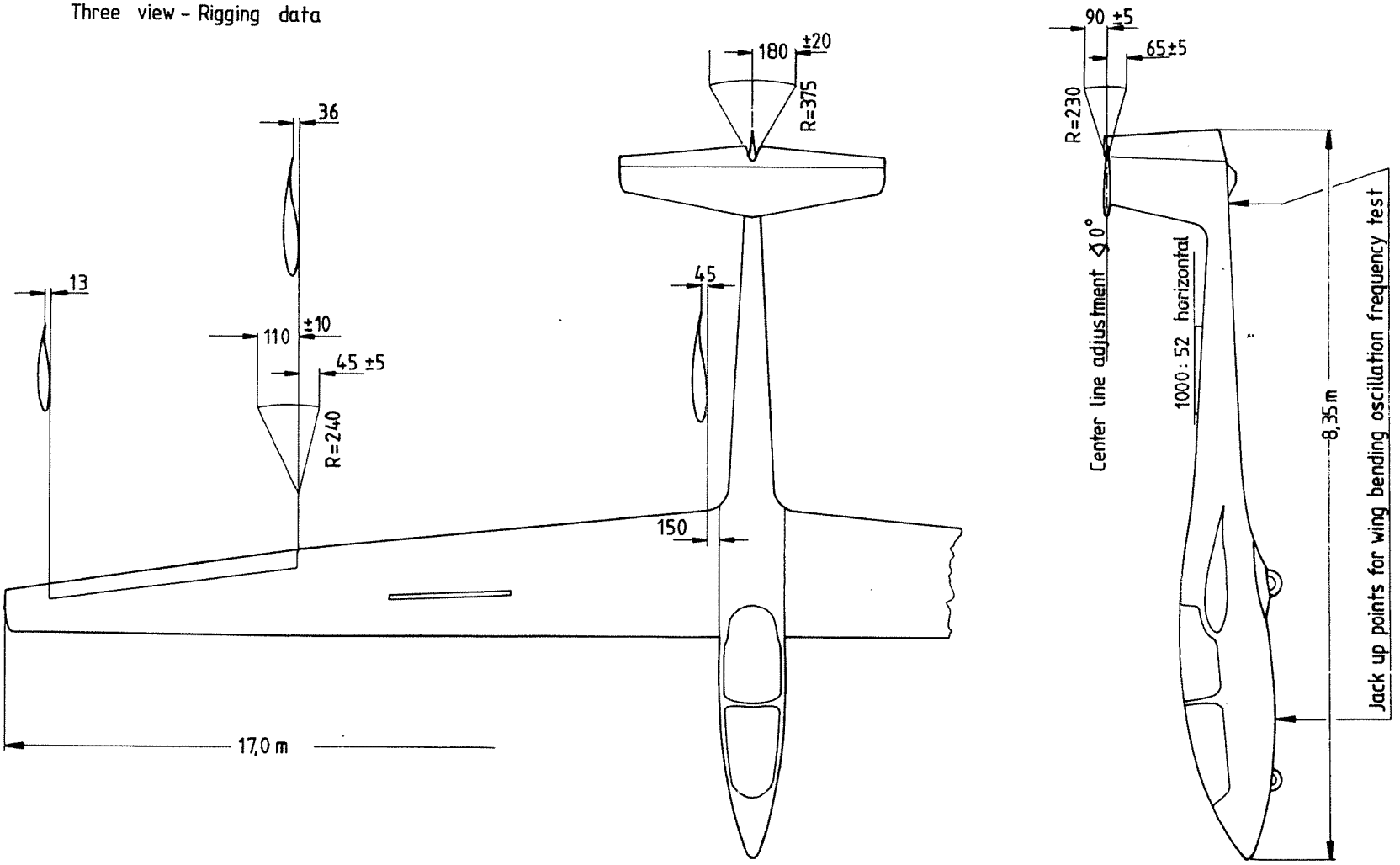


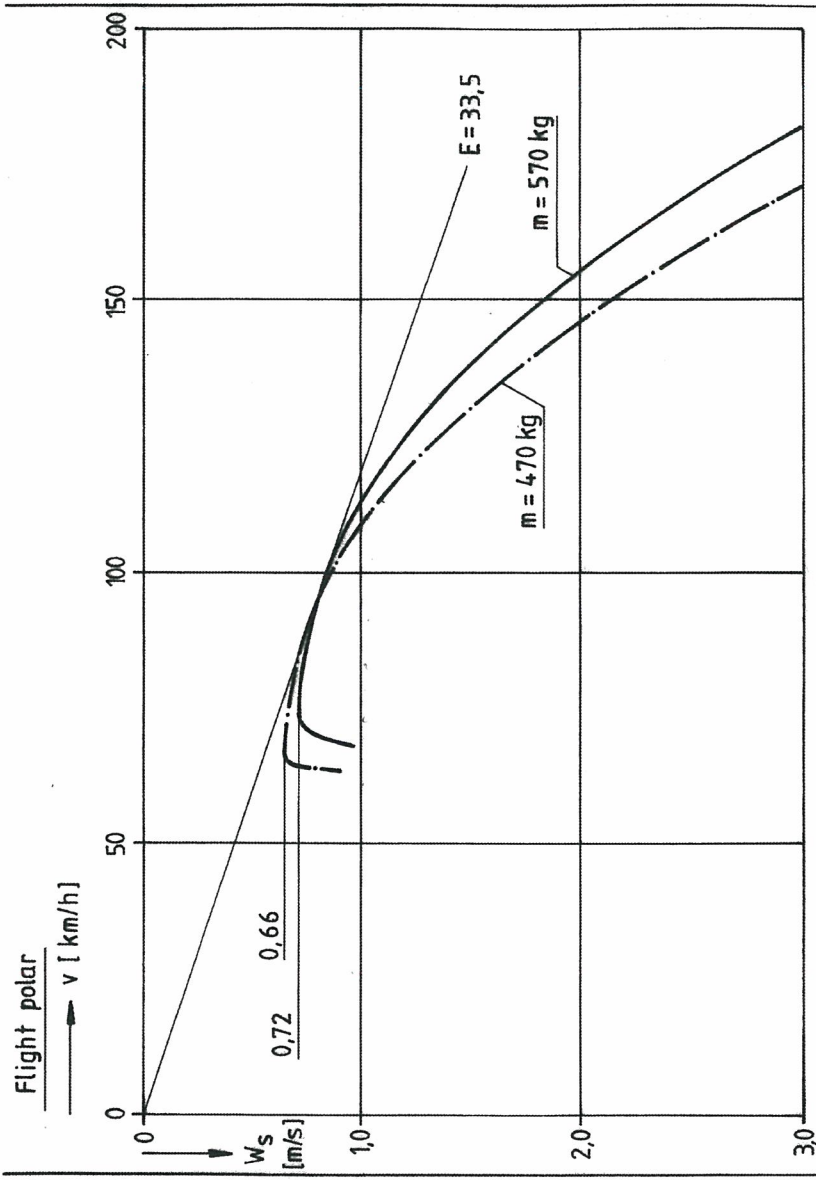


LUBRICANTS : multi purpose grease

OIL : machine oil or car engine oil

Three view - Rigging data




Flight polar
v [km/h]
0
50
100
150
200
0,66
0,72
E = 33,5
m = 570 kg
m = 470 kg
0
1,0
2,0
3,0
w_s [m/s]

Attachment 1 of TN 4b

Spin training with the ASK 21: Summary of important information and further recommendations

Introduction

This appendix puts together pieces of information, which are important for spin training, but are found on different places in the Flight Manual. Furthermore, some general recommendations were added. About 170 ASK 21 were fitted with an attachment for spin ballast according to TN 4a (winter 2013). Now, it seems advisable to supply more information and more compact.

Spin Characteristics

The ASK 21 spins in upright flight as well as in inverted flight.

WARNING: *Intentional spins are only permitted in upright flight.*

The ASK 21 spins fast, steeply, and combined with a pitch oscillation. The oscillation of the spin causes a variance in pitch attitude that can range from extremely steep to nearly flat. Thereby the nose can pitch up almost to the horizon and the cockpit noise can calm down nearly completely. The pilot may not be used to such flat phases from other gliders of plastic design. The oscillation is more pronounced with increased loading. Nevertheless, it is possible in all phases to recover from a spin within one additional turn. But there are some important points to be regarded.

WARNING: *The following important points have to be regarded during recovery (see Flight Manual page 13):*

- *Deliberately apply opposite rudder **up to the stop**, and keep it at the stop until the rotation ends.*
- *Short pause (approx. ½ turn) after applying rudder and before releasing the stick.*
- *As long as rotation has not stopped, only give in to the pressure of the stick. Do **not** push the stick.*

Disregarding these points can delay or even prevent recovery.

WARNING: *During recovery from stalls in the presence of wing drop, or from departures and spins, application of forward stick prior to opposite rudder can delay recovery up to three additional turns.*

In order to obtain a reproducible result independently of the setting of the elevator trim, look out to bring the stick into neutral position, i.e. to the middle elevator course. In no case, the stick may be pushed to full nose down position.

Familiarize yourself with the spin characteristics

WARNING: *The combination of varying cockpit noise levels, varying pitch attitudes, and varying rotation rates and airspeed indications can cause disorientation to those unfamiliar with spinning this aircraft. If this occurs, positive application of recovery controls should be initiated immediately to minimize any effects of disorientation.*

We strongly recommend even experienced gliding instructors to familiarize them with spinning the double seated ASK 21. This may happen through a fellow instructor already experienced in spin training on the ASK 21. When the spin ballast attachment is new in the gliding club, there might be opportunities through the national gliding associations or in training courses for the continuing education of instructors. Apart from that, there are also flight schools offering spin training with the ASK 21. A list of such schools can be requested from Alexander Schleicher, or looked for on their web site.

Condition of the aircraft

The condition of the glider must be identical to the condition during the last valid weighing. This condition is documented in the equipment list, on which the weighing report refers.

When the batteries in the wing root were installed during weighing, they must also be installed during flight.

CAUTION: *Control surface gaps have to be treated either according to the Maintenance Manual, Section VIII, or according to Maintenance Instruction C.*

Disregarding this item can delay spin recovery or may even prevent recovery.

The spanwise gaps of ailerons and elevator must be *air-tight*. According to the Maintenance Manual Section VIII this is achieved with a certain adhesive tape. According to Maintenance Instruction C this is achieved with a teflon sealing/slip tape under the mylar fairing strips. Mylar fairing strips without sealing tape beneath are not sufficient!

The rudder gap either stays open (Maintenance Manual Section VIII), or a zig-zag-tape is placed on the forward edge of the mylar fairing strip (a combined zig-zag-fairing tape is also possible, Maintenance Instruction C).

Usage of the Spin Ballast Table

Directly before flight the pilots have to weight themselves with the equipment worn in flight (clothes, parachute ...) (see Flight Manual, page 47a). When the load in the front seat is below 70kg (154lbs), compensate missing load by attaching trim ballast in the front fitting, so that the load in the front seat equals 70kg (154lbs). For this purpose, follow the instructions on page 13. During the further procedure, the front pilot and the front trim ballast count together as a pilot of 70kg (154lbs).

According to the spin ballast table page 47b, spin ballast has to be attached. Every other trim ballast and (loose) equipment in the cockpit has to be removed.

By following the spin ballast table a c.g. of approx. 406 mm (16 inch) is set in for the flight. In any case, a maximum of 12 kg at the tail may not be exceeded. This amount of 12 pieces of ballast may not be sufficient to reach the 406mm with heavy pilots. With such a loading (larger masses on the front and tail of the glider), the glider may even be spinning at more forward c.g.-positions.

Higher masses in the cockpit and on the tail influence the rotational speed of the spin and the amplitude of the superimposed pitch oscillation. With higher masses, the average pitch attitude is approx. –40° and the pitch amplitude is about ±30°.

In all spins, the altitude loss is approximately 60 m (200 ft) per turn with a variance of 45 m (150 ft) minimum to 80 m (250 ft) maximum.

Spin Entry Procedure

The spin entry procedure is described on page 34 of the flight manual.

An aileron impulse against spin direction in due time can support spin entry.

CAUTION: *We recommend to enter spins in a generously safe altitude.*

For example it may be recommendable to enter the spin not below 1000 m (3280 ft) AGL, when you intend to spin one turn and then recover. If you want to spin three turns and then recover, do not enter the spin below 1300 m (4270 ft) AGL.

When determining your minimum altitude for entering a spin, always bear in mind, that the student may not recover correctly at first go, or other imponderability may happen. For example, recovery may be postponed by three additional turns during a wing drop or spin, when forward stick was applied before opposite rudder.

WARNING: *If a spiral dive sets in, opposite rudder, opposite aileron, and relaxed back stick pressure must be used immediately to prevent overstressing the structure.*

If cockpit noise due to outside airflow continues to increase to the point that conversation between crewmembers is difficult, or if the airspeed indicator is increasing through 110 km/h (60 kts), the aircraft is no longer spinning but is likely in a spiral.

NOTE: *We recommend not to use the airbrakes during recovery to reduce the airspeed, since the tolerable load factor with extended airbrakes is only +3,5g / -0g.*

Spin Recovery

see Flight Manual page 13, and above "Spin Characteristics"

Emergency procedures

For your own safety, the decision height for a bail out should be determined before start. It should be agreed upon, who makes the decision, and what the instruction to bail out is.

If, for whatever reason, the glider has not yet finished the spin after one turn, the following questions have to be checked:

- Is *full* rudder applied against the spin? Is back pressure upon the stick released, and aileron neutral?
- Is the glider really in a spin – and not in a spiral dive?

If both questions can be answered with „Yes", the glider should still be given the chance, to recover from the spin (Patience!). The altitude loss in a spin is 45 m to 80 m (150 ft to 250 ft) per turn. After further three turns it propably makes sense to restart the recovery procedure.

Attachment 2 of TN 4b

Excerpt of the USAF Manual

The US Air Force flight tested the ASK 21 with spin ballast in 1989. Their results also went into the concept of Technical Note 4b (TN4b). In the report of the USAF there is also a recommendation for the Flight Manual. This text is too detailed for the average student pilot. As an offer to the flight instructor, it is attached below. Since it is older than TN4b there are some deviations from TN4b (e.g. concept of spin ballast table).

Some definitions are given at the end of the text. Remarks and omissions made by AS are indicated by square brackets [].

Schleicher ASK-21 (TG-9) Stall and Spin Evaluation

Doyle B. Janzen, Charles J. Precourt

July 1989,
Air Force Flight Test Center Edwards Air Force Base

This text may supply useful information for the pilot.
It is not part of the approved flight manual.

[..] The following discussion is the recommended writeup for SectionVI (Flight Characteristics) of the flight manual. The information is also appropriate for the manufacturer's flight manual.

[..]

DEPARTURE AND SPIN SUSCEPTIBILITY

Entry Techniques

The simplest spin entry is accomplished from wings level with the pitch attitude held constant at 10 degrees nose high until stall, while smoothly applying full rudder and full aft stick. Proper timing of aileron inputs prior to stall can generate additional yaw (adverse yaw due to aileron) to assist spin entry. This is particularly true at more forward cg when rudder and elevator alone fail to produce spin entry.

Spin entry is sensitive to entry conditions. If the entry attitude is too nose high, it results in a spiral dive. If the entry attitude is too shallow, it results in a steep-banked sideslip. The spiral or sideslip occur more frequently as the cg is moved forward. Spin entry is unlikely with the in-flight cg forward of 12.4 inches [315 mm]. In this case, entry attempts result in spirals or sideslips regardless of control input techniques.

Mass Properties Effects

Spin entry success is also sensitive to inertia loading. The ASK 21 aircraft has the unique feature of tail ballasting, meaning that it can be loaded at both ends of the fuselage. Although the tail weights were designed to control cg, they greatly effect the inertia terms that govern aircraft response to flight maneuvers. Since the tail weights significantly increase the inertia of the longitudinal axis of the aircraft, any initial yaw rotation results in more angular momentum than without tail weights. This greater momentum results in, achievable spins at cg's further forward than the low inertia case.

Flight testing has produced spins at cg's as far forward as 12.9 inches [328 mm]. With minimum inertia loadings (solo, lightweight pilot without tail ballast), incipient spins can be achieved at cg's aft of 13.0 inches [330 mm] and sustained spins aft of 15.0 inches [381 mm]. With higher inertia loadings (two pilots and tail ballast), incipient spins can occur aft of 12.5 inches [318 mm] and sustained spins aft of only 13.5 inches [343 mm]. Therefore, the tail weights cause the target cg where spins can be expected to move progressively more forward as pilot weights increase.

[..] In reference to test results [..], the best cg for spin training is 16.0 inches [406 mm]. [..] The maximum number of tail weights permitted is [12]. If pilot weights call for more than [12] tail weights [..], use [12] tail weights which will result in a cg slightly ahead of 16.0 inches [406 mm]. Due to the higher inertia of this case, the aircraft will still spin easily for training.

No Rudder Spin Entry

Spin entry without using rudder input can occur under certain conditions. A wing drop at stall can generate sufficient yaw to cause the rudder to float to the prospin position. Wing drop can occur due to adverse yaw from uncoordinated aileron inputs near stall or turbulence. In this case, if recovery is not initiated by applying rudder opposite the wing drop and then breaking the stall with forward stick, a spin can develop.

[..] If proper coordination is not exercised near stall, a departure or spin may occur with only stick inputs.

SPIN CHARACTERISTICS

Spin Modes

The ASK 21 has two spin modes, one upright and one inverted. Both are classified as fast, steep, and oscillatory, However, the oscillation of the spin causes a variance in pitch attitude that can range from extremely steep to nearly flat. The average attitude value is classified as steep. The spin modes may also appear smooth instead of oscillatory if they are only examined for three turns or less. This is because the period and frequency of the pitch oscillation vary as a function of cg and inertia loading. Variations from one oscillation per turn to one oscillation every three turns can be seen, depending on loading.

Spin-Parameters

The pitch attitude during ASK 21 upright spins averages 40 to 50 degrees nose low. The steep phase of the oscillation is as much as 70 degrees nose low and the flat phase as high as the horizon. In no case does the flat phase tend toward an unrecoverable situation. On some occasions, the spin attitude is steep enough that the AOA is momentarily less than stall, resulting in recovery as the aircraft pitches down out of the spin.

The oscillation occurs more frequently as the cg is moved aft, while increases in inertia loading result in a larger amplitude of the oscillation. For example, at a forward cg, the oscillation is seen every third turn. At the aft cg limit, the oscillation occurs every ¾ to 1 turn. At low inertia values, the pitch attitude oscillates typically ±15 degrees about 50 degrees nose low, while at high inertia the oscillation is ±30 degrees about 40 degrees nose low.

The rotation rate of the spin is as fast as 140 degrees per second, or one turn every 2.5 seconds. This rate occurs at the steep phase of a spin oscillation. During the flat phase, the rotation rate is as slow as 90 degrees per second or one turn every 4.5 seconds. The average rotation rate is fastest at forward cg 's and high inertias, where oscillations occur least frequently. Toward the aft cg limit, where oscillations to flat attitudes are more frequent, the average rotation rate is slowest.

In all spins, the altitude loss is approximately 200 feet [60 m] per turn with a variance of 150 feet [46 m] minimum to 250 feet [79 m] maximum. This indicates that in spite of the oscillatory nature of the spin mode, the descent rate remains relatively constant.

Airspeed indications during the spin oscillate along with pitch attitude. In most cases, airspeed oscillates between 30 and 40 KIAS [56 and 74 km/h] During larger oscillations in pitch attitude, higher sideslip angles are present and airspeed erroneously reads zero or less (pointer unwinds [backwards]).

Since airspeed indications can be unreliable during spins, particular attention is necessary to recognize the transition to a spiral. If cockpit noise due to outside airflow continues to increase to the point that conversation between crewmembers is difficult, or if the airspeed indicator is increasing through 60 KIAS [110 km/h], the aircraft is no longer spinning but is likely in a spiral. Opposite rudder [, opposite aileron,] and relaxed back stick pressure should be used immediately to avoid potential overspeed or overstress situations associated with high-speed spirals. Spoilers should be used as necessary to control airspeeds during all spin or spiral dive recoveries. [Remark: AS does not recommend the use of airbrakes during recoveries. Extracting the airbrakes has an unfavourable influence on the lift distribution, and the tolerable load factor reduces to +3,5g / -0g, see Flight Manual Section II.5].

[..]

Cockpit noise also varies during sustained spin oscillations. During steep phases of the spin, cockpit noise from outside airflow is loudest, while during flat phases, the cockpit is very quiet.

WARNING: *The combination of varying cockpit noise levels, varying pitch attitudes, and varying rotation rates and airspeed indications can cause disorientation to those unfamiliar with spinning this aircraft. If this occurs, positive application of recovery controls should be initiated immediately to minimize any effects of disorientation.*

Control forces during spins are light. There is a tendency for the ailerons to float into the direction of the spin, accompanied by 5 to 10 pounds [2,3 to 4,5 daN] of lateral force on the control stick. At the higher spin rates, the elevator and rudder forces at full prospin deflection drop to zero.

CONTROL EFFECTS

Flight Manual Recovery

When opposite rudder is initiated at a slow point or flat phase of the spin, the rotation stops in ¼ to ½ turn and the aircraft recovers. In the majority of cases, even at higher rotation rates, opposite rudder recovers the aircraft in ½ to ¾ of a turn from the point of input. However, with cg's of 14 to 16 inches [355 to 406 mm] and at higher inertias, recovery can take up to 1½ additional turns to recover once opposite rudder is applied. It is imperative that a slight pause occur between application of opposite rudder and forward stick or even greater delay in recovery can occur.

[Due to this statement the flight manual had been changed, adding the rule to obey a short pause between applying full rudder and relieving stick back pressure.]

A recovery of 1½ turns may take up to 5 seconds, which may seem excessively long to an inexperienced pilot. The flight manual procedure has a 100 percent success rate if given sufficient time to work.

Aileron Effect

For the ASK 21, ailerons against the spin produce a noticeable bank angle away from the spin turn direction as well as a nose down pitch rate. This sometimes results in recovery as the yaw rate decreases through inertial coupling and the nose pitches down leaving the aircraft in a steep sideslip to terminate the spin. In other cases, the aircraft remains in the spin with a bank angle away from the spin direction. Therefore, ailerons against the spin are not a reliable contributor to spin recovery.

Ailerons with the spin increase rotation rate but this effect is masked by the oscillatory characteristics of the spin. In the majority of cases, ailerons into the spin achieve a slightly higher rotation rate and a more

sustainable spin. The results of testing isolated aileron inputs indicate neutral aileron is the best position for recovery.

Elevator Effects

In some case, application of forward stick with no rudder input will result in a continued spin. During either the incipient phase of the spin or at the start of a nose up oscillation, full forward stick can produce up to three more turns before recovery.

WARNING: *During recovery from stalls in the presence of wing drop, or from departures and spins, application of forward stick prior to opposite rudder can delay recovery up to three additional turns.*

Hands Off

In the majority of cases, when the controls are released during a spin, the stick moves laterally in the direction of the spin. The stick usually reaches full aileron deflection and then starts forward toward neutral. The aircraft pitch attitude steepens and then the rudders return to neutral. At this point, the aircraft self-recovers in a steep attitude.

If the controls are released just after the pitch attitude has cycled nose low and the rotation rate is high, the stick moves abruptly into the direction of the spin and remains at full aft/full aileron deflection. Rudders also remain at full deflection, or nearly so, and the spin continues indefinitely until the pilot forces the controls to the recovery position. This is most prevalent in the 14- to 16-inch cg range [355 to 406 mm] with higher inertia loadings. Since airloads on the controls can occasionally cause them to "lock out" in a prospin position, releasing the controls is not a viable option for departure or spin recovery. The spin recovery procedure must be used to ensure successful recovery.

INVERTED SPINS

Flight testing has verified that the ASK 21 has an inverted spin mode. Testing has been conducted between 15.8 inches cg [401 mm] and the aft cg limit.

WARNING: *Intentional inverted spins are prohibited.*

Susceptibility

[..] Inverted spins become less likely to occur at cg's forward of 15.8 [401mm] inches since control positions become more critical. Overall, the ASK-21 is extremely resistant to inverted spins since only sustained inverted stalls result in spins, regardless of cg. Although testing indicates increased resistance forward of 15.8 inches cg [401 mm], this does not imply inverted spins at more forward cg's are impossible.

Characteristics

The inverted departure and spin entry are essentially a mirror image of the upright case. The nose falls to approximately 60 degrees nose low and then hesitates. Cockpit g forces build up to –2g and the nose then oscillates back up to 40 degrees nose low. The spin develops in approximately 180 degrees of rotation and is oscillatory just as the upright spin. Altitude loss is 200 to 300 feet per turn [61 to 91 m] and rotation rate is one turn every 3 to 2½ seconds. At the cg's tested, the inverted spin oscillations occur every ¾ to 1 turn. Once the spin is developed, gforces oscillate between –1 and –1.5g. Airspeed oscillates near 40 KIAS [75 km/h] and remains stalled throughout. Cockpit g forces are uncomfortable but other spin characteristics are very comparable to the upright case.

Inverted spin recovery is immediate (¼ to ½ turn) when controls are neutralized. Altitude loss from initiating recovery to level flight is 400 to 500 feet [122 to 152 m]. Since the spin includes a component of roll rate as well as yaw rate, the aircraft rolls to an upright attitude during recovery on its own, without further pilot input. Airspeeds are typically 90 to 100 KIAS maximum [167 to 185 km/h] during inverted spin dive recoveries.

Definitions

Term	Definition (see page 5 of USAF-report)
Departure	Event in poststall flight, that precipitated entry into a poststall gyration or spin. Momentary event, indicated by uncommanded, divergent aircraft motions, and synonymous with complete loss of control
Incipient spin	For the purpose of this report, an incipient spin means achieving a minimum of one turn, and the aircraft self-recovered in spite of maintaining prospin inputs.
Sustained Spin	For the purpose of this report, a sustained spin was a spin that continued at least five turns, or indefinitely, as long as prospin inputs were maintained.

General Technical Note for:

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
D - 36163 Poppenhausen

Model:

ASK 21	TN-No. 28
ASK 23 / ASK 23 B	TN-No. 13
ASW 19 / ASW 19 B	TN-No. 27
ASW 20, all production series versions	TN-No. 40
ASW 20 TOP, all production series versions	TN-No. 40
ASW 24 Prototype	TN-No. 40
ASW 22 / ASW 22 B / ASW 22 BL	TN-No. 11
ASW 22 BE / ASW 22 BLE / ASW 22 M	TN-No. 6
ASW 24 / ASW 24 B	TN-No. 11
ASW 24 E	TN-No. 6
ASW 24 TOP	TN-No. 4
ASH 25	TN-No. 15
ASH 25 E / ASH 25 M	TN-No. 13
ASH 26	TN-No. 5
ASH 26 E	TN-No 9

Subject: Nose bolt with O-Ring

Serial number applicability:

ASK 21	German TC No. 339	all Serial Numbers
ASK 23 / ASK 23 B	German TC No. 353	all Serial Numbers
ASW 19 / ASW 19 B	German TC No. 308	all Serial Numbers
ASW 20, all production series versions	German TC No. 314	all Serial Numbers
ASW 20 TOP, all production series versions	German TC No. 05.851	all Serial Numbers
ASW 24 Prototype	Serial-No. 24000	
ASW 22 / ASW 22 B / ASW 22 BL	German TC No. 351	all Serial Numbers
ASW 22 BE / ASW 22 BLE / ASW 22 M	German TC No. 834	all Serial Numbers
ASW 24 / ASW 24 B	German TC No. 04.366	all Serial Numbers
ASW 24 E	German TC No. 859	all Serial Numbers
ASW 24 TOP	German TC No. 864	all Serial Numbers
ASH 25	German TC No. 04.364	all Serial Numbers
ASH 25 E / ASH 25 M	German TC No. 858	all Serial Numbers
ASH 26	German TC No. 383	all Serial Numbers
ASH 26 E	German TC No. 883	all Serial Numbers

Compliance: None, optional retrofit on customer's request. Serial version in new production sailplanes.

Reason: We learnt of incidents, mainly with aircraft other than Schleicher types, where pilots have flown either **without** the horizontal stab nose bolt fitted or with the nose bolt **wrongly** fitted.

These incidents cause us to incorporate an O-ring into this nose bolt so that it can no more be removed from the stabilizer leading edge and protrudes visibly if not screwed in.
This feature has already successfully been incorporated into the ASW 27.

General Technical Note for:

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
D - 36163 Poppenhausen

Action:

In accordance with drawing 000.33.9001, Sheet 1 drill a hole into the nose fitting at the stabilizer underside and ream. As shown on Sheet 2 a groove must be milled into the nose bolt for the O-ring; afterwards the bolt must be protected against corrosion by using a suitable surface treatment (see Drawing 000.33.9001, Sheet 2). Then insert the nose bolt into the nose fitting of the horizontal stabilizer and fit the O-ring into the groove of the nose bolt. For this purpose the O-ring should be greased, e.g. with Vaseline.

Where applicable this Technical Note must inserted as Appendix into the respective aircraft's Flight and Operations Manual (Flight and Maintenance Manual respectively) and the corresponding entry on this action must be made into the relevant "Record of Revision", or "Amendments Record", or "Index of Corrections" of the manual in question.

Material and drawings:

Drawing 000.33.9001, Sheet 1, Nose fitting for bolt with O-ring in the horizontal tail
Drawing 000.33.9001, Sheet 2, Nose bolt with O-ring for horizontal tail

Notes:

This action can be accomplished by a competent person. The accomplishment of this mod must be checked & certified by a licensed aviation inspector in the aircraft's log-book; Flight and Operations /Maintenance Manual and in the inspection documents.

Poppenhausen, June 28, 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 March 14, 2000 (signed by 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 for	**Alexander Schleicher** GmbH & Co. Segelflugzeugbau D-6416 Poppenhausen

Glider model:

ASK 18, ASK 18B	TN-No. 7
ASW 19, ASW 19B	TN-No. 23
ASW 20/20L, ASW 20B/20BL, ASW 20C/20CL	TN-No. 34
ASK 21	TN-No. 21
ASW 22	TN-No. 6
ASK 23, ASK 23B	TN-No. 7
ASH 25,	TN-No. 4

Subject: New production series tow release couplings for aerotow and winch launch.

Serial number applicability:

ASK 18/18B,	Data Sheet No. L-307,	all serial no.s
ASW 19/19B,	Data Sheet No. L-308,	all serial no.s
ASW 20/20L,	Data Sheet No. L-314,	all serial no.s
ASW 20B/20B1,	Data Sheet No. L-314,	all serial no.s
ASW 20C/20CL,	Data Sheet No. L-314,	all serial no.s
ASK 21,	Data Sheet No. L-339,	all serial no.s
ASW 22,	Data Sheet No. L-351,	all serial no.s
ASK 23/23B,	Data Sheet No. L-353,	all serial no.s
ASH 25,	Data Sheet No. 04.364,	all serial no.s

Compliance: None; applicable to new built gliders and in case of replacement of tow release couplings.

Reason: According to the company TOST they have stopped the previous production series of the tow release couplings "Nose tow release coupling E 72/75" and "Safety tow release coupling G 72/73". These have been replaced by the new tow release coupling productions series "Nose tow release coupling E 85" and "Safety tow release coupling Europa G 88". In order to guarantee a problem-free exchange of the previous productions series against the new one, the new tow release couplings show externally almost no differences.

Action:

1. Where replacement is required or where a corresponding installation location is provided the new tow release coupling production series can be installed instead of the previous ones.

2. When this mod is accomplished, a copy of this Technical Note must be inserted as Annex into the Flight and Maintenance Manual of the glider (Operations Manuals respectively). The accomplishment of this action must be entered into the corresponding table in the manuals (the table headline reads: Additions to.., Amendments to .., Record or Log of Revisions ..).

Notes: The glider owners must regard the "Operating and Maintenance Instructions" for the new production series tow release couplings issued by TOST and giving the service time until the next overhaul !

Poppenhausen, January 17, 1990 ALEXANDER SCHLEICHER GmbH & Co.

i.A. Lutz-W. Jumtow.

The German original of this Technical Note has been approved by the LBA under the date of March 1, 1990 (signature: SCHMALJOHANN). The translation into English has been done by best knowledge and judgement; in any case of doubt the German original is controlling.

ALEXANDER SCHLEICHER SEGELFLUGZEUGBAU
D-36163 Poppenhausen (Wasserkuppe) Germany
Phone 06658 - 890

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

SCHLEICHER ASK 21

This Manual is FAA approved for U.S. registered gliders and is required by FAA Type Certificate Data Sheet No. G 47 EU 1.10.83

Registration: N 2 2 1 C W

Factory Serial Number: 2 1 9 3 1

Owner:
.....
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German edition of Instructions for Continued Airworthiness are approved under §12(1)2 Luft GerPO

Published: March 9, 1983

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

Record of Revisions

Rev No.	Page (s) Affected	Date of Revision	Date of Insertion	Ref. / Signature
TN 4b	36, 38, 39, 43, 49, 50, 51, 52, 53, 59	31.10.13	Nov. 13	mg
TN 10	45	20.12.83	03.01.84	Juw
TN 11	2, 8, 9, 11, 43, 49, 50, 51, 52	09.03.84	18.03.84	Juw
TN 14	2, 49	16.05.84	08.06.84	Juw
TN 15	2, 58, 59	08.06.84	23.06.84	Juw
TN 20	2, 3, 43, 45, 45a, 45b, 60	03.11.87	23.11.87	Juw
TN 24	2, 3, 25, 27, 34, 35, 45b, 45c, 45e, 61, MI	04.05.92	19.10.92	Juw
correction	2, 41	--	26.04.99	Juw
TN 29	45d, 45e, 45f	25.07.03	19.09.03	mm
TN 33	MI (alternative rim for main wheel)	01.06.10	23.08.10	mg

I.2 PAGES INCLUDED

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45a	Oct. 16, 1987
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I.3 CONTENTS

I.4 TECHNICAL DATA

Wing

Airfoil Wortmann	FX SO2 196 (inner wing)		
	FX 60 -126 (wingtip)		
Span	b = 17,00 m	= 55,70 ft	
Area	F = 17,95 m^2	= 192,96 sqft	
Aspect ratio	= 16,1		
	t_i = 1,50 m	= 4,92 ft	
	t_a = 0,50 m	= 1,67 ft	
Angle of incidence at root		= $+2^o$	
Dihedral (wing center line)		= $+4^o$	

Sweep: iner wing leading edge, straight.

Ailerons

Span	b_Q = 2,80 m	= 9,18 ft	
Area (both)	= 1,12 m^2	= 12,03 sqft	
Inner chord	= 0,24 m	= 0,79 ft	
Outer chord	= 0,16 m	= 0,52 ft	

Fuselage

Length (rudder included)		= 8,35 m	= 27,40 ft
Cockpit width (inner)		= 0,71 m	= 2,33 ft
Cockpit height		= 1,00 m	= 3,28 ft
Fuselage wetted area		= 12,33 m^2	= 132,55 sqft

Vertical tail unit

Height above fuselage center line			
	h = 1,37 m	= 4,49 ft	
Area	= 1,357m^2	= 14,59 sqft	
Aspect ratio	= 1,383		
Upper chord	= 0,80 m	= 2,62 ft	

Lower chord = 1,17 m = 3,84 ft
Airfoil Wortmann FX 71-L-150/30.

Rudder
33 % of vertical tail unit chord
Area = 0,45 m^2 = 4,86 sqft
Chord (middle) = 0,33 m = 1,08 ft

Horizontal tail unit
Span = 3,1 m = 10,16 ft
Area = 1,92 m^2 = 20,64 sqft
Aspect ratio = 5,05

Elevator
Area = 0,576m^2 = 6,19 sqft
30,1 % of horizontal tail unit chord

Airbrakes
Schempp-Hirth type, on upper wing only.
Area = 0,35 m^2 = 3,77 sqft
Span = 1,35 m = 4,43 ft
Height = 0,13 m = 0,43 ft

Weights
Max all up weight = 600 daN = 1320 lbs
Empty weight, app. = 370 daN = 814 lbs
Weight of non lift
producing parts = 410 daN = 902 lbs
Max wing loading = 33,4 $daNm^2$ = 6,84 lbssqft
Max load of occupants, luggage, etc. :
see load table in the Flight Manual.

II. DESCRIPTION OF AIRCRAFT AND COMPONENTS

Aircraft

The ASK 21 is a two-seater midwing with T-tail, airbrakes, fixed shock absorbing main wheel and a nose wheel.
The structure is made in a highly developped fiberglass technology. On certain critical areas carbon fibers are used.

Wing

Double T spar made of fiberglass roving flanges and fiberglass cloth webs. The skin consists of a 9mm Conticell core with fiberglass on both sides.
Easy wing assembly by tongue and fork connection, fixed by two 36ø bolts. Two shear bolts at the fuselage which fit the bushings in the wing center rib, absorb the shear loads to the fuselage. The rear shear bolts are secured by an automatic safety device.

Fuselage

The fuselage is designed as a honeycomb (tubus core) construction throughout which means considerable increase of strength compared to non sandwich shells.
2-piece canopy, forward hinged in front and rearward hinged in back; adjustable back rests.

Tailplane

T-tail consisting of the same construction as the wing.

Control Surfaces

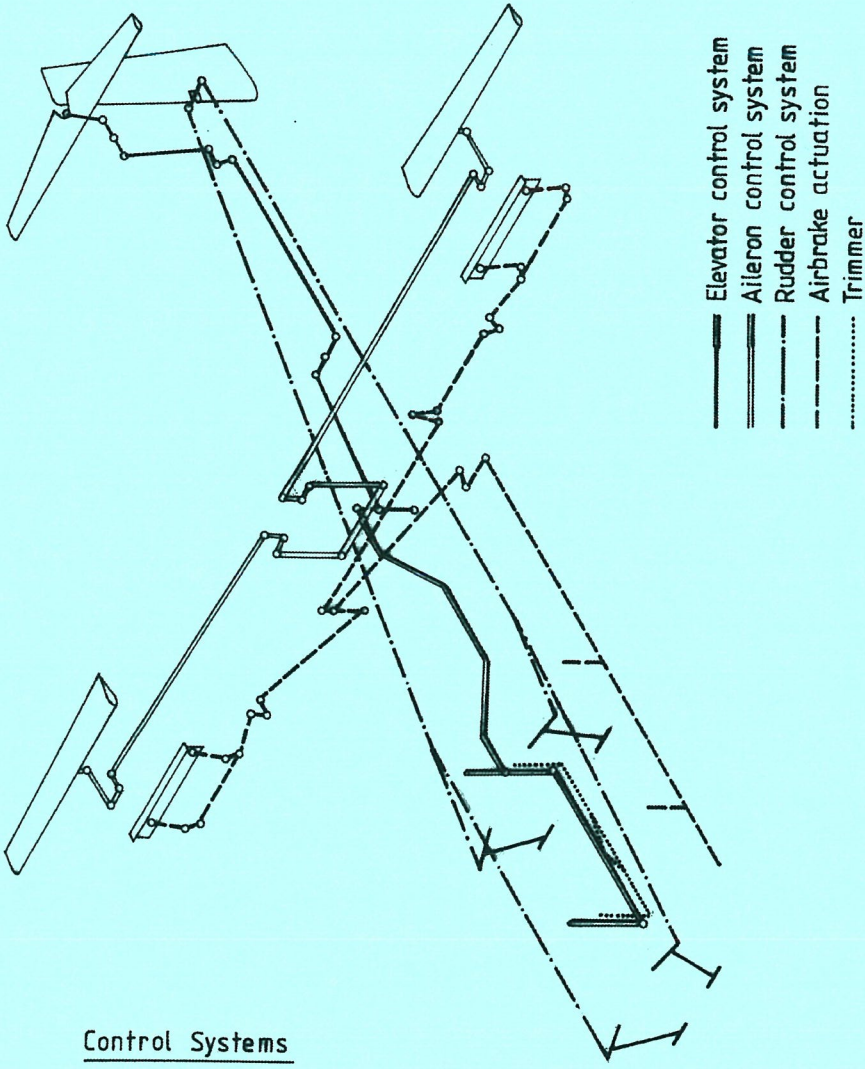
Sandwich construction with Rohacell foam core.

III. DESCRIPTION OF A/C ASSEMBLY & EQUIPMENT

III.1 CONTROL SYSTEMS

General

Except for the rudder which is operated by cables ,



Control Systems

the whole control system is actuated by pushrods. The long pushrods are 16 Ø x 1,0 mm aluminium with ball bearing supports. The cockpit controls and the shorter pushrods are welded steel. The control system levers are milled duraluminium or welded steel.

Elevator control system

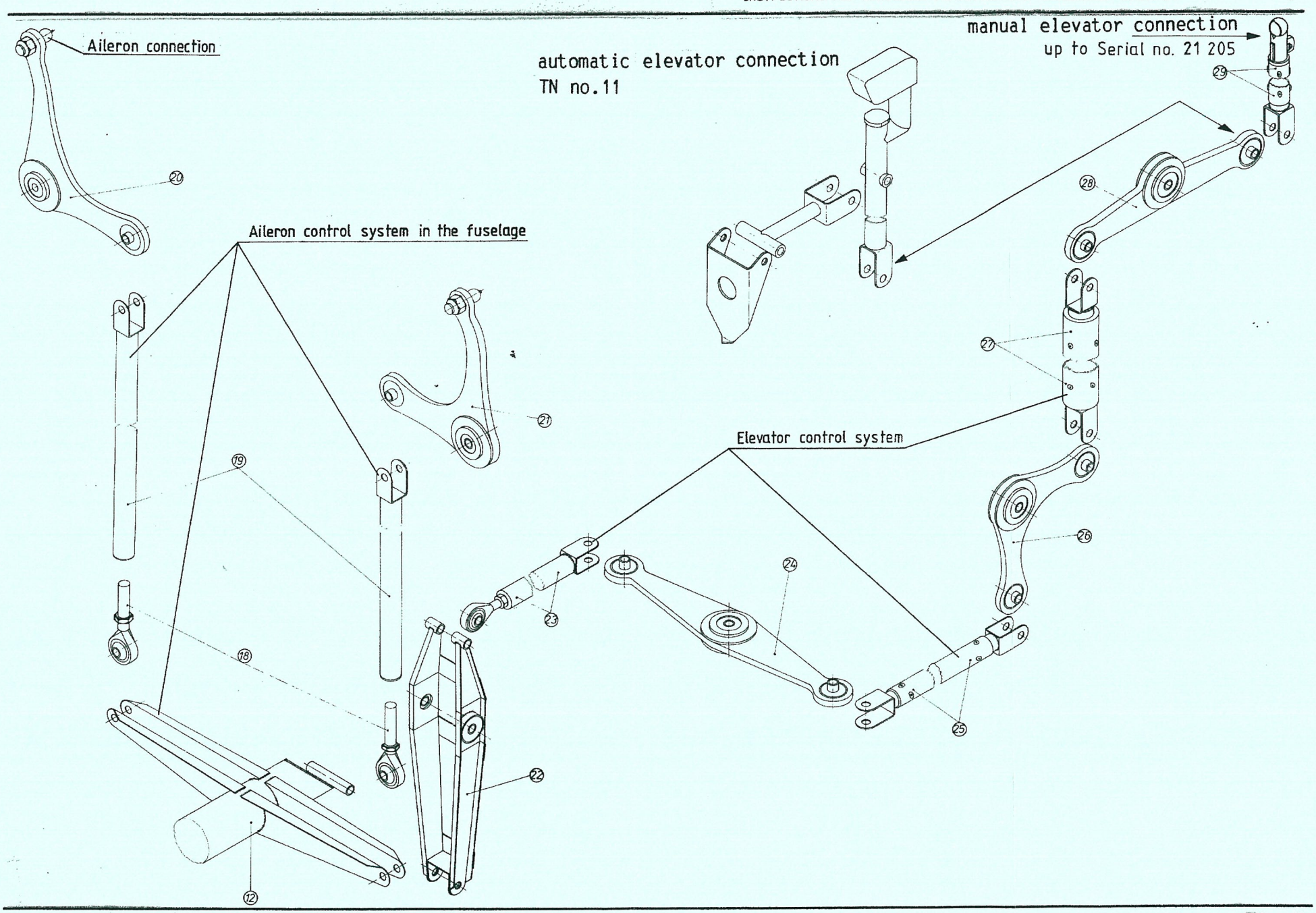
Both control sticks are built as 2-armed levers and feature universal joints. The control sticks are linked together by a main steel tube torsion rod at the bottom. This torsion rod features at its front and rear end an adjustable stop for both control sticks. Another bent steel tube torsion rod leads from the rear control stick to a combined elevator/aileron rocker arm. From there a short aluminium pushrod leads to a 180° duraluminium bellcrank which is linked up by a long aluminium pushrod which runs through 4 support bearings; the support bearings consist of a fiberglass bracket with 3 ball bearings. Via a 90° duraluminium bellcrank, the control forces are lead upwards into the fin using a fiberglass plastic pushrod. Here connects a 180° duraluminium bellcrank to a short aluminium pushrod which in turn connects to a M12.41/HOTELLIER joint which operates the elevator.

Elevator with automatic connection:

Instead of the aluminium pushrod, an actuating pushrod is installed, which is supported with a parallel rocker.

Trim

The trim is spring suspended and consists of 2 trim levers, 1 connecting pushrod and the 2 trim springs with slotted gate sheet metal. The trim levers are connected to the control sticks with a knurled nut at the control stick bearing bolt. A friction brake is tightened with this knurled nut at the control stick


Aileron connection
20
Aileron control system in the fuselage
automatic elevator connection
TN no.11
manual elevator connection
up to Serial no. 21 205
29
28
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21
19
Elevator control system
26
24
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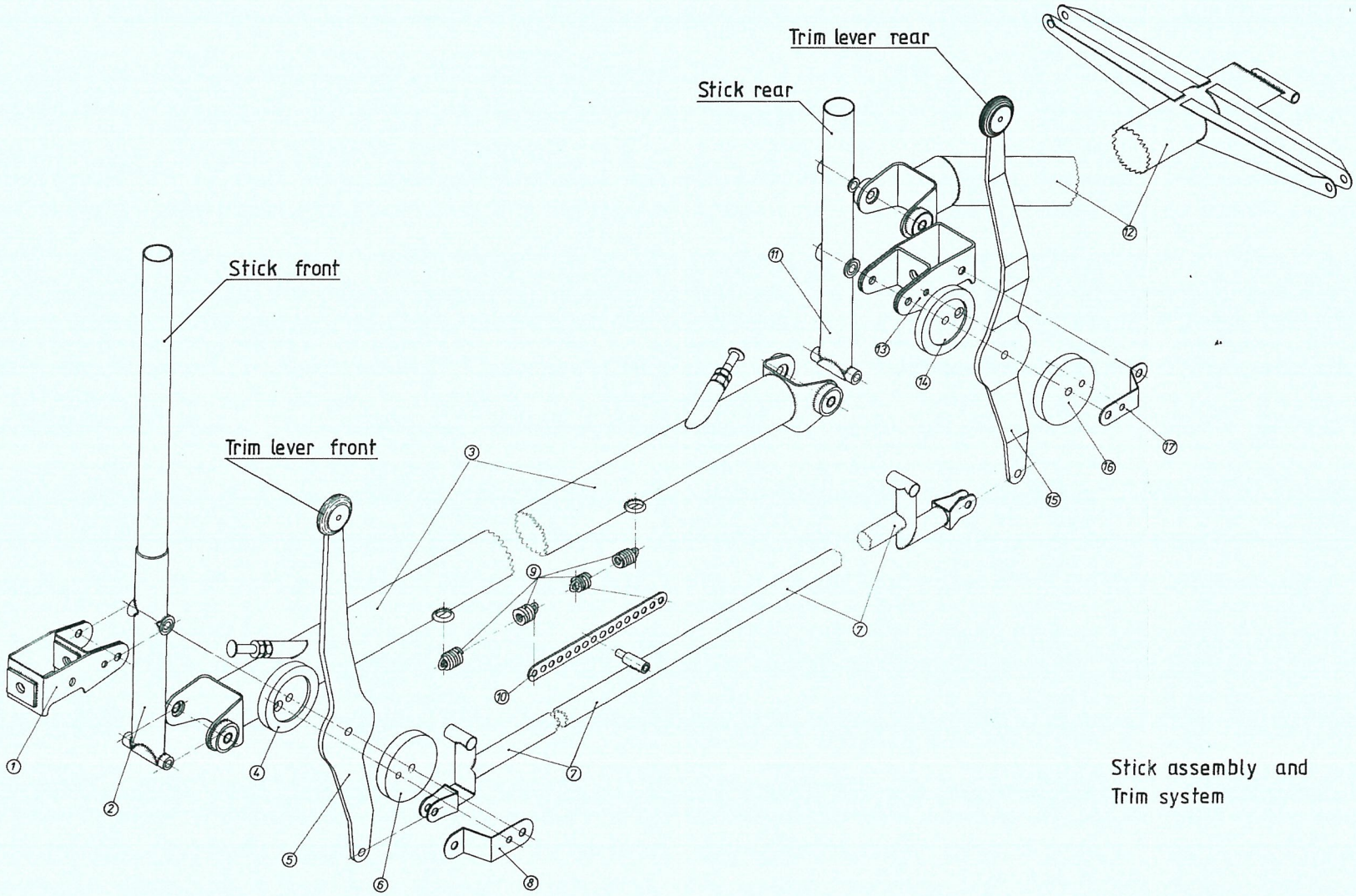
12



Stick assembly and
Trim system

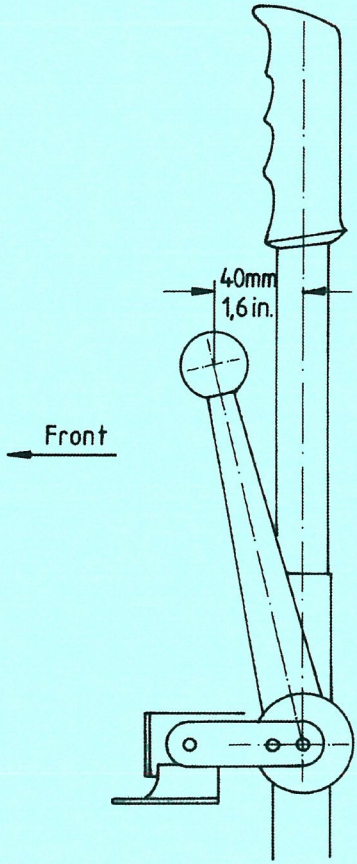
bearing bolt. The braking force should be distributed evenly between the front and rear brake. The brake should be tightened so strong that even with extremely opposed positions of stick and trim lever, the trim will not move. The trim connecting pushrod features a stop at its front and rear end.
The springs with the adjusting plate between them, are suspended into the 2 rings of the front control shaft. The adjusting plate itself is mounted to the bolt of the trim connecting pushrod; here the trim may be adjusted.
The trim should be adjusted such that with 1 pilot and the trim set full forward, a trimmed speed of 150-160 km/h (81-86,3 kts; 93,2-99,4 mph) is reached; then the trim lever is in a slightly forward position when the stick is free and in its center position (elevator connected).
To adjust the trim roughly to a trimmed speed of max. 160 km/h (86,3 kts; 99,4 mph):

1. Connect elevator.
   (This is inapplicable when your glider features the automatic elevator connection).
2. Adjust the trim spring such that the stick is set to the above-mentioned relative position to the trim lever. Friction must be balanced by "feeling for" the center position.

Trim indicator

In addition to the visible position of the trim lever itself, the trim features a trim indicator. The trim indication should be in the center position when the trim lever is vertical to the glider's longitudinal axis. It can be adjusted by opening the clamp at the trim connecting pushrod and by displacing the Bowden cable. Then retighten the clamp.

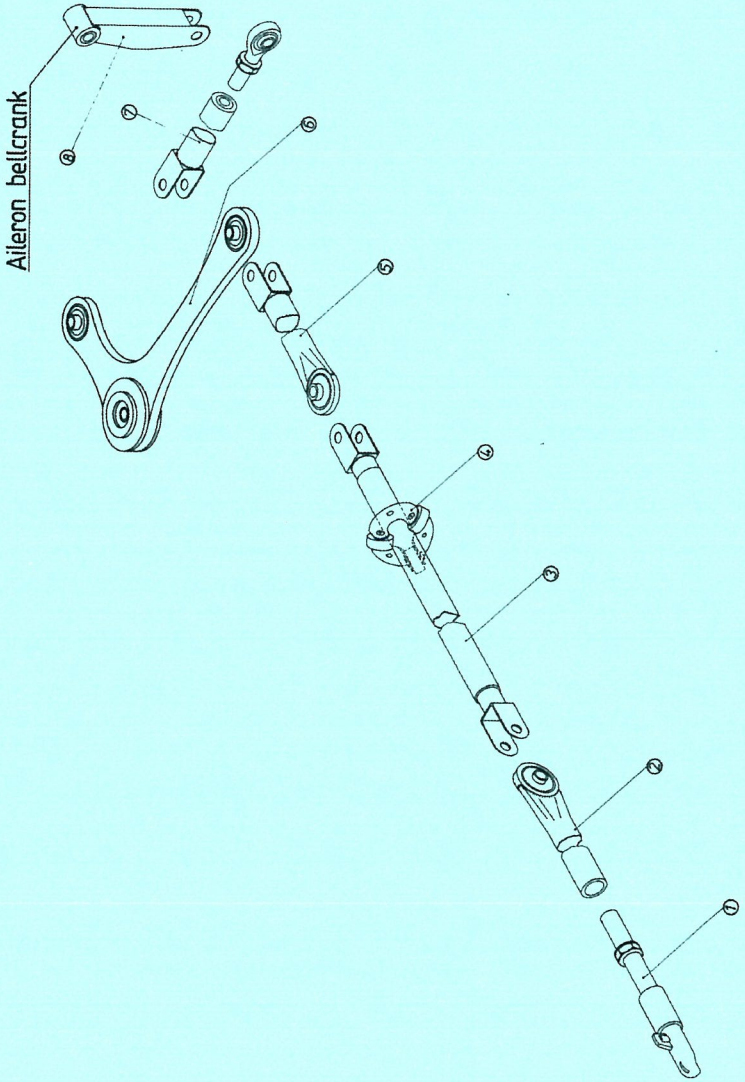
Trim Basic Adjustment



Aileron control system

A short aluminum pushrod leads from the horizontal aileron control system lever at the rear elevator/ aileron control system torsion rod upwards to a 90° duraluminum bellcrank in the fuselage. By a HOTELLIER joint (M12.41) follows from here the long aluminum pushrod in the wing. This pushrod is supported altogether seven times in each three ball bearings. For the compensation of the bellcrank travels short steel-tube pushrods are articulated by ball bearings (14C6) at both ends of the long pushrod. The inner short pushrod features the HOTELLIER connection with the adjusting screw. At the 90° duraluminum bellcrank the aileron pushrod actuates the aileron through a HIRSCHMANN-UNIBAL adjustable head (SMx CP6).

The stops for the aileron are positioned in the pushrod box in front of the rear stick. These are two plywood blocks glued into the pushrod box and cut out such that they stop laterally the travel of the front torsion shaft.

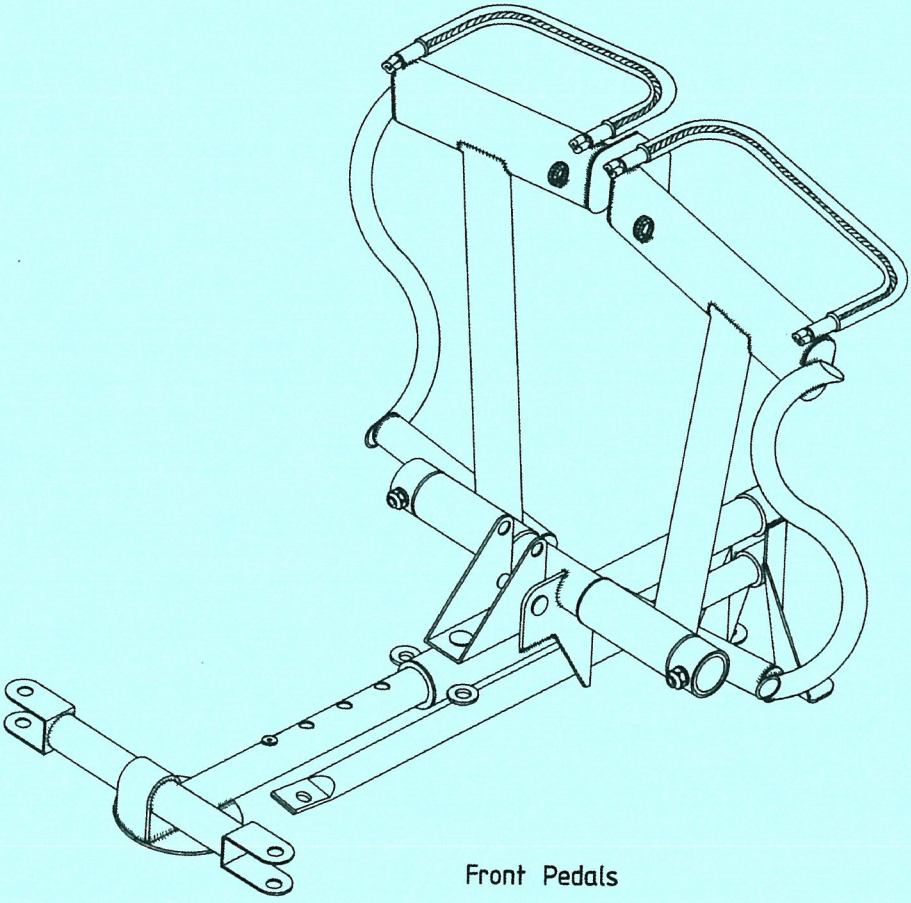


Aileron control system in the wing

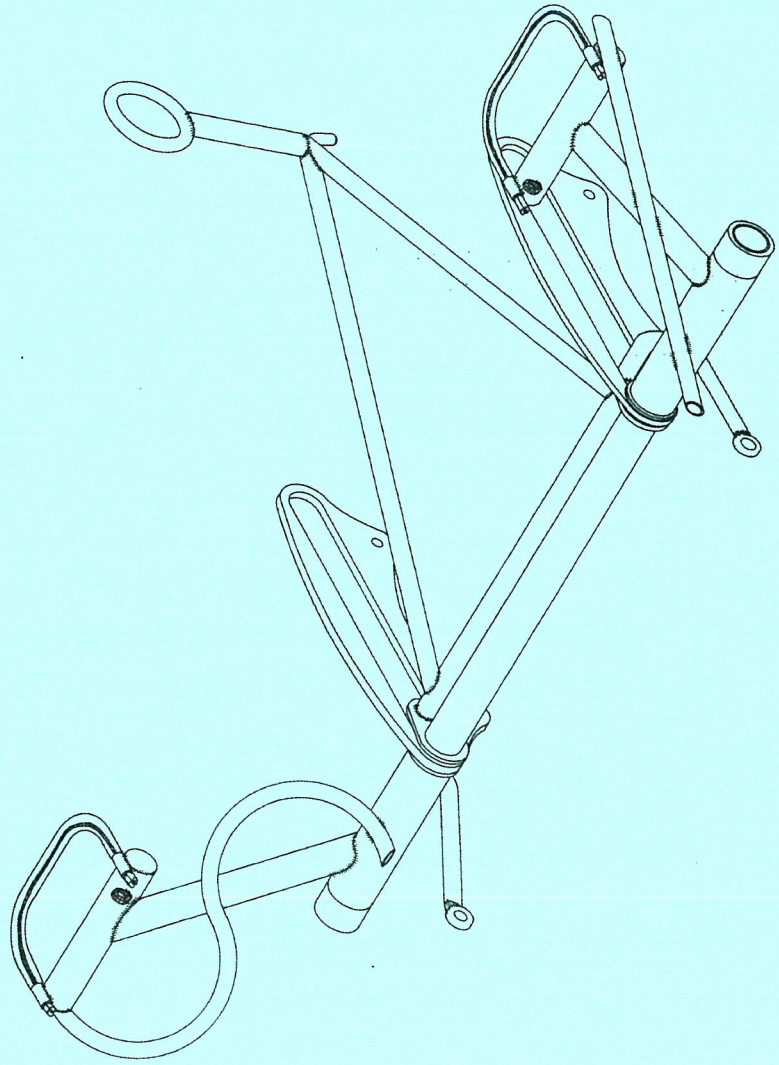
Rudder control system

The rudder is actuated by cable (3,2Ø LN 9374).
Both front and rear pedals are adjustable. The rudder cables are running from a fixed point through S-type pedal loops to an adjusting plate in the rear cockpit. Here are joined together the cables from the front and rear pedals. From the adjusting plate the cables run through nylon tubes to the rudder-actuating lever.

At the adjusting plate slight inaccuracies in the cable length may be adjusted and also the pedal inclination. The cables are held taut by springs at the pedals; at the rear pedals this spring serves simultaneously for holding down the adjusting stop.
For the adjustment of the cables at the adjustment plate the rear seat must be removed.
The stop forthe rudder is located in the back of the rudder.
The rudder lever strikes a stop at the bearing bracket.



Front Pedals

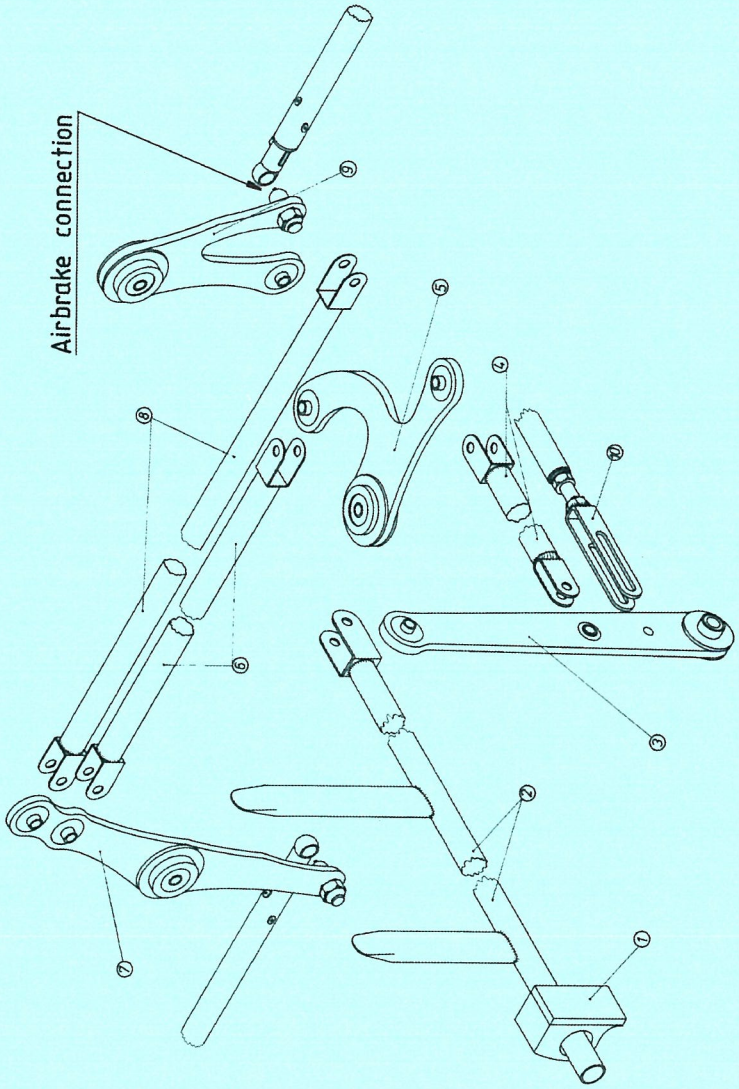


Rear Pedals

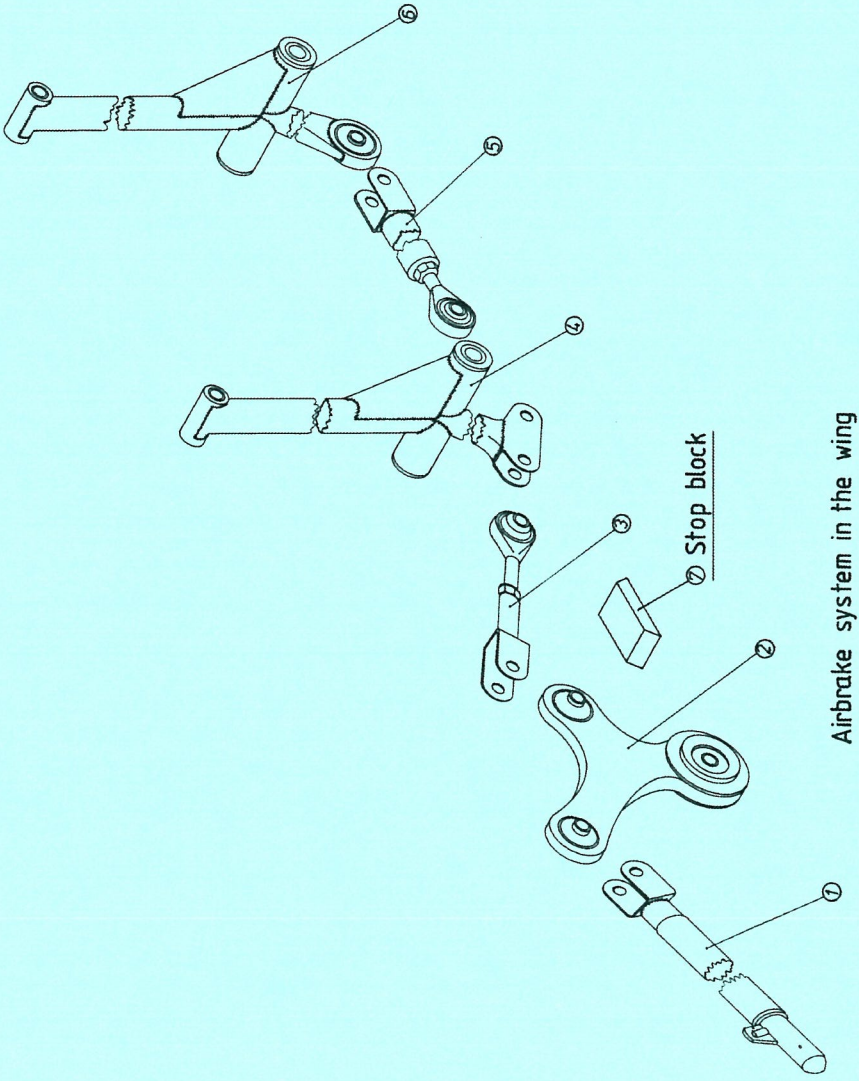
Airbrakes

The airbrakes are actuated by pushrods. On the left cockpit wall runs a connecting rod with a handle each for the front and rear cockpit. In the front cockpit the rod is running in a nylon guide, in the rear cockpit it is supported by a duraluminum rocker arm. From this arm another pushrod - placed under the arm - continues to a 90° duraluminum bellcrank and runs below the rear spar tunnel wall.
The back of the spar tunnel wall features two rocker arms and the pushrod which produces the counterclockwise travel of the actuating levers. By a HOTELLIER joint (M12.41) the pushrods in the wing are connected to the actuating levers. They run through three ball bearing guides and lead to the airbrake toggle joint lever.
A short pushrod leads to the inner airbrake lever which on the other hand is connected to the outer airbrake lever by a pushrod so that synchronous movement is guaranteed.

Stop of the airbrake control: Brake cylinder.



Airbrake system in the fuselage



Airbrake system in the wing

III.2 LANDING GEAR

The landing gear consists of the shock absorbing main wheel 5.00-5 and the non shock absorbing nose wheel 4.00-4. The trailing boom main wheel uses two hollow-type rubber shock absorbers (type KE 120/95 core A with mounting member, quality RTK 55).
The rim is a Cleveland wheel 4078 (B), 5.00-5 Type III!

Brake:	Cleveland brake assy 30-9.
Main brake cylinder:	Master cylinder 10-20.
Tank for brake fluid:	Below rear seat pan on LH side.
Main wheel:	Tire with tube 5.00-5, 6ply rating.
Nose wheel:	Tire with tube 4.00-4, 4ply rating.

Tire pressure

Main wheel	2,7 bar = 38 psi.
Nose wheel	2,0 bar = 28 psi.

To fill up the brake

Brake fluid: ESSO UNIVIS J-13 or
AEROSHELL FLUID 4 !

You absolutely have to observe that only brake fluid on a mineral oil basis is used.
Car brake fluid on ester basis will destroy gaskets and tubes in a very short time.

FOR TAILWHEEL OPTION ONLY

III.2 LANDING GEAR

The landing gear consists of the shock absorbing main wheel 5.00-5 and the non shock absorbing nose wheel 4.00-4. The trailing boom main wheel uses two hollow-type rubber shock absorbers (type KE 120/95 core A with mounting member, quality RTK 55).
The rim is a Cleveland wheel 4078 (B), 5.000-5 Type III.

Brake:	Cleveland brake assy 30-9.
Main brake cylinder:	Master cylinder 10-20.
Tank for brake fluid:	Below rear seat pan on LH side.
Main wheel:	Tire with tube 5.000-5, 6ply rating.
Nose wheel:	Tire with tube 4.000-4, 4ply rating.
Tail wheel:	Tire with tube 210 x 65.

Tire pressure

Main wheel	2,7 bar = 38 psi.
Nose wheel	2,0 bar = 28 psi.
Tail wheel	2,5 bar = 35 psi.

To fill up the brake

Brake fluid: ESSO UNIVIS J-13 or
AEROSHELL FLUID 4 !

You absolutely have to observe that only brake fluid on a mineral oil basis is used.
Car brake fluid on ester basis will destroy gaskets and tubes in a very short time.

March 9, 1983

Filling up the brake

Brake fluid must be filled up from bottom to top in order to avoid air bubbles. For a simple fill up device you need instrument flexible tubing of about 2 m length (=6,56 ft) and a funnel filled with approx. 1/4 l of brake fluid at the upper end. The brake cylinder uses a fill up nipple at its bottom. The lower end of the hose must be slipped onto the nipple. When loosening the hexagonal head screw by one turn, a valve opens the nipple.

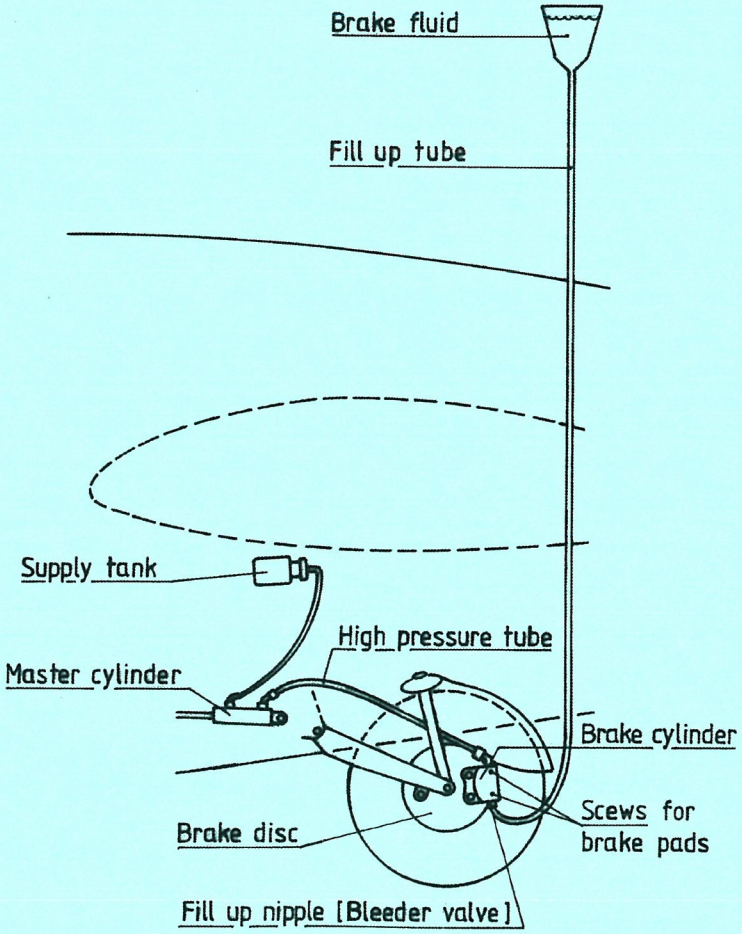
Hold up the funnel as high as possible so that the brake fluid may run in with pressure. You absolutely have to take care that no air bubbles get into the system. Therefore, always sufficient fluid must be also in the funnel. Fill up until the fluid in the storage tank stands at 2/3. Now retighten the nipple and remove the fill up device. Reattach the dust shield cap !

For the refilling of brake fluid the small plastic tank is taken out of its support. Open it and refill the brake fluid !

If the brake system has been emptied already to such an extent that air has penetrated between master cylinder and operating cylinder, filling up must be done again from bottom to top.

Air in the brake system will cause an extension of the actuating travel at the airbrake lever. In consideration of the flexibility of the flexible pipes etc. one may assume that there is no air in the system, if the flexible travel does not exceed 50 mm = 1,97 in for an actuating force of 20 kg = 44 lbs at the airbrake lever.

Brake System



Inspection and Replacement of Brake Linings

Minimum thickness of brake linings and brake disc:
The linings must be renewed at the minimum residual thickness of 2.54 mm = 0.10 in !
The brake disc must be renewed at the minimum residual thickness of 4.242 mm = 0.167 in !
Reference: WHEEL and BRAKE ASSEMBLIES CATALOG, Component Maintenance Manual, Appendix A, Fits and Clearances, A-1. Brake Lining Wear Limits, A-2. Brake Disc Minimum Thickness, from Messrs. Parker Hannifin Corporation, Avon, OH. USA.

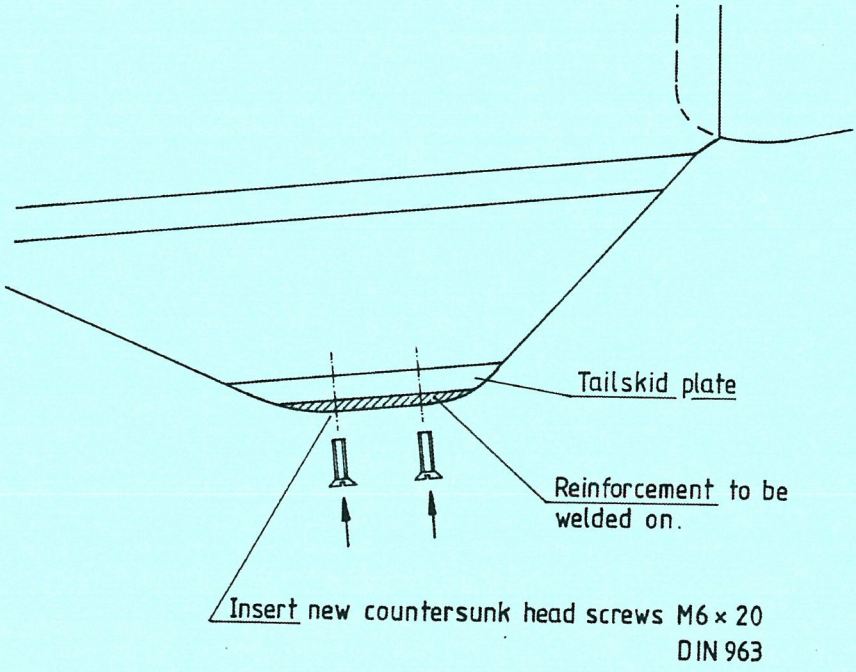
1. Remove wheel fairing.
2. Loosen the two 1/4" screws which are safetied by wire. Do not unscrew the brake line hose!
3. Take out the brake shoes with linings. The linings must be renewed before they have been worn down as far as the rivets as otherwise the brake disc will be damaged and the braking effectiveness unacceptably reduced. To rivet the new linings in place it is best to use a riveting tool designed for the purpose. Alternatively, however, a hammer, centerpunch, and round punch of not less than ϕ 6 mm at the tip may be used.
4. Now replace brake shoes and tighten the two 1/4" screws and secure them with locking wire.
5. Remount wheel fairing.
   Brake linings and rivets to suit can be obtained from Messrs. Schleicher. Orders must specify brake linings suitable for the Cleveland 30-9 brake assy.

Tail Skid
Watch the wear of the tail skid metal plate and either reinforce it in time by welding on sheet metal, or replace it by a new one. Remove the tail skid plate for the welding job.
The rubber tail skid is designed so that it will shear away from the fuselage with strong lateral forces. It may be glued on again or be repaired using contact glue (Pattex). You must apply plasticised fabric adhesive tape over the gap (glue joint) between skid and fuselage in order to prevent long grass from being caught.

Tailskid

Check wear and either reinforce in time the tail plate by welding on sheet steel or replace it by a new one. Remove the tailskid plate for the welding job.
The rubber tailskid is designed so that it will shear away from the fuselage with strong lateral forces. It may be glued on again or be repaired by use of contact glue. It is important to seal the glue seam between rubber and fuselage with tape in order to prevent that long grass will be peeled off or will cut into the seam.

Reinforcement of the tailskid plate



III.3. Radio Equiment

The front instrument panel is provided for the installation of the radio. For installing the radio the mounting accessories and cable harness supplied by the radio manufacturer should be used. Regarding the layout of the instrument panel you have to consider that the radio must be clearly visible and easily accessible to the pilot in the flying position.
As to the clear visibility, however, priority must be given to the flight control instruments. A suggestion for instruments layout is given on the drawing for the instrument panels.

The Becker radio may be installed both horizontally or vertically.

The loudspeaker may be fitted below the rear instrument panel cover on the LH side.
The swan neck (boom) microphone is mounted on the RH cockpit wall.
A support for a dryfit battery (12V, 6.4Ah) is provided in the baggage compartment of the left wingroot.

III.4 Oxygen Equipment

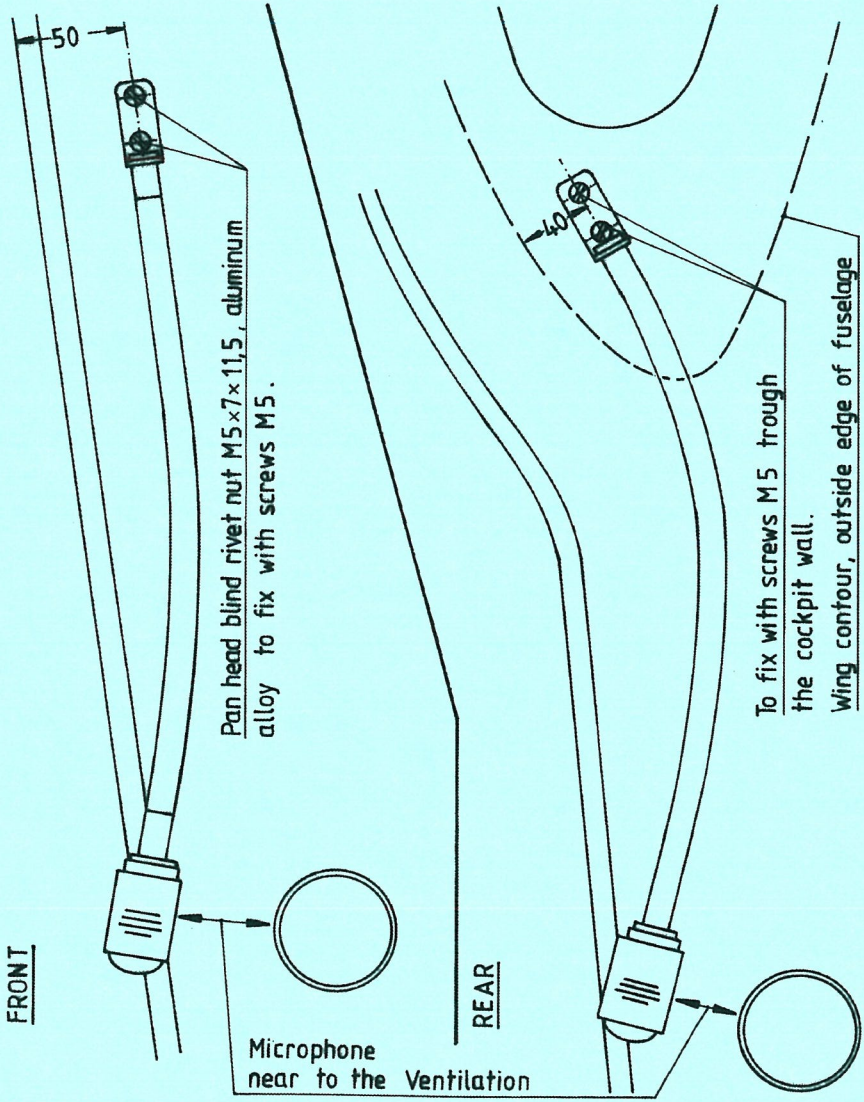
Suitable bottle fixing brackets for two 4 liter oxygen bottles of dia. 100 mm are available as an optional accessory from Messrs. SCHLEICHER.

When fitting the oxygen bottle(s), ensure that it is properly installed and securely anchored.

NOTE: Fitting of oxygen equipment causes only a minimal change in the empty-mass C.G. position ! However, it is necessary to re-weigh the glider and redetermine the empty mass C.G.

When flying at greater heights while using the oxygen system, it should be borne in mind that any particular system may only be suitable for a limited altitude range. The makers' instructions should be complied with.

Installation of boom microphones on the RH cockpit wall



III.5 PRESSURE PORTS & CONNECTIONS FOR THE INSTRUMENTS

(see drawing on page)

(1) Airspeed indicator: total pressure.

(2) Altimeter: static pressure or without any connection.

(3) Variometer

(4) Total energy probe

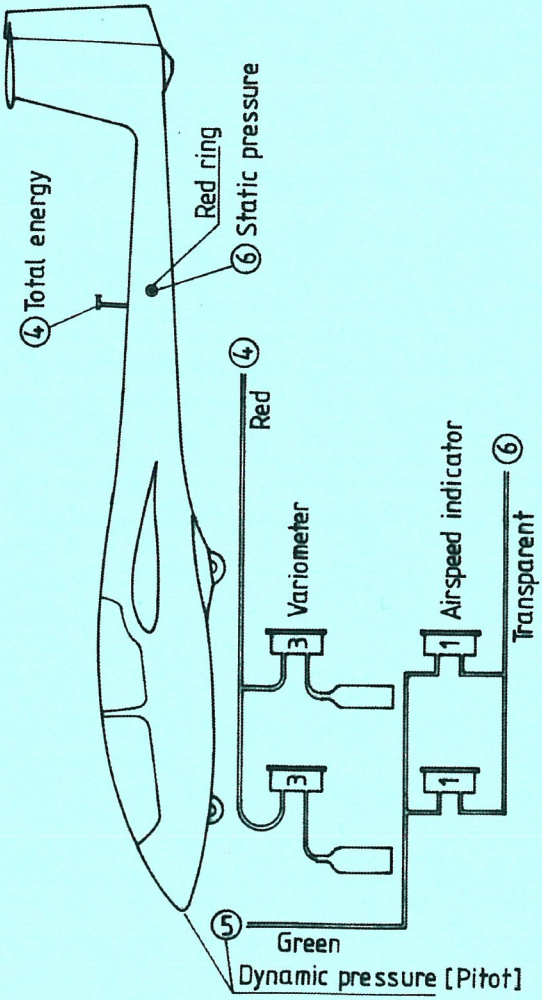
(5) Dynamic pressure (pitot tube)

(6) Static pressure

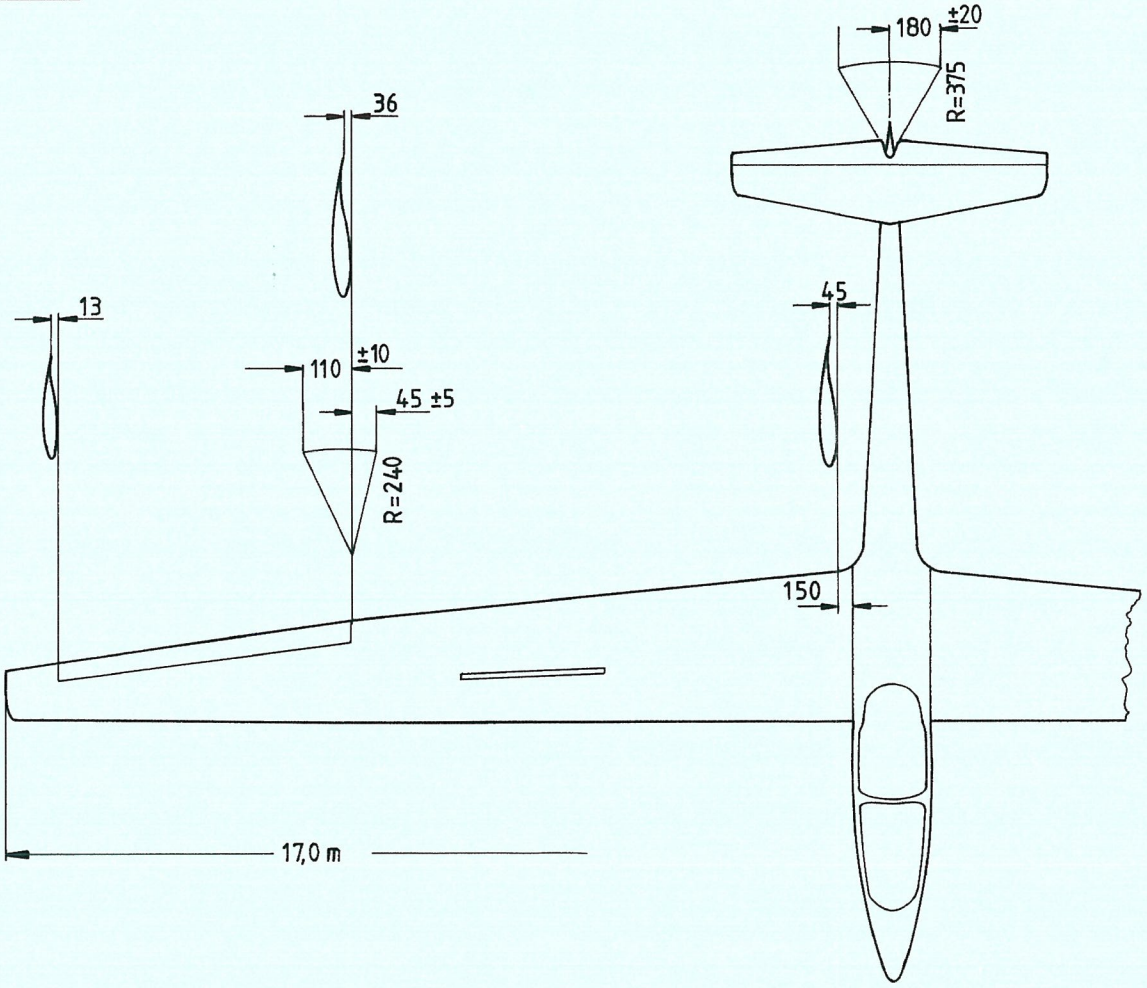
Colors of flexible tubing

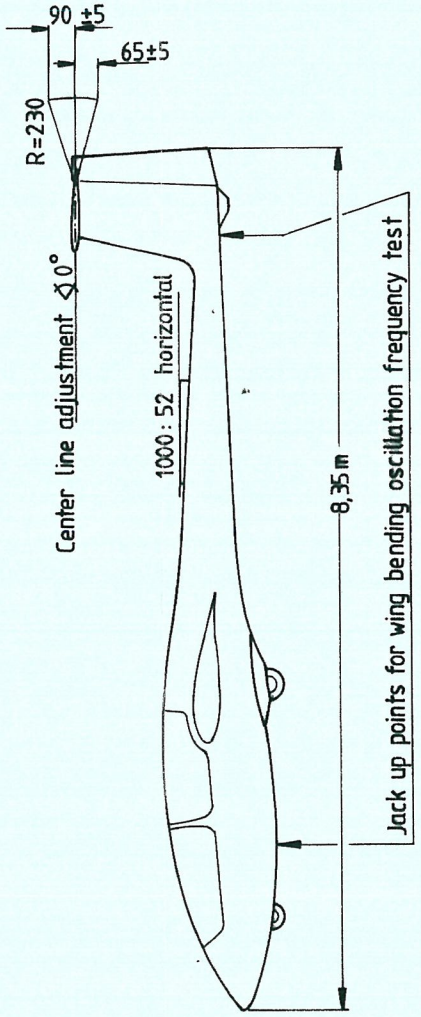
Pitot pressure:	green
Static pressure:	transparent
Capacity flasks:	blue
Total energy probe:	red.

Pressure Ports And Connections For The Instruments



IV. Rigging data





V. AIRWORTHINESS LIMITAION SECTION

The Airworthiness Limitation section is FAA approved for U.S. registered gliders in accardance with the provisions of 14 CFR section 21, 29.

In addition, this section es required by FAA Type Certificate Data sheet No. G 47 EU and it specities maintenance requred under 14 CFR sections 43.16 and 91.163, unless an alternative programm has been FAA approved.

LBA-approved on:

Log of revisions

Revisions No.	Pages affected	Description	LBA approval, signature	Date

March 9, 1983

NOTE: Damage to wing, fuselage, tail unit, and controls surfaces must be repaired prior to the next flight.
Repairs beyond the scope of the REPAIR MANUAL issued by Messrs. Schleicher must be carried out only by FAA-certificated aircraft repairers rated for composite aircraft structure work and only in accordance with Schleicher repair methods approved by FAA.

V.1 Inspection Procedures to extend Service Life

Proceed in accordance with Chapter VIII.1.

V.2. Components With Limited Service Life

Tow Release Couplings

The Tost tow release couplings, factory fitted,
i.e. the C.G. Safety Tow Release "Europa G 72", or "G 73", or "G 88" respectively, and
the front Nose Tow Release "E 72", or "E 75", or "E 85" respectively,
have a limited service life (TBO) and must be returned to TOST for re-inspection in regular intervals. The service life is stated in the appertaining Manufacturer's Authorized Release Certificate.
The instructions given in the TOST "Operating Manual" or in the "Operating and Maintenance Instructions" for the tow release couplings must be observed!

Instruments

The flight monitoring instruments are not normally subject to service life limitations. As a general rule, the makers' instructions should be complied with.

Oxygen Equipment

For oxygen systems fitted, the relevant section of the appertaining Manufacturer's Inspection Release Certificate states the overhaul time limit. Over and beyond this, the oxygen bottles must be re-inspected by a technical inspection institute every five years in accordance with pressure vessel regulations.

Special Servicing Procedures

At regular intervals of 6 years the brake line hose of the hydraulic wheel brake must be replaced. Should this hose be found to be in good condition, it need not be replaced, on condition that its condition is checked at least every 100 flying hours.

VI. Weights and C.G. positions

You will find the min and max C.G. limits with regard to the glider empty weight on the diagram on page 37.

Min pilot weight front seat = 70 kg (154.3 lbs).
Max pilot weight both seats = 110 kg (242.5 lbs) each.

Pilot weight always means pilot + parachute. If the empty weight c.g. positions are within the permissible range, it is assured that also the in-flight c.g. is within the permissible range - provided that the load limitations (pilot weights) have been observed.

The max all up weight of 600 kg (1323 lbs) must not be exceeded. In the case that the empty weight comes to more than 380 kg (838 lbs), the max permissible pilot weights have to be reduced accordingly.

Weights of non-lift producing members

The weight of the non-lift producing members is composed of pilots' weights, fuselage, tail units, and equipment, - without the weight of the wings.

The weight limit of 410 kg (904 lbs) for the non-lift producing members must not be exceeded.

After repairs, repaintings or the installation of additional equipment, at the latest however every 4 years the empty weight and the c.g. positions must be re-established.

Table for spin ballast

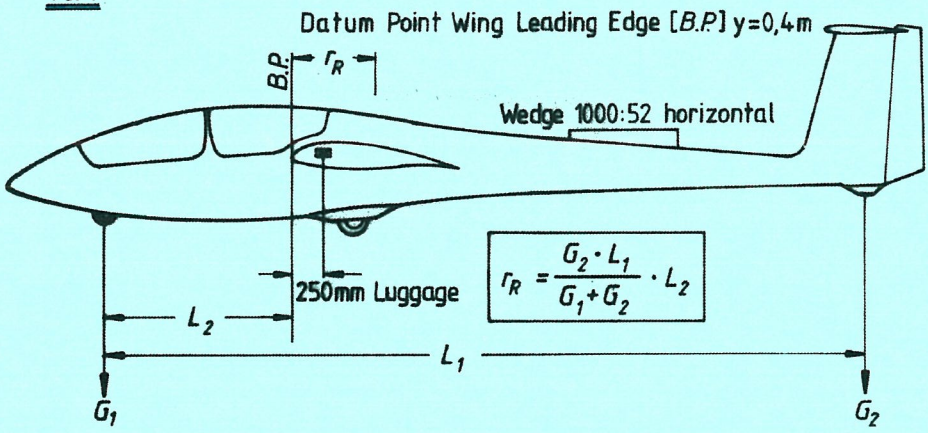
When the plane is equipped with an attachment for spin ballast (TN4b):

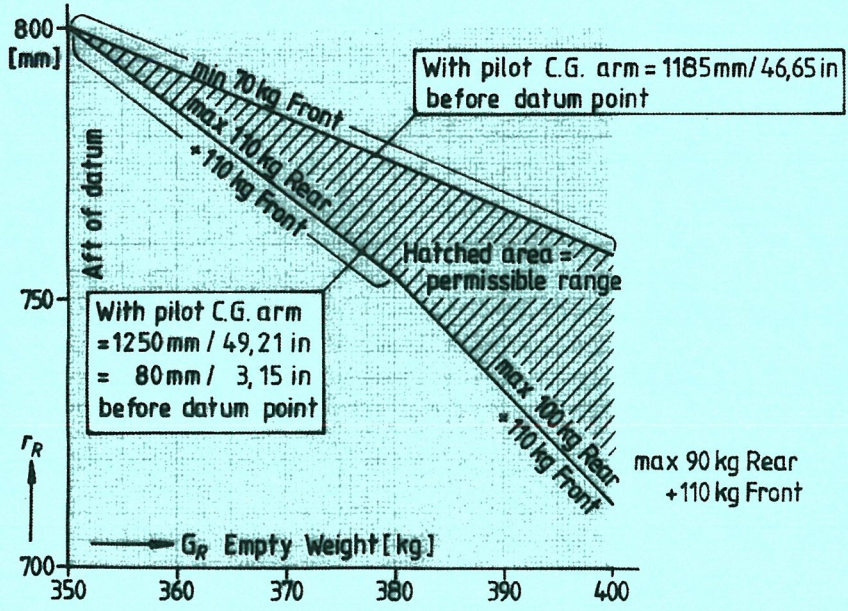
After every weighing any spin ballast-table (Flight Manual page 47b) must be removed. Removing the spin ballast-table does not compromise the airworthiness of the ASK 21. But spin ballast may not be used without valid spin ballast-table.

A new table for the spin weights can be requested from the manufacturer. A copy of the weighing formula and the equipment list, signed and stamped by the inspector, must be forwarded to the manufacturer. The table is to be filed after page 47a in the Flight Manual.

Weight and Balance Sheet

VI. 1





VI.2 C.G. Positions at the last Weight & Balance

Date of weight & balance	Empty weight c.g. behind datum ((mm/in)	Front seat payload incl. chute (kg/lbs) min	Front seat payload incl. chute (kg/lbs) max	Rear seat payload incl. chute (kg/lbs) min	Rear seat payload incl. chute (kg/lbs) max	Old spin ballast table* removed (check off)	Signature of inspector, inspection stamp
21.10.15	30,28	154	242	0	242	✓	see also FM page 48 [stamp, signature]

* Flight Manual Page 47b

CAUTION: *As always, only calibrated scales may be used for weighing. The lever arms for determining the empty mass c.g. have to be determined during every new weighing.*

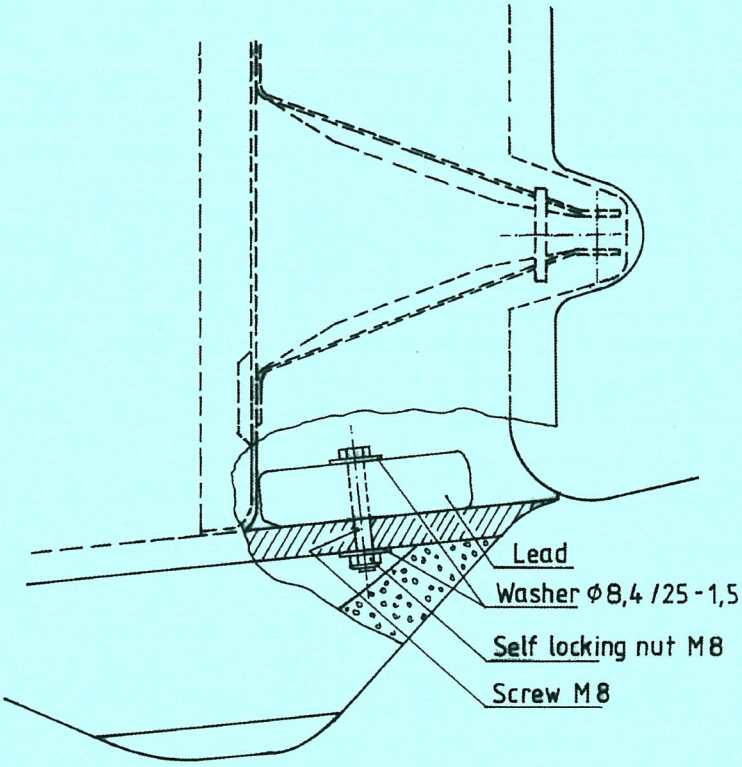
Weight, empty weight C.G. and payload have to be certified by an inspector on page 48 of the Flight Manual and on page 38 of the Instructions For Continued Airworthiness.

VI.3 Installation of *fixed* ballast in the tail

It may be necessary to install ballast in the tail in order to get the empty weight C.G. within the permissible range.

1. The amount of the lead ballast which is required is established either by calculation or by a weight and balance procedure.
2. Suitable cast lead plates are available with the company Schleicher.
3. Remove the rudder.
4. By use of a knife remove the tailskid very carefully. Grind off glue residues and other impurities.
5. From below drill a hole of 8mm (0,3in) diameter:
   centrically to the lead plate. The long side of the lead plate must be placed next to the vertical tail unit spar so that the plate will not turn.
6. Shorten the M8 screws, screw them on and safety with a selflocking nut. A washer must be added on each side.
7. Reglue the rubber skid with contact cement.
8. After the hardening smooth the tailskid/fuselage gap and tape it in order to prevent the peeling off or catching of long grass.
9. Refit the rudder and safety duly with castellated nut and cotter pin.

Installation of ballast in the tail



VI.4 WEIGHTS & TAILHEAVY STATIC BALANCE OF CONTROL SURFACES

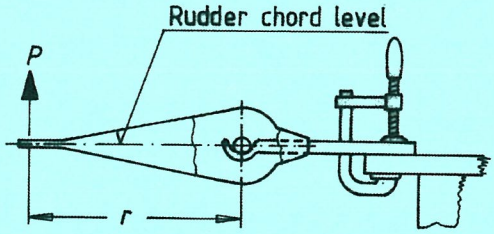
After repairs or repaintings the weight of the control surfaces and their tailheavy static balance must be checked. For this job the control surfaces have to be removed. For the determination of the tailheavy static balance M = P * r the control surfaces must be seated in the fulcrum with as little friction as possible. If necessary, suspend them in their bearings with thread.
To measure P at the trailing edge it is best to use a spring balance of 1 kg scale to which a small piece of tape is attached. If necessary, a letter balance will do, too.
If weights or tailheavy static balance moments are not within the approved tolerances, you should contact the company Schleicher.

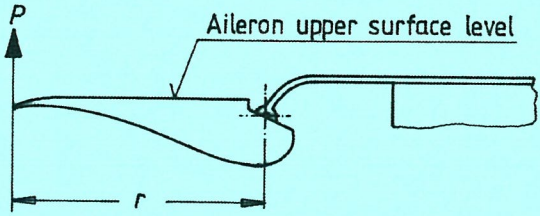
Tolerances in weight and tailheavy static balance of control surfaces and tolerances in play (backlash) of control systems (controls fixed):

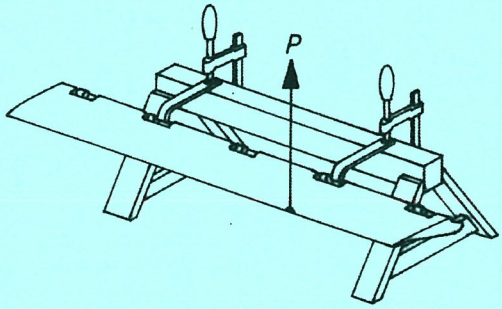
	Weight tolerance kg / lbs	Tailheavy static balance tolerance cm*kp / in*lbs	Tolerance in play (backlash) Degree / mm / in
Rudder	1.75 - 2.59 / 3.86 - 5.71	17.1 - 22.3 / 14.84 - 19.35	0.672° / 3.88 / 0.15
Elevator	3.15 - 4.1 / 6.95 - 9.04	13.9 - 18.4 / 12.06 - 15.96	0.92° / 2.84 / 0.11
Aileron	2.85 - 3.75 / 6.28 - 8.27	17.4 - 22.9 / 15.10 - 19.87	0.864° / 3.01 / 0.12

Tailheavy static balance measurement of controls.

$$M = P \cdot r \ (daN \cdot cm)$$







Determination of P by use of a spring balance or a letter balance.

VII. Check Lists

Pre Flight Check

1. Main pins safetied?
2. Rear wing attachment pins: is the safety lock visible above the pin?
3. Horizontal tail unit pins safe tied? Is the spring retainer engaged?
4. Elevator pushrod connected? Safetied with a spring clip? Not applicable for gliders using the automatic elevator connection!
5. Aileron pushrods connected? Safetied with a spring clip? Do not forget the visible control through the access hole cover!
6. Airbrake pushrod connected? Satisfied with a spring clip? Do not forget the sight control through the access hole cover!
7. Check for foreign objects!

ATTENTION: *At all L'Hotellier quick release joints, one must be able to touch the ball pivot by feeling through the slot in the ball socket. Check the proper engagement of the safety lock by pushing it on to close!*

Pre take-off Check

1. Tail dolly removed – ballast checked?
2. Parachute properly fastened – raise line?
3. Safety harness properly fastened - all operating elements within reach?
4. Put your toes under the toe straps! Do not flatten the straps! Danger of jamming the pedals!
5. Airbrakes retracted and locked?
6. Placard for spin ballast?
7. Altimeter adjusted?
8. Radio on – Frequency and volume checked?
9. Trim adjusted?
10. Control circuit check – Controls easy to operate?
11. Airspace for start and release clear?
12. Check wind
13. Prepared for take-off interruption?
14. Both canopies closed and locked – Emergency jettisoning procedure in mind?

VIII. PERIODICAL INSPECTIONS

The following maintenance checks have to be carried out periodically, however, imperatively at the latest annually :

1. Check the whole glider - outside and inside where accessible - for cracks, holes, dents and white spots in the fiberglass.
2. The attachment hinges and pins must be checked for corrosion, tool marks and play. If the front shear pins of the wing/fuselage junction show too much lateral play due to ground loopings, thin metal washers must be added on these pins. The spar pins must show some play, otherwise the wings possibly cannot be rigged at all with different temperatures. Besides here the bearing pressure is so low that there is no danger of wearout.
   On the other hand the rear pins of the wing/fuselage junction require more attention. In the case of play (backlash) at these pins they have to be replaced in time against oversize pins. The play at these pins always should be within the tolerances H7/g6.
   Good preventive maintenance will increase considerably the service life of all pins and fittings. Always clean and relubricate the pins prior to every rigging. Do not misalign the pins !
3. Check all metal parts for corrosion and, if necessary, repaint them. As priming a zinc-chromate prime has to be used.
4. Make sure that there is no play in the wing/fuselage attachment and in the tail unit/fuselage attachments (see also above point 2).

4. Check that there is no play in the fuselage/wing and fuselage/tailplane connections (see also above Point 2.).

5. The condition of all accessible bearings, fittings, joints, stops in the control linkages, and especially the control cables and towing hook cables, must be checked.
The plastic tubes inside the S-shaped rudder pedal tubes must be checked for proper and tight fit !

6. The controls, including the airbrakes, must be subjected to an operational test, and their control deflections measured.

7. If any control is not free-moving over its entire range of movement, then the cause is to be established and eliminated.

8. The condition of the main landing gear and tailskid (foam skid with wear plate or pneumatic tailwheel respectively) including tire, brake linings, and rubber shock absorber must be checked. See also that there is sufficient brake fluid in the tank.

9. The towing hooks must be inspected according to the manufacturer's "operations and maintenance instructions".

10. The pressure openings (pitot and static pressure ports) on the fuselage, including their flexible lines, are to be checked for blockages and leaks.

11. Condition and function - if applicable, maximum permissible operational time - of all instruments, VHF-transceiver unit, and other equipment are to be checked !

12. The wing bending frequency is to be measured and compared with the stated value in the latest inspection report. For this test the fuselage must be rigidly supported on two supports, in order to obtain comparable values; for the position of the supports see the Survey Drawing on page 29.

13. Check that the equipment and instrumentation are in accordance with the Equipment Inventory (Section XIV. APPENDIX of this manual).

14. After repairs or alterations to the equipment the new empty weight and the C.G. position are to be found by calculation or weighing, and are to be recorded in a summary of weights.

Checking and securing the L'HOTELLIER quick-release connectors in the control linkages

1. **Securing**
   Past experience showed that the quick-release connectors in the airbrake, aileron and particularly in the elevator control linkages were incorrectly assembled or that their assembly was even completely forgotten (as of serial no. 21206 the aircraft was then supplied with an automatic elevator connection). A sticker (Fig.1) fixed to the fin and the access hole cover, serve to remind the pilot of the correct assembly. All quick-release connectors must be secured in addition by means of a spring clip (Fig.2). With the older type of connectors the check hole must be drilled to approx. 1,2 mm ⌀ for this purpose.

Fig. 1

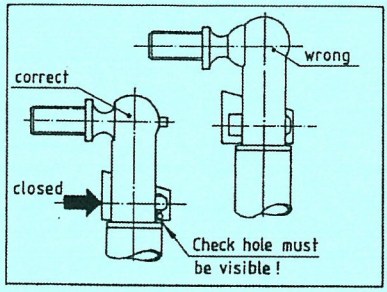
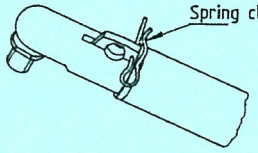


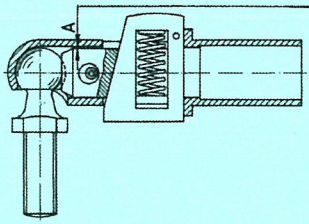
Fig. 2



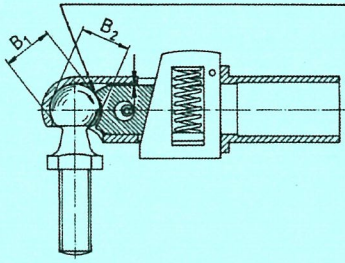
* Spring clip no.50030771 can be ordered from Alexander Schleicher or from the company A.Würth, P.O.Box 1261, D-7118 Künzelsau.
(This part is also identical with the FORD brake securing spring clip).

2. Inspection

As experience accumulated in Australia has shown, the condition of the L'HOTELLIER quick-release connectors must be checked on every annual inspection of the aircraft, especially when it has been operated frequently and from sandy airfields.



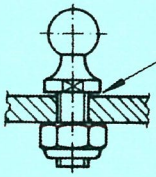
Clearance A must not exceed 0.15 mm (0.006 in); check this by using a wire of the above diameter!



Bad wedging effect causing wear of the ball.

The greatest and smallest diameters B to be found must not differ by more than 0.1 mm (0.004 in).

The tight seat of the ball ends inside the fittings must be checked as loose ball ends are likely to break under bending loads in the thread area.



Gap generated by an unscrewed and incorrectly refitted ball end or owing to overloading / wear out of the lever part.

NOTE: The Technical Note "Technical Data No. IM.10.01A, Issue B 01/89", by the manufacturer L'HOTELLIER must be observed!

Inspecting the taping of the control surface gaps

For aerodynamic reasons the control surface gaps between wing and aileron and between stabilizer and elevator respectively are taped where the control surface hinges are located.

Should this adhesive tape come off or be damaged, this may lead to flutter! Therefore the sealing adhesive tape must be inspected in regular intervals and where necessary replaced.

If the adhesive tape needs to be removed for maintenance, or repair purposes, or because of aging please observe the following: as a replacement you must use only the Tesa tape no.46451, white, 25 or 38 mm wide, made by Beiersdorf AG, Hamburg.

Where other types of adhesive tape have been used, flutter cases have been repeatedly reported!

Where a plastic fairing tape (elastic lipseal) has been fixed at the control surface gaps, you have to observe MAINTENANCE INSTRUCTION C.

3rd Stage:

Before reaching a service life of 12000 flight hours an inspection in accordance with TN no.29 must be accomplished. Depending on the results of this inspection, as well as on the history of the aircraft and the evidence of the percentage of aerobatics being below 12.5 % as compared to the total flight time, Messrs. Schleicher will decide on a release to service for up to 15000 hours.

The Inspection Program must then again be repeated and on the condition that the results are again positive, or any defects found have been correctly repaired, the aircraft may be approved for increase of service life up to 18000 hours.

It will be decided at a later date whether an extension of service life beyond 18000 hours may become possible. A research program which is intended to clear the preconditions of this aim, has already been started with the BMVBW (Federal Ministry of Transport).

Inspection Program

Please contact SCHLEICHER in order to obtain the Inspection Program for the ASK 21, Issue 2 dated 28.04.92, or any later issue effective.

The inspections must be carried out only by the manufacturer, or by an appropriately licensed aircraft repairer.

The results of the inspections must be entered into the Inspection Program which is at the same time the report of findings, where each item must be annotated with a comprehensive comment, as laid down.

If the inspections were carried out by a licensed aircraft repairer, a copy of the filled in Inspection Program (report of findings) which must be signed by the inspector, must be returned to SCHLEICHER for the purpose of evaluation.

Special Checks

After rough landings :

Check the landing gear suspension mount at the front main bulkhead !
Check the wheel fork for deformation; gear box !!
Check the control shaft above the wheel for deformation!
Make sure that the rubber buffers have not come over the support discs !
Check spar tongue and fork for white areas !
Check the wing connections at the fuselage !
Check the cross tube at the front main bulkhead for compression deformations !
Determine wing bending oscillation frequency and compare the value with that of the last inspection report. In case of differences by more than 5 % contact the Schleicher factory. (See survey drawing on page of the Instructions For Continued Airworthiness for jack up points).

After ground loops :

Inspect the fuselage tail cone at the transition to the fin and also the attachment of the horizontal tail unit to the fin !
Check wing connections at the fuselage !
Inspect horizontal shear web in the fuselage (between front and rear main bulkhead) !

IX. LUBRICATION SCHEME

Bearings : the slotted-sealed ball bearings are filled with a longlasting grease and are capped off. So it is unnecessary to regrease this bearing. The 14C6 self--aligning bearings in the pushrods and in the duraluminum rocker arms are also greased and covered with felt seals so that they likewise do not need any regreasing for a long period of time. The same applies to the ball bearings of the pushrod guides.

The grease nipples at the controlstick and at the landing gear rocker arm should be lubricated at least annually.
The grease nipples of the control systems are accessible from the top when the seat cushions are removed. The rear seat has to be removed in order to reach the grease nipples of the landing gear rocker arm.

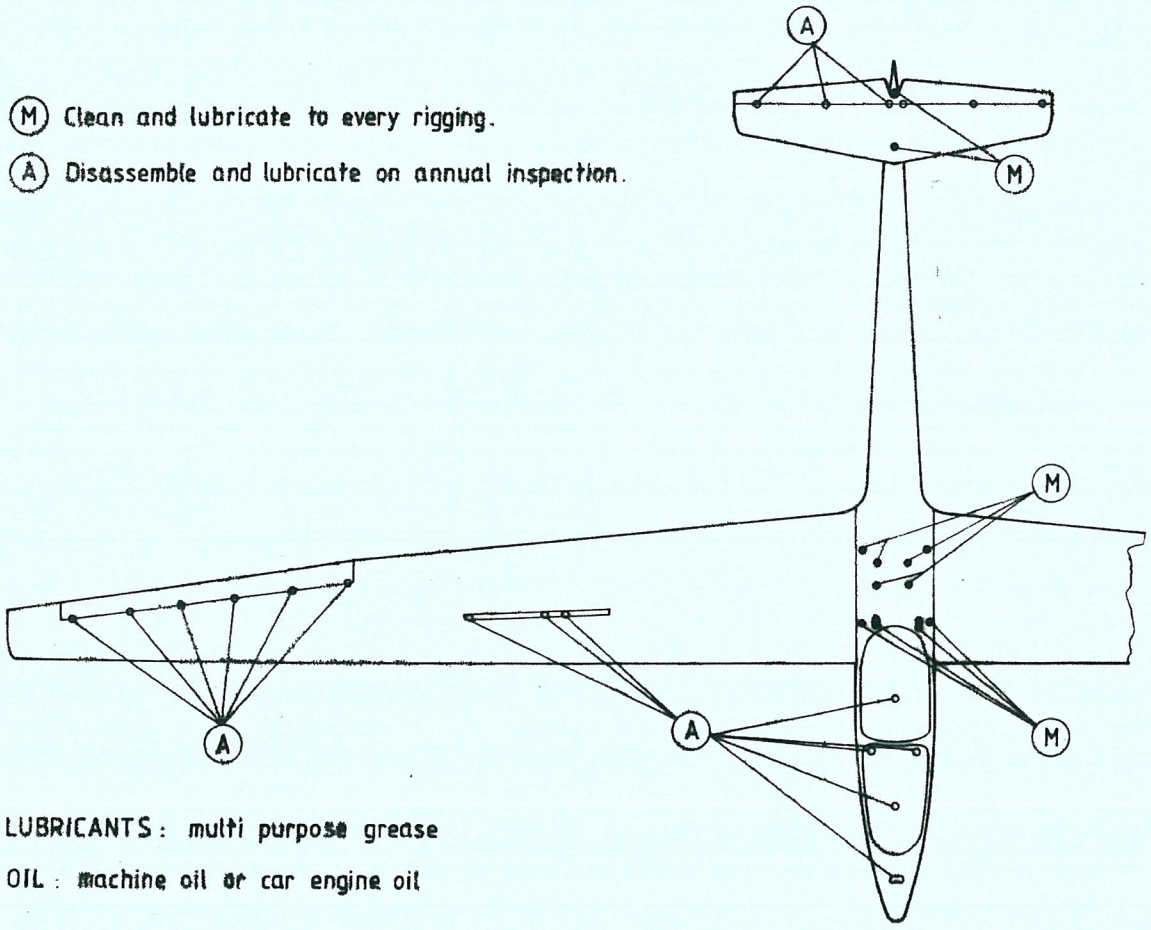
The canopy locks and especially the emergency jettisoning device in the front cockpit have to be kept well lubricated.

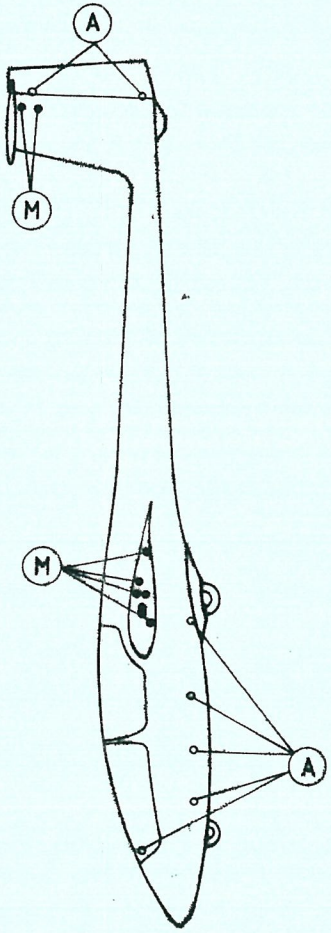
Dirty tow releases are cleaned best with compressed air, brush and through movement of the kinematics. Then regrease them with a spray oil or some similar agent.

LUBRICATION SCHEME

(M) Clean and lubricate to every rigging.

(A) Disassemble and lubricate on annual inspection.





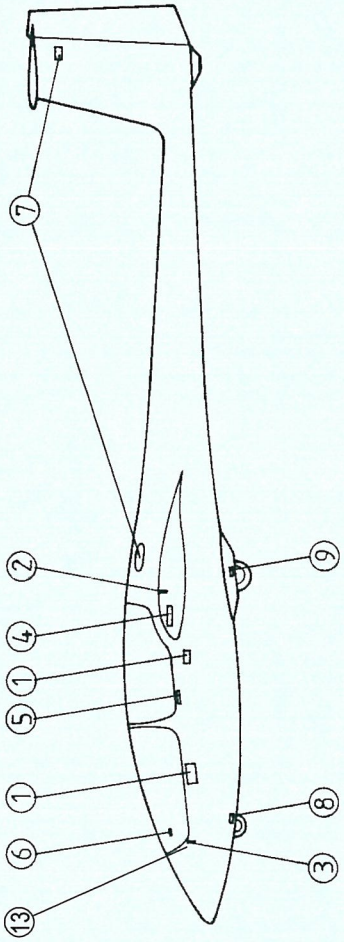
LUBRICANTS: multi purpose grease

OIL: machine oil or car engine oil

X. Placards and Markings

1. Data placard with weight & balance data;
   one placard each for the front and rear seat on the right cockpit wall.
2. Fire-proof type plate;
   on the right at the spar tunnel bottom.
3. Placard stating the approved Airworthiness Category; on the front instrument panel.
4. Max. baggage compartment loading,
   on placard each left and right on the rear cockpit wall close to the baggage compartment opening.
5. Placard on the rear instrument panel.
6. Placard for „Pre take off check";
   on the underside of the front instrument panel cover so that the placard is visible when the canopy is open.
7. Placard on left side of top of fin.
   Note: This placard is cancelled if your glider features the automatic elevator connection. Placard in the access hole cover
8. Placard for tire pressure nose wheel: 2.0 bar (29 psi).
9. Placard for tire pressure main wheel: 2.7 bar (39 psi).
10. Airspeed indicator marking.
11. G-meter marking.
12. –
13. For gliders equipped with an attachment for spin ballast (TN4a):
    Placard for spin ballast (at the front instrument panel)
    (see XIII. Description of Symbolic Placards)

Settings of placards



For tailwheel option only

X. Placards and Markings

1. Data placard with weight & balance data;
   one placard each for the front and rear seat on the right cockpit wall.
2. Fire-proof type plate;
   on the right at the spar tunnel bottom.
3. Placard stating the approved Airworthiness Category; on the front instrument panel.
4. Max. baggage compartment loading,
   on placard each left and right on the rear cockpit wall close to the baggage compartment opening.
5. Placard on the rear instrument panel.
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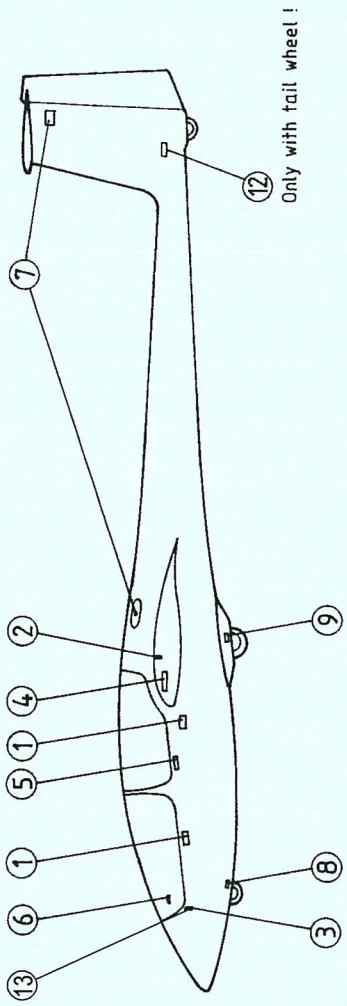
8. Placard for tire pressure nose wheel: 2.0 bar (29 psi).
9. Placard for tire pressure main wheel: 2.7 bar (39 psi).
10. Airspeed indicator marking.
11. G-meter marking.
12. Placard for tire pressure tail wheel: 2.5 bar (36 psi).
13. For gliders equipped with an attachment for spin ballast (TN4a):
    Placard for spin ballast (at the front instrument panel)
    (see XIII. Description of Symbolic Placards)

Settings of placards



Segelflugzeugbau A. Schleicher Poppenhausen

Model Serial no.

DATA PLACARD

Approved for:

Max. speed for calm air		280 km/h
Max. speed for rough air		200 km/h
Max. maneuvering speed	V_M	180 km/h
Max. aero tow speed	V_F	180 km/h
Max. winch launch speed	V_W	150 km/h

WEIGHT AND BALANCE

Min. payload front seat	kg
Max. payload front seat	kg
Max. payload rear seat	kg
Baggage in wingroots	max. 2 × 10 kg
Max. permissible all-up weight	kg

(1) 2 off

Loading of baggage compartment: max. 10 kg

(4) 2 off

Pre Take Off Check:

1. Tail dolly removed – ballast checked?
2. Parachute properly fastened – raise line?
3. Safety harness properly fastened – all operating elements within reach?
4. Put your toes under the toe-straps! Do not flatten the straps! Danger of jamming the pedals!
5. Airbrakes retracted and locked?
6. Placard for spin ballast?
7. Altimeter adjusted?
8. Radio on – frequency and volume checked?
9. Trim adjusted?
10. Control circuit check – Controls easy to operate?
11. Airspace for start and release clear?
12. Check wind
13. Prepared for take-off interruption?
14. Both canopies closed and locked? – Emergency jettisoning procedure in mind?

(6) 1 off

(5) 1 off Rear

Attention! Emergency bailout!

a) Pull back both canopy side-locks and push canopy upwards.
b) Undo safety harness.
c) Get up and bail out.
d) With manual chute seize release grip and pull out entirely after 1–3 sec.

(2)

A. Schleicher
6416 Poppenhausen

Model : ASK 21
Serial no: 21 XXX
Registration letters :
Made in West Germany

(3) 1 off

Aerobatics prohibited!
Equipment as under airworthiness category "U" (Utility)

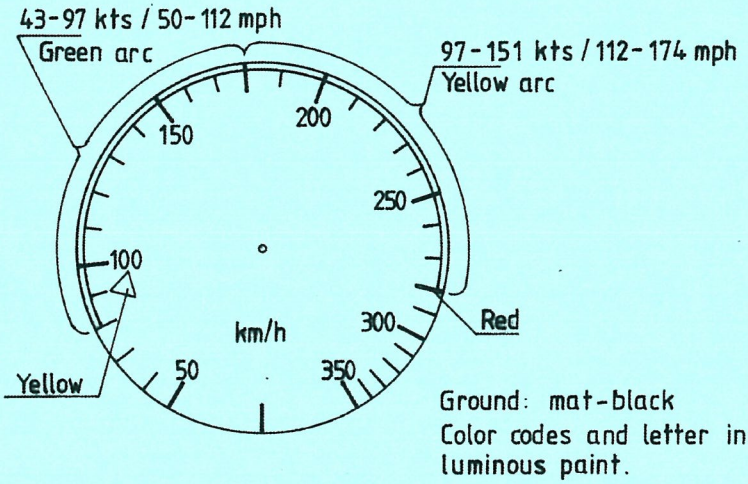
For equipment without g-meter and bottom strap.

(3) 1 off

Aerobatics as per Flight Manual
Equipment as under airworthiness category "A" (Acrobatic)

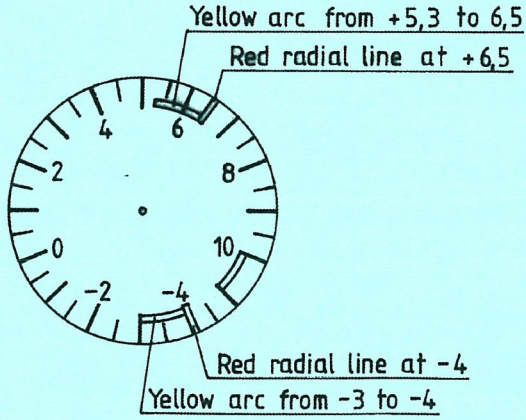
For epuipment with g-meter and bottom strap.

Airspeed indicator color codes

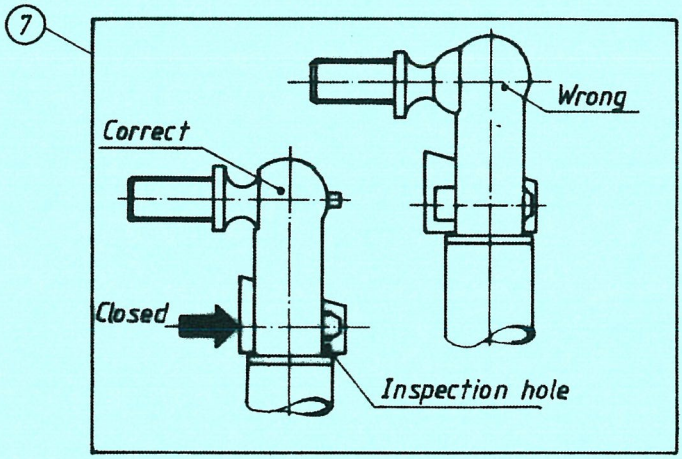


G-meter color codes

a) Positive range



b) Negative range


7
Wrong
Correct
Closed
Inspection hole

XI. REPAIRS

On principle repairs must only be made by the manufacturer or by a certified (licensed) technical aviation facility.
For exceptions see repair manual. In case of doubt contact the manufacturer !

XII. MODIFICATIONS

Minor modification

A modification to the aircraft which has no influence on its airworthiness and is feasable by using standard working methods, may be done without prior notification to the Civil Aviation Authority if it is done in accordance with a technical note issued by the Civil Aviation Authority.

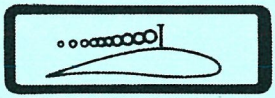
Major modification

A modification to the aircraft which has an influence on its airworthiness or requires a change of the operation instructions or of the operation limitations or is not feasable by using standard working methods, must only be done by a certified (licensed) technical aviation facility. The major modification must only be done in accordance with technical documentations which were subject of a supplementary type-approval under the test regulations for aircraft.
A supplementary type-approval is not necessary, if the major modification is restricted to only some single units. Prior to the carrying out of the major modification the proof of the airworthiness must be furnished in accordance with the test regulations for aircraft.

XIII. DESCRIPTION OF SYMBOLIC PLACARDS

Rudder pedals adjustment: grey knob on RH side of the console.

To adjust pedals backwards:
Take your feet off the pedals and pull pedals backwards; then let go the grey knob and load the pedals in order to lock them.
To adjust pedals forwards:
Pull grey knob and push pedals forwards with your heels; then let go the grey knob and load the pedals in order to lock them.



Airbrakes: blue lever in the LH arm rest; pull to extend airbrakes.

Trim: noseheavy.

Trim: tailheavy.

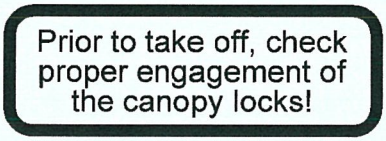
Tow release: yellow knob LH below canopy frame.

OPEN front canopy:
Move white levers LH and RH on canopy frame backwards.

EMERGENCY JETTISONING of front canopy:
Push lever with red flat knob to the left

Canopy emergency jettisoning: push to the left the red flat knob above the instrument panel

Ventilation



This placard must be fitted in the front and rear cockpit in full view of the pilot.

When the plane is equipped with an attachment for spin ballast (TN4b)

Placard at the front instrument panel, informing about mounted spin ballast.

A M8-screw must be mounted through the placard from the back. The placard is visible, when spin ballast is mounted on the tail (= DANGER). When spin ballast is removed, the placard is covered by the nut that otherwise holds the spin ballast.

XIV APPENDIX

XIV.1 Equipment List

Minimum equipment

1. Airspeed indicator

a. Winter GW 6005 50 - 350 km/h
b. PZL PS 08 50 - 350 km/h

2. Altimeter

a. Winter 4 HM 6
b. Winter 4 FGH 10
c. PZL W-12 S

3. Safety harness

Gadringer Bagu V-B/1
Schugu II-C/V
Bogu I-B/V front
Bogu I-A/V rear

Additional minimum equipment for aerobatics :

G-meter BM 770 L

Additional minimum equipment for cloud flying :

Turn & bank indicator Apparatebau Gauting WZ-402/31.
Compass : Ludolph FK 5
Ludolph FK 16
PZL BS-1
PZL B-13/KJ

VHF-transceiver

a. Dittel FSG 15/25
b. Dittel FSG 16/25
c. Dittel FSG 40 S
d. Becker AR 2008/25
e. Becker AR 2009/25
f. Avionic Dittel ATR 720

XIV APPENDIX

XIV.1 Equipment List

Minimum equipment

1. Airspeed indicator

a. Winter	GW 6005	50 to 350 km/h
b. PZL	PS 08	50 to 350 km/h
c. Winter	6 FMS 4	50 to 300 km/h
d. Winter	6 FMS 421	0 to 300 km/h
e. Winter	6 FMS 5	50 to 300 km/h
f. Winter	7 FMS 4	50 to 300 km/h
g. Winter	7 FMS 5	50 to 300 km/h

2. Altimeter

a. Winter	4 HM 6
b. Winter	4 FGH 10
b. PZL	W-12 s
d. Winter	4 FGH 20

3. Safety harness

a. Gadringer
Bagu V-B/1
Schugu II-C/V
Bogu I-B/V vorne
Bogu I-A/V hinten

b. Schroth

Additional minimum equipment for aerobatics

a. G-meter	BM 770 L
b. G-meter	AM 10
c. G-meter	BM 470 - 2
d. G-meter	BJ 10 - 2
e. G-Meter	G 510
f. G-Meter	GM 510 - 2

Additional minimum equipment for cloud flying

Turn & bank indicator Apparatebau Gauting WZ - 402/31

Compass	Ludolph	FK 5
	Ludolph	FK 16
	PZL	BS-1
	PZL	B 13 / KJ

VHF - transceiver

a. Dittel	FSG 15/25
b. Dittel	FSG 16/25
c. Dittel	FSG 40 S
d. Becker	AR 2008/25
e. Becker	AR 2009/25
f. Avionik Dittel	ATR 720
g. Dittel	FSG 71 M

XIV.2 Maintenance Instructions

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

The general **"Maintenance Instruction ALL FRP GLIDER MODELS dated June 19, 1986"** describes the removing of play between the sockets (= bushings) and bolts (= pins) of the wing-to-fuselage transition.

The general **Maintenance Instruction "PAINT CRACKS"** dated June 26, 1989, describes how to inspect, preserve, and repair the paint surface.

The **Maintenance Instruction A** for the ASK 21 (dated March 23, 1987) describes how to readjust the airbrakes.

The **Maintenance Instruction B** for the ASK 21 (dated July 4, 1990) describes how to install oversize drag pins (rear).

The **Maintenance Instruction C** for the ASK 21 (dated May 7, 1992) describes how to fix for the first time or how to replace the plastic fairing tape (elastic lipseal) at the control surface gaps.

ASK 21
Maintenance Instruction
Wheel-Rim Tost Penta, Issue I

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
D - 36163 Poppenhausen

Subject: Alternative rim for main wheel

Applicability: ASK 21, TCDS EASA.A.221,
variants ASK 21 and ASK21Mi, all serial numbers

Reason: The rim Tost Penta 125 – 1¼" can be installed instead of the rim specified in the Maintenance Manual (Cleveland 40-78B)

Action: For every rim model there is an appropriate set of space bushings, which are threaded onto the axle on both sides of the wheel. Whenever the rim models are exchanged, the space bushings have to be replaced, too. Furthermore, a tyre tube with short valve must be used. The brake calliper retains unchanged.

Material: For the Tost-rim:

Part no	Pcs	Denomination
210.21.0027	1	Space bushings for Tost Penta 125-1¼" (Left: l = 37; Right: l = 31)
210.21.0028	1	Clamp washer for Tost Penta 125-1¼"
	1	Tyre tube with short valve

For the Cleveland-rim:

Part no	Pcs	Denomination
210.21.0005	1	Space bushing left f. main wheel (l = 29)
210.21.0006	1	Space bushing right f. main wheel (l = 30)
210.21.0007	1	Space ring f. main wheel (Ø35/10 - 10)
210.21.0008	1	Clamp washer f. main wheel (Ø40/10,1 – 2)
	1	Tyre tube with short valve

Notes: none

Poppenhausen, 01.06.10

Alexander Schleicher
GmbH & Co.

i.A. M. Greiner

(M. Greiner)

INSTRUCTIONS FOR THE MAINTENANCE
L'HOTELLIER BALL AND SWIVEL JOINTS

HISTORIQUE DU DOCUMENT

REV.	DATE	OBJET DE LA MISE A JOUR	RED.	QUAL.	RESP.
A	11/85	Creation of document	BE	MJD	JMB
B	02/86	Representation of 1 swivel	BE	MJD	JMB
C	01/89	Adjunction of Fig.1 and Fig.2	BE	MJD	JMB
D	07/92	Updating of function of CR147	BE	MJD	JMB
E	03/94	Updating following DEI229-EM	BE	MJD	JMB

LISTE DES DESTINATAIRES

B.E. B.C. Q.C. B.C. Q.C. C.B.	OR. +1 EX. 1 EX. 1 EX.	PRODUCTION	1 EX.

DOCUMENT IMA N° : 10.01	INSTRUCTIONS FOR THE MAINTENANCE L'HOTELLIER BALL AND SWIVEL JOINTS	E08-A

COMPOSITION DU DOCUMENT

PAGE	IND.	PAGE	IND.	PAGE	IND.	PAGE	IND.	PAGE	IND.
TIT	E	SOM	E	1	E	2	E		

SUMMARY

Louis L'HOTELLIER S.A.
93, avenue Charles De Gaulle - 92270 BOIS COLOMBES
Tél.(1)42.42.13.94 Télex 611153F LHOTAIR Télécopie (1)47.60.07.07

DOCUMENT IMA N° : 10.01	INSTRUCTIONS FOR THE MAINTENANCE L'HOTELLIER BALL AND SWIVEL JOINTS	E08-A

1 - PREVENTIVE AND SAFETY MAINTENANCE INSTRUCTIONS

The rotation of the swivel around the ball must be done with resisting strengh, due to minimum frictions. Consequently it is mandatory to lubricate the swivel/ball assy. This lubrification must be done after cleaning and before assembly, with a non cold coagulating grease.

Eg : ESSO purpose (general use) :
Spray containing oils enriched with silicone (recommended for assemblies exposed to sand or other abrasive materials).

It is mandatory to verify, after each assembly, the correct location of the ball in the swivel. To do so, a location hole is drilled in the locker. When the assembly is good, the hole must be visible and must enable to insert the pin "B" réf. L'H 140-31, or other devices, linked to the locker only.

2 - PERIODICAL CHECK

During the annual visit or no later than every 500 flight hours, it is necessary to verify balls and swivels as follows :

2.1. FREE MOVEMENT OF THE BALL INTO THE HOUSING

- Check that the ball move free of friction point.
- Check the angular displacement.
- Check that there is no crack at the base of the ball

2.2. BALL SPHERICITY MEASUREMENT (See fig. 2)

The variation between several measures of the ball diameter must not exceed 0,1 mm.
This check aim is to detect an abnormal ball wear.

2.3. BALL THREAD CHECK

No thread damage is acceptable. During reassembly the collar must be perfectly set on its base. It is mandatory to fix the ball in position with an adequate locking device.

2.4. SWIVEL VISUAL CHECK

No deformation or penning in ball location or in the locking device seat is acceptable.

2.5. MEASUREMENT OF THE LOCKER LOWER PART PROJECTION AFTER ASSEMBLY OF THE SWIVEL ON THE BALL (see fig. 1)

This projection must be higher than 2 mm.
The aim of this requirement is to verify the efficiency of the automatic take up clearance

2.6. CHECK OF THE LINK BETWEEN DRIVE ROD AND SWIVEL

In the case of an adjustable swivel, verify that the link between swivel and drive rod is tight and properly secured by an adequate locking device.

2.7. SWIVEL ASSY OPERATION CHECK

Seat or locker : no clamping, due to oxydation or other reason, is acceptable.

If after these verifications, one of the above check is out of tolerance, it is mandatory to replace both ball and swivel.
nevertheless it is recommended to replace this assembly every 10 years or every 3000 flight hours.

IMPORTANT NOTE

Any defection parts may be returned to Ets Louis L'HOTELLIER for technical investigation.

FIG. 1

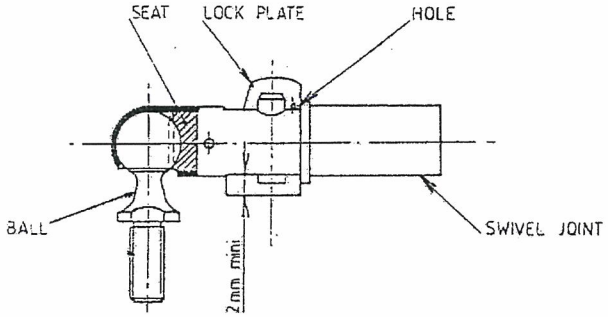
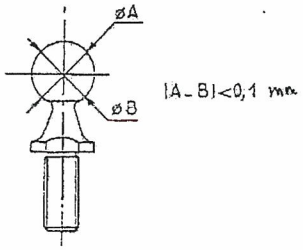


FIG. 2



Sheet: 1 of 1	All FRP glider models Maintenance Instruction dated 19.06.86	Alexander Schleicher Segelflugzeugbau 6416 Poppenhausen

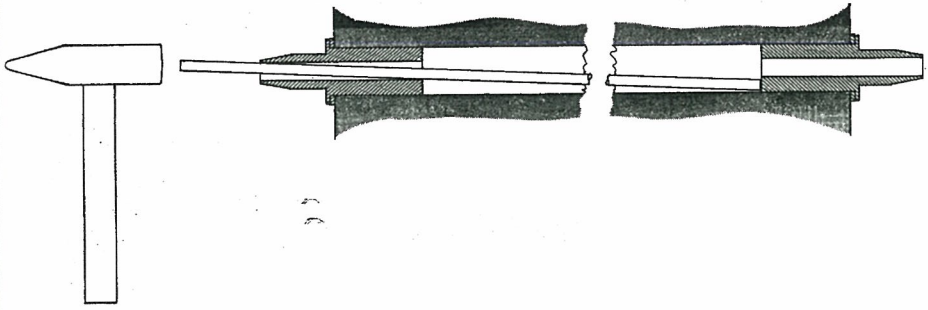
Removing play between the sockets and bolts of the wing-fuselage transition

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

E. Steinweller, Fulda

„Safir-Normdruck" 09 6181 83

Sheet: 1 of 4	**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 2	ASK 21 Maintenance Instruction A	**Alexander Schleicher** GmbH & Co. Segelflugzeugbau D - 6416 Poppenhausen

Subject: Re-adjusting the airbrakes.

Affecting: All ASK 21 serial no.s.

Compliance: As required.

Reason: It is important to check in regular intervals the locking of the airbrakes. Each airbrake has its own toggle in the wing. For this reason it must be checked that both airbrakes lock simultaneously and securely.

Action:

1. This is checked by connecting the brakes individually and marking the point on the operating lever gate in the cockpit at which the linkage's dead center occurs. Both dead points should be within 5 mm (0.2 in) of each other and, in the locked state, the individual brakes should still have 10 mm of free movement of the front lever forwards in the gate.

2. If you observe that the airbrakes do not have an even over-center lock, the toggle over dead center must be readjusted. This must be done with the airbrake pushrod disconnected from the HOTELLIER ball quick-disconnect.
   As shown in Fig.1 the short pushrod (1) is to be disconnected from the toggle crank (2); back off the lock-nut (3) and screw out the pushrod (1) by 1/2 to 1 turn. Re-connect in the reverse order and check again as described under point 1.).

3. If the airbrakes still do not have sufficient dead lock force, peel a little off the toggle stop block (4). Using a punch carefully remove some layers from the stop block (4); then again readjust the airbrakes as described under points 1.) and 2.).

Material: New safety nut NM 6, DIN 980-6, if needed.

Poppenhausen, March 23, 1987

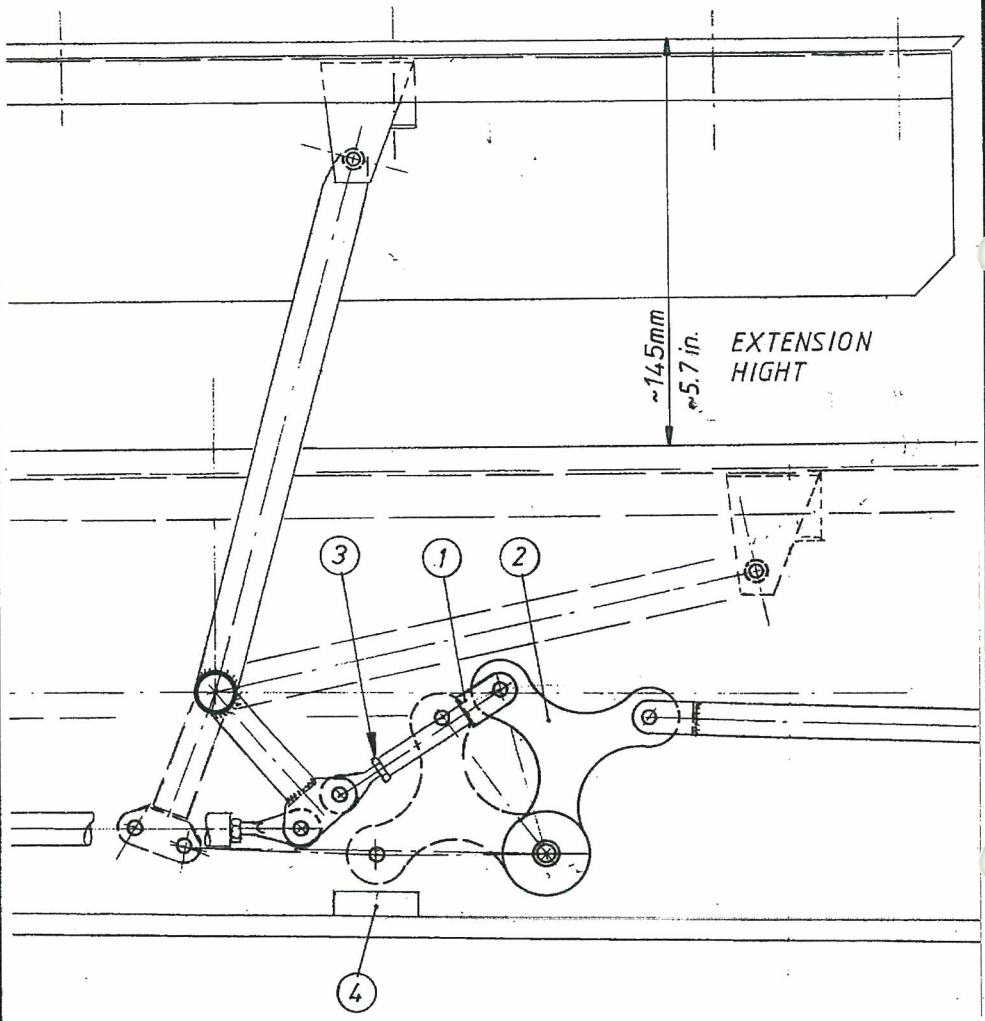
ALEXANDER SCHLEICHER
GmbH & Co.

L.W. Jumtow.

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

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
D - 6416 Poppenhausen

Fig.1



SHEET: 1 of 1	ASK 21 Maintenance Instruction B Issue I	Alexander Schleicher GmbH & Co. Segelflugzeugbau D-6416 Poppenhausen

Subject: Installation of oversize drag pins

Affecting: All serial no.s ASK 21.

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 at the new drag pins.

Note: The following pin diameters are available:
11.95 mm, 12.0 mm, 12.1 mm, 12.2 mm and 12.3 mm.

Poppenhausen, July 4, 1990

ALEXANDER SCHLEICHER
GmbH & Co.

Gerhard Waibel

Gerhard Waibel.

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

ASK 21
Maintenance Instruction C
Issue I

Alexander Schleicher
GmbH & Co.
Segelflugzeugbau
D - 6416 Poppenhausen

Subject: Fixing for the first time or replacing the plastic fairing tape (elastic lipseal) at the control surface gaps of aileron, and horizontal and vertical tail.

Affecting: All ASK 21, Data Sheet no. L-339, as of serial no.21001, optional.

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.

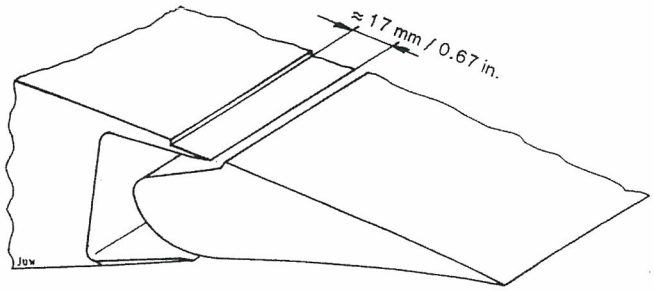
This continuous transition is achieved by means of an elastic lipseal which is applied to the wing, the stabilizer and the fin respectively in order to bridge the actual gap between wing & aileron, stabilizer & elevator, and fin & rudder, due to its curvature into which it is pre-formed to ensure tight seating on the control surfaces.
It is important to ensure that the seal underneath this bridging lipseal is 100 % airtight. The control surface gaps are sealed in addition by means of a Teflon sealing/slip tape, which at the same time serves to reduce the friction of the elastic lipseal on the aileron and elevator surfaces.
Should the elastic lipseal come off or be damaged, this may lead to flutter!

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

Action:

1. If the elastic lipseal was not fitted before to your glider, a step must first be rebated in the upper wing surface as illustrated in Fig.1.
   NOTE:
   Only the finish layer is carefully removed down as far as the outer FRP lamination without damaging the glass layer.

Fig.1 Upper Wing Surface



2. If the elastic lipseal needs to be removed only for maintenance or repair purposes, please observe the following:

   For disassembly of **elevator or aileron:**
   The elastic lipseal and the sealing/slip tape need to be removed only on the upper surface (where the control surface hinges are located).

   For disassembly of the **rudder:**
   Here it is not necessary to remove the elastic lipseal at the fin.

2.1 The elastic lipseal must be removed very carefully so as to avoid any delaminations of the layers in this area. Remove any adhesive residue by means of synthetic resin thinners.

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

3. Fixing for the first time or replacing the plastic fairing tape (elastic lipseal)

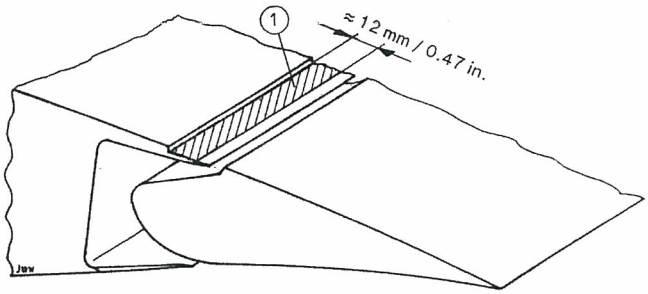
   Notes:
   All surfaces must be completely clean, dry and free from dust and grease!
   This can best be tested by sticking a self adhesive tape to the cleaned surface and then pulling it off again to check that no further dust particles adhere to it.

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

3.1 Upper Wing Surface

   Apply a 12 mm wide temporary positioning tape (1) [e.g: 12 mm Tesafilm 104] abutting the front edge of the approx. 17 mm wide recessed step [Fig. 2].

Fig.2 Upper Wing Surface



Now apply the sealing/slip tape (2) [3M Scotch Teflon Tape 30 mm wide] abutting the rear edge of the temporary positioning tape (1) . Be careful that the sealing/slip tape lies slack over the gap.
Set the aileron to maximum positive deflection, so that later the Teflon sealing/slip tape is not stretched during normal full control deflections!
Apply full aileron several times so that the sealing/slip tape fits well into the gap.
Then the Teflon sealing/slip tape (2) must be firmly rubbed down on to the surface.

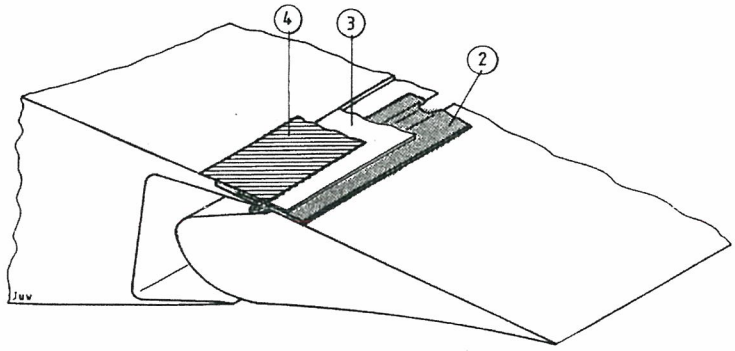
Then remove the temporary positioning tape (1) first applied.

Peel the protective backing from the plastic fairing strip (3) [Mylar foil, 30-15mm wide] and firmly stick it on abutting the front edge of the recessed step in the wing by means of its adhesive film layer [Fig.3].

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

Finally, a protective adhesive tape (4) is applied over the abutment of the front edge of the plastic fairing strip (3) and the step in the wing [Fig.3]. This tape should be as thin and moisture-proof as possible; an example of a suitable tape would be white Tesa film No.104, 25 mm wide.
This protective tape serves to prevent the detachment of the front edge of the plastic fairing strip (elastic lipseal) which might result in dangerous flight characteristics.

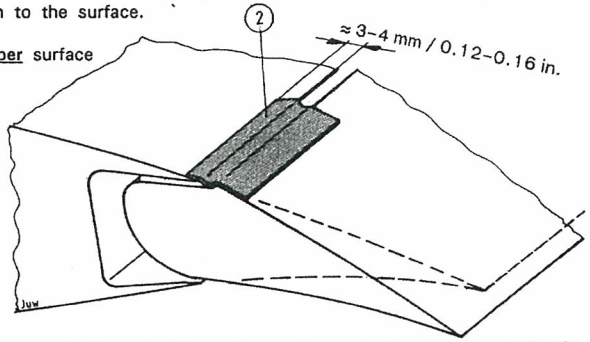
Fig.3 Upper Wing Surface



3.2 Horizont tail upper surface:

There is no recessed step at the stabilizer. As shown in Fig.4 the sealing/slip tape (2) [3M Scotch Teflon Tape 30 mm wide] is stuck on over the stabilizer-to-elevator gap. At the same time the elevator must be set to maximum positive deflection, so that later the Teflon sealing/slip tape is not stretched during normal full control deflections!
Be careful that the sealing/slip tape lies slack over the gap. Apply full elevator several times so that the sealing/slip tape fits well into the gap.
Then the Teflon sealing/slip tape (2) must be firmly rubbed down on to the surface.

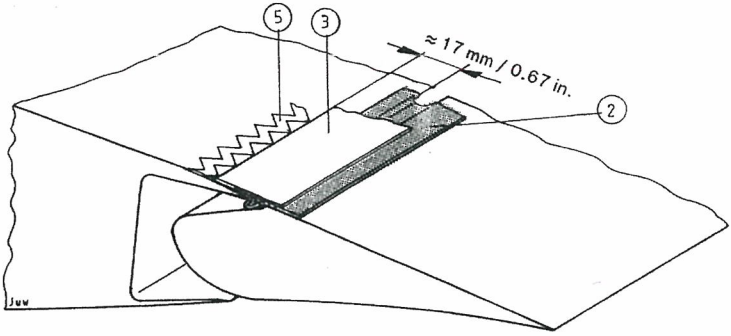
Fig.4 Horizont tail upper surface



Peel the protective backing from the plastic fairing strip (3) [Mylar foil, 30-15mm wide] and firmly stick it on to the stabilizer by means of its adhesive film layer [Fig.5].
Press the adhesive zones of the plastic fairing strip firmly down on the surface using a soft wooden block (e.g: Balsa) or a hard rubber roller.

The zig-zag-tape (5) is stuck on abutting the edge of the plastic fairing strip (3).
NOTE: The front teeth (in the direction of the flight) must not be flattened by pressing them too far down into the glue film, otherwise their turbulator effect will be reduced!

Fig.5 Horizont tail upper surface



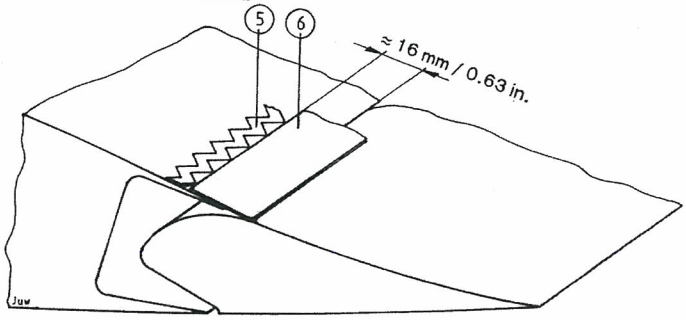
3.3 Wing and horizont tail lower surface:

Remove protective backing from plastic fairing strip (6) [Mylar foil 22-15 mm wide] and stick it on to the wing and horizontal tail lower surfaces, by means of its adhesive film layer [Fig.6].

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

Then the zig-zag-tape (5) is stuck on abutting the edge of the plastic fairing strip (6). [See the NOTE under point 3.2].

Fig.6 Wing and horizont tail lower surface

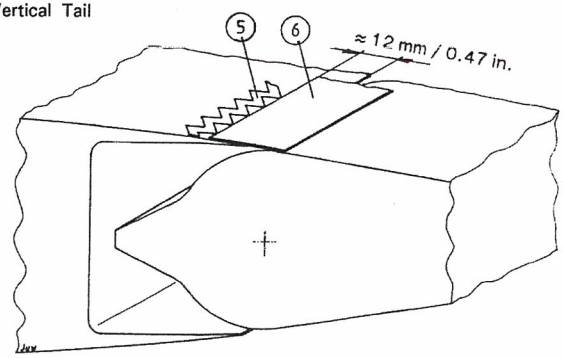


3.4 Vertical tail:

There are no recessed steps at the fin. As shown in Fig.7 the plastic fairing strip (6) [Mylar foil, 22-15 mm wide] is stuck on over the rudder-fin transition at the left and right side (with its adhesive film layer on the fin), then pressed firmly down on the surface.

Then the zig-zag-tape (5) is stuck on abutting the edge of the plastic fairing strip.

Fig.7 Vertical Tail



Material:

	Wing Surfaces Upper	Wing Surfaces Lower	Horizontal Tail Sfce.s Upper	Horizontal Tail Sfce.s Lower	Vertical Tail Sfce.s L & R *
(1) Temporary positioning tape Tesafilm No. 104, 12 mm wide	2x 2.85 m				
(2) Sealing/slip tape 3M Scotch Teflon Tape, 30 mm wide	2x 2.85 m		1x 3.10 m		
(3) Plastic fairing tape Mylar foil, 30-15 mm wide	2x 2.85 m		1x 3.10 m		
(4) Protective adhesive tape Tesafilm No.104, white, 25 mm wide	2x 2.85 m				
(5) Zig-zag tape Mylar foil, 0.5mm thick;12 mm wide		2x 2.85 m	1x 3.10 m	2x 1.50 m	2x 1.25 m
(6) Plastic fairing tape Mylar foil, 22-15 mm wide		2x 2.85 m		2x 1.50 m	2x 1.25 m

Optional in the place of (5) and (6):

(7) Combi-Zig-zag/plastic fairing tape Mylar foil, 38-20 mm wide		2x 2.85 m		2x 1.50 m	2x 1.25 m

* = left and right

The materials required can be obtained from Messrs. Schleicher.

Notes:

1. This action can be accomplished by a competent person.
2. In the place of the plastic fairing tape (6) and the zig-zag-tape (5) optionally a combi-Zig-zag/plastic fairing tape (7) may be glued on.
3. Ensure that the elastic lipseal is in tight contact with the surfaces of the controls even when they are fully deflected.
   The secure and firm adhesion of the elastic lip must be checked.

Poppenhausen, May 7, 1992

ALEXANDER SCHLEICHER
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(Lutz-W. Jumtow)

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

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REPAIR MANUAL

REPAIR MANUAL

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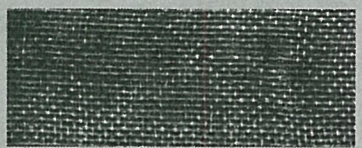
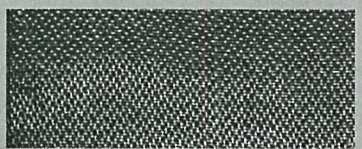
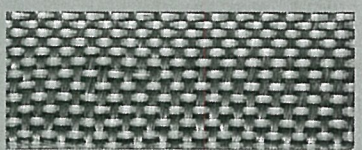
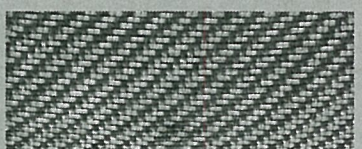
	63	90070	8.4505.6	1610* * US-Spezifikation
	106	91110	8.4545.6	
	163	92100		
	163	92110	8.4548.6	

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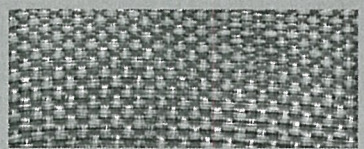
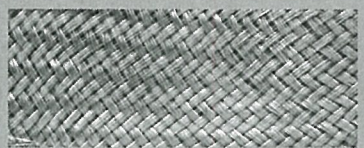
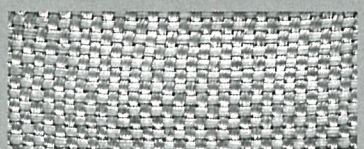
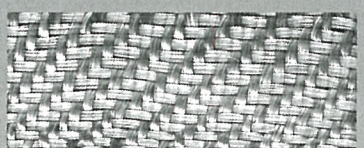
	280	92115		1510* * US-Spezifikation
	280	92125	8.4551.6	
	395	92130		
	395	92140	8.4554.6	

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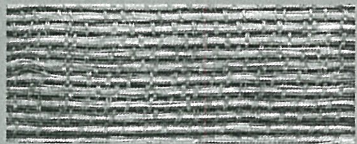
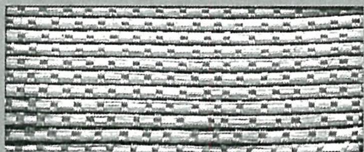
	220	92145	8.4520.6	
	430	92146	8.4525.6	

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	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

Rev.No./Date. Sig.

Author

Date July 1994

Muster / sample	weight g/m²	Gewebe - Bezeichnung (code) f. Kohlefasern (carbonfibre) producer	LN	remarks
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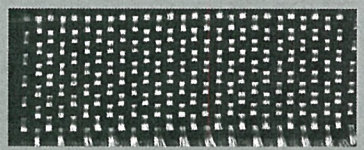
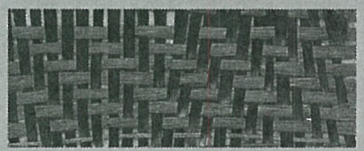
	190	02902		INTERGLAS
	200	03040		INTERGLAS
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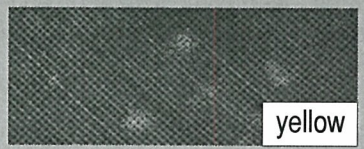
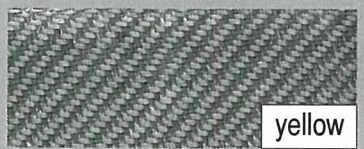
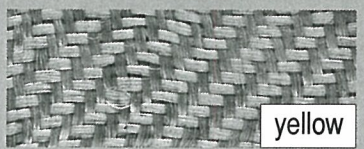
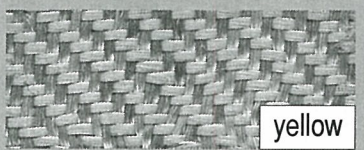
Muster / sample	weight g/m²	Gewebe - Bezeichnung (code) f. Aramid-Fasern (-fibre) Interglas	DIN 65 427	remarks
 yellow	63	98605	5.2230.3	120* * Mil-y 83370 A
 yellow	120	98608	5.2231.3	
 yellow	170	98612	5.2234.3	
 yellow	225	98631	5.2235.3	

Fig.1 REPARATUR DER KLASSE 3 / REPAIR CLASS 3

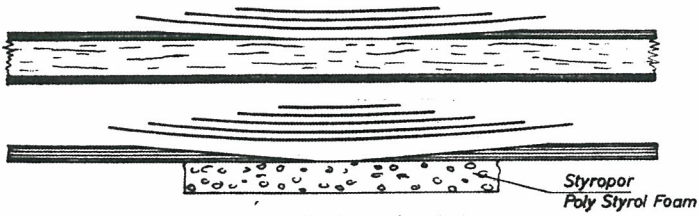


Fig.2 REPARATUR DER KLASSE 2/ REPAIR CLASS 2
(Innenseite zugänglich)/ (inside skin accessible)

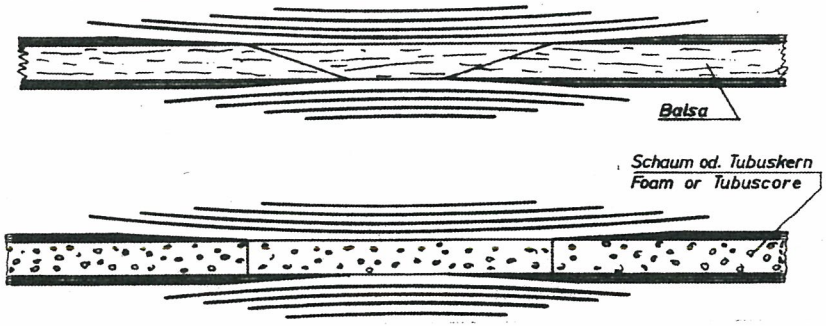


Fig.3a REPARATUR DER KLASSE 2 / REPAIR CLASS 2
(Innenseite unzugänglich)/ (inside skin inaccessible)
Vorbereitung der Reparaturstelle /Preparing the repair area

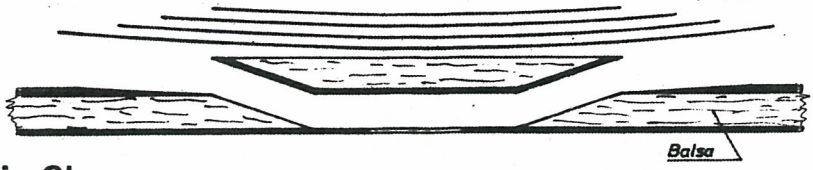
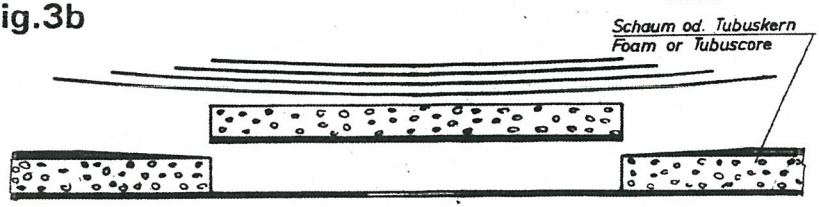
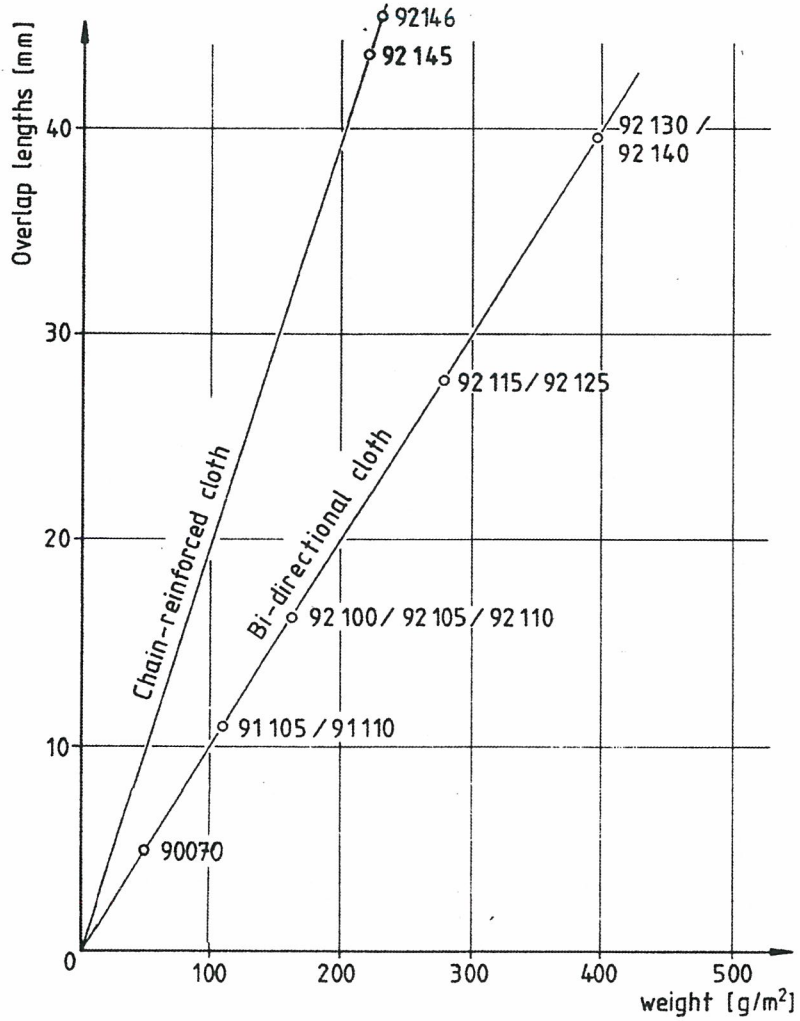


Fig.3b



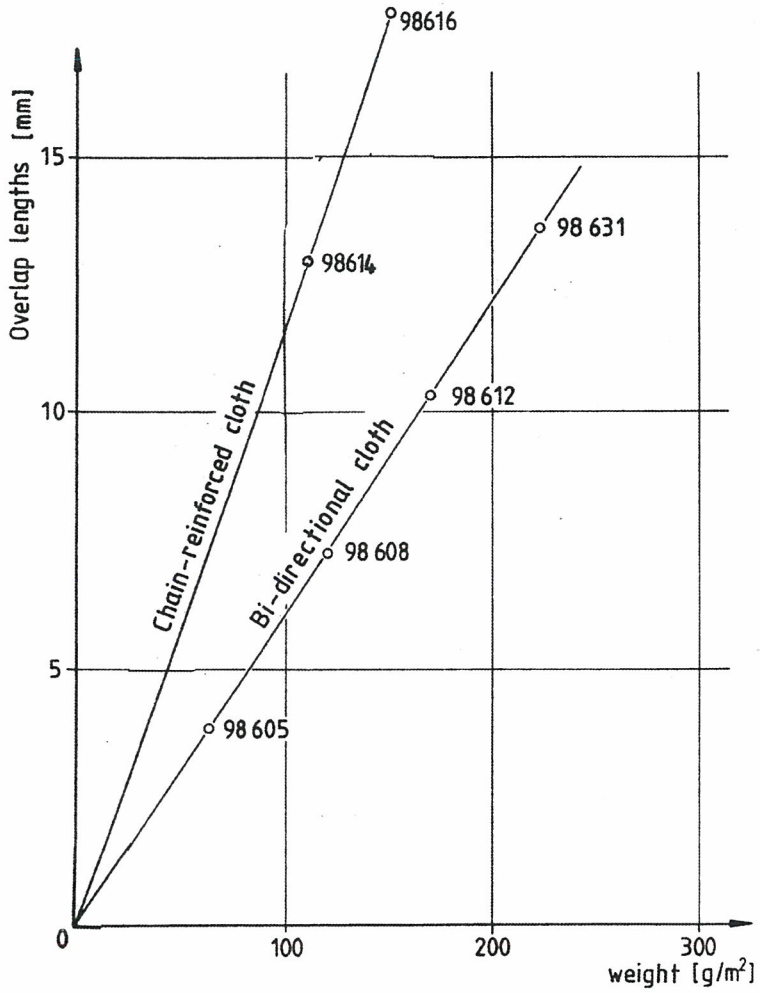
The taper of all scarf joints is shown greatly exaggerated.

Diagram: overlap length for glass fiber



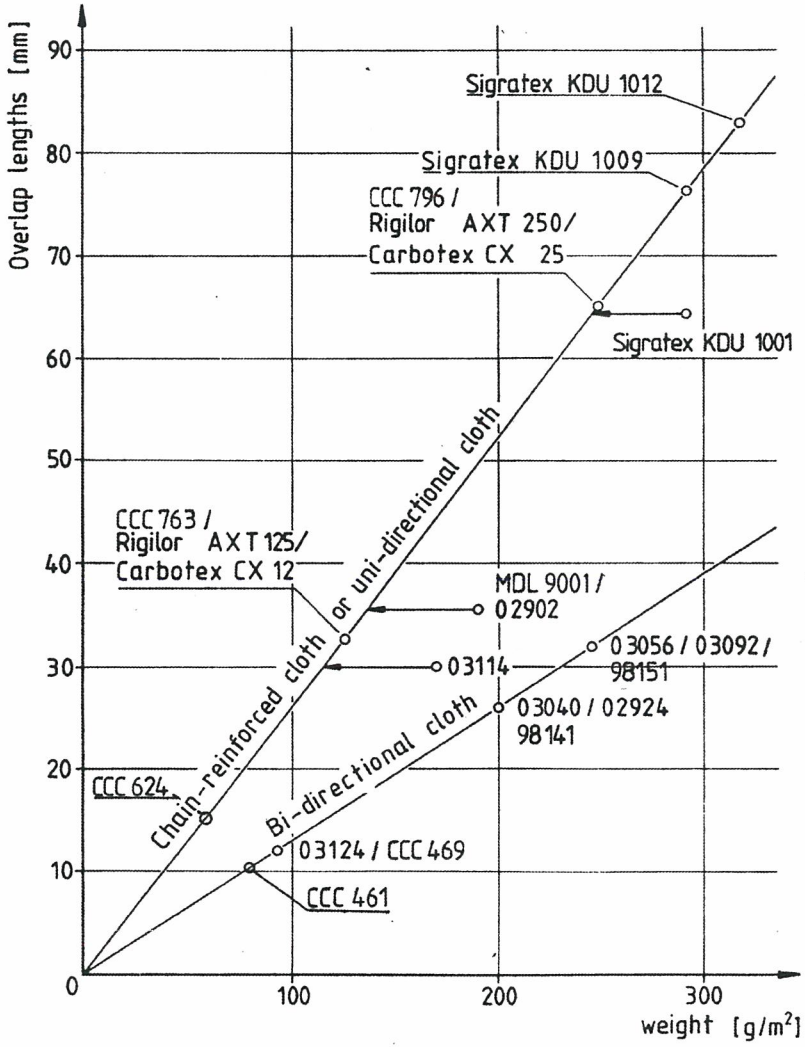
Scarf lengths are half as long as overlaps.

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 Benzstraße 14 89155 Erbach	C. Cramer GmbH & Co. KG Weberstr. 21 48619 Heek-Nienborg

CARBON FIBER MATS

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

ROVINGS,

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

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

FOAM MATERIALS — As per: 14.01.94

PVC hard foam 5.1360.2 according to DIN 29 898

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

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

RESIN FILLERS:

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

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

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

PAINT

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

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

new Post Code: D-36163

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

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

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

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

Notes:

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

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

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

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

Poppenhausen, July 4, 1994

ALEXANDER SCHLEICHER
GmbH & Co.

Gerhard Waibel

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

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

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

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

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

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

Substitute for Carbotex CX 12 and CST 125, respectively:

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

Substitute for Carbotex CX 25 and CST 250, respectively:

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

X) Currently available ex stock from SCHLEICHER!

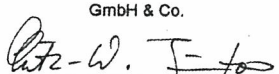
This Repair Instruction must be inserted as Annex into the Repair Manual !

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

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

Poppenhausen, July 7, 1998

Alexander Schleicher
GmbH & Co.

By order 
(Lutz-W. Jumtow)

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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.

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.

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

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

Applicability: Sailplanes and powered sailplanes:

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

all variants

Urgency: None

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

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

Poppenhausen, 1. May 2013

Alexander Schleicher
GmbH & Co.

i.A. M. Grei

(M. Greiner)

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