ALEXANDER SCHLEICHER SEGELFLUGZEUGBAU

D - 6416 Poppenhausen / Wasserkuppe

Flight and Operations Manual

for the Sailplane Model

A S W 2 0

July, 1977 Edition

This manual is always to be carried on board !

It belongs to the sailplane A S W 2 0

Serial No. ....20476.....

Registration No. ....C-GTRM.....

Owner : .....

.....

.....

Manufacturer : Alexander Schleicher
Segelflugzeugbau
D-6416 Poppenhausen

This manual is the translation of the German original which is approved by the Federal Office of Civil Aeronautics of the Federal Republic of Germany (LBA). The translation has been done by best knowledge and judgement.

In any case the original text in German language is authoritative.

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1.1 Preface

The ASW 20 has been licensed according to the 'Airworthiness Requirements for Sailplanes and Powered Sailplanes' (LFSM), issued on November 1, 1975.
Contrary to earlier requirements (BVS and LFS), some major modifications have to be observed.
Please notice that the minimum safety factor is 1,5. The safety factor is the proportion of ultimate load against limit load.
This points to important consequences for the flight operations :
Breaking loads will be reached either by exceeding the permissible loads by 50% or by exceeding the permissible speeds by a $\sqrt{1.5}$ = 1.22 factor, in other words by only 22%.
Therefore the stated placard speeds must be observed at all times.
One major difference is that the new regulation requires a speed limit for strong air turbulence. The new LFSM requirement considers a 15 m/s (3.000 feet per minute) up or down gust.
For easier understanding the following examples are given :

1. From a 5 m/s downdraft you enter a 10 m/s upcurrent (this is a + 15 m/s gust), or from a 10 m/s upcurrent you step into a 5 m/s downdraft (this is a - 15 m/s gust).

2. From the downdraft of a rotor of - 8 m/s you get into its upcurrent of + 7 m/s (this is a + 15 m/s gust).

This turbulence can be absorbed by the sailplane as long as the pilot does not charge it by additional loads due to unintended control

deflections.
The airworthiness requirement does not include gust and maneuver loads simultaneously.
Gliding and metereological literature show even stronger turbulences (in cumulo-nimbus clouds e.g.) so that max. speed for 'strong turbulence' can be too high in extreme situations.
At maneuvering speed full control deflections can be applied, but only 80% of the deflections are allowed for elevator and rudder simultaneously.
As mentioned above the requirement does not cover gusts and maneuver loads at the same time. Therefore aerobatic maneuvers are not allowed in noticeable turbulence.

At redline speed the sailplane can absorb either + or - 7,5 m/s gusts (this is the transition from 3 m/s downdraft into 4,5 m/s lift), or one third of the possible deflections can be applied.
Again gust and maneuver loads cannot be absorbed simultaneously.

Airworthiness requirements are nothing more than a great amount of aviation experience gathered to the present time and are continously developped by designers and aviation authorities in cooperation.
It is assumed that sailplanes are operated with good judgement as in all areas of aviation.

A short chapter of aerodynamics for pilots of flapped sailplanes.

The introduction of so-called 'laminar' airfoils in the sailplane design - specially together with fiberglass structure - has resulted in great improvements of sailplanes during the last 20 years. For sailplanes with rigid profiles - that means without flaps - the profiles used provide moderate laminar effects for the whole angle of attack range, from thermalling up to highspeed cruise at 150 to 180 km/h.

In order to reduce drag laminar airfoils have been developped for modern sailplanes, they extend the laminar boundary to a greater part of the wing surface. The disadvantage of this method is that the lower drag can only be achieved for a smaller range of angle of attack. By the flap movement, however, this range of low drag can be shifted up to the point where it is needed at the momentary flight condition.

Please notice that the angle of attack against the airflow is the dertiminative figure for the flap position and not the flying speed.

In order to calculate the speed to fly for a given angle of attack, the altitude, the load factor (g-load), and the wing loading of the sailplane must be known in addition.

The effect of the altitude may be neclected, since the airspeed indicator always shows an airspeed reduced to m.s.l.

Every pilot knows from his instruction time that the minimum speed goes up in steep turns or when loading the aircraft with ballast (fuel, flight instructor). In conformity to the same law as the minimum speed the speed ranges of the single flap settings do also shift by changement of the wing loading and/or the load factor.

The following table will show to you the coherencies. The data stated are based on performance measurements.

W/S lb/sqft	Load factor	Min. Speed (knots) Flap Pos. 5	Low Drag Speed Range [knots] Flap Pos. 4	Flap Pos. 3	Flap Pos. 2	Flap Pos. 1
5	0.5	26	27 – 30	30 – 41	41 – 50	above 50
	1.0	36.5	38 – 42.5	42.5 – 58.5	58.5 – 71	above 71
	1.3	41.5	43 – 48.5	48.5 – 66.5	66.5 – 81	above 81
	2.0	51	53.5 – 68.5	68.5 – 82.5	82.5 – 101	above 101
8	0.5	29	31 – 34.5	34.5 – 47	47 – 57	above 57
	1.0	41.5	43 – 48.5	48.5 – 66.5	66.5 – 81.5	above 81.5
	1.3	47.5	49 – 55.5	55.5 – 75.5	75.5 – 92.5	above 92.5
	2.0	59	61 – 78	78 – 94.5	94.5 – 115	above 115

W/S (kg/m²)	Load factor	Min. Speed (km/h) Flap Pos.5	Low Drag Speed Range [km/h] Flap Pos.4	Flap Pos. 3	Flap Pos. 2	Flap Pos. 1
	0,5	48	50-56	56-76	76-93	above 93
≤	1,0	67,5	70-79	79-108	108-132	above 132
≤	1,3	77	80-90	90-123	123-150	above 150
	2,0	95	99-127	127-153	153-187	above 187
	0,5	54	57-64	64-87	87-106	above 106
≤	1,0	77	80-90	90-123	123-151	above 151
≤	1,3	88	91-103	103-140	140-171	above 171
	2,0	109	113-145	145-175	175-213	above 213

Now these above-mentioned coherencies should not confound the ASW 20-pilot nor make him give up because it is too complicated. There is a very simple method of estimating the correct flight attitude.

The flap has been designed such that the changement of the angle of attack produced by flap deflection just compensates the difference of angle of attack which results from the new flight attitude. This means that the fuselage and tailplane remain always almost parallel to the airflow.

Since the glide angle is very flat for the whole speed range of the ASW 20, the relation of the ship to the horizon remains the same for load factor 1 (1g) provided that the flaps are used properly. A simple pitch indicator will move only in a small range, even in turns and other accelerated maneuvers, and, therefore, is a good control instrument for the low drag- angle of attack. (This is, however, not true for flap position 5 or for extended air brakes because in this case you are leaving intentionally the aerodynamically optimum ranges in order to produce more drag).

The table also shows the control actions for some flight maneuvers.

Principally, a flapped glider has two pitch controls : flaps and elevator. However, only <u>one</u> combination of both control settings results in optimum performance for a given flight attitude.

Case 1
Acceleration from thermalling to fast cruise :

According to the law that energy remains constant we can only pick up speed (kinetic energy) by giving away altitude (potential or static energy) with regard to the air around us. This is only possible by reducing our g-load (or load factor) below 1.

For thermalling our speed was 85 km/h and n = 1.3 (because of 40° bank) in flap position 4. Now we want to accelerate downwards (n = o.5) and, pursuant to our table, therefore simultaneously must reduce bank and put the lever at least into No. 3 position, but as soon as our speed exceeds 92 km/h we must even put the flap lever into position No.2. If we now do not do anything else, the static stability of the sailplane will balance out at approximately 130 to 160 km/h and load factor 1. If we want to fly faster, we have to set flap position No.1.

The stick shows only little movment during the whole maneuver which manifest itself also by the fact that the trim hardly needs to be adjusted. With a conventional rigid profile wing the whole trim range would be needed for such a maneuver.

Case 2
Pullup into a thermic from very high speed (wing loading 33 kp/m^2) :

From fast cruise of 200 km/h (1g) a pullup into a thermic shall be done. This is impossible without increasing the load factor. Since turbulence is to be expected, a mild 1.3 g - pullup should be initiated.

Looking at our table we find that flap position 1 still should be set for load factor 1.3 and 200 km/h

The pullup is initiated by slightly pulling the stick. At about 183 km/h flap position 2 is set. The sailplane meanwhile climbs so rapidly that no further pulling is necessary and a straight climb at load factor 1 is following. Flap position 2 can be maintained down to 130 km/h, then flap position 3 is set.

To finish the climb, we are shortly setting flap position2 which is reducing the load factor to about 0.5, then bank is applied and simultaneously the flap lever is shifted to position 4. The stick position is again the same during the whole maneuver and the trim needs only slight adjustment.

- In a flapped sailplane the flap handle is the more active pitch control whereas the stick is more or less a correcting control.

- The flap handle directly controls the wing lift and is, therefore, much more sensitive than a conventional elevator which through rotation of the aircraft changes the angle of attack, and thus relatively slowly changes the lift.

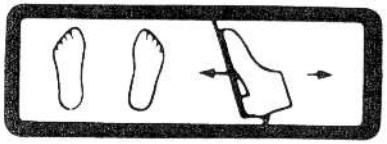
- At high speed flight of above approximately 180 km/h the pitch is merely controlled by elevator movement, since flap position 1 covers more than the angle of attack range which is necessary.

For low altitude flights (approach, slope soaring, finish gate low passes) and when thermalling together with other sailplanes you absolutely have to leave off the operation of the flap handle because of the sudden altitude changes which are hardly to calculate.

1.2. Operating Handles, Placards, and Nomenclatures

Stick with wheelbrake lever and transmitter button (optional).

Rudder pedal with longitudinal adjustment.

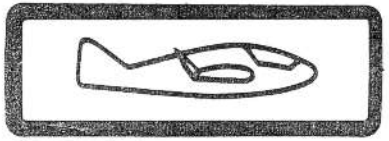


Rudder pedal adjustment :
grey knob RH of control stick

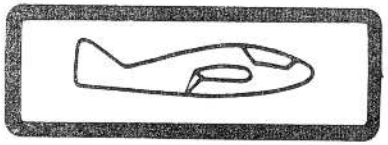
To move pedals back :
Take load off pedals and pull back. Release control knob suddenly and put slight pressure on pedals to adjust them.
To move pedals forward :
Pull knob and simultaneously push pedals forward. Release control knob suddenly and lock in place by putting slight pressure on pedals.

Flap control : Black lever on upper LH cockpit wall.

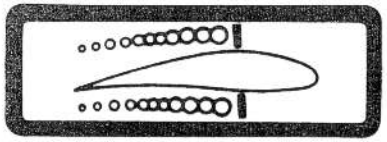
Marking of the essential flap positions by numbers 1, 2, 3, 4, and 5 below the flap lever.



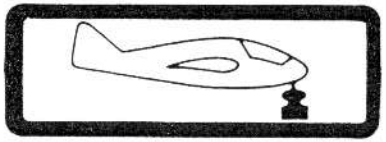
FLap lever in high speed position



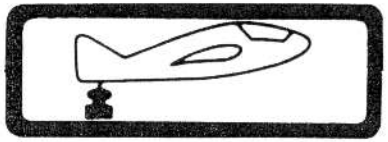
Flap lever in landing position



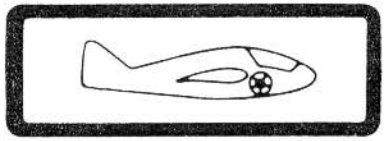
Air brakes (spoilers):
Blue lever on LH cockpit wall. Extending of air brakes by pulling lever backwards.



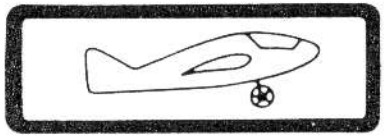
Trim noseheavy:
press together the green trim knob(left cockpit wall) and push forwards.



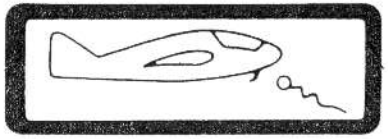
Trim tailheavy:
press together the green trim knob and push backwards.



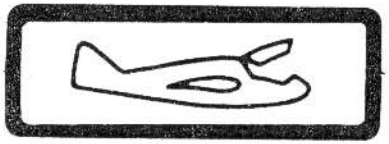
Landing gear retracted :
Black handle on lower LH cockpit wall pulled back.



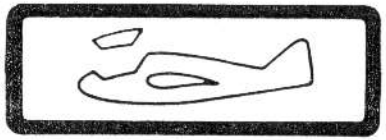
Landing gear extended



Tow release :
Yellow knob LH of stick



Open canopy :
Move white knobs LH and RH on upper side of canopy frame forward.



To jettison canopy:
Pull red handle above instrument panel; the normal canopy locking mechanism must be opened before !!!

Ventilation :
Light blue knob above LH area of instrument panel.
Knob pulled = Open

Additional ventilation :
Intake in sliding window

Water ballast :
Dark blue lever LH and RH on upper cockpit wall. To open valve move lever forward.
Note : LH lever for left wing tank, RH lever for right wing tank.

<u>Anchoring point for parachute static line :</u>

Red ring on main bulkhead

Serial number and Type Plate:

A. Schleicher
6416 Poppenhausen

Muster: AS – W 20
Werk Nr: 20 XXX
Kennz :
Made in West Germany

loading of baggage compartment.

Loading of baggage max. campartment 15 kp [33 lb]

Data Placard and loading scheme:

Segelflugzeugbau A.Schleicher Poppenhausen
Type: S.No.

Data plate

Permission for:		
Winch Launch	up to	
Aero tow	up to	
Max. speed	up to	
Maneuvering speed	up to	
Max. speed for flaps pos.	1	
Max. speed for flaps pos.	2	
Max. speed for flaps pos.	3	
Max. speed for flaps pos.	4	
Max. speed for flaps pos.	5	
Gear down	up to	

Weight and Balance

single	max.		min.	
dual				

Max. permissible all up weight

1.3.

Operation Values and Limitations

Maximum indicated airspeeds

(equivalent airspeeds are about 5 % higher, see page 49)

For flap position 1 (below 3000 m m.s.l. / 9000 feet m.s.l. *)	265 km /h(143 knots)
For flap position 2	200 km/h (108 knots)
For flap position 3	200 km/h (108 knots)
For flap position 4	160 km/h (86 knots)
For flap position 5 (lan-	120 km/h (65 knots)
In rough air **	180 km/h (97 knots)
With full control deflec- tions (maneuver speed)	175 km/h (94 knots)
For winch and auto tow	120 km/h (65 knots)
For aerotow	175 km/h (94 knots)
For extending landing gear	175 km/h (94 knots)

For this purpose the following colored calibration markings appear on the airspeed indicator :

Red line at		265 km/h (143 knots)
Green range between	90 and	180 km/h (48,5 and 97 knots)
Yellow range between	180 and	265 km/h (97 and 143 knots)
White range between	85 and	200 km/h (46 and 108 knots)
White marking WK 5	at	120 km/h (65 knots)
WK 4	at	160 km/h (86 knots)
WK 2 and 3	at	200 km/h (108 knots)

The yellow ▷ at 90 km/h shows the recommended approach speed for landing.

* Please note : The inflight flutter tests are done at about 2.500 m to 3.500 m m.s.l.
Since the airspeed indicator reads too low values

at increasing altitude, the critical flutter speed , however, is more or less determined by true airspeed for light aircraft, the following speed limits are valid for high altitude flights :

Altitude meter m.s.l.	feet m.s.l.	Max. Speed (indicated km/h	knots
o-3000	0-10.000	265	143
5000	16.400	240	130
7000	23.000	215	115
9000	29.500	195	105
11000	36.000	170	92
13000	42.600	145	78

If the above limited values are not exceeded, the true airspeed will be constantly 315 km/h above 3000 m / 10000 feet m.s.l. and thus is high enough to face the strongest wind in wave flight.

**Please note : Rough air, according to airworthiness requirements, is turbulence found in wave rotors, thunderstorm clouds, dust devils and when skimming mountain crests. An experienced pilot will know that he must be aware of even stronger turbulence in thunderstorms or in alpine regions.

Weights (masses)

Empty weight with min. equipment	about 255 kg/ 565 lbs.
Max. all-up weight	454 kg/ 1000 lbs.
Max. weight of non lift producing components	235 kg/ 518 lbs.
Permissible water ballast (depending on cockpit load)	max. 120 kg/ 265 lbs. or 32 US.Gal.

See table on page 20.

Preventive actions against flutter caused by special conditions of operation

In very hot weather conditions (temperatures above 35°C; = 90°F) in USA, Australia, South Africa and Brazil, low frequency flutter has been observed on some individual ASW 20 (frequency of about 5 Hz = 5 cycles per second), with strong sideways oscillations of the control stick.
Beside the high temperature of 35 °C, other conditions - as mentioned hereafter - must be met:

- low flying altitude
- water ballast of 80 - 120 kg (175 - 265 lbs)
- flap position 1
- flying speed of about 230 km/h (125 kts).

As until today no satisfactory explanation of the phenomenon could be given, neither by test nor by flutter calculation, we have tested the installation of a flutter damper. Fitting and removing the damper is relatively easy (see page 40 m).

For gliders registered in Germany a general installation of the damper into all ASW 20 seems not to make sense, as the above operational conditions are not given.

If flights in hot countries are planned, the installation of the damper is strongly recommended.

The damper could be tested in outside air temperatures of up to -35 °C (-31 °F) without the roll control being inacceptably restricted. If flights at great altitudes and/or in very cold weather are planned the damper must be removed.

During the flight tests with the damper it was found that after short familiarization the damper was no more felt as discomfort. On the other hand the directional stability of the ASW 20 in turbulent air is considerably increased, as short and sharp gusts do not lead to uncontrolled aileron deflections due to the damper.

Weak link in towing line

600 kg (1320 lbs) for auto / winch and aerotow

In Flight Center of Gravity

Datum point is the leading edge of the wing root rib (without the fillet of the wing - fuselage fairing).
The horizontal reference line is the center line of the fuselage tail cone or a 1000 : 45 wedge template levelled out on the top side of the fuselage aft portion (see the page "rigging data" in the appendix).
In flight center of gravity range is from 240 mm (9.45 inch) to 360 mm (14,17 inch) behind datum.

Cloud flying

The sailplane is suited for cloud flying.

Flights under icing conditions are not recommended, specially if the glider has been wet before climbing through the icing level. Experiences have shown that in the area of the rather narrow control gaps, any rain or condensation drops dry off relatively slowly and turn to ice when climbing above the freezing level. Therefore, one has to face a stiffening of the controls, leading to blocked controls in extreme cases.
Isolated climbs above the freezing level with a dry sailplane did not lead to any stiffening of the controls, even though the leading edges of wings and control surfaces showed severe icing.

Flights with water ballast above freezing level should be avoided because of the risk of icing-up of the tank ventilation.

Aerobatics

Without water ballast semi-aerobatics are approved for the ASW 20. Further particulars see page 29.

Seating position:

1. Do not use soft seat or back cushions which are thicker than 2 cm.
2. The backrest must be adjusted such that the pilot is seated with his head just below the canopy and as far forward as possible. When the stick is in the normal position (trim 10 mm off the front edge of the slotted gate), the upper arm should rest against the body while the elbow rests on the upper thight. Such a comfortable seating position is preventive against PIO (pilot induced oscillations).

Extreme Pilot Sizes

Tall pilots can fly without the adjustable seatrest, however, they have to use a stiff cushion that levels the edge of the towing hook fairing and the box of the wheel. They should also use gym shoes with heels as low as possible so that theycan use the most forward pedal position.

Small pilots should check prior to start if they can apply full rudder deflections and if they cannot fall off the pedals with their feet. If necessary, a board with a support for the heels can be installed on the pedals.

Do not use soft (lead or sand) seat cushions. We recommend to use only trim weights in the fuselage nose and seat cushions made from a foam which cannot be compressed (Styrofoam, Conticell or safety foam like Dunlopillo etc.).

Limit Load Factors

At 175 km/h (94 knots) :

maximum positive load factor	+ 5.3
maximum negative load factor	- 2.65,

reducing proportionally with airspeed to

maximum positive load factor	+ 4.0
maximum negative load factor	- 1.5

at 265 km/h (143 knots).

1.4. Weight and Balance Information

Payload in cockpit (pilot plus parachute) :

minimum 70 kg (154 lbs)
maximum 115 kg (253 lbs)

For possible exceptions see page 31 !

If the useful load is below the minimum, the shortfall below the minimum payload must be made good by the addition of trim weights in the fuselage nose (this is available as an optional extra, see page 20a).

We recommend that unexperienced pilots and/or pilots who fly this model for the first time, do not make their first flights with the rearmost C.G. position, i.e. they should not go for a just still acceptable minimum payload, but should stay approx. 10 - 15 kg above the minimum useful load in the pilot seat.
Light pilots should fix about 4 trim discs more than the actually required minimum.

The loading of the baggage compartment has no significant effect on the CG location. It must not, however, be loaded by more than 15 kg (33,1 lbs). Hard objects weighing more than 1 kg (2.21 lbs) should be carefully secured in the baggage area in order to prevent accidents.

Loading of Water Ballast

The maximum all up flying weight of 454 kg (1000 lbs) must not be exceeded. For the determination of the proper amount of water ballast the following table may be used :

Payload [lb] for Pilot + Parachute

Empty Weight [lb] see page 31

	150	175	200	225	250
525	full	full	full	30	27
550	full	full	30	27	24
575	full	30	27	24	+
600	30	27	24	+	+
625	27	24	+	+	+

Water Ballast in US Gallons

+ These weight combinations exeed max. permissible weight of non lift producing components.

E. Steinweller, Fulda 03 8081 79

Empty Weight [kp] see paga 31

Payload [kp] for Pilot+Parachute

	65	75	85	95	105	115
240	voll	voll	voll	voll	109	99
250	voll	voll	voll	109	99	89
260	voll	voll	109	99	89	79
270	voll	109	99	89	79	+
280	109	99	89	79	+	+

As an option the ASW 20 can be equipped with a pin in front of the rudder pedals which allows the installation of interchangeable trim weights.

These trim weights are recommended if the sailplane is flown by several pilots of more than 20 kg (45 lbs) difference in weight.

By the installation of a permanent lead trim weight in the tail above the tail skid the glider is trimmed in such a way that the heaviest pilot gets an in flight C. of G. of about 0,3 m behind datum. This is causing, of course, an increase of the minimum permissible cockpit payload so that a light-weight pilot cannot fly the sailplane without additional ballast.

In order to avoid the taking along of heavy and unwieldy lead cushions a light-weight pilot shall install trim-discs at the bolt in front of the pedals

The lead discs weigh 1 kg (2.2 lbs) each.

Since the weights are installed so far forward in the sailplane, they have 2.5 times the effectivity

of the same mass in the seat.

If 1 kg is installed in front of the pedals, the minimum cockpit payload is by 2.5 kg (5.51 lbs) lower; if 2 kg (4.4 lbs) are installed, the payload is by 5 kg (11.02 lbs) lower, and so on.

Remark (important !) :

1. Only 7 weights, i.e. 7 kg, are allowed to be installed at the fittings.

2. The nut must be properly fixed and checked for every take - off. Itmust be safetied with a safety pin.

3. If the minimum cockpit payload trimmed by the ballast weights is exceeded by more than 30kg (66 lbs), i.e. if a heavier pilot wants to fly again, the trim weights have to be removed.

The inner cockpit wall at the right hand side must show the following placard :

Minimum Cockpit Load without Trim Weight kg (lb)
1 Trim Disc is equivalent to 2,5 kp (5 lb) Cockpit Load

Check Weight and proper fixing of Trim Discs prior to Start.

1.5.
Minimum Equipment

Airspeed indicator with 50 to 300 km/h range
(25 to 160 knots, 30 to 190 mph),
Lap and shoulder straps,
Parachute or back-cushion at least 6 cm thick
(2.5 inches) when compressed,
Altimeter.

Additional minimum equipment for cloud flying :
Turn and bank indicator,
Compass,
Transceiver (Federal Republic of Germany only).

Experience to date has shown the pitot pressure system for the airspeed indicator satisfactory for cloud flying.

If the compass cannot properly be compensated on the instrument panel, it should be mounted either above the control stick or on the right cockpit wall in the area above the map pocket.

Instruments which weigh more than 1.000 grams (2.2 lbs) should not be mounted solely with the 4 instrument screws, but should be braced against one or possibly several of the rubber buffers.

It is strongly advised to use only instrument panels made from fiberglass. Panels made from other materials might, in the case of crash landings, lead to serious injuries.

An equipment list of approved or suitable instruments for the minimum equipment can be found in the annex of this manual (see page 47a and 47b).

1.6.
Emergency Procedures

Recovery from spins according to (German) standard procedure
(1) Apply opposite rudder, i.e. against the direction of rotation of the spin.
(2) Short pause.
(3) Ease the control column forward, until the rotation ceases and sound airflow is established again.
(4) Centralise rudder and allow sailplane to dive out.

Remarks :
1. Recovery from spin can be easierachieved, if the flaps are set in negative position (handle forward). Extending the airbrakes (spoilers) slows down rotation speed, but needs more height for recovery and, therefore, is less recommended.
2. If the ASW 20 recovers itself from spin, it starts a spiral-like sideslip with high increase in speed. Recovery from this flight attitude is done by usual control movements (opposite rudder and reducing bank by use of ailerons; approx. half travel of controls is needed).

Emergency Bailout
(1) Open (white) canopy locks.
(2) Pull red canopy emergency release knob and push canopy upwards.
(3) Open safety harnesses.
(4) Try to push yourself away from the sailplane. Watch the tailplane !

Jammed Elevator Control Circuit
A jammed flap control system will convert the ASW2 into a 'rigid profile' sailplane. However, not every pilot will remember that he still has pitch control by use of flaps even though the elevator control circuit is jammed. Thus he probably still can improve his situation for an emergency bailout or even avoid bailout entirely.

1.7.

In Flight Information

Instructions for rigging and derigging are given on pages 32 to 34.
After rigging it is advisable to check all controls, dive brakes, wheel brake, and tire pressure.
Even when the sailplanes is hangared it must be preflighted by checking all controls.
According to experience hangared sailplanes are subject to hangar switching damages and are endangered by small animals.

Winch Launch

Maximum winch launch speed is 120 km/h (65 knots, 75 mph). Recommended flap setting is No.3 (0°).

When the trim lever is in the center or in slight back position, the sailplane lifts off by itself and takes to a moderate climb. When safety height is reached, slight back pressure can be applied.

The landing gear can only be retracted after the tow.
Winch tows with water ballast are only recommended with more than 10 knots headwind.
There is a strict warning :
No tailwind tows on low powered winches !

Aero Tow

Maximum aero tow speed is 175 km/h (94 knots, 109 mph). Tested lengths for manila or nylon tow-ropes are within the 25 - 60 m (80 to 200 feet) range. For tows behind 180 hp or even stronger tow planes the tow-rope should be at least 40 m (130 feet) long.
For take-off roll flap position No. 2 (-6°) is recommended. After about 50 km/h (25 knots) have been gained, flap position No.3 (0°) or even No.4 (+9°) is applied for earlier lift-off.

Pilots with little experience on flapped sailplanes should use flap position No.3 for the whole tow.

The pilot should try to keep the tailskid on the ground until take-off. This means several advantages. Lift-off will be at the earliest possible time. The landing gear gets lower loads. The direction stability during ground roll is considerably improved. During flight tests aerotows with stronger than 25 knots crosswinds were demonstrated.

After take-off an altitude of about 5 feet should be maintained in order to avoid pitch oscillation because of ground effect and turbulence behind the towplane. Retracting of the landing gear is only allowed after release, since the landing gear doors cover the towing hook.

Free Flight

Because of the possibility of loading the ship with water ballast, the all up weight varies in a wide range.
The following speeds are given for an all up weight of 350 kg (772 lbs). The speeds for maximum all up weight of 454 kg (1000 lbs) are given in brackets.

Minimum speed in level zero bank flight is :

For flap position 4	70 km/h or 38 knots (80 km/h or 43 knots)
For flap position 3	72 km/h or 39 knots (82 km/h or 44 knots)
For flap position 2	73 km/h or 39,5 knots (83 km/h or 45 knots)
For flap position 1	76 km/h or 41 knots (87 km/h or 47 knots)

For flap position 5 (flaps 55° down, ailerons -8° up) minimum speed in level flight is :
66 km/h or 35,5 knots
(75 km/h or 40,5 knots).

Extending of the airbrakes (spoilers) increases minimum speeds by approx. 7 km/h or 4 knots.

In bankings the minimum speeds are increased. An increase of 10 % is valid for 30° bank, 20 % are valid for 45° bank.

About the proper use of flap settings this manual has already informed you at length in the preface page 8.

Maximum approved wing loading is not always the most favorable, the type of flight rather has to be considered.

For long distance flights ballast is not necessary, since the optimization of weak morning and evening thermals matters and not a slightly increased cruising speed.

For speed tasks the following wing loadings are proposed :

0 to 1 m/s (200 feet per min.), flying weight should be as low as possible (wing loading below 33 kg/m^2 or 6,75 lbs per sq.ft.)

1,5 m/s (300 feet per min.), flying weight about 360 kg or 800 lbs (wing loading 35 kg/m^2 or 7.2 lbs per sq.ft.)

If the rate of climb is higher than 2 m/s (400 feet per min.), the ASW 20 should fly with max. all up weight of 454 kg (1000 lbs).

Dangerous Flight Attitudes

The ASW 20 has an extremely harmless stalling flight which is indicated by large stick movements without noticeable speed change. The aileron effectivity, too, is noticeably weaker when stalling speed is reached. In all configurations approach to stall speed can be noticed by slight tail buffeting.
Even in stalled flight attitude (the vario will read 1,5 to 2 m/s sink in calm air, that is 300 to 400 feet per min.) ailerons and rudder work in the usual manner, as long as only half control deflections are applied. Full control deflections result in light wing dropping, whereas full deflected controls in opposite directions with stick pulled completely back will cause rapid wing dropping.
Initiated from turning flight wing dropping is more rapid than from level flight.
The loss in altitude for wing dropping is about 20 m (60 feet). For flap position 5 (landing position) loss in altitude can be 50 m until recovery, since the airflow may separate from the horizontal tail surface, if the elevator remains in full up deflected position. For recovery move stick in less pulled back position, until elevator effectivity is regained.
Only at rear C. of G. positions (near minimum cockpit load) the ASW 20 will not maintain a stationary stall with the stick hard back, but starts 'porpoising'.
Full deflections of rudder and aileron will cause wing dropping, opposite rudder and aileron deflections will lead to a spin. Wing dropping as well as spinning are terminated with the (German) standard procedure (opposite rudder and elevator neutral, see page 22).
If no corrective measures are taken, the sailplan will terminate the sideskid or spin by itself and will pass into a spiral-like side slip. This

side slip can also be terminated with opposite rudder, before the ship eventually changes to a spiraldive with the typical build-up of high speeds.
At forward C. of G. positions the ASW 20 spins very steeply and starts spiraldive after less than one turn, whereas at rear C. of G. positions the gliders pitch becomes steeper and steeper after an initial flat and slow turn (approx. 30° negative pitch) until the transition into spiraldive develops after 5 to 7 turns.
Rain drops, hoarfrost, and icing deteriorate the aerodynamic flow and will cause a change in flight characteristics. Therefore, a safety margin of 10 km/h, 5 knots or 7 mph should be added to the above speeds for level flight and circling. These speeds must be regarded as minimum speeds.
Again we point out that the ASW 20 spins easier and flater with positive (down) flap settings (4 and 5) than with negative (up) flap settings (2 and 1).
Therefore, setting the flaps in negative positions is a measure to prevent wing dropping and spins. Because of the involved altitude losses (about 15 m or 50 feet) this is impossible near the ground or when thermalling in gaggles. Here only a safety margin in extra speed compared to minimum speed is good airmanship.

Landing

Lower the landing gear in time, at the latest in 100 m (300 feet) altitude, and put the flap lever in position No.4.
The approach normally should be made at about 90 km/h or 48,5 knots (yellow ▷ at airspeed indicator), this speed should be trimmed. For turbulent air a correspondingly faster speed must be flown. Only if the pilot is very sure that he can make the threshold of his airstrip, the flap lever is moved to position No.5 (flaps 55° down).

Because of the enormous aerodynamic twist of this flap configuration (flap down, ailerons up) the performance of the sailplane is bad in this flap setting. By extending of the airbrakes (spoilers) the performance can be further reduced (glide ratio 4 in 1 at 85 km/h or 46 knots) so that very steep approaches are possible with headwind.

● For strong headwinds flap setting No.5 is not recommended because of the danger of landing short off the field.

● Those pilots having no experience with flaps for landings should only use flap setting 4 for headwind landings !

Setting the flaps from position No.5 back to position No.4 is not recommended near the ground because of the danger of loss in altitude. This maneuver should only be done after plenty of training at a safe altitude and in a very careful manner.
In flap position No.4 sideslipping is very effective with the ASW 20. At low bank and high yaw angles the loss in performance is great.
In flap position No.5 such great yaw angles are impossible.

Because of the good landing qualities which can be achieved by flap setting 5 in combination with the variable effectivity of the spoilers sideslipping is restricted to extreme situations (approaches in rain, snow-showers or into the sun), since then the landing field can be observed more easily through the slide window.
Therefore, landing with sideslip should be practiced occasionally under good conditions.

Water ballast must be dumped before landing !

Semi Aerobatics

Besides spinning (only with normal to rear C. of G. limits more than one turn is possible) the following aerobatics are approved :
Loops, Stall Turns, Lazy Eight, and Chandelle, as well as combinations of these maneuvers.
Negative load factors are not certified. The flap control is actuated according to the remarks in the preface (see page 8). The speed limits for the different flap settings must be carefully observed.

Loop

A starting speed in the lowest point of about 160 to 180 km/h, 85 to 95 knots, or 100 to 112 mph is recommended. Flap setting No.1.

Stall Turn

A stall turn is started with 190 to 210 km/h, 102 to 113 knots, or 118 to 130 mph. At about 100 km/h, 54 knots, or 62 mph the turn is started by full application of the rudder and, if need be, supported by some opposite aileron deflection. Flap setting No.1.

Lazy Eight

This maneuver can be done up to 180 km/h, 100 kts, or 112 mph in the crossing point. It is an excellent practice for control and airspace coordination which every pilot should exercise with flap setting No.2.

Chandelle

This maneuver is started like a stall turn, however, the transition to level flight must already be initiated at 110 km/h, 60 knots, or 70 mph, by applying full rudder and full contrary aileron deflections. The stick, too, must be remarkably pushed. Flap setting No.1.

Aerobatics are not approved with water ballast on board.

A warning seems to be necessary for aerobatics : Experiences with the ASW 15 and ASW 17 as well as the flight tests show that high g-loads can be much better absorbed by the pilot in the reclined position with legs higher up than in the older gliders or even in motor aircrafts. The temporary installation of a g-meter is recommended in order to get a feeling for the load factors.
The rubber suspended instrument panel amplifies ground roll shocks by a factor of 1.5 whereas the low-frequency g-loads in flight are read in correct manner.

1.8. Empty Weight Center of Gravity Limits

After repairs, installations of additional equipment, repainting of the sailplane etc. special attention is to be given to the empty weight center of gravity which must remain within the permissible limits.
Datum point and reference line are the same as stated in paragraph 1.3.
A diagram of the empty weight center of gravity location range is given on page 44. If these limits are maintained, it is assured that also the inflight C. of G. is within the permissible limits provided the load limitations have been properly observed.
The inflight C. of G. has a great effect on the flight characteristics, it is, therefore, absolutely necessary to observe the prescribed limits.

A C. of G. location aft of the rear limit is dangerous because this adversely affects the stall and spin characteristics. Moreover the elevator becomes hypersensitive.
Excessive forward C. of G. location leads to a loss in the flight performance and prevents from flying in the maximum lift range which is very important in tight circling.

Permanent Trimweight Installed Above Tailskid

After repairs on the front fuselage, if a heavy instrumentation is installed, or if the sailplane is very often flown by heavy pilots, it is useful to install a lead trimweight in the tail.

The weight of this lead ballast is determined by a weight and balance procedure. The basal surface of the cast lead should be 3,3 cm by 20 cm (1.3 inch by 7.9 inch) in order to get it through the opening of the fin spar. The lead is fixed to the fuselage by 2 bolts of 8 mm diameter. For its installation the rubber tailskid has to be removed.

Analogously to the resulting more tailheavy C. of G. position the minimum cockpit load is increased. The new cockpit load is determined according to page 44 and to be registered on page 31.

Arms for C. of G. calculations :

Lightweight pilot (65 kg or 143 lbs)
X_S = 625 mm vor BP
X_S = -24,6 inch forward of datum

Heavy pilot (115 kg or 253,5 lbs)
X_S = 550 mm vor BP
X_S = -21,65 inch forward of datum

Instruments in the instrument panel
X_S = 1250 mm vor BP
X_S = -49,2 inch forward of datum

Oxygen bottle (4 liter)
X_S = 80 mm hinter BP
X_S = +3,15 inch behind datum

1.9. Center of Gravity at the Last Weighing

Date of Weight and Balance	Empty Weight Center of Gravity	Payload in Cockpit incl. parachute minimum	Payload in Cockpit incl. parachute maximum	Signature of Examiner
MAY 18/92	25.35 643.89mm			Blaine Moore m325366
APRIL 12 1996	609.3 mm TAIL UT REMOVED			Dovie Scott m121520
FEB 5th 2002	627.0 mm	78kg	129 kg	SHAWN BRADSHAW 1408622
MAR 19 2004	632.7 mm REGULATOR & BISHKER REMOVED	80.5 kg	132 kg	

2.1.

Rigging

All pins and fittings including the ball pip fittings are to be cleaned and lubricated.
Insert right wing (2 prong-spar end)from the side into the fuselage tunnel, then left wing from the opposite side. Align the main fittings, push in the main pins and safety. Now the wing tips can be released.
Connect ailerons and dive brakes and double-check the connection by trying to pull the push-pull rods away from the ball fittings.
The horizontal tail, first, is only inserted into the vertical tunnel of the fin. Then the ball fitting at the elevator is connected. And now the horizontal tail is pushed back until the Allan bolt at the nose can be screwed in.
The l'Hotellier ball and socket connectors must be secured

The taping of the wing-fuselage junction with a plastic tape brings about a lot of performance with but small expenditure (1-2 points on the L/D).

The inspection hole of the fuselage above the wings must also be taped so that its cover plate is not sucked off at high air pressure loads.

Do not tape the canopy gap, otherwise any emergency exit is jeopardized.

It is recommended to wax the taping area prior to taping so that the tape can be removed later on without pulling the lacquer finish off.

Loading of the water ballast

Water ballast must only be filled into the rigged glider.

On page 20 of the Flight Manual the max. permissible amount of water is determined.

re that both wings get the same amount of
This may easily be verified by leveling
ded glider.

loading of water is not symmetrical, one
s both exit pipes by means of a short tube
ns both valves. With level wings the ball
ll become nearly symmetric. After the ba-
the valves are reclosed and the connec-
be is removed.

is done through the exit pipe near the
gear doors by using a big funnel. The fil-
th pressure water is strongly prohibited,
the ventilation pipe is too narrow and
er pressure becomes too strong when the
ir is full and will blow up the wing.

ng tank takes about 60 l (15.8 USGal.).
, this maximum cannot be carried, since
ateral acceleration will press some water
the ventilation.

re, you either fill the tanks full up and
e gallon (open the valve approx.10 sec.)
each side from the first with only 15
.

ht the full ballast can be dropped in less
minutes; this is equivalent to 1/4 USGal.
per second.

:

ll tanks the wing cannot be layed down
e wing tip on the ground because then the
wing is emptying through the ventilation

2.2. Checking

After rigging respectively prior to the first flight every day : Make sure that all assembly connections have been properly mounted and are safetied.
Check for foreign matters in the cockpit, check the controls for ease of operation.
It is advisable to inspect the entire aircraft from time to time. Many a bolt without safety and many a damaged area has been noticed this way. Especially with a newly developped aircraft such inspections are very important despite of the fact that the aircraft has been designed and built with care.

2.3. Derigging

First of all drop water ballast completely, disconnect the exit pipes. Derigging is done in inverted sequence like the rigging.

2.4. Road Transport

The Schleicher Company can supply drawings for a light weight trailer. It is important that the wings are sitting in well fitted saddles or are supported at the spar roots as near as possible to the wing root rib.
Good attachment points for the fuselage are : tail-skid, wheel, wing attachment pins, and the instrument panel bulkhead.

If transported on an open trailer, the ASW 20 can be made water-proof to a certain extent by taping up aileron gaps, dive brakes, canopy, pitot head and static vents. For some variometers a taping up is not allowed (e.g. Pirol, Bohli).

Since we are dealing, however, with a sailplane of which the performance depends on the quality of its surface, the purchase of a light, water-proof cover or better yet of an enclosed light-colored trailer is a good investment. It is important to keep the closed trailer well ventilated in order to avoid high temperature and high atmospheric moisture.

Road transport and parking of the sailplane with water ballast is prohibited.

2.5. Upkeep and Maintenance

Moisture is an enemy of fiberglass. Always take great care that no water remains in any corner. The upper dive brake boxes are not vented for performance reasons. They have to be kept dry with the aid of a sponge.
On the suspicion that water has soaked into different components, one should store them in a dry room and turn them over daily. Do not underestimate the amount of condensation which can get inside an airplane. Therefore, hangars and trailers should always be well ventilated (remove the instruments before a longer storage period).

If the glider is equipped with water tanks, special attention must be given to their maintenance. If the tanks are not needed for a longer period, they should be altogether removed. If they are in use, they should be removed and checked for leaks every month.

If water is found in the wing structure, the wing must be dried in the before-mentioned manner. Afterwards the tanks (which have to be also dry) can be reinstalled. To do this one is using the line in the wing nose which leads to a 30 mm Ø hole in the wing tip.

With this line the water bag is placed tautly into the wing nose. The line is wound up and safetied so that it cannot interfere with any mechanism. The ventilation pipe should be placed on top of the water bag.

With some training it takes only half an hour to remove, inspect and reinstall the tanks. The time spent standsin no relation to the damages which the water can cause in the structure if it remains there over a longer period.

Excessive sun radiation is harmful for the finish therefore, the sailplane should never be exposed to sunlight any longer than necessary.

The maintenance of the finish with a good cleaning and polishing compound (silicon-free, if possible) prolongs the life of the lacquer and improves the surface, an important factor for good performance. The advantages of a fiberglass aircraft can only be fully utilized if the surfaces are smooth and free from imperfections, especially in the area of the wing and control leading edges as well as at the fuselage nose.

The essential is not to have a light lustre but to remove all irregularities, such as dust perticles, mud splashes, insects etc.;
Experiences of competition pilots show that roughnesses caused by insects can reduce the slow speed performance by some 15 % and high speed performance up to 30 %.

Cleaning of the Plexiglass Canopy

The plexiglass canopy is best cleaned with a recommended plexiglass cleaner, in an emergeny soap and water will do. Use a soft cloth.

After landings on wet, muddy ground or in dusty fields the landing gear must be cleaned. For this purpose one removes the seat pan in order to get good access with a vacuum cleaner and to facilitate a thorough cleaning job.

The tire pressure should be between 2,5 to 2,7 Bar (35 to 38 psi) for 790 lbs all up weight. At maximum all up weight (when water ballast is used) 3,2 to 3,4 Bar (45.5 to 48 psi).
If the tire pressure is too low, the tire deforms to such a degree during landings that the landing gear doors will be destroyed.

The skidplate has to be removed in time or should be protected against excessive wear by welding several stellite beads on to it.

The rubber tailskid has been designed such that it will shear off under strong sideloads. It can be glued on again or repaired with contact cement. It is important to cover the gap from rubber skid to fuselage in order to prevent any peeling and catching of long grass.

The towing hooks are especially exposed to soil and dirt and require frequent cleaning and oiling. For this purpose remove the fiberglass seat pan.

Lubrication of the Bearings

Most ball bearings are, so far as possible, covered and, therefore, will normally require no special care for a longer period of time.

The control hinge bearings must be dismantled and relubricated at the annual inspection.

The Pitot and Static Pressure Ports

must be sealed off by taping for the transport on an open trailer provided that the instrument manufacturers allow this.

The Safety Harness

must be regularly checked for tears and corrosion spots.

If the safety harness installed is the asymmetric Autoflug type (Boberg), it must be checked that the short lap belt is installed on the right cockpit wall (in flight direction).

2.6. Overhaul

The tow coupling must be removed after every 2000 launches or every 3 years at the latest and has to be sent to the manufacturer for reconditioning.

For the Tost combi-release some facilities are valid (see accompanying paper in the log-book).

The rudder cables are to be renewed as soon as any wear spots are noticed.

2.7. Repairs

Smaller repairs on fiberglass components can be effected by the owner in accordance with the guidelines as set forth in the Repair Manual for the ASW 12, ASW 15, ASW 17, and the ASW 19.

All major repairs and overhauls have to be effected by the manufacturer. In case of doubt information and advise can be obtained from the Schleicher Company.

2.8. Notes for the Inspection

The dive brake boxes have no water drain.

After rain showers the boxes must, therefore, be dried with a sponge etc. For better sealing of the dive brake covering plates grease as used for accumulator maintenance has been found suitable.

It is very important to check the proper locking of the dive brakes from time to time. Every brake has its own dead point locking in the wing. Therefore, it has to be checked whether the left and right dive brake do reliably and simultaneously lock.
For this purpose connect first one airbrake to the ball fitting in the fuselage and mark the dead point (locking point) on the dive brake lever nylon bearing in the cockpit. Do the same with the other airbrake.
Both dead points should be apart from each other no more than 5 mm (0.2 inch). Otherwise the mechanism must be adjusted (screws in the pipes behind the baggage compartment). Moreover there should be a surplus forward range of the dive brake lever of about 5 mm (0.2 inch).
The wing root-fuselage junction must be checked at least on the annual inspection for play or looseness between the fuselage pins and the wing root holes. Play in this junction results in a clac-clac noise when the rudder is deflected and can lead to awkward tailplane oscillations at high speeds.
The play is removed by putting thin metal washers under one or several pins. The pins are pushed out of the fitting tube by feeding a steel rod through the hole of the opposite pin and blowing the pin out with a hammer.
The pin should be replaced after the installation of the washer with but some blows of a 1 lb. hammer.
If the fitting is too wide, the pin can either be safetied by 4 mm ø (0,16 inch) bolts and nuts or by treating the wide end of the pin slightly with a knurling tool in a lathe as it is used for macking rough handles on metal rods.

On major repairs of the control surfaces there is hte danger that they become heavier and that the C. of G. of the control surfacesmoves back.

With major repairs on the control surfaces there is always the danger that their weight and tailheavy moment then exceed the limits. This can lead to control surface flutter and we recommend, therefore, to take care from the first that repairs on control surfaces are made as light-weight as possible.
A table showing the permissible weights, the static tailheavy moments, and the permissible play of the control surfaces is provided in the Appendix (p.46). If these limits are exceeded, you should contact the manufacturer.

After repaintings on the control surfaces, e.g application of anti-collision or ornamental paintwork, advertisings or competition letters, the tailheavy static moments must be new established in all cases; for the static balance measurement see the drawing in the Appendix (p.45).
After painting jobs we recommend to check carefully that no ventilation or drainage holes have been filled up with filler or paint. In case of doubt new holes must be drilled in a place where water penetration, icing-up, and dirt are unlikely.

The strong pedal springs (5 kp = 11 lb. tension unexpanded; c = 1,5 kp/cm = 8,4 lbs/in) must not be exchanged against weaker ones, because they are required for a sufficient high rudder circuit frequency, in order to prevent flutter. Worn out springs must be replaced by new ones.

Prevention against flutter by checking the sealing of the wing control surface gaps: EITHER a) OR b)

a) Sealing with a plastic-treated fabric tape (TESABAND): the plastic coat on the fabric must not be damaged, discolored or even weather-worn. The tape must not tighten with full control surface deflections (negative). If the fabric tape is recessed into the wing contour, a turbulator (zig-zag or nap tape) must be fixed in addition directly in front of the fabric tape.
b) Sealing with an elastic lip (steel or plastic respectively): Check that there is a Teflon sealing tape underneath and that it is not damaged. Even with full control surface deflections (negative) a 100 % airtight fit of the steel (or plastic) lip must be guaranteed.

Inspection Program to Extend Service Life

1. General

Fatigue tests on CFRP wings and CFRP wing spars have shown that a service life expectancy of 12000 hours can be reached for these components without problems. However, as this fatigue test program did not examine the entire aircraft made of CFRP and GRP, this service life of 12000 hours can be granted only if the long-term airworthiness of each individual aircraft is demonstrated in a special multi-stage inspection program (over and above the mandatory annual C of A inspections) for the purpose of extending the service life.

2. Time Limits

When the aircraft has reached a service life of 3000, 6000, and 9000 hours respectively, an inspection must be carried out in accordance with a particular inspection program laid down by Messrs. Schleicher, from whom a copy of this program must be obtained. If the results of this inspection are positive in each case, or if any defects discovered have been corrected repaired, the service life of the aircraft is extended after its 9000 hours inspection by another 3000 hours, i.e. to a total of 12000 hours.

For a possible extension of service life beyond 12000 hours, detailed requirements will be established in due course.

Inspection Program

The appropriate inspection program must be obtained from Messrs.Schleicher. The inspections may be carried out only by the manufacturer, or by an appropriately licensed aircraft repairer.
The results of the inspections must be listed in an inspection report in which each item must be annotated with a comprehensive comment, as laid down.
If the inspection is not carried out by the manufacturer, but by a licensed aircraft repairer, a copy of the filled in inspection report **must** be forwarded to Messrs. SCHLEICHER for the purpose of evaluation.
Messrs. SCHLEICHER will issue an acknowledgement of receipt and send it back to the aircraft owner. Only then the inspector must certify the increase of the service life in the logbook and in the aircraft inspection records.

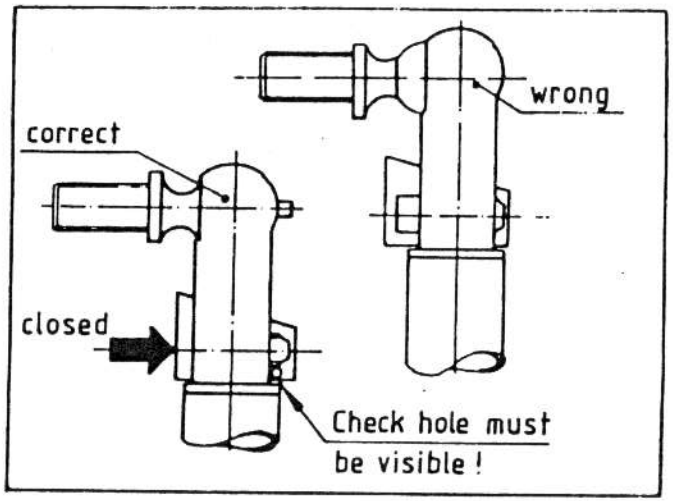
The need for annual Certificate of Airworthiness inspections and overhauls is not affected by this rule (for German registered aircraft § 27 (1) LuftGerPO* applies).

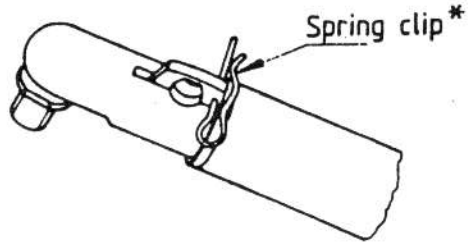
*LuftGerPO = Aircraft Examination Rules

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 control linkages, particularly the one at the elevator, were incorrectly assembled or their assembly was even completely forgotten. A sticker fixed to the fin serves to remind the pilot of the correct assembly. In addition all quick-release connectors **must** be secured by means of safety pins, spring clips etc.. With the older type of connectors their check hole must be drilled to approx. 1.2 mm dia. for this purpose. The aileron, flap and airbrake connectors in the fuselage must be secured analogously.



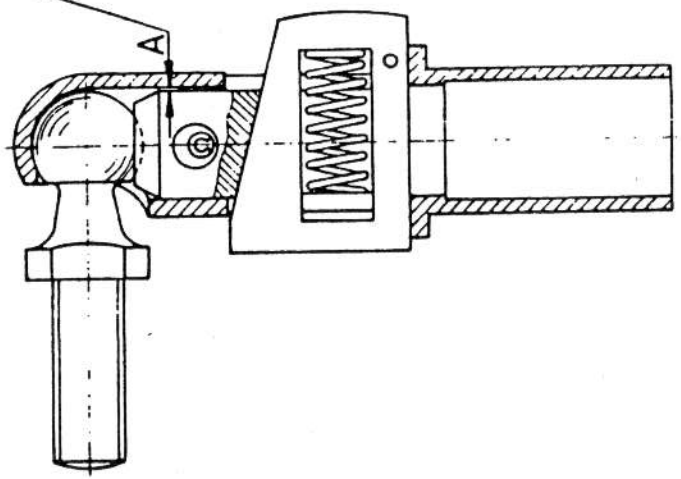


*Spring pin no.50030771 can be ordered from Alexander Schleicher or from A.Würth, P.O.Box 1261, 7118 Künzelsau, F.R.Germany.

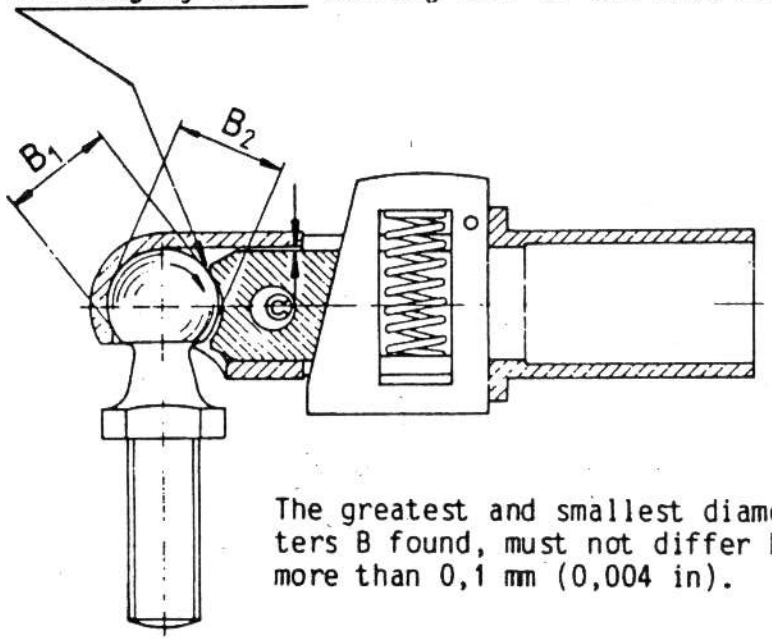
2. Inspection

According to experience accumulated in Australia the following inspection of the L'Hotellier connections must be carried out at every annual inspection, especially when the glider is operated frequently from sandy and dusty airfields.

Clearance A must not exceed 0,15 mm (0,006 in); check by using a wire of 0,15 mm diameter !

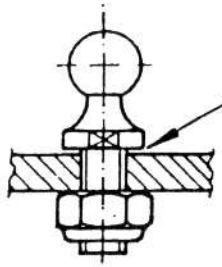


Bad wedging effect causing wear of the ball end.



The greatest and smallest diameters B 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 may be broken due to bending loads in the thread area.



Gap generated by unscrewing of the ball end or wear out of the fitting material.

Inspection, maintenance and adjustment of the tow hook

During operation the following incident has been noticed on several occasions:
On winch and aero-tow the tow hook releases under severe load - usually during a jerky start to the tow. There may be various causes for this; two of them have been found out.

1. Tow hook does not lock correctly.

2. Tow hook installation not correct for modified ring pair.

CAUSE 1:

a) Clean the tow hook from top to bottom, using compressed air if necessary. Remove the seat pan and the cockpit rear wall for this.

b) The operating cable is too short. Check that the plastic tube on the ball-grip does not strike the guide on the instrument panel. If necessary, shorten this tube ! Check also whether the cable is too short between the bellcrank on the pedal and the tow hook, or whether friction is too high. If necessary, the cable should be oiled or even replaced. When the tow hook is locked [illegible], then the upper bellcrank must not strike the pedal stand. If this should occur, or the crank has less than 5 mm (0,2 in) clearance to the pedal stand, then the bowden cable between the forward fuselage bulkhead and the forward tow hook bulkhead should be shortened, which then involves adjusting the brass cable ends. Check whether the bowden cable mentioned above is long enough to avoid the seat pan and the pilot seated in it pressing down on the cable and putting it under tension.

c) The automatic ring of the tow hook is stiff to move,and hence the tow hook cannot lock. If cleaning does not improve this, then the tow hook must be removed, replaced and overhauled.

d) The latching action of the tow hook itself is set up too critically. Consult the tow hook manufacturer.

CAUSE 2:

a) The modification to the double ring pair (large ring oval) makes it possible for the second ring (which is now larger) to touch the structure surrounding the tow hook and, if the cable is twisted, it can then cause the automatic mechanism to unlatch.

The solution here is to relieve the structure which surrounds the tow hook (this material is a mudguard only). The seam which supports the landing gear doors, can also be shortened to about 5 mm (0,2 in) in front of the tow hook.

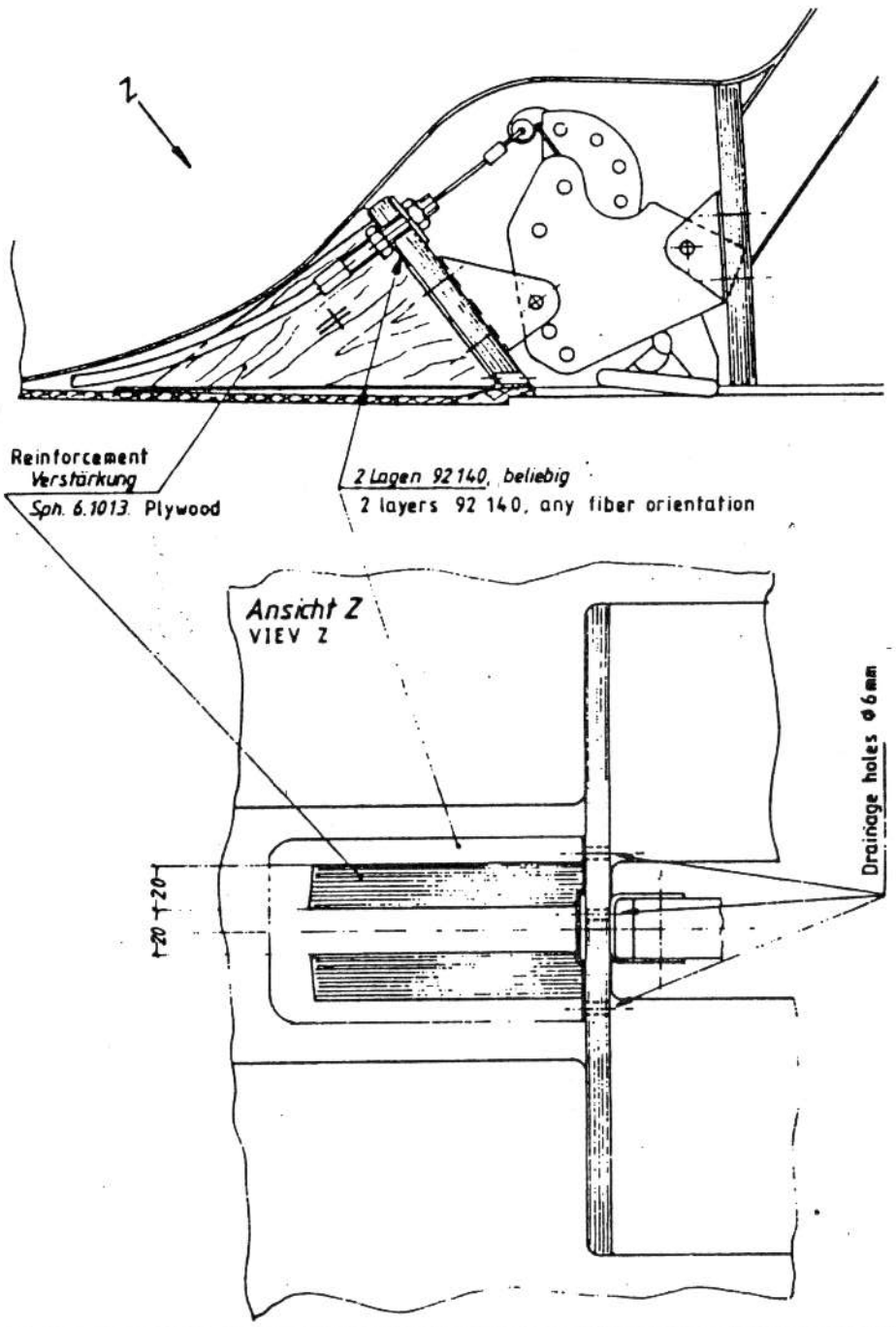
b) After a belly landing and/or if water has been allowed to stand in the cockpit for a long period, the glued joint between the rear tow hook bulkhead and the fuselage shell may fail. This weakens the tow hook installation to the point where the tow hook may twist under a severe load (such as occurs during cable snatches); this movement may be enough to cause a stiff and/or too critically adjusted tow hook cable to open the latch of the tow hook.
In this case the glued joint between tow hook and bulkhead must be repaired; clean up the gluing surface and fill the slot (e.g. made with a piercing saw blade) with a filler paste consisting of:

100 parts by weight	Epikote 162
38 parts by weight	Epikure 113
10-15 parts by weight	Aerosil.

Filler powders other than Aerosil must not be used, as they produce a weaker joint (microballoons) or swell when damp (cotton flock). If necessary, reinforce the repaired areas with an additional layer of glass cloth.

A successful reinforcement to the forward tow hook bulkhead of the C.G. tow hook has proved to be two wedge-shaped plywood blocks (see sketch on page 40h). Two layers of glass cloth 92140 are laid over the joint surfaces of the blocks, with random fiber orientation, and resined together.

Do not forget to preserve the water drainage holes !



4. Further notes for the annual inspection and for special inspections following belly, wingtip or cornfield landings

After belly landings the seat pan inside the cockpit must be taken out in any case, to detect and repair possible damage in this area.
For most repair cases it is not sufficient to replace abrased paint and FRP; but it is rather necessary to inspect and repair very carefully the supporting internal structure. Delaminated FRP looks white and/or the grey gelcoat layer shows cracks.
Special attention must be paid to the plywood bulkheads to which the control stick and the tow hooks are connected. These bulkheads are intendedly made from plywood, as they have proved to provide remarkable crashworthiness in severe crashes, the plywood breaking in a good, predictable manner and preventing effectively the control stick and the tow hook from hurting the pilot so that they slip off below the seat pan.
With minor incidents like belly landings on not so smooth grounds, the bulkheads may be damaged and, therefore, must be inspected and if necessary repaired. Especially the glued joint with the FRP has to be checked.

To save the above mentioned advantages in crashworthiness, the bulkheads should not be reinforced by FRP, specially not in the area where the stick is attached. On the other hand, good preservation of the wooden parts is necessary so that they cannot be weakened by rottening.

After wingtip landings and ground loops all control circuits have to be checked very carefully; especially if it can be assumed that the control surfaces, also the elevator, may have been exposed to great loads following contact with ground, grass, crops or bushes, and that, therefore, the control circuits may have been damaged.

One case of severe elevator flutter with an ASW 19 (which is very similar in design to the ASW 20) for instance could be explained by the fact that a buckled control rod had remained undetected. This caused a considerable reduction of the elevator control circuit stiffness which enabled the elevator flutter. It can be assumed that partially unglued or delaminated bulkheads and ribs, enlarged pushrod guides, loose and/or distorted fittings lead to the same effect.
Damage to the control circuits have also been detected following hangar rush and road transport so that after unusual events a thoroughful inspection is always necessary.

With landings in high crops or grass, there is the risk - especially when the landing position of the flaps was set - to overload and damage the flap control circuit. Most likely the flap pushrod inside the wing is buckled. Though this pushrod is not visible, it is easy to be checked. In flap position 3 (0°) and with the stick in the center position, the trailing edge of the flap is no longer in line with the fixed part of the root rib and the trailing edge of the aileron; also the flap actuating control is jamming when operated.

5. Inspection and testing of the emergency canopy jettisoning mechanism

During the annual inspection the emergency canopy jettisoning mechanism has to be actuated and checked for grooves and/or corrosion. If defects are found, the metal surfaces have to be smoothed using a file, sandpaper, etc.; grease well before reassembly.

Reference to available Maintenance and Repair Instructions

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"Maintenance and improvement of the wheel brake."

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"Aerodynamic improvement by sealing of the control surface gaps with strips of foam tape."

intenance Instruction C:
"Adjusting the airbrakes."

intenance Instruction D:
"Elimination of excessive control surface play and/or high-frequency vibration in the aileron control system caused by this."

intenance Instruction E:
"Improvement of cockpit comfort by referring to available different backrests and their positions, as well as to pedal rake angle adjustment, modified landing gear levers and different safety harness systems."

intenance Instruction F:
"Exchange of a wing pair." (This Maintenance Instruction applies to non-European gliders only).

Maintenance Instruction G:
Installation of turn point camera(s).

Maintenance Instruction H:
How to adjust the tow release coupling in case of unintentional release. This Maintenance Instruction has already been included with this manual amendment.

Maintenance Instruction I:
Adjusting control surfaces if the glider has a tendency to turn off from level flight.

Maintenance Instruction J Issue III dated 24.04.87:
describes how to apply an elastic lip seal (plastic fairing strips) to the control surface gaps on the wing upper and under sides.

Repair Instruction K dated 18.05.84:
Assembly instructions for the elevator actuator bearing fitting.

Maintenance Instruction L dated 26.01.90:
Exchange of the fourth elevator push rod in the fuselage.

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.

Amendments to:
Page 38, para 2.6 "Overhaul" and
Page 40 I, para 4. "Notes for the annual C. of A. Inspection"

Annual check must be done on rudder cables, S-shape cable guide tubes, towing hook release cable, and on all Bowden cables.
Particular attention must be paid to those areas of the control cables which with the normal pedal movements are bent at the ends of the S-shape cable guide tubes, and to the visible towing hook release cable ends.
Watch particularly for hand sweat and corrosion inside the Bowden cable sleeve (regard the FAA Advisory Circular AC 43-13.1A § 198, see LBA-Circular No. 10-02/89-1 dated 21.06.89!).

NOTE: Check the rudder cables inside the area of the steel tube 'S' by moving the pedals back into the rearmost position and then undoing the cables at their front mounting.

Rudder control cables and towing hook release cable must be replaced after each **3000 operating hours** respectively!

7. Preventive actions against flutter caused by special conditions of operation

Under operational conditions as detailed on page 17a of the Flight Manual, the installation of a hydraulic damper into the aileron control circuit is strongly recommended. In countries with desert climate where above mentioned conditions may occur several times a year, Schleicher recommends the general installation of this damper.

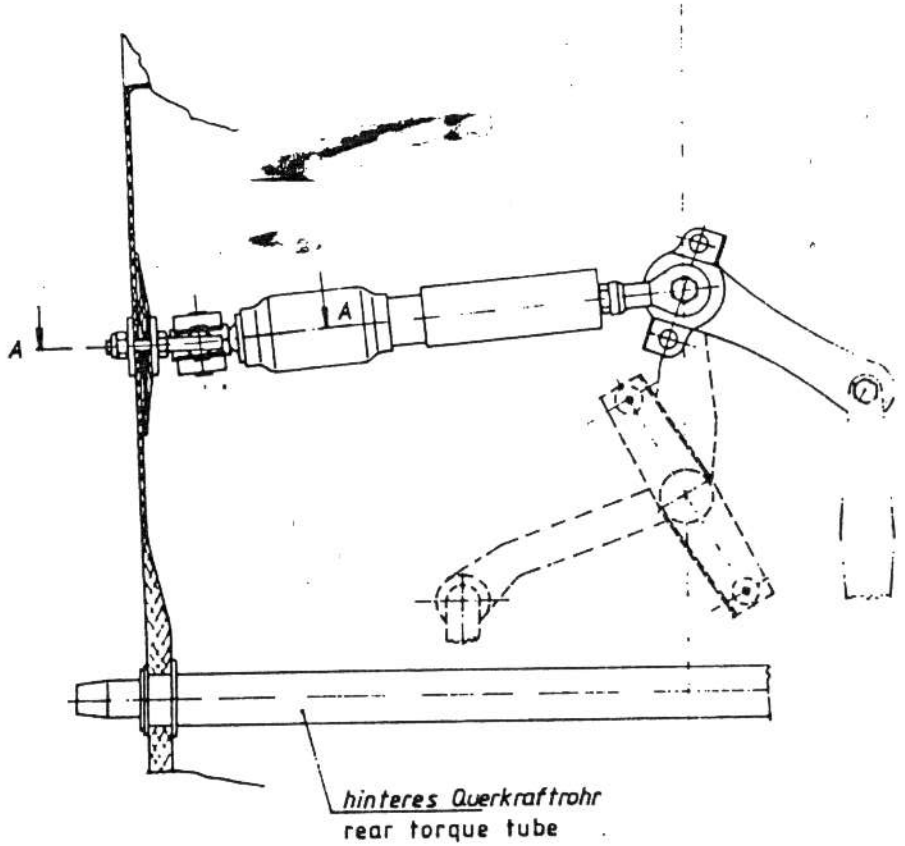
In the sketches on pages 40n thru 40r the installation of the damper is shown. For proper connection to the aileron control circuit a longer bolt M 6 must be used. For every installation use new self-securing nuts n M6 DIN 980/6 or N M8 DIN 980/6. The plywood ground plate is permanently glued into the wingroot rib (fuselage-side) and well preserved. The cutouts for the pushrods are not prefabricated, as they must be fitted individually for each glider.

After the installation of the damper it is most important to check the aileron control system for free movement in a special test.

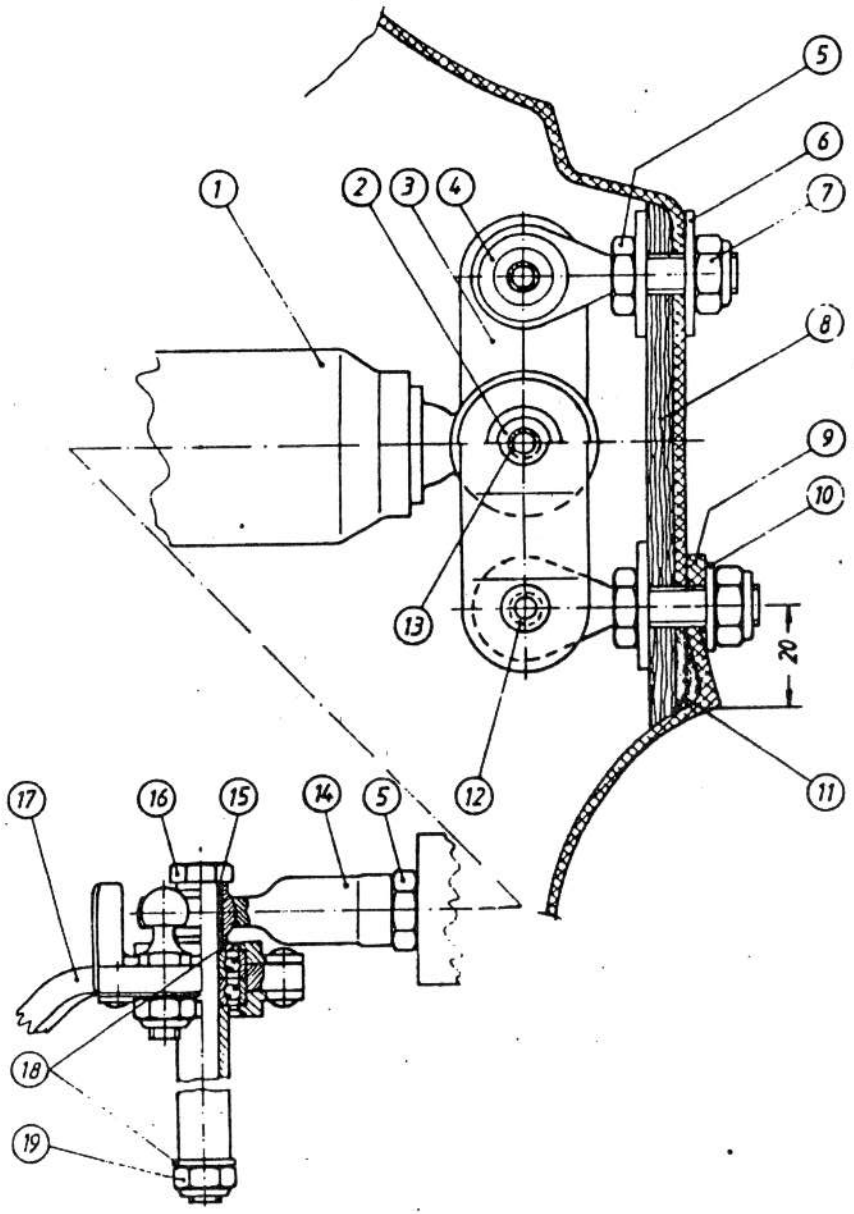
Kits for the installation of the damper are available from Schleicher directly or from their foreign agents.

The installation of the damper raises the fuselage weight by about 0,7 kg (1,54 lbs); the influence on the C.G. position is negligible.

Ansicht von oben
View from above

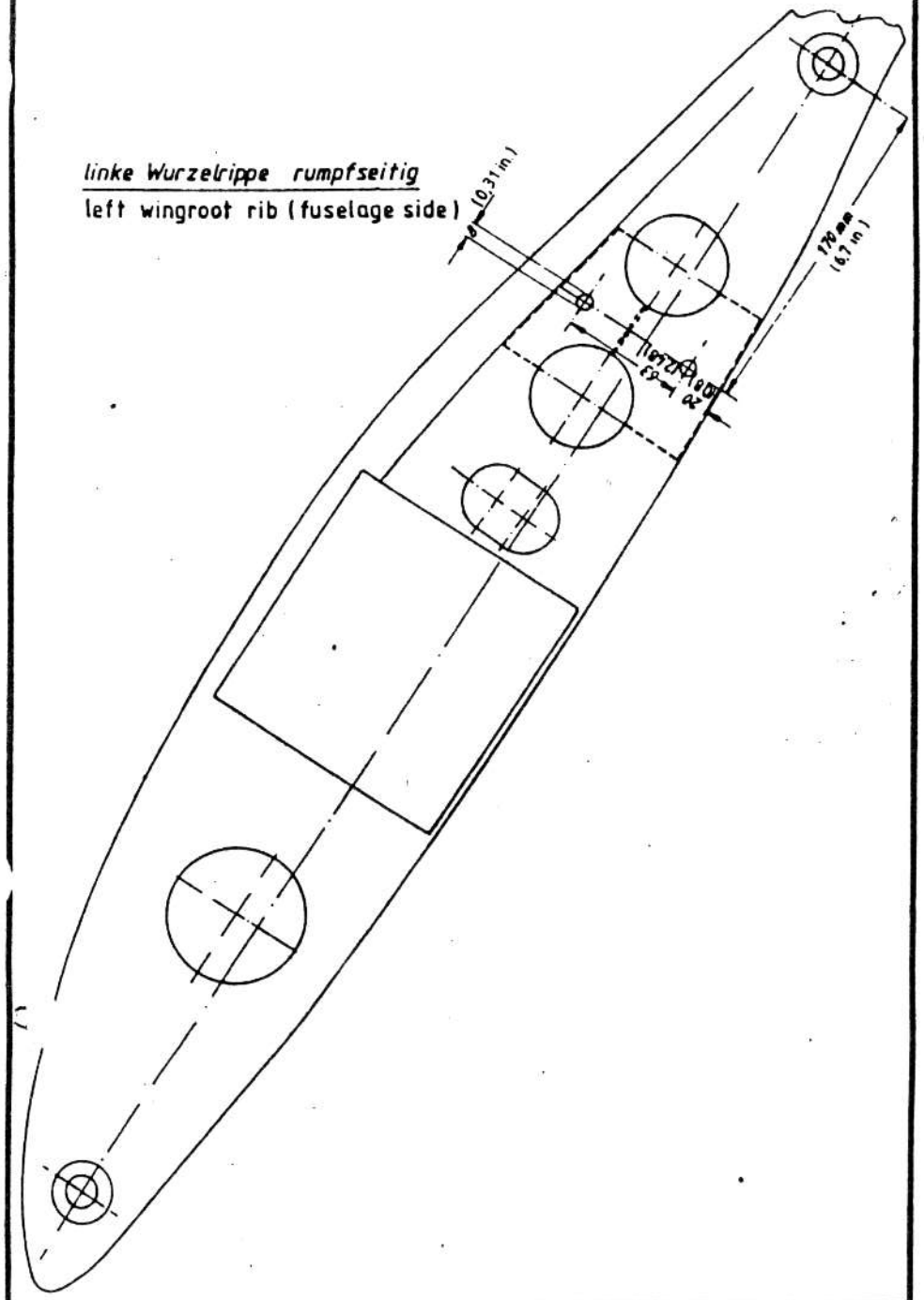


Schnitt A-A

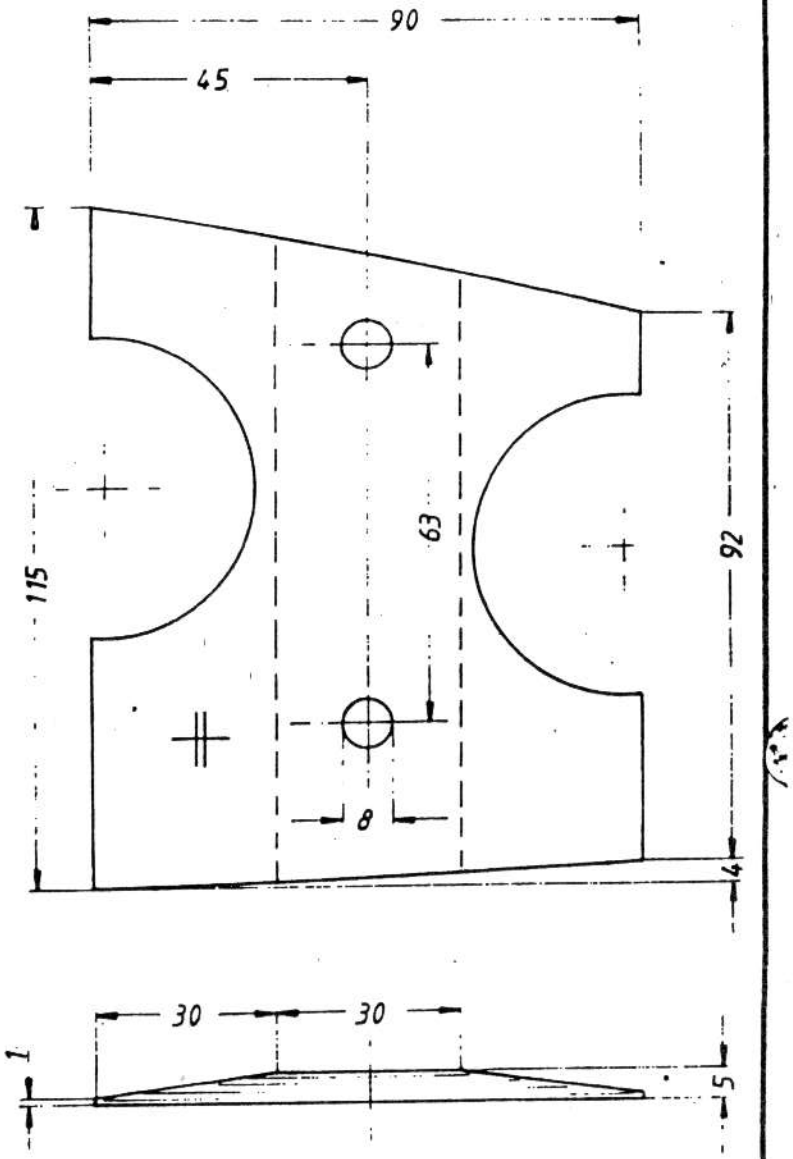


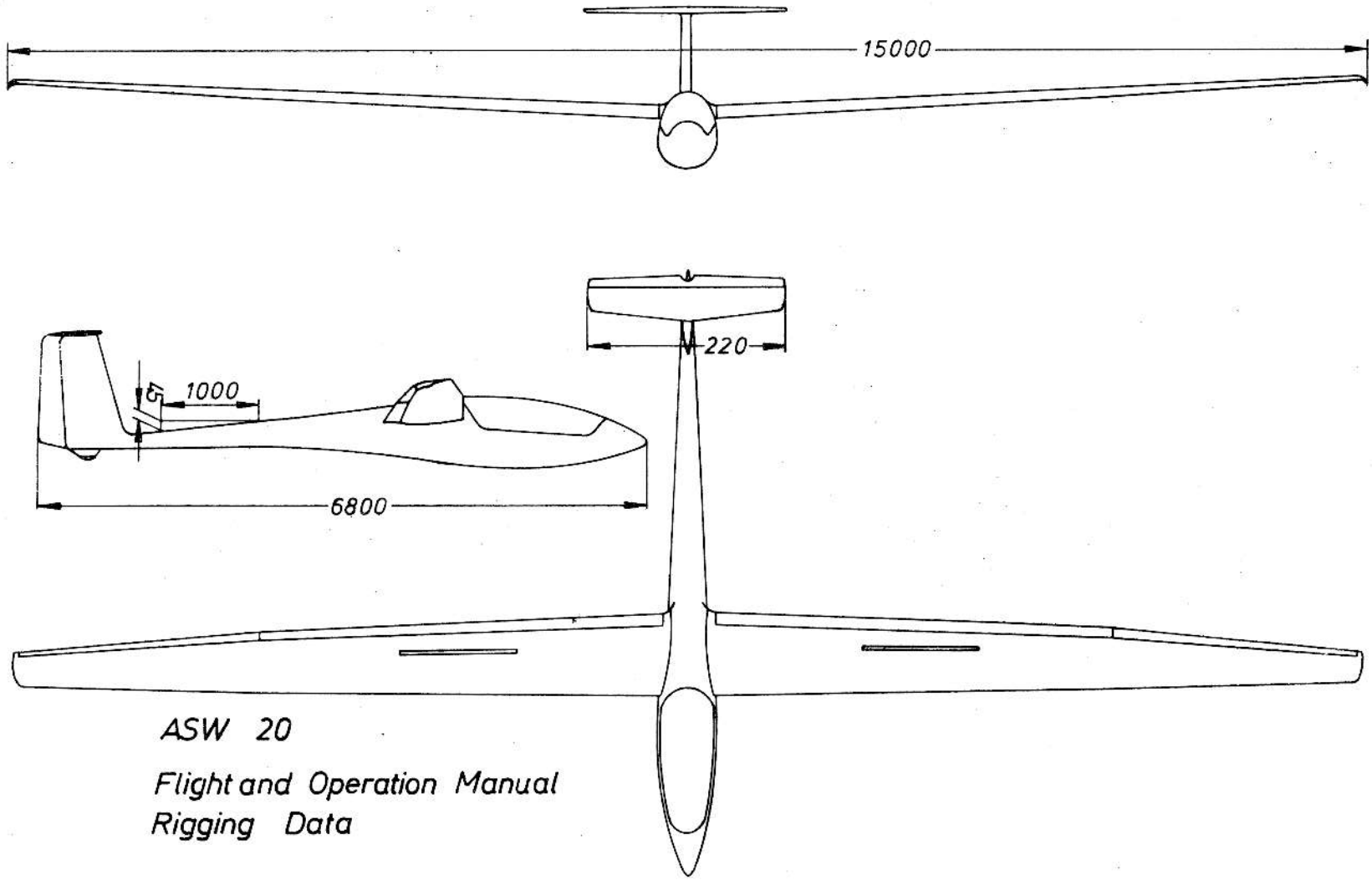
ASW 20 - Operations Manual

Benennung	LM. Nr	Werkstoff	Abmessung Teil- oder DIN-Nr.	Bemerkung
herungsmutter NM 6	19		DIN 980 - 6	
eibe 6,4	18		DIN 125 - St	
rieb f.Q.R i. Rumpf	17		200 41 0009	
hskantschraube M6 × 90 × 70	16		DIN 931 - 8.8	
anzbuchse	15		200 41 0021	
nkkopf GIR 8 GW	14			Fa. Elges
rnet B6 × 1 × 32	13		DIN 7340 - St	
rnet B6 × 1 × 17	12		DIN 7340 - St	
ilf	11			
eibe 8,4	10		DIN 125 - St	
eibe, konisch	9	GFK	ø 8,4 / 20 - 4	
stärkung	8	Sph. 6 1013 0	5 × 115 × 90	200 41 0101
erungsmutter NM 8	7	D	DIN 980 - 6	
eibe B 8,4	6		DIN 9021 - St	
hskantmutter M8	5		DIN 936 - 6	
nkkopf SMX CP 6.48.34	4			Fa. Hirschmann
che	3		200 41 0019	
tanzbuchse	2		200 41 0020	
pfer, elhydraulisch	1		01-20-070-200	Fa. Stabilus



rkung, Reinforcement
olz 6.1013.0 plywood





ASW 20

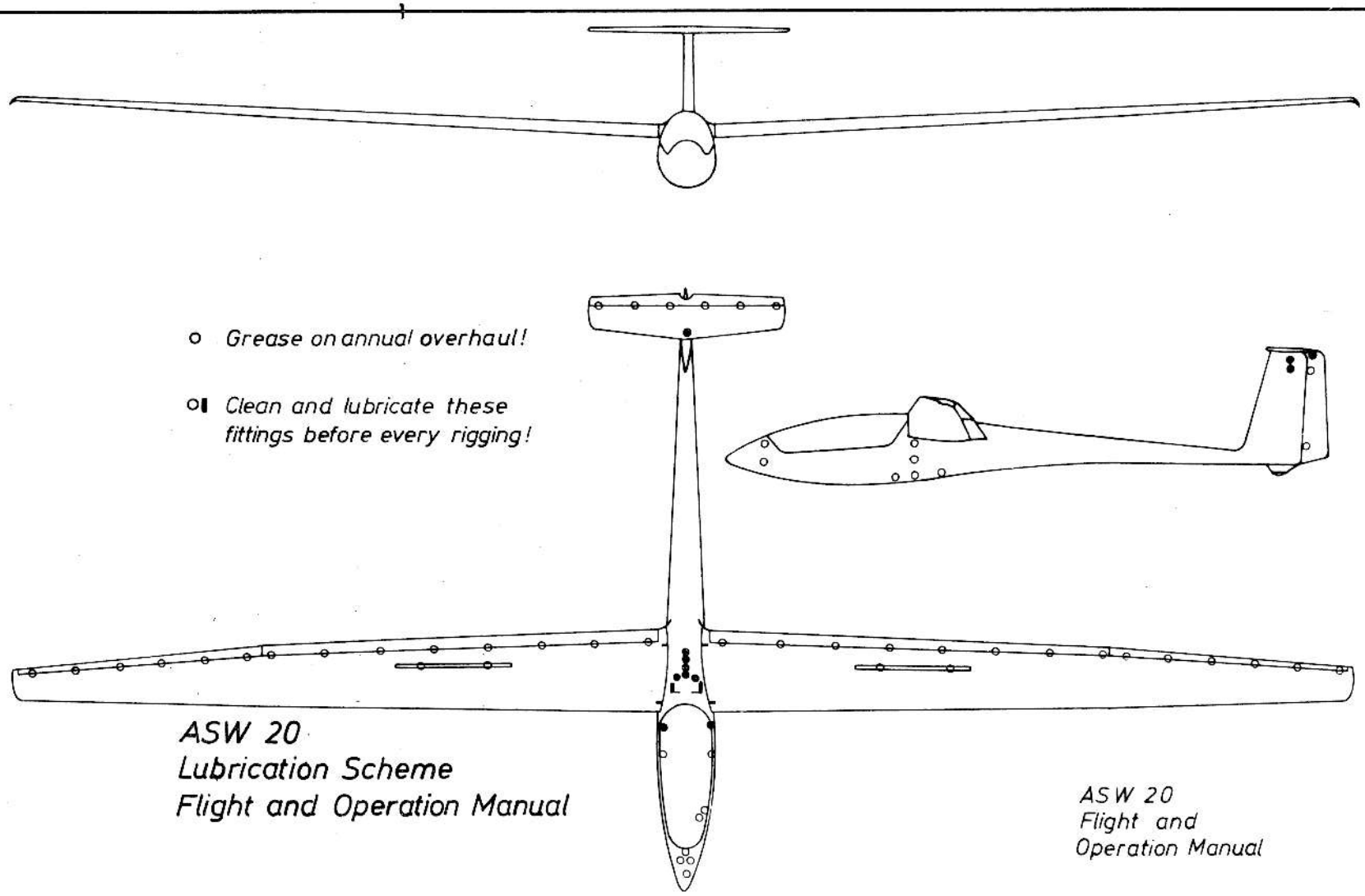
Flight and Operation Manual
Rigging Data

Control Deflections for ASW 20

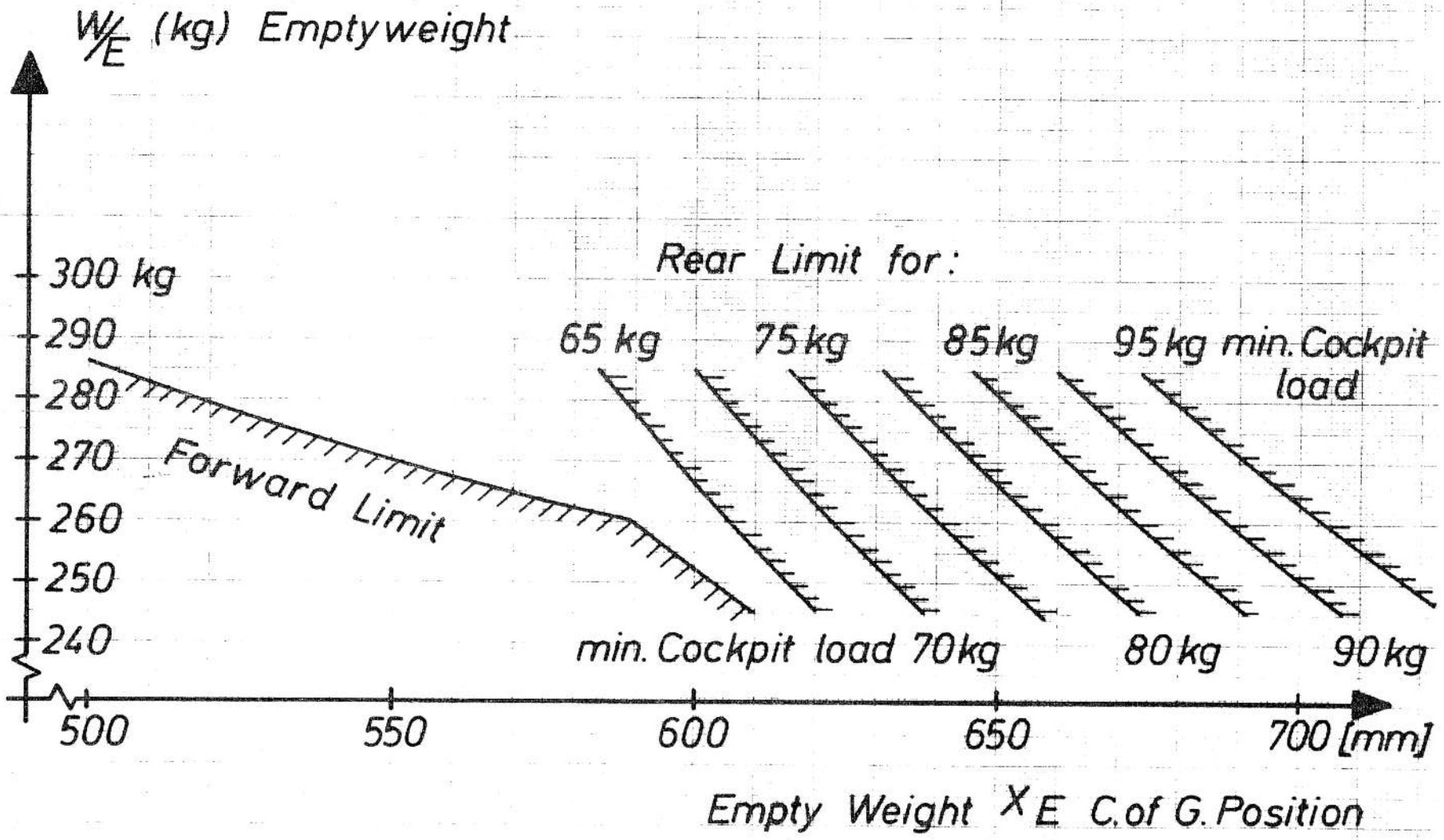
Flap Lever Position	Stick Position	right Wing Aileron	right Wing Flap	left Wing Flap	left Wing Aileron
① - 11°	right	-21° ± 2°	-17° ± 2°	-5,5° ± 2°	-1,5 ± 2°
	neutral	-11° ± 1°	-11° ± 1°	-11° ± 1°	-11° ± 1°
	left	-1,5° ± 2°	-5,5° ± 2°	-17° ± 2°	-21° ± 2°
② -6°	right	-21° ± 2°	-13 ± 2°	+0,5° ± 2°	+ 8° ± 2°
	neutral	- 6° ± 1°	- 6° ± 1°	- 6° ± 1°	- 6° ± 1°
	left	+ 8° ± 2°	+0,5° ± 2°	- 13° ± 2°	- 21° ± 2°
③ 0°	right	-16° ± 2°	- 7° ± 2°	+ 6,5° ± 2°	+ 14° ± 2°
	neutral	0° ± 1°	0° ± 1°	0° ± 1°	0° ± 1°
	left	+14° ± 2°	+6,5° ± 2°	- 7° ± 2°	-16° ± 2°
④ +9°	right	- 8° ± 2°	+ 2° ± 2°	+15° ± 2°	+20° ± 2°
	neutral	+7,5° ± 1°	+ 9° ± 1°	+ 9° ± 1°	+7,5° ± 1°
	left	+20° ± 2°	+15° ± 2°	+ 2° ± 2°	- 8° ± 2°
⑤ flap +55° aileron -8°	right	-21° ± 3°	+50° ± 3°	+60° ± 3°	+40° ± 3°
	neutral	- 8° ± 1°	+55° ± 2°	+55° ± 2°	- 8° ± 1°
	left	+ 4° ± 3°	+60° ± 3°	+50° ± 3°	-21° ± 3°

\+ means down deflection
\- means up deflection

Elevator: -22° ± 3,5; +18° ± 2°
Rudder: left and right 30° ± 3°

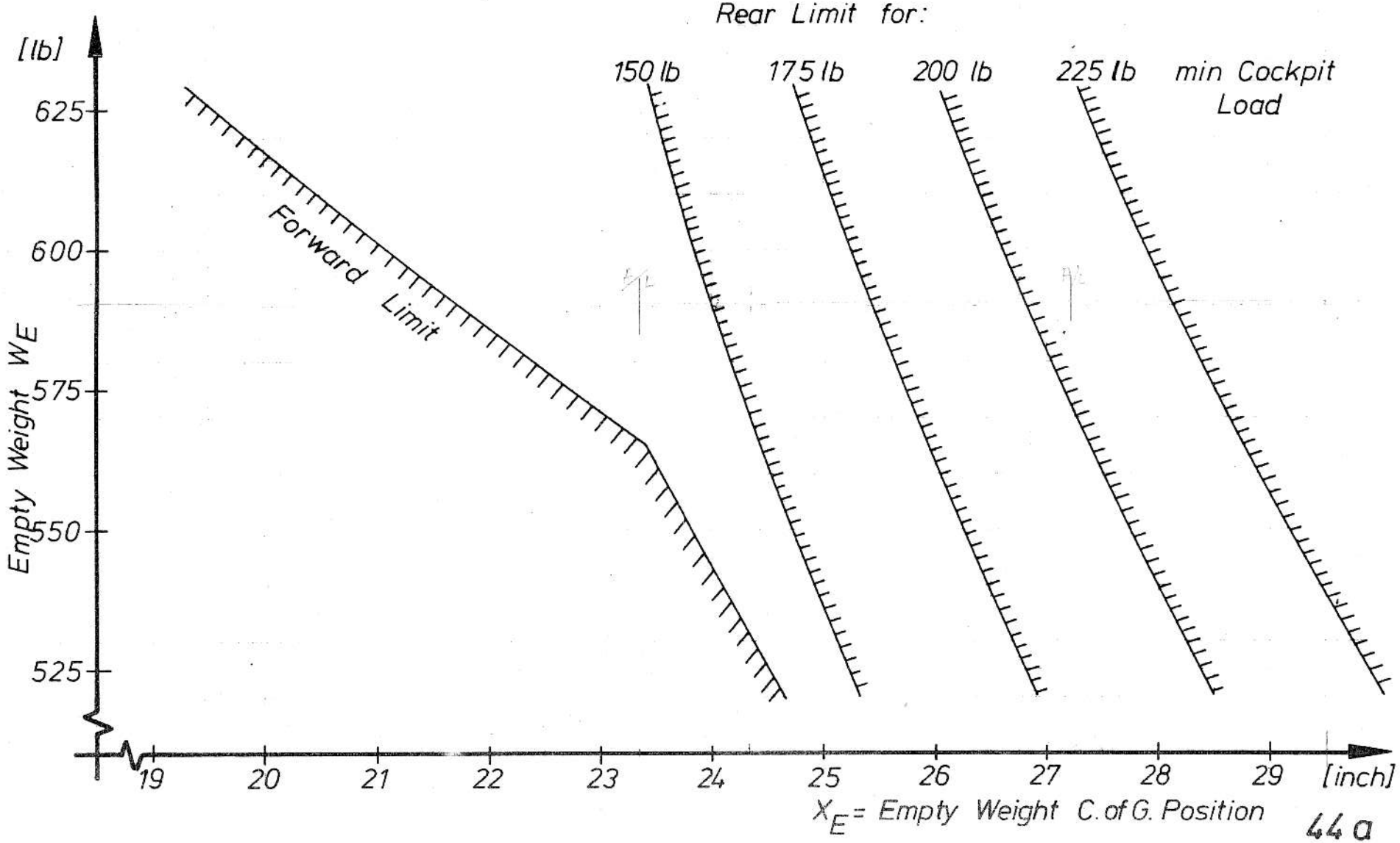


ASW 20
Lubrication Scheme
Flight and Operation Manual

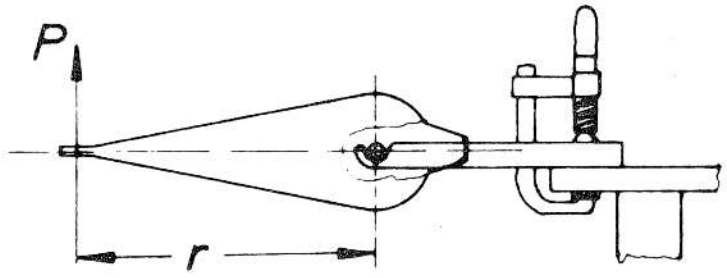

W/E (kg) Emptyweight
300 kg
290
280
270
260
250
240
Forward Limit
Rear Limit for :
65 kg
75 kg
85 kg
95 kg min. Cockpit load
min. Cockpit load 70 kg
80 kg
90 kg
500
550
600
650
700 [mm]
Empty Weight X E C. of G. Position

ASW 20 Flight Manual

Empty Weight C.of G. Positions and Limits



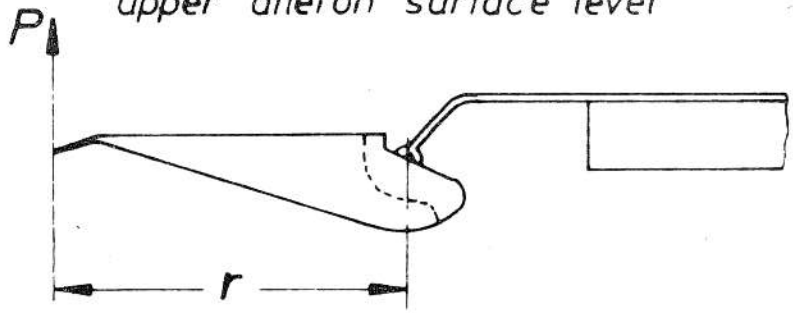
rudder chord level

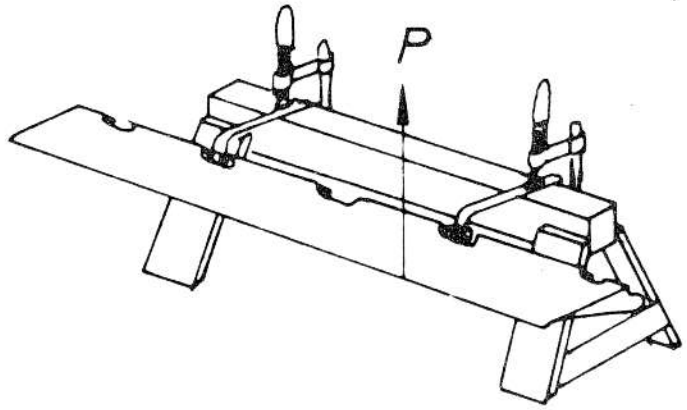


$M = P \cdot r$ [kp · cm] or (inch-pounds)

determination of P by use of spring balance or a letter – balance

upper aileron surface level





Tolerances in Weight and Tailheavy Static Balance for Control Surfaces and in Play (Backlash) of Control Circuits (Stick, Pedals or Flap Lever fixed).

	Weight Tolerance [kg]	Tolerances for tailh. Stat.bal.[cmkg]	tolerable play (backlash) mm
Rudder	2,8 - 3,6	8,6 - 11,0	0,8° 4,5
Elevator	2,1 - 2,7	6,6 - 8,4	1,15° 3,0
Ailerons	2,2 - 2,6	2,8 - 3,5	1,25° 1,75
Flaps	5,1 - 6,5	12,3 - 15,7	1,1° 2,75

	Weight Tolerance [lb]	Tolerances for tail h. Stat. bal. [inch lb]	tolerable play (backlash) inch
Ruder	6,18 - 7,93	7,45 -9,53	0,8°	0,18
Elevator	4,63 - 59,5	5,72 -7,28	1,15°	0,12
Ailerons	4,85 - 5,73	2,43 -3,03	1,25°	0,07
Flaps	11,23 14,32	10,65 -13,60	1,1°	0,11

EQUIPMENT LIST

Issue July 1977

Minimum Equipment

1. Airspeed Indicator
   a. Winter 6 FM 5.
      order/N: 651124 (km/h), 651224 (mph)
      651324 (knots)
   b. PZL PR-350

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

3. Four-part Safety Harness
   a. Autoflug AFG 013305
      consisting of :
      shoulder straps Schugu FAG - 7B - 1
      lap belt Bagu FAG - 7E - 1
      For left shoulder strap use the attachment point next to the fitting of parachute static line
   b. Gadringer Schugu II B (45 cm long)
      Bagu IV D

Additional Minimum Equipment for Cloud Flying

1. Turn and Bank Indicator
   a. Apparatebau Gauting WZ - 402/31

2. Compass
   a. Ludolph FK 5
   b. Ludolph FK 16
   c. PZL BS - 1
   d. PZL B 13/KJ

3. VHF - Transceiver (COM)

a. Dittel FSG 6 / 63
b. Dittel FSG 12
c. Dittel FSG 15
d. Dittel FSG 16
e. Dittel FSG 40 S
f. Becker AR 10
g. Becker AR 7
h. Becker AR 2008 / 25
i. Becker AR 2009 / 25

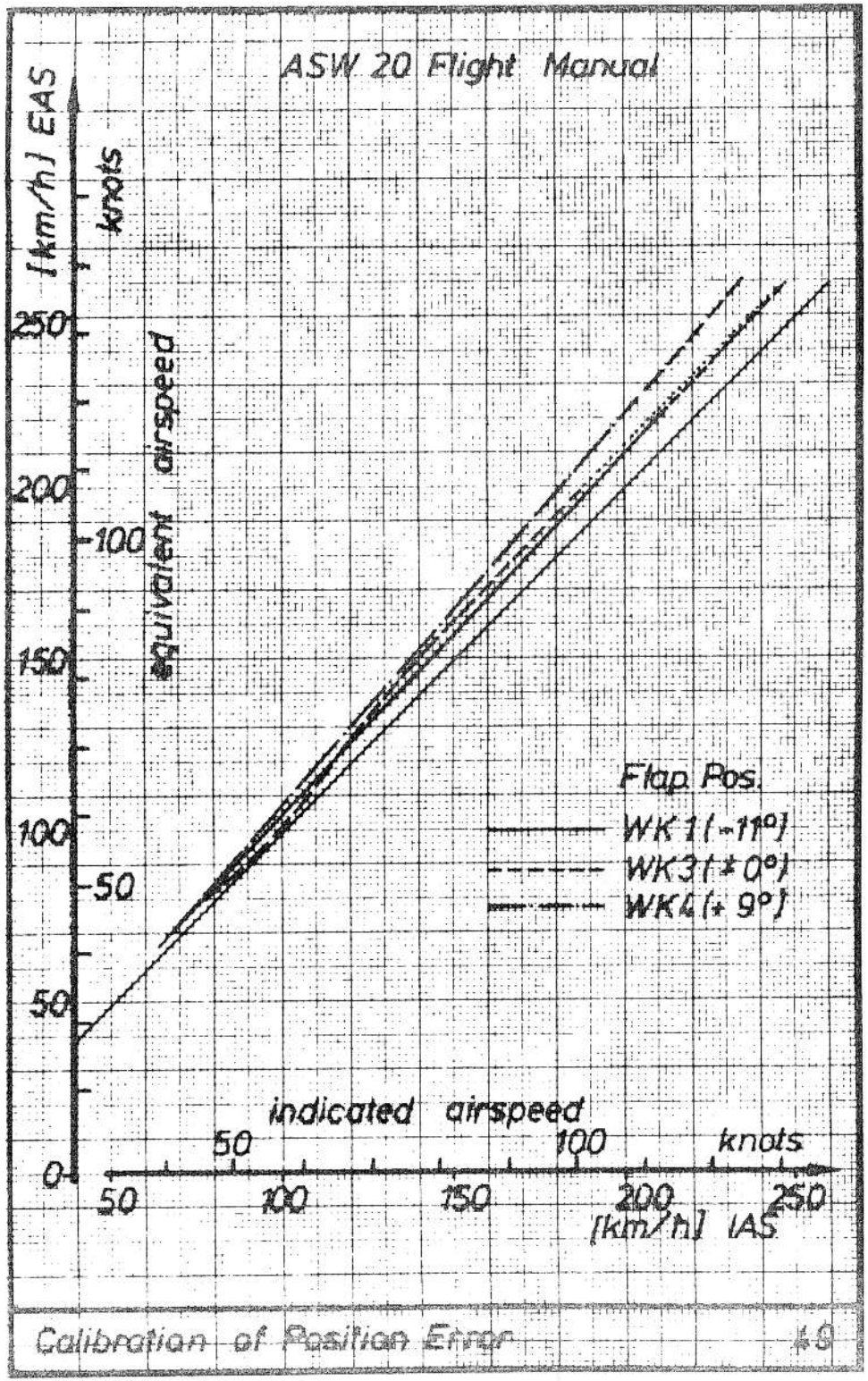
3.8. Check List

Preflight Check

1. Control connections, mainpins and bolts safetied ?
2. Control check forcewise and for full deflections ?
3. Parachute static line connected ?
4. Gaps for control surfaces in flight direction 1,5 mm or wider ?

Prior to Start

1. Parachute connected to harness ?
2. Safety harness fastened ?
3. Landing gear doors locked ? (in Down)
4. Airbrakes locked ?
5. Trim lever adjusted to a middle position ?
6. Flap control lever in starting position ?
7. Altimeter adjusted ?
8. What is the wind direction now ?
9. Close your canopy now and move white levers back !



6. Reference to available Maintenance and Repair Instructions

During operational life of a glider model the manufacturer receives various inquiries regarding damage, defects or special equipments. For these cases Maintenance and Repair Instructions are established, if reiterated occurence of such reason may be assumed.

Unlike the Technical Notes, the Maintenance and Repair Instructions are issued in alphabetical order. The following are available until today:

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"Adjusting the airbrakes."

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"Improvement of cockpit comfort by referring to available different backrests and their positions, as well as to pedal rake angle adjustment, modified landing gear levers and different safety harness systems."

Maintenance Instruction F:
"Exchange of a wing pair." (This Maintenance Instruction applies to non-European gliders only).

E. Steinweller, Fulda 03 6081 79

Alexander Schleicher
Segelflugzeugbau
6416 Poppenhausen

Kind: Aerodynamic improvement.

Subject: Covering the control surfaces gap on the wing under and upper sides by an elastic lip seal.

Types affected: All ASW 20 model variants, as of serial no. 20001.

Compliance: None; optional.

Reason: Performance test measurements with an ASW 20 C have shown that a continuous transition from wing to camber-changing flap /aileron can save some considerable drag in high speed flight. It is important in this connexion that the sealing underneath this transition lip must be 100 % airtight.
The problem of producing a continuous transition is solved by fixing an elastic lip seal to the wing, the curvature of which bridges over the gap between wing and control surfaces and which rests with its pre-tightened fit against the control surfaces.

Also the control surfaces gap on the wing under side must first be sealed by applying Teflon tape, which at the same time serves to reduce the friction of the elastic lip on the flaps or ailerons.

The additional friction involved in the aileron control circuit is low and tolerable. Also the additional force involved for the flap actuation is low.

Action:

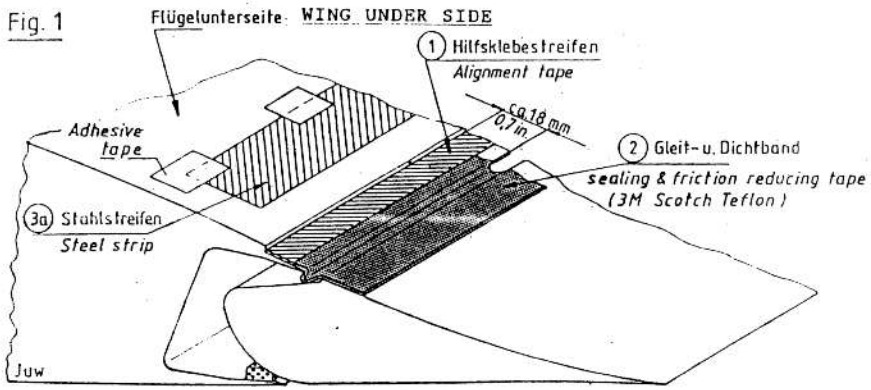
1. Covering the control surfaces gap on the wing under side:

1.1 The adhesive fabric tape (TESABAND) is removed from the wing under side control surfaces. Glue residues - also in the recess - must be completely removed by using synthetic resin thinner. To begin with and as an auxiliary measure, a 12 mm wide alignment tape (1) (e.g. Tesafilm 104, 12 mm) is applied flush with the front edge of the recess (see Fig.1).

Note:
All glue areas must be completely clean, dry, and free from dust and grease !
The complete cleanness is best checked by applying a Tesafilm strip to the cleaned area, removing it again, and checking that no dust particles are sticking to the Tesafilm.

...nweiler, Fulda

Fig. 1



1.2 Now the sealing & friction reducing tape (2) (3M SCOTCH Teflon tape, 30 mm wide) is applied - again flush - along the rear edge of the alignment tape (1) . Please keep the drawn-off backing film of this sealing tape for later use with the steel strips.

1.3 When applying the above Teflon tape push the /flaps ailerons to the maximum negative setting to ensure that the tapes will not be under tension afterwards with normal negative control surface deflections and do not hinder such negative deflections !
The sealing & friction-reducing tape (2) must be strongly rubbed into contact.

1.4 If the steel tape (3a) is used, it first must be thoroughly de-greased using acetone or Tri etc. Then position the strip - inverted - on the wing in front of the recess where it must be held in place by several short tape strips. Using scissors the steel tape strip is easily cut into the five pieces as shown in Fig.2a.

Fig. 2a

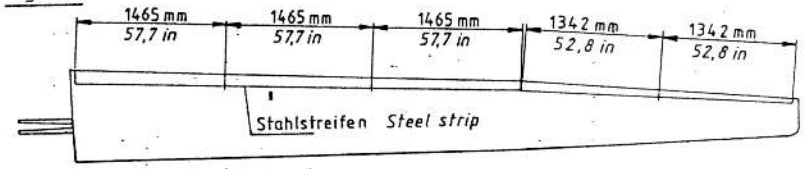
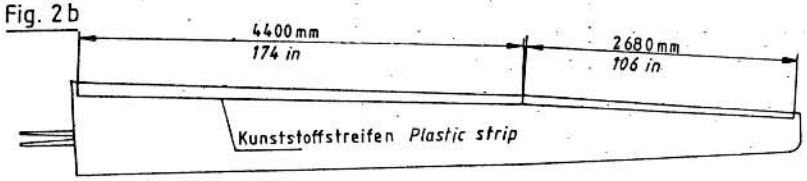


Fig. 2b



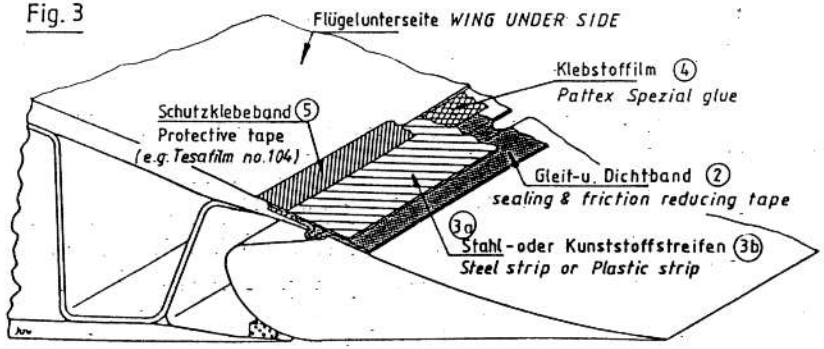
Now the alignment tape (1) which was applied at first as an auxiliary measure, is removed again; this is done step by step for each steel strip. In its place the Pattex Spezial glue is brushed on this area and also brushed on the entire width of the respective steel strip which is positioned in front of this area. The Pattex has to dry on for about 15 minutes.
For the following application of the steel strips it is best to put first the drawn-off backing film of the sealing & friction-reducing Teflon tape, which we kept for this purpose, onto the wing-side Pattex strip, otherwise it is impossible to align each steel strip with the necessary exactitude. It is an advantage to have the use of two pairs of hand for the glueing on of the steel strips; one person starting to remove the backing film at one end while the other person holds taut the steel strip at the other end to prevent it from rolling up. Then bit by bit the backing film is removed, the steel strip aligned and pressed into contact.

1.5 If the application of the self-adhesive plastic tape (3b) (MYLAR) is chosen, the auxiliary alignment tape (1) can be removed at once entirely. Then the backing film is removed off the plastic strip and the latter then fixed - flush - onto the recess in the wing, along the whole span length (see Fig.3).
The steel strip or the plastic strip respectively being applied, a soft wood block (e.g. balsa) or a hard rubber roller is used and the strip(s) - in the glue areas - pressed strongly into contact.

1.6 Then the butt joints of the five steel strips and the ends of the plastic strip respectively are also covered with the sealing and friction-reducing Scotch Teflon tape (2).

1.7 At last the wing control surfaces are moved into their maximum negative setting and are kept in this position for 24 hours; during this period the glue or self-adhesive film respectively will cure and reach its ultimate adhesion force.

Fig. 3



1.8 At last a protective tape (5) is still applied over the butt joint of plastic/steel lip and wing; the tape to be used for this purpose should be as thin as possible and moisture-resistant; e.g. Tesafilm no.104, white, 25 mm wide is suitable (see Fig.3). This tape is applied for safety reasons and prevents a peeling-off of the lip seal from the front that could possibly lead to dangerous flight characteristics.

2. Covering the control surfaces gap on the wing upper side:

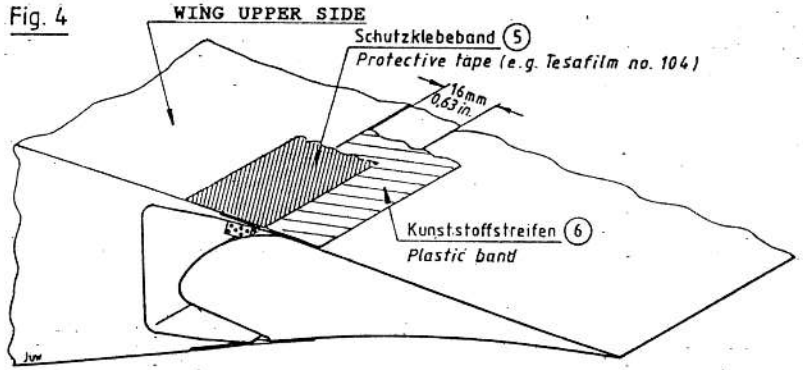
2.1 To enable the application of an elastic lip seal to the wing upper side, at first a recess (as shown in Fig.4) must be milled in by carefully excising the paint coat up to the outer FRP-layer (≈ 0,5 mm depth).

2.2 The recess area must be carefully cleaned (see note under point 1.1), then the backing film is removed off the self-adhesive MYLAR plastic strip (6) and the strip with its self-adhesive film then glued flush - onto the recess in the wing, along the whole flap / aileron span length, (see Fig.4).
Then a soft wood block (e.g. balsa) or a hard rubber roller is used to press the strip strongly into contact in the glue areas.

2.3 The butt joints and the ends of the plastic strip (6) are covered with the sealing and friction-reducing Scotch Teflon tape (2) .

2.4 Finally the protective tape (5) (Tesafilm no.104, white, 25 mm wide) is applied over the butt joint of plastic lip and wing; This tape is applied for safety reasons and prevents a peeling-off of the lip seal from the front that could possibly lead to dangerous flight characteristics.

Fig. 4



Alexander Schleicher
Segelflugzeugbau
6416 Poppenhausen

Notes:

1. It is strongly recommended to check the elastic lip at the flaps and ailerons for 100 % airtight fit.
2. Also check the elastic lip at the wing for safe and tight bonding.
3. The material required for this optional mod can be ordered from SCHLEICHERS or from the SCHLEICHER-representative in your country.

Material:

For Wing under side	For Wing upper side	
15 m	-	Tesafilm no.104, 12 mm
15 m	15 m	Tesafilm no.104, 25 mm
15 m	-	3M Scotch Teflon tape, 30 mm
2 tubes	-	Pattex Spezial glue (for steel tape only)
9 m	-	Steel tape, 33 mm, pre-curved by 5 mm
5,4 m	-	Steel tape, 33 mm, pre-curved by 8 mm
9 m	-	Mylar tape, 37,5 mm, pre-curved by 6 mm
5,4 m	-	Mylar tape, 37,5 mm, pre-curved by 9 mm
-	15 m	Mylar tape, 21,5 mm, pre-curved by 4 mm

Mass and C.G.: It is not necessary to redetermine the mass and C.G. data.

Poppenhausen, April 24, 1987

ALEXANDER SCHLEICHER
GmbH & Co.

L.W. Jumpow.

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

Luftfahrt-Bundesamt

33 BRAUNSCHWEIG, den 08. Juli 1987

1 63-303.61

Hinweis:

Durch diese Mitteilung unterrichtet Sie das LBA vorab über den Inhalt einer beabsichtigten Lufttüchtigkeitsanweisung (LTA), deren endgültiger Text demnächst in den Nachrichten für Luftfahrer, Teil II (NfL II) rechtsverbindlich bekanntgemacht werden wird.

LUFTTÜCHTIGKEITSANWEISUNG (Entwurf)

Nach § 14 der Betriebsordnung für Luftfahrtgerät wird nachstehende Lufttüchtigkeitsanweisung (LTA) erlassen.
Ein durch sie betroffenes Luftfahrtgerät darf nach dem in der LTA angegebenen Termin, außer für Zwecke der Nachprüfung nur in Betrieb genommen werden, wenn die angeordneten Maßnahmen ordnungsgemäß durchgeführt worden sind.

87-141 Schleicher

Datum der Ausgabe:
06. Juli 1987

Betroffene Segelflugzeuge:
Geräte-Nr. 314
ASW 20, alle Baureihen, Werknummern
20001 bis 20860, 20950 und 20951.

Betrifft:
Quersteuerung

Anlaß/Grund:
Vorbeugung gegen Querruderflattern

Maßnahmen und Fristen:
Sofort, vor dem nächsten Start sind die Maßnahmen entsprechend den Angaben in der Technischen Mitteilung durchzuführen.

Technische Mitteilung des Herstellers:
Alexander Schleicher Technische Mitteilung ASW 20 Nr. 31 vom 24. Juni 1987.

Die technische Mitteilung wird hiermit Bestandteil dieser Lufttüchtigkeits-anweisung.

Durchführung und Bescheinigung:
Alle Maßnahmen können von einer sachkundigen Person durchgeführt werden.
Die Maßnahme 3 muß bis spätestens zur nächsten Jahresnachprüfung von einem berechtigten Prüfer im Bordbuch bescheinigt werden.
Die Vorschriften über die Führung der Betriebsaufzeichnungen gemäß § 15 der Betriebsordnung für Luftfahrtgerät sind zu beachten.

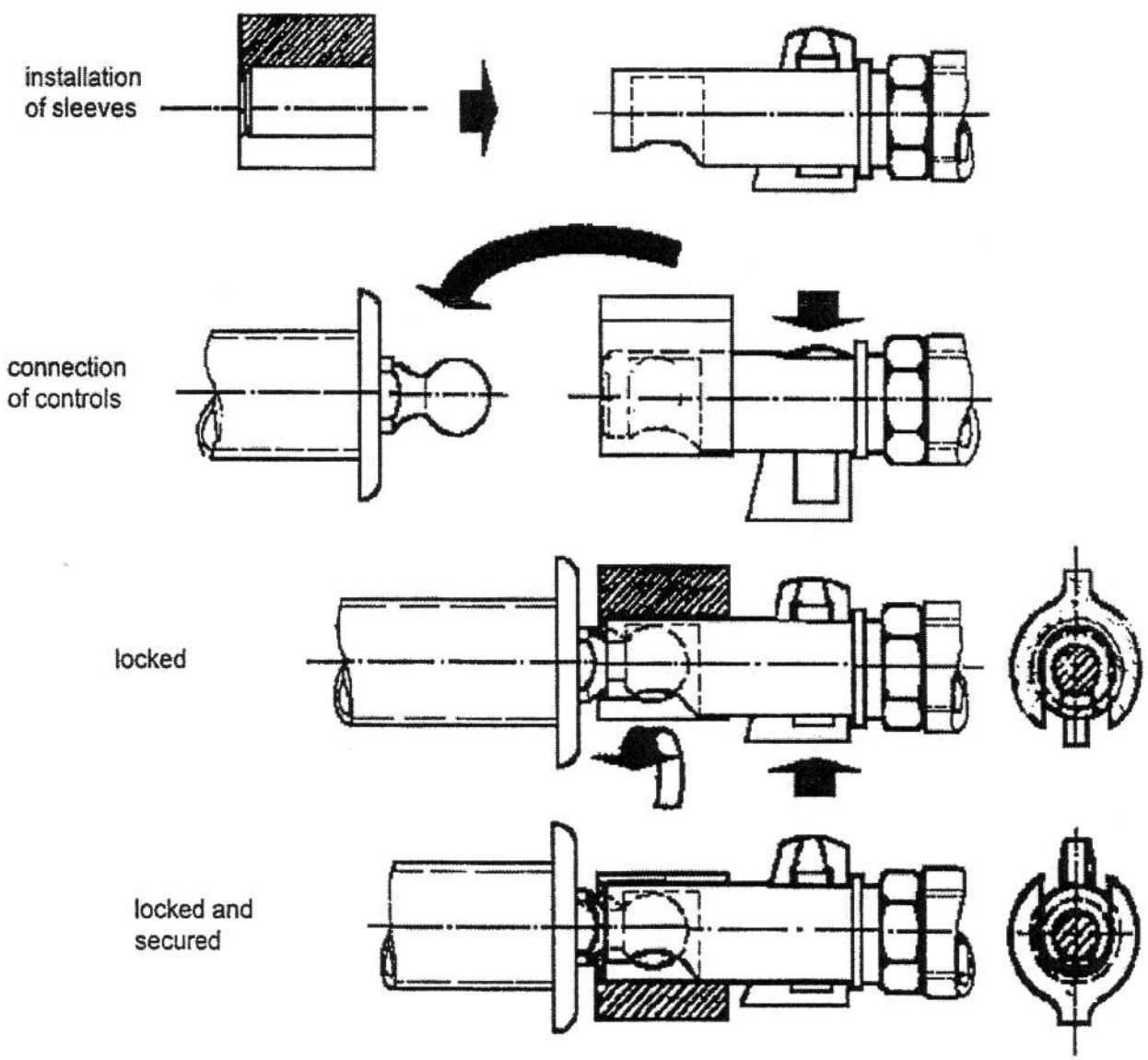
Section III

Installation instruction for Uerlings type sleeves by means of the example of the locking cam

(for the ratchet type connector, the installation is to be accomplished analogously)

For installation, the sleeves have to be slid <u>axially</u> onto the L'Hotellier ball and socket connectors.

They may <u>by no means</u> be clipped radially onto the L'Hotellier ball and socket connector. Radial clipping (excessive opening of the sleeve) may lead to cracks or ruptures due to overstressing so that the sleeve cannot function properly any more.



1- PREVENTIVE AND SAFETY MAINTENANCE

The action of the ball within the swivel should be a drag load, due to minimum friction. To this end, the ball and swivel joint should be lubricated. Lubricant shall be applied after cleaning the parts, before their assembly, using non cold-setting grease.

e.g. : ESSO GENERAL PURPOSE SPRAY CONTAINING SILICONE ENRICHED OILS (recommended for units exposed to sand and grit).

After each installation make sure that the ball is safely engaged into the swivel. A pilot hole is provided in the lock plate to this end. When the connection is true, the hole can be seen and pin " B ", part reference L'H 140-31, or other items (integral only with the lock plate), may be fitted.

2- SCHEDULED INSPECTION

During yearly overhaul, or once every 500 flight hours, whichever comes first, check the balls and swivels. Proceed as follows :

2-1 Determine ball concentricity (See Fig. 1)

The maximum permissible deviation between ball shaft and sphere is 0.05mm. This check aims at detecting any buckling of drive rods.

2-2 Determine ball sphericity (See Fig. 2)

The variation between a number of spherical diameter readings shall not exeed 0.05mm. This check aims at detecting any abnormal ball fretting.

2-3 Check condition of threaded parts of ball

No thread should show any damage. On assembly, the collar should safely rest on its base. The ball shall be secured by an adequate locking device.

2-4 Visual inspection of swivel joint

The swivel should show no sign of distorsion or peening in the recess where the ball fits, or at the seat and locking system. The aim of such inspection is identical to that of § 2-1

2-5 Projection of lock plate bottom after fitting ball into swivel joint

(refer to drawing)

The projection shall exceed 2mm. The aim of this requirement is identical to that of § 2-2.

2-6 Check attachment of drive rod and swivel joint

When the swivel is adjustable, check that the attachment of drive rod and swivel is tight and secured by an adequate locking device.

2-7 Check the operation of swivel after assembly

There should be no binding of seat or lock plate due to oxidation or to any other reason.

Date.

TECHNICAL DATA
Nº IM.10.01A
ISSUE B 01/89

INSTRUCTIONS FOR THE MAINTENANCE
L'HOTELLIER BALL AND SWIVEL JOINTS

E08

In case any of the above 7 checks is not within allowance, the ball and swivel joint shall be removed and replaced with a new unit. It is anyway recommended to replace ball and swivel joints once in 10 years, or after 3000 hours of flight.

IMPORTANT NOTE

Defective parts may be returned for TECHNICAL INVESTIGATION TO Ets Louis L'HOTELLIER

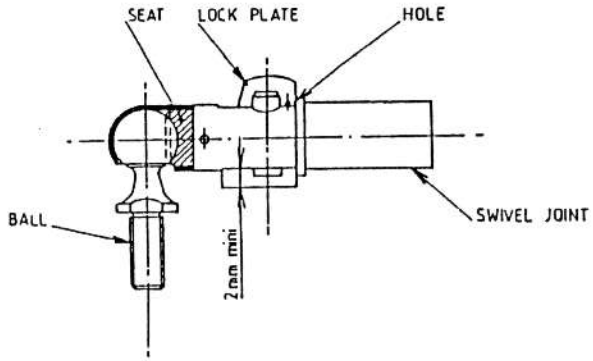


FIG. 1

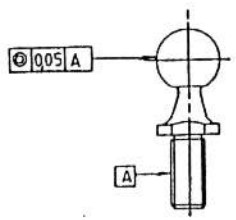
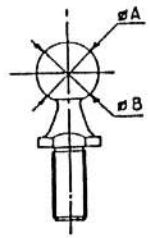


FIG. 2



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Date.

SHEET: 1 of 4	ASW 20 Technical Note No. 31	Alexander Schleicher Segelflugzeugbau 6416 Poppenhausen

Subject: Preventive measure against aileron flutter.

Serial number applicability: All ASW 20 variants and serial nos. 20001 thru 20860; 20950 and 20951.

Compliance: Immediately, prior to the next take-off.

Reason:

Recently two ASW 20s had aileron flutter in flap position 1 at a speed of about above 200 to 210 km/h. The said ASW 20s were improperly equipped with an elastic plastic tape to seal the gap between wing and flaps/ ailerons on the under sides; they used strips of tape which were insufficiently curved, and above all the teflon strip which has to lie underneath for sealing the gaps, was missing. Owing to this, air exchange between wing upper side and under side is possible which causes - depending on the control surfaces' deflection - periodical separation of airflow and this unusual kind of aileron flutter.
These latest findings also account for earlier flutter incidents which occurred mainly in countries with warm climate (see TN no.12). In those cases the gliders used insufficiently stiff plastic tape (partly even without fabric stiffening) which softened under high temperatures and therefore could crease periodically inwards and outwards thus causing varying airflow separation on the control surfaces under side and thereby leading to aileron vibrations.
But also the factory-standard TESA fabric-tape (which is adequately plastic-treated) gets worn out after some time and then it has no more sufficient stiffness and may lead to the above described flutter incidents.

Action:

1. Prior to the next take-off it must be checked whether the control surface gap on the wing under side is equipped with a sealing, i.e. either

1.1 with the factory-standard, plastic-treated fabric-tape TESABAND 4651, white, 38 mm wide (see Fig.1); in that case the plastic coat on the fabric must not be damaged, discolored or even weather-worn; the tape must not tighten with full control surfaces deflections.
or

1.2 with the pre-curved steel strip (0,07 mm thick) or the pre-curved plastic tape (MYLAR 0,25 mm thick) respectively; in that case check that both require absolutely a Teflon sealing tape underneath for the purpose of sealing the gap and reducing the friction (see Fig. 2).

If 1.1 or 1.2 are positive, the ASW 20 can be continued in operation without any restrictions.

2. If 1.1 or 1.2 are negative, the ASW 20 must be operated temporarily no longer in flap position 1 and no longer above 200 km/h.
For this purpose, a red radial line must be fixed to the A.S.I. at the 200 km/h mark and in addition a placard showing "Vmax = 200 km/h. Furthermore, the foremost hole in the flap lever gate (flap position I) must be covered by a strong adhesive tape and a placard must be fixed in front of the flap lever stating "Flap position 1 suspended".

Vereinsdruckerei Fulda
Satz-Normdruck 09 618 E

This temporary action is permissible only till Aug. 1, 1987, at the very latest. By this date the relevant sealing must be renewed.

2.1 In case of the factory-standard fabric-tape TESA 4651, white, 38 mm wide, you have to regard the following in addition: if your glider is an ASW 20 or ASW 20 L you do not have to try to make a recess into the wing for the application of the TESA; just tape it onto the wing surface; according to the aerodynamics experts the relatively thick and wide fabric tape serves possibly also as a turbulator preventing laminar separation bubbles on the control surface under sides. But if your ASW 20 and ASW 20 L had already the fabric tape recessed into the wing contour, then you should apply a turbulator in addition (zig-zag or nap tape) which you have to fix directly in front of the fabric tape.
With the ASW 20 B, BL, C, CL pneumatic turbulator holes in the wing under side are factory-standard, together with the recess in the wing contour for the application of the fabric tape (or of the optional elastic lip sealing respectively); so when renewing the TESA tape on an ASW 20 B, BL, C, or CL you have to take care that the turbulator holes are not put out of operation. Anyhow, these turbulator holes must be checked for proper operation from time to time and cleaned if necessary.

2.2 In case of the elastic lip sealing: this has to be renewed as shown in Fig.2, following the Maintenance Instruction J, Issue III; alternatively, the elastic lip sealing can be new applied instead of the above TESA tape sealing.

3. The Maintenance Manual has to be amended in order to include notes with respect to the annual glider re-inspection covering the condition of the adhesive tape or the elastic lip sealing, including the blow turbulators.
The following Maintenance Manual pages must be exchanged for pages with the entry "TN No.31 June 24, 1987" and the accomplishment of this action must be documented on the page "Amendments to the Manual" or "Index of Corrections" respectively.

ASW 20:	Pages 40 & 40 1.
ASW 20 L:	Pages 44 & 44 1.
ASW 20 B / BL / C / CL:	Pages 60, 70, & Maintenance Instruction J, Issue III.

Material & drawings:

For the sealing as per "Action Point 1.1":
TESABAND 4651, white, 38 mm wide.
For the sealing as per "Action Point 1.2":
Flaps:
9 m Teflon tape, self-adhesive, 30 mm wide.
2 x 4,5 m metal tape, 33 mm wide, pre-curved by 5 mm (see Fig.3) and Pattex Spezial glue; or
2 x 4,5 m MYLAR tape, 37.5 mm wide, pre-curved by min. 6 mm, coated with a glue film of 14 mm width (see Fig.4).
2 x 4,5 m Tesafilm no.104, 25 mm wide, white (to cover the front edge of the elastic lip).

Ailerons:
5,4 m Teflon tape, self-adhesive, 30 mm wide.
2 x 2,7 m metal tape, 33 mm wide, pre-curved by 8 mm (see Fig.3) and Pattex Spezial glue; or
2 x 2,7 m MYLAR tape, 37.5 mm wide, pre-curved by min. 9 mm, coated with a glue film of 14 mm width (see Fig.4).
2 x 2,7 m Tesafilm no.104, 25 mm wide, white (to cover the front edge of the elastic lip).
Manual pages as per "Action Point 3." and Maintenance Instruction J, Issue III dated April 24, 1987.

Mass and C.G.: A redetermination of the mass and C.G. data is not necessary.

Notes:

1. We recommend the fixing of an elastic lip sealing on the control surfaces gap, as both flight performance and flight characteristics are slightly improved by this.

2. The optional additional elastic lip sealing on the upper control surfaces gap does not require the sealing Teflon tape and so far no problems with this have been reported.

3. All actions under this TN can be accomplished by a competent person. The accomplishment of the "Action Point 3." must be certified by a licensed aviation inspector in the glider's inspection documents and in its logbook at the latest during the next annual re-inspection.

4. Maintenance Instruction J, Issue III, has been new revised for this TN and herewith becomes part of this TN.

FIG.1

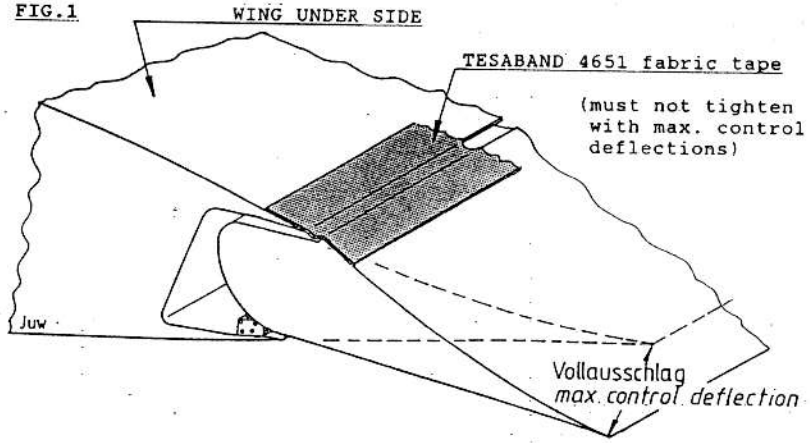


Fig. 2

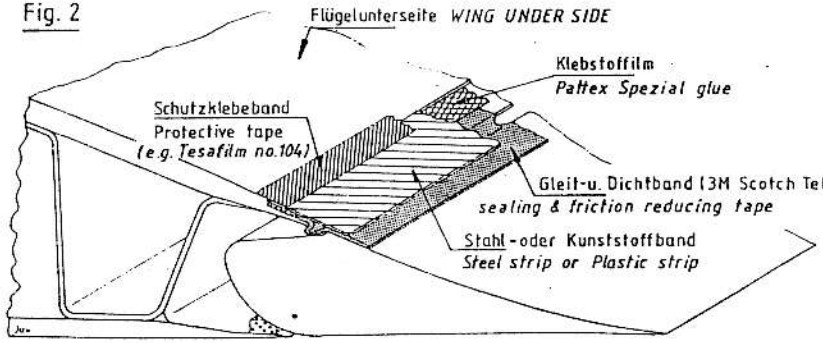


Fig. 3 METAL - FLAPS

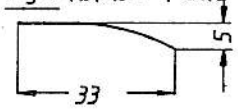


Fig. 4 MYLAR - FLAPS

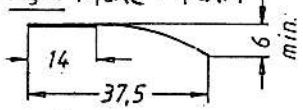


Fig. 5 METAL - AILERONS

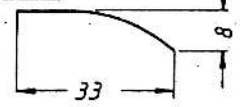
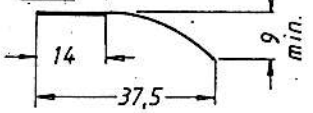


Fig. 6 MYLAR - AILERONS

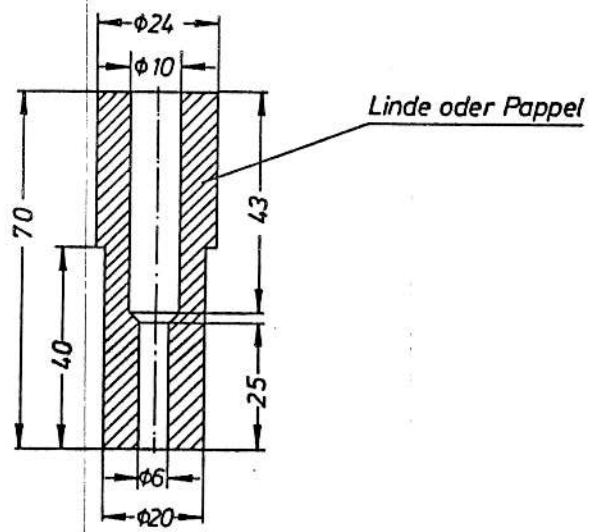


Poppenhausen, June 24, 1987

ALEXANDER SCHLEICHER
GmbH & Co.

Gerhard Waibel

The German original of this Technical Note has been approved by the LBA under the date of July 13, 1987 (signature: Volosciuc). 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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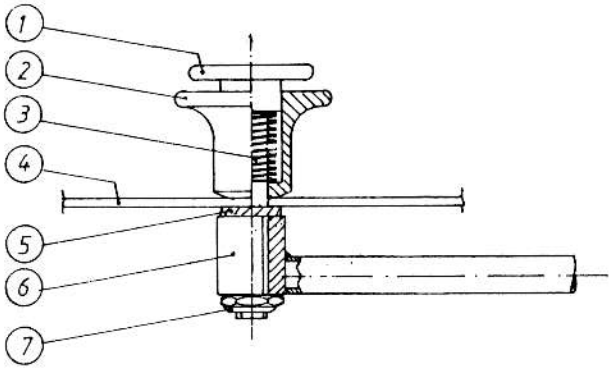

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1	Zahnscheibe A 6,4	5		DIN 6798	
1	Kulisse	4		200.49.0018	
1	Druckfeder	3		99 000 1213	
1	Klemmgriff	2			siehe Blatt 2
1	Rändelschraube M6 x 40	1			siehe Blatt 2

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Bearb	19.03.87	Jun	ASW 20	Klemmgriff für Trimmung	1:1
Gepru					
Norm					

A. Schleicher GmbH & Co
Segelflugzeugbau
6416 Poppenhausen

Zeichnungsnummer L-314
200.49.0030 TM-Nr. 30

Blatt 1 2 Bl

Zust	Anderung	Datum	Na	Urspr	Ers f	Ers d

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wahlweise Ausführung

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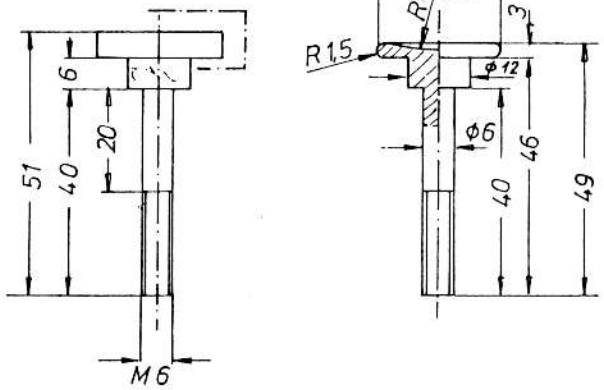
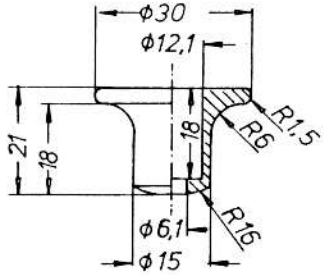
① 

② 

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St.	Benennung	Ltd. Nr.	Werkstoff	Rohmaße Teil- oder DIN-Nr.	Bemerkung
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1	Rändelschraube M6 x 40 (45)	1	wahlweise Al-Leg.	DIN464 - 5.8	ohne Rändel !

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Bearb	19.03.87	JUW
Geprü		
Norm		

Typ: ASW 20

Benennung: Klemmgriff für Trimmung Einzelteile

Maßst: 1:1

A. Schleicher GmbH & Co
Segelflugzeugbau
6416 Poppenhausen

Zeichnungsnummer L-314
200. 49. 0030 TM-Nr. 30

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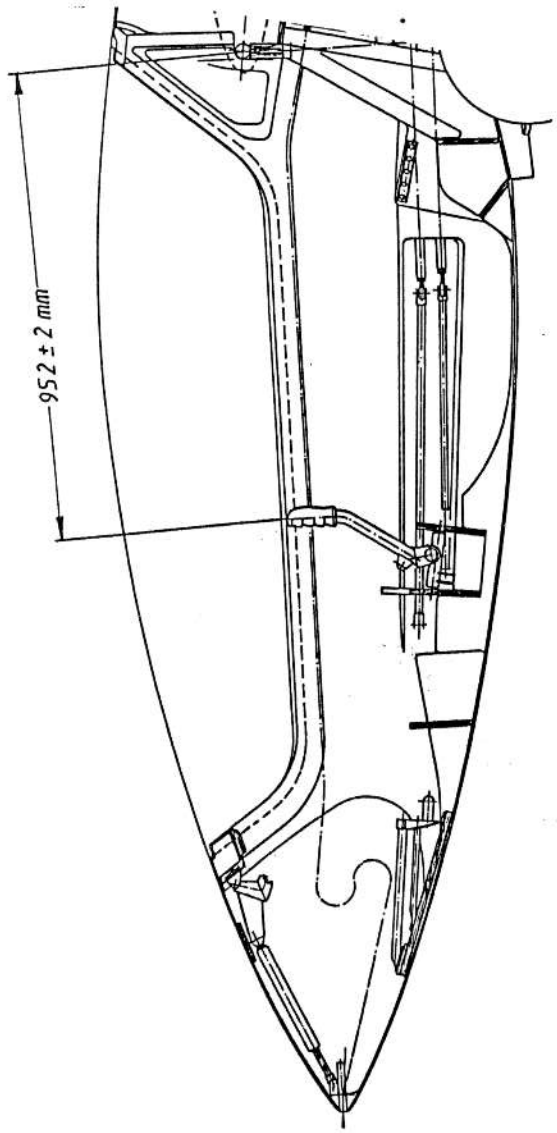
Zust	Änderung	Datum	Na

Urspr | Ers. f | Ers. d



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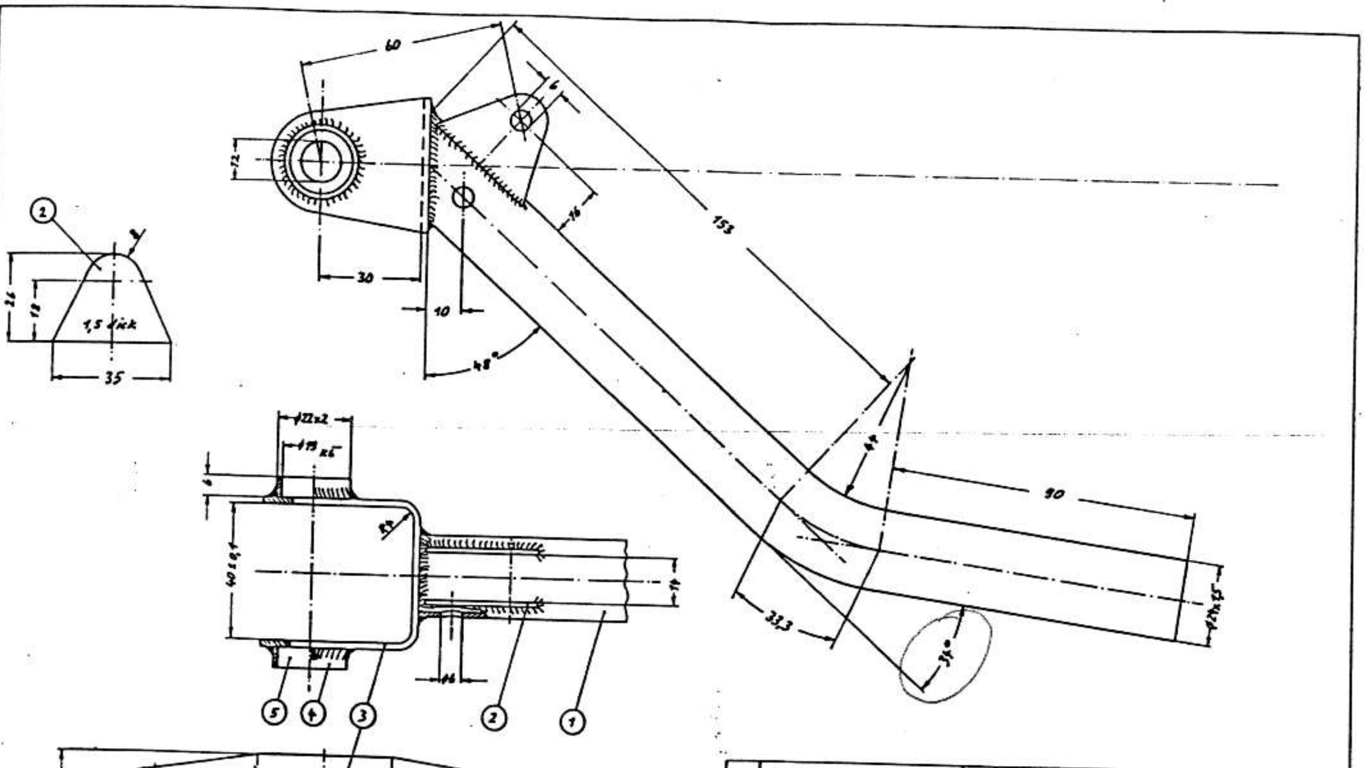
				Norm					
				A. Schleicher Segelflugzeugbau 6416 Poppenhausen			Zeichnungsnummer L-314 200. 11. S 4	TM-Nr. 30	Blatt Bl.
Zust.	Änderung	Datum	Na.	Urspr.			Ers. f.	Ers. d.	



Stk.	Benennung	Lfd. Nr.	Werkstoff	Rohmaße Teil- oder DIN-Nr.	Bemerkung
2	Pendelkugellager (SKF)	5		126	
2	Rohrbuchse	4	St. 35.29	ø22×2 - 6	
1	U-Bock	3	1.7214.4	130×40×2	
2	Lasche	2	1.7214.4	35×26×1,5	[illegible]
1	Rohr	1	St. 35.29	ø24×1,5 ca. 280	

[illegible]	1:1	Steuerknüppel	Zeichnung Nr. L-314 200.48.0001 99.000.7154

SHEET: 1 of 2	ASW 20 / 20 L Technical Note No.30	Alexander Schleicher Segelflugzeugbau 6416 Poppenhausen

Subject: Preventive measure against unintentional PIO (pilot induced oscillations).

Serial number applicability: All ASW 20 and 20 L, serial no.s 20001 thru 20611.

Compliance: Accomplishment of the action required under this T.N. until the next annual glider inspection, but at the latest until March 31, 1988.

Reason: Various flight and accidents reports from pilots with little experience with the ASW 20 do indicate that the pilots themselves did induce (unintentionally) pitch oscillations.

Besides strong turbulence and rough air the following circumstances - mostly in multiple combinations - were found:-

1. Incorrect fastening of safety harnesses.
2. Wrong installation of asymmetric AUTOFLUG-safety harnesses.
3. Soft seat cushions.
4. Loose lead cushions, used in the seat or on the backrest.
5. Rear C.G. positions.
6. Trim untightened.
7. Sticks misplaced to the rear and sticks which are too much cranked.

Sticks which are either too much cranked or misplaced too far to the rear, favor PIOs because in rough air the forearm and the hand on the stick are propped up behind the universal joint of the stick and from this unintentional elevator deflections result which still reinforce the maneuvering g-loads.

Action:

1. Check that your stick form is identical with the enclosed drawing (200.48.001). Only sticks with this stated crank angle are permissible; sticks differing from that are no longer allowed, even if there should be a previous LBA-approved Modification For A Single Unit for another stick type.
   Re-install the original stick type. In the case that a brake lever is (to be) fitted to the stick, the extension by means of the wooden compensating piece (200.48.0012) is permissible.

2. Check the most forward position of the stick as per drawing (200.11.S4) and if necessary re-adjust. The adjustment is done at the variable head in front of the stick; for this purpose the elevator must also be in the full down position within the tolerances given in the Operations Manual page 42 (ASW 20) or page 46 (ASW20 L).

3. Remove the existing trim knob; as the landing gear locking mechanism is no more secure while works at the trim are accomplished, the seatpan has to be removed also and the fuselage must be jacked up.
   The new, spring-loaded trim knob must be installed as shown on drawing 200.49.0030. Attention must be paid that the green knurled head screw ① is absolutely locked with the retaining nut ⑦ .

E. Stierwalter, Fulda

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ASW 20 / 20 L
Technical Note
No.30

Alexander Schleicher
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With the elevator in the zero position, the trim knob must be adjusted at about 10 mm behind the front edge of the slotted gate; the adjustment is done at the universal joint of the trim spring pot.Finally check that all parts are free-moving and re-install the seatpan.

4. If the 4-part, asymmetric AUTOFLUG safety harness (consisting of shoulder harness FAG 7B-1, and lap belt FAG 7E-1) is installed in your glider, it must be checked whether the short lap belt member is mounted at the right cockpit wall (in flight direction !) and is diagonally opposite to the long shoulder harness which is mounted at the main bulkhead close to the red parachute static line anchoring ring. Only then the prescribed position to strap oneself in can be achieved.

X NOT INSTALLED

5. Exchange the following pages in the respective Flight and Operations Manuals:-
   ASW 20: p. 13, 19, 20, and 38;
   ASW 20 L: p. 14, 20, 21, and 42;
   for pages with the same numbers but with the reference entry of T.N. no.30 dated 01.04.87.
   These pages give important notes for preventing PIO.

6. The exchange of the pages in the Manuals must be documented on page 4 "Amendments to the Manual".

Material & drawings: See drawings: 200.11.S4; 200.48.0001; 200.48.0012; and 200.49.0030.
Manual pages as stated under above para ACTION, points 5 & 6.

Mass and C.G.: The influence of this mod is negligible.

Notes: This action can be accomplished by a competent person. The ac-accomplishment of this mod must be inspected by an aviation inspector holding the appropriate license and certified in the glider logbook and in the inspection certificates.

Poppenhausen, April 1, 1987

ALEXANDER SCHLEICHER
GmbH & Co.

Gerhard Waibel

Gerhard Waibel.

The German original of this Technical Note has been approved by the LBA under the date of April 10, 1987 (signature: SCHMALJOHANN). The translation into English has been done by best knowledge and judgement; in any case of doubt the German original is controlling.

E. Stenweiler, Fulda

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