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 44 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.

Inspection program for extending service life

1. General information

The results of operational strength experiments on wing spars have shown that a life expectancy of 6000 hours can be achieved for GRP gliders, if the long--term airworthiness of each component is re-established in a special multi-stage test program, over and beyond the obligatory annual inspections.

2. Time limits

When the glider has reached a service life of 3000 flight hours, then an inspection is to be carried out under a prescribed program. If the result of this inspection is positive, or if defects discovered have been repaired correctly, then the service life of the glider is increased by 1000 hours, i.e. to a total of 4000 flight hours (First Stage).

The aforementioned test program is to be repeated when 4000 flight hours have been reached. If the results are positive, or the defects discovered have been repaired correctly, then the service life can be raised to 5000 flight hours (Second Stage).

When the glider has reached a service life of 5000 flight hours, then the test program prescribed should again be carried out. If the results are again positive, or the defects discovered have been repaired correctly, then the service life can be raised again to 6000 flight hours (Third Stage).

For operation beyond 6000 flight hours, certain requirements will be established at the proper time.

3. The relevant test program is to be obtained from the manufacturer.

4. The inspections may only be carried out by the manufacturer, or by a technical aviation company with appropriate authorization.

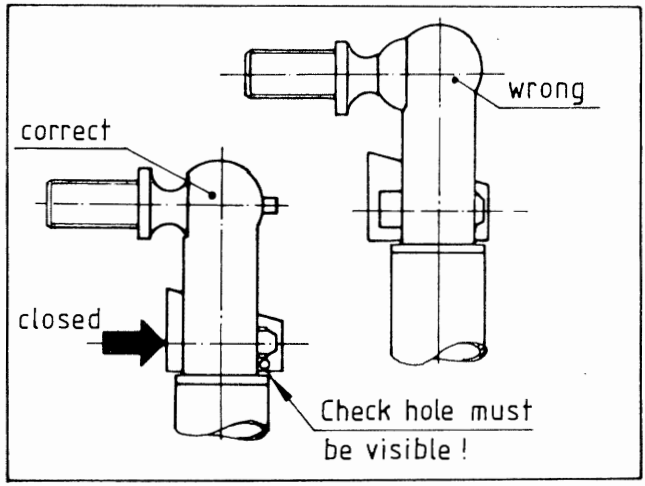
5. The results of the inspection are to be listed in a report, and every measure is to be commented upon. If the inspections are carried out by a technical aviation company, then a copy of the report is to be sent to the manufacturer for assessment.

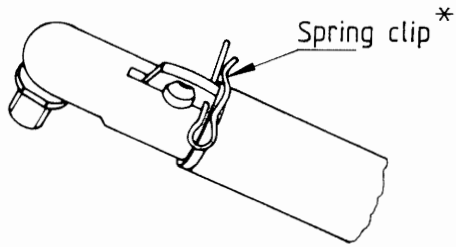
6. The annual inspection required by § 27 (1) of the LuftGerPO (= Aircraft Examination Rules) is not affected by this rule.

Checking and securing the L'Hotellier quick-close connections of the control circuit

1. Securing

The experience of the past shows that mostly the connection of the elevator was incorrectly fitted or even worse simply was forgotten. A sticker on the fin serves to remind the pilot of the correct connection; in addition the securing by means of a spring pin is recommended.
To do this on older ASW 20 gliders the check hole must be drilled to 1,2 mm in diameter.
Aileron, flap and airbrake connections in the fuselage can be safetied by the same method.



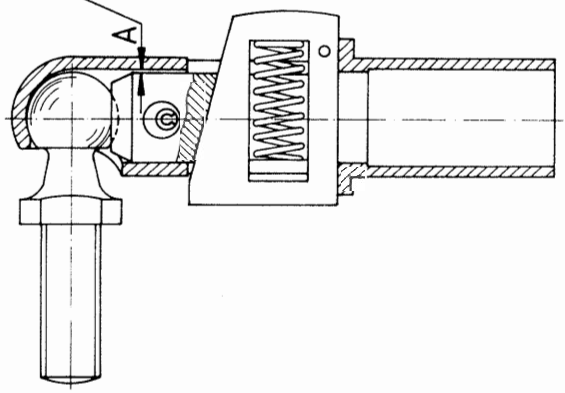


*Spring pin no.50030771 can be ordered from Alexander Schleicher or from A.Würth, P.O.Box 1261, 7118 Künzelsau, F.R.Germany.

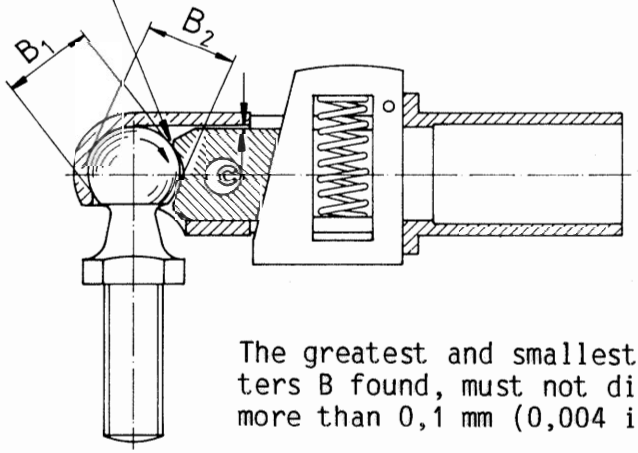
2. Inspection

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 !

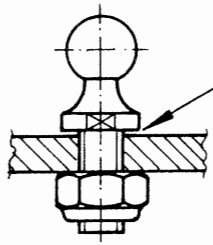


Bad wedging effect causing wear of the ball end.



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 closed, 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.

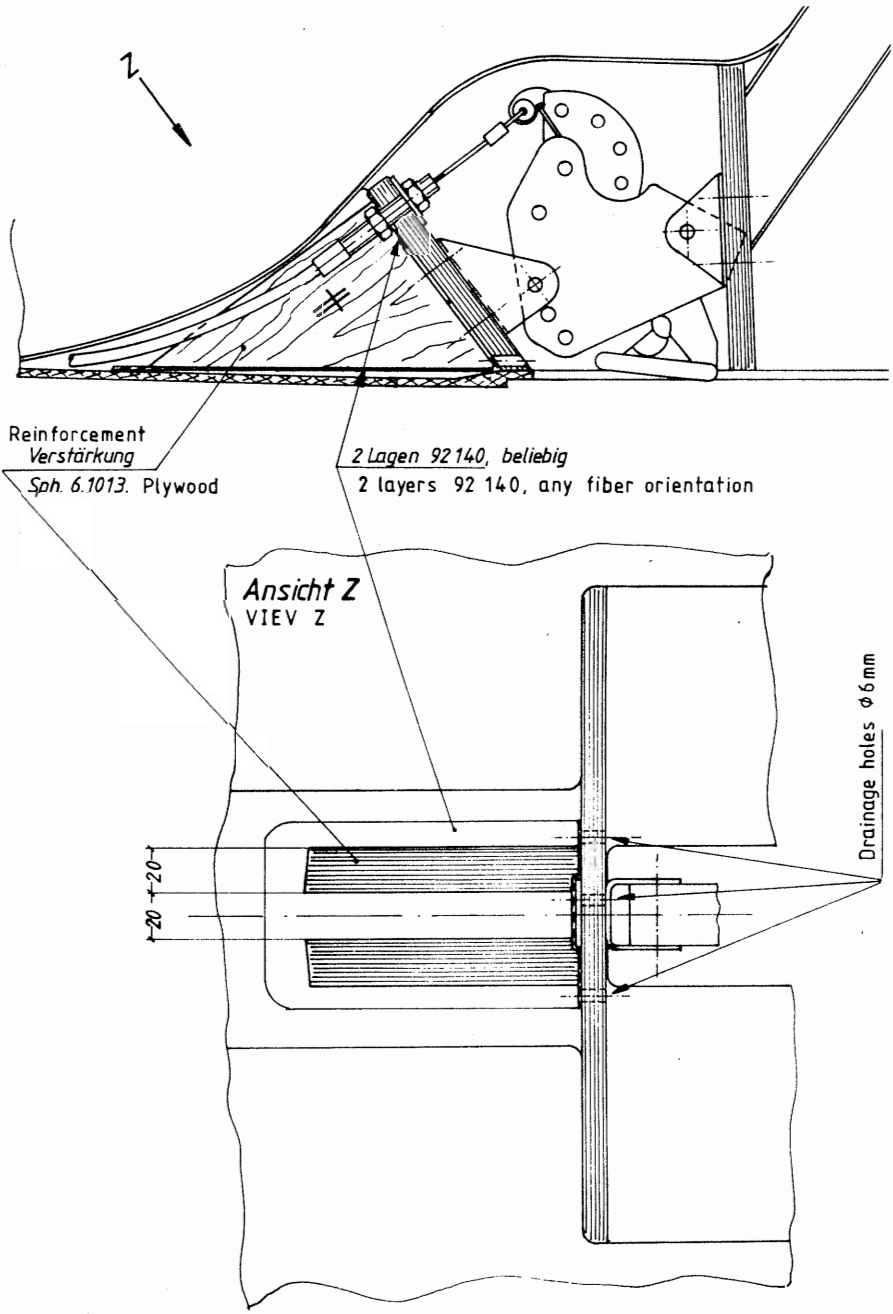
b) After a belly landing and/or if water has been allowed to stand in the cockpit for a long period, the glued joint between the rear tow hook bulkhead and the fuselage shell may fail. This weakens the tow hook installation to the point where the tow hook may twist under a severe load (such as occurs 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 44h). 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 push-rod 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.

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:

Maintenance Instruction A:
"Maintenance and improvement of the wheel brake."

Maintenance Instruction B:
"Aerodynamic improvement by sealing of the control surface gaps with strips of foam tape."

Maintenance Instruction C:
"Adjusting the airbrakes."

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

Maintenance 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."

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

Maintenance Instruction G:
"Installation of the turnpoint camera(s)."

Maintenance Instruction H:
"Adjusting the tow hook after the occurence of unintentional release." (This Maintenance Instruction is now already included into the amendment to this Manual).

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

Maintenance Instruction J:
(only applicable to the gliders ASW 20 B and C).

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

Under operational conditions as detailed on page 18a 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.

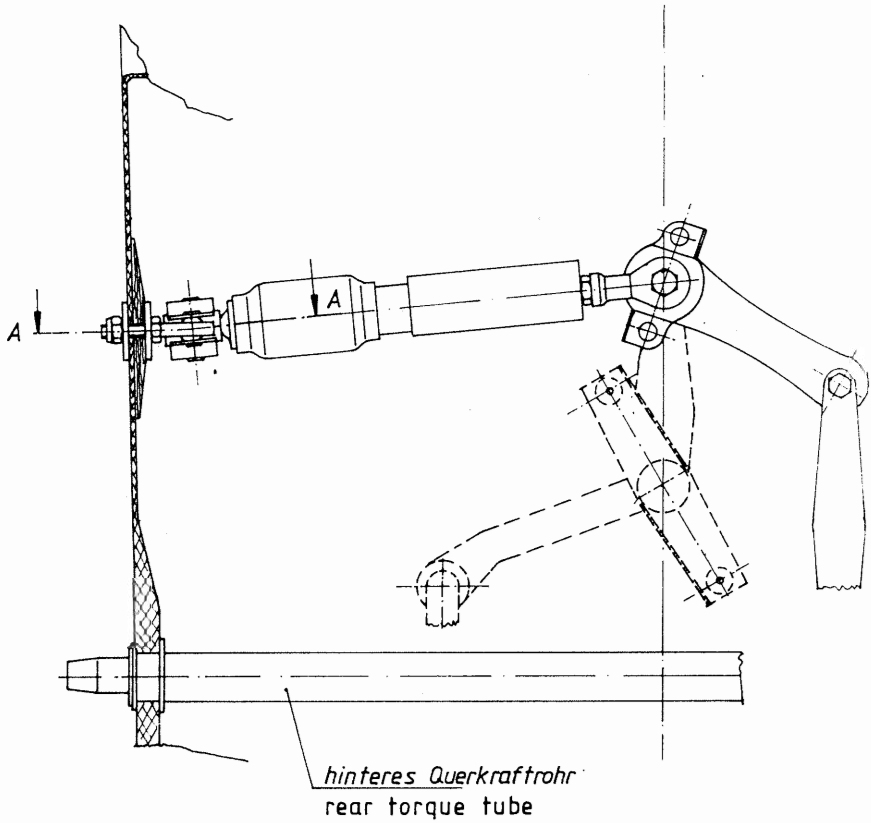
In the sketches on pages 44n thru 44r the installation of the damper is shown. For proper connection to the aileron control circuit a longer bolt M 6 must be used. For every installation use new self-securing nuts n M6 DIN 980/6 or N M8 DIN 980/6. The plywood ground plate is permanently glued into the 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.

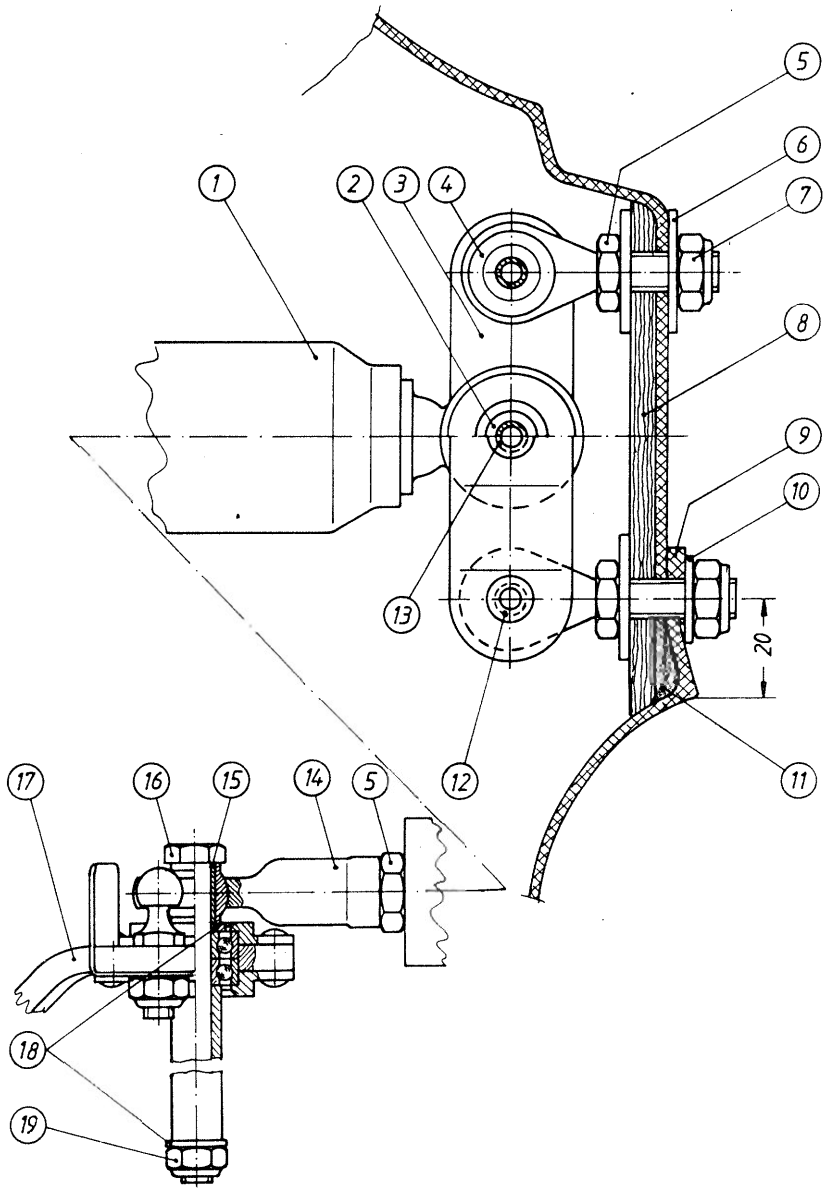
Kits for the installation of the damper are available from Schleicher directly or from their foreign agents.

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.

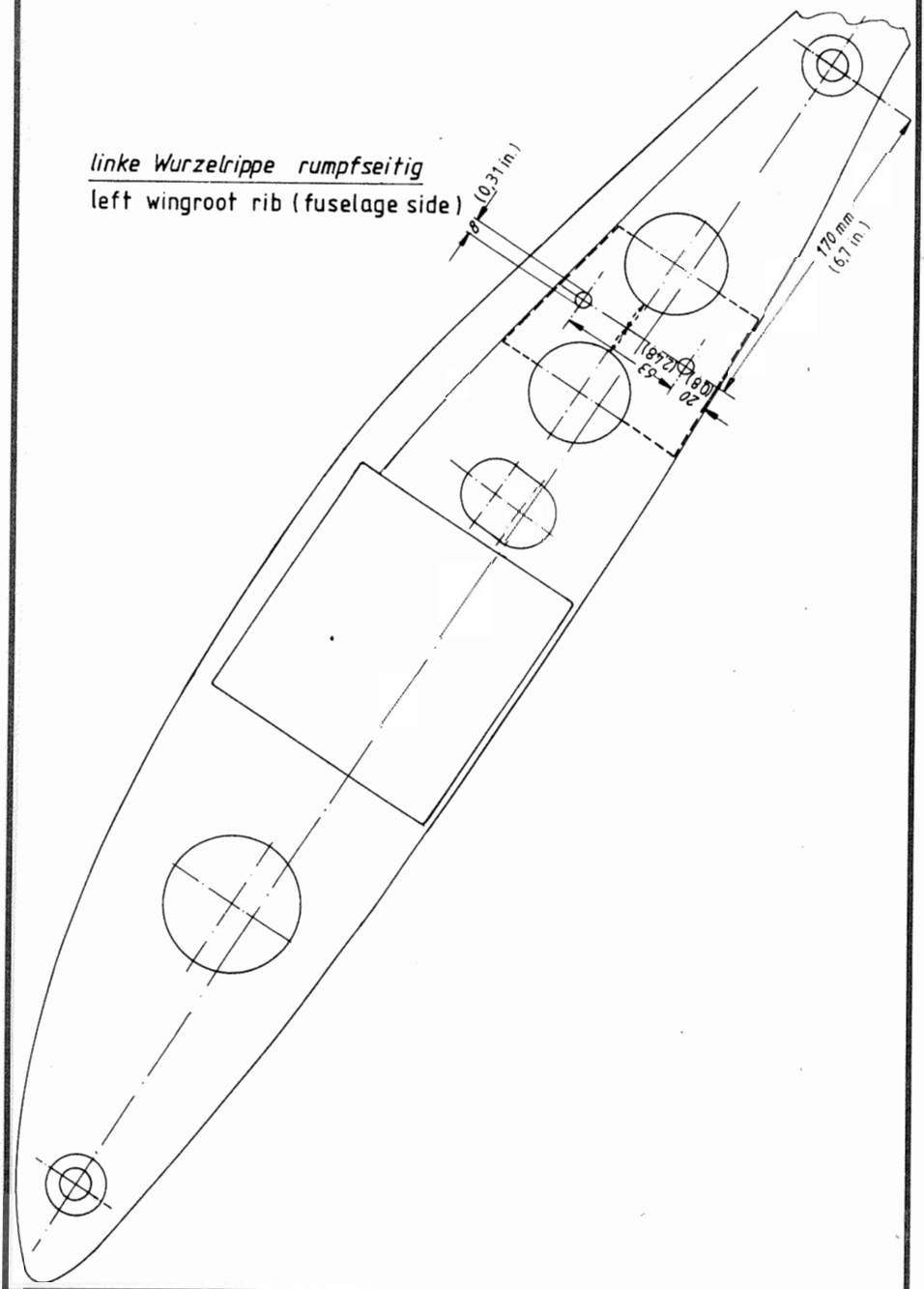
Ansicht von oben
View from above



Schnitt A-A



1	Sicherungsmutter NM 6	19		DIN 980 – 6	
2	Scheibe 6,4	18		DIN 125 – St	
1	Antrieb f.Q.R i. Rumpf	17		200. 41. 0009	
1	Sechskantschraube M6×90×70	16		DIN 931 – 8.8	
1	Distanzbuchse	15		200. 41. 0021	
1	Gelenkkopf GIR 8 GW	14			Fa. Elges
1	Rohrniet B 6×1×32	13		DIN 7340 – St	
2	Rohrniet B 6×1 ×17	12		DIN 7340 – St	
	Speiß	11			
1	Scheibe 8,4	10		DIN 125 – St	
1	Scheibe, konisch	9	GFK	ø 8,4 / 20 – 4	
1	Verstärkung	8	Sph. 6.1013.0	5×115×90	200. 41.0101
2	Sicherungsmutter NM 8	7	D	DIN 980 – 6	
3	Scheibe B 8,4	6		DIN 9021 – St	
3	Sechskantmutter M8	5		DIN 936 – 6	
2	Gelenkkopf SMX CP 6.48.34	4			Fa. Hirschmann
2	Lasche	3		200.41.0019	
1	Distanzbuchse	2		200.41.0020	
1	**Dämpfer, ölhydraulisch**	**1**		**01-20-070-200**	**Fa. Stabilus**
St.	**Benennung**	**Lfd. Nr.**	**Werkstoff**	**Abmessung Teil- oder DIN-Nr.**	**Bemerkung**


linke Wurzelrippe rumpfseitig
left wingroot rib (fuselage side)
8 (0.31 in.)
170 mm (6.7 in.)
63
20

Verstärkung, Reinforcement
Sperrholz 6.1013.0 plywood