SCHEMPP-HIRTH GmbH & Co KG, KIRCHHEIM-TECK
Federal Republic of Germany

FLIGHT and SERVICE MANUAL

for the Sailplane

Mini-Nimbus HS 7

Translation of the German Manual

Issue: April 1977

This Manual should always be carried in the Sailplane

It belongs to the Sailplane

Mini-Nimbus HS 7

Registration Number : .....

Serial Number : .....

Manufacturer : .....

Owner : .....

The pages 5 - 38 are approved by the Luftfahrt-Bundesamt

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

LUFTFAHRT-BUNDESAMT BRAUNSCHWEIG

12. Okt. 1977

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Amendments

No.	Item	Page	Date
1.	Technical Note No. 328-2 Installation of a nose tow hook instead of the C/G hook	5, 6, 18, 23, 27, 28	February 1978
2.	Modification Bulletin No. 328-8 Modification of wing water ballast tanks (S/N 82 and up)	4, 9	July 1978
3.	Technical Note No. 328-6 Amendments for the issue of a U.S. Type Certificate	cover page 12, 34, 38a, 23	December 1983
4.	Technical Note No. 328-7 Supplementary winch launch and aerotow instructions: Flap settings	26, 27	November 1985
5.	Technical Note No. 328-12 Retrofit of a nose tow release mechanism - optional all serial numbers -	4, 18, 26	January 1999
6.	Supplement of the equipment and instruments	2	February 2008

1 GENERAL

The Mini-Nimbus HS 7 is a single seat 15 m flapped sailplane in all fiber-glass construction.

W i n g

The cantilever two-piece wing has a double trapezoidal shape. It is built as a FRP-foam-sandwich shell with spar caps of parallel glass fibers and shear webs of FRP-foam-sandwich.
The trailing edge air brakes are a combination of spoilers and flaps.
The ailerons have internal drive.
Two integral water tanks have a total capacity of 190 liters.

F u s e l a g e

The fuselage is necked behind the wing.
The one-piece canopy is faired into the fuselage and hinged at the right hand side.
The fuselage shell is built in a pure glass-fiber lay-up and therefore has a high energy absorption. The fuselage shell is stiffened by FRP-foam-sandwich bulkheads.
The pilot is seated in a semi-reclined position.
The landing gear wheel is retractable.
A towing hook is installed as standard just in front of the landing wheel.

Horizontal Tail Plane

The horizontal tail plane is of an all flying T-type. It is trimmed by means of a spring loaded click-stop device on the flap operating rod in the cockpit. It is built in a FRP-foam-sandwich construction.

Vertical Tail Plane

Fin and rudder are built in a FRP-foam-sandwich construction. The rudder has an internal drive.

2 OPERATING LIMITS

2.1 Airspeed limits (IAS)

		km/h	knots	mph
Maximum speed Flap pos. -4, -7	V_{NE}	250	135	155
Maximum speed Flap pos. 0, +6, +10	V_{FE}	180	97	112
In strong turbulence	V_B	200	108	124
Maneuvering speed	V_A	200	108	124
Airplane tow	V_{AT}	180	97	112
Auto-winch tow	V_{WT}	150	81	93

Note

At increasing altitudes the true airspeed (TAS) is higher than the airspeed indicated on the ASI (IAS). This has no influence on the strength and loading capacity of the sailplane. For reasons of flutter safety however the following indicated airspeeds should not be exceeded.

Altitude m	Altitude ft.	V_{NE} IAS km/h	IAS knots	IAS mph
0	0	250	135	155
3 000	9 800	250	135	155
6 000	19 700	223	120	139
10 000	32 800	177	96	110

Pressure error (at MSL)

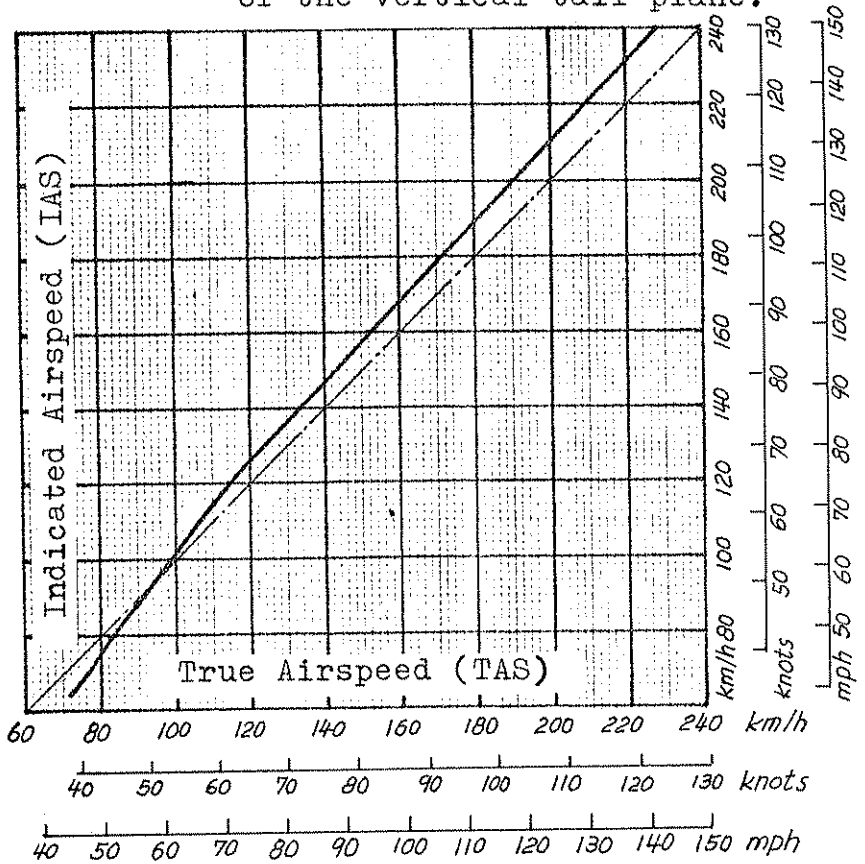
Dynamic pressure intake

Pitot tube in the nose of the fuselage.

Static pressure intake

Airspeed Indicator: 15 cm under the rear edge of the spar cut-out.

Variometer: In the area of the instr. panel and at the rear portion of the fuselage about 0.9 m in front of the vertical tail plane.



Note: All speeds stated in this Manual are indicated airspeeds (IAS).

2.2 Airworthiness Category

U (Utility) according to the LFMS

Based on the Airworthiness Requirements LFSM full control movements can be applied up to the maneuvering speed V_A.

At higher speeds it is possible to overstress the sailplane, therefore full control movements are not allowed at speeds exceeding 200 km/h, 108 knots or 124 mph.

At the maximum airspeed V_{NE} = 250 km/h, 135 knots or 155 mph a maximum of one third of the full control movement is permitted.

The elevator control movement at V_{NE} must be even less which depends on the permitted maneuvering load factor.

Under normal weather conditions this sailplane can be safely flown at high speeds up to V_{NE} = 250 km/h, 135 knots or 155 mph.

In strong turbulence, i.e. in wave rotors, thunder clouds, visible up-currents, or when flying over mountain ridges, the airspeed V_B = 200 km/h, 108 knots or 124 mph must not be exceeded.

2.3 Load Factors

The following load factors should not be exceeded:

+ 5.3 / - 2.65 at speeds of 200 km/h, 108 knots, 124 mph
+ 4.0 / - 1.5 at speeds of 250 km/h, 135 knots, 155 mph

} air brakes closed

+ 3.5 air brakes extended

The safety factor then is j = 1.5

2.4 Weights

Maximum takeoff weight 450 kg, 992 lb.

Max. weight of non-load carrying structure 230 kg, 507 lb.

Max. weight of water ballast (kg or liters) see page 9.

2.5 Loading instructions

Cockpit load (pilot and parachute)

Max. 110 kg, 243 lb.

Min. 70 kg, 154 lb.

The maximum takeoff weight must not be exceeded.

Less weight than 70 kg, 154 lb. must be compensated with ballast (lead or sand cushion) on the seat, safely attached, e.g. onto the suspension of the seat belt.

C.G. arm of the pilot

incl. parachute or back cushion

550 mm, 21.65 inches ahead of datum.

Water ballast

Maximum takeoff weight with water ballast 450 kg, 992 lb.

Max. water ballast at different empty weights and cockpit loads:

Cockpit load kg	70	80	90	100	110
Empty weight kg	kg or lit.	kg or lit.	kg or lit.	kg or lit.	kg or lit.
220	160	150	140	130	120
230	150	140	130	120	110
240	140	130	120	110	100
250	130	120	110	100	90
260	120	110	100	90	80
Cockpit load lb.	154	180	200	220	243
Empty weight lb.	lb.	lb.	lb.	lb.	lb.
480	358	332	312	292	269
500	338	312	292	272	249
520	318	292	272	252	229
540	298	272	252	232	209
560	278	252	232	212	189

At high cockpit loads care is to be taken not to exceed the max. permitted weight of non-lifting parts (230 kg, 507 lb.).

The baggage compartment can be loaded with a weight of max. 15 kg, 33 lb. of which only 5 kg, 11 lb. are allowed to be removed.

The weight of objects which do not belong to the originally installed equipment must be considered when determining the maximum permitted water ballast.

2.6 C.G. Range

a) C.G. range in flight (gross weight C.G.)

+220 mm (+8.66 in.) to +355 mm (+13.97 in.)
at all weights.

Datum

Wing leading edge at root rib.

Leveling means

Slope of rear top surface of fuselage: 100 to 5.1 tail down, i.e. main landing gear wheel on the ground and tail skid jacked up about 49 cm (19.3 in.).

Be cautious not to exceed the permitted aft C.G. position. When a minimum cockpit load (pilot and parachute) of 70 kg (154 lb.) is observed, it is certain to be within the limits.
Less weight is to be compensated with ballast on the seat (see page 8).

b) Empty weight C.G. range

After repair work, installation of additional equipment, new painting etc. the empty weight C.G. position must be checked. If it should not be within the limits, compensating weight must be added. If the limits of the empty weight C.G. are followed, it is certain that the gross weight C.G. is also within the permitted range.

To facilitate the checking of the empty weight C.G. position the following table shows besides of the C.G. range for different empty weights also the max. permitted tail weight, calculated for the corresponding aft empty weight C.G. position.

If the determined tail weight does not exceed these values, the empty weight C.G. position is within the limits.

Empty weight kg	C.G. range aft of datum mm	Tail weight kg
220	605 - 643	28.7
225	596 - 636	29.0
230	588 - 630	29.3
235	581 - 624	29.6
240	573 - 619	29.9
245	566 - 613	30.1
250	559 - 608	30.4
255	552 - 603	30.7
260	546 - 598	31.0

Empty weight lb.	C.G. range aft of datum inches	Tail weight lb.
490	23.66 - 25.18	63.65
500	23.36 - 24.96	64.24
510	23.07 - 24.74	64.80
520	22.79 - 24.54	65.40
530	22.53 - 24.34	65.97
540	22.27 - 24.14	66.52
550	22.02 - 23.96	67.11
560	21.79 - 23.78	67.68
570	21.56 - 23.61	68.26

The calculation of the C.G. ranges was made for the following cockpit loads

forward C.G.: with max. 110 kg (243 lb.)

aft C.G. : with min. 70 kg (154 lb.)

2.7 Weak links for towing

Winch and Airplane tow

max. 600 ± 30 kg (1320 ± 66 lb.)

2.8 Mimimum Equipment

Airspeed Indicator with a range of
min. 50 km/h to min. 270 km/h
min. 27 knots to min. 146 knots
min. 31 mph to min. 168 mph
marked as follows:

	km/h	knots	mph
White Arc flaps 0,+6,+10	77-180	41-97	48-112
Green Arc normal range	77-200	41-108	48-124
Yellow Arc warning range	200-250	108-135	124-155
Red Radial max. speed	250	135	155
Yellow Arrow approach	85	46	53

Altimeter

Four-piece safety belt

Manual or automatic parachute or back cushion, compressed 10 cm (4 in.) thick.

Placards (see pages 23 - 25)

Flight and Service Manual

For Cloud Flying (additional to the min. equipment)

Magnetic Compass, Variometer, Turn & Bank.

The installation of an artificial horizon, a clock, an accelerometer and a radio is recommended.

The installed ASI system was found to be suitable for cloud flying.

2.9 Acrobatics

The Mini-Nimbus HS 7 is approved for the following acrobatic maneuvers :

	recommended entry speeds km/h	knots	mph
Inside loops	200	108	124
Spins	60	32	37
Turns	200	108	124
Lazy eight	180	97	112

It is recommended to install a recording accelerometer in addition to the equipment listed under 2.8.

Acrobatic maneuvers are permitted only without water ballast.

Loose objects are to be removed.

2.10 Wing and Tail Setting

Reference : Rear fuselage center line.

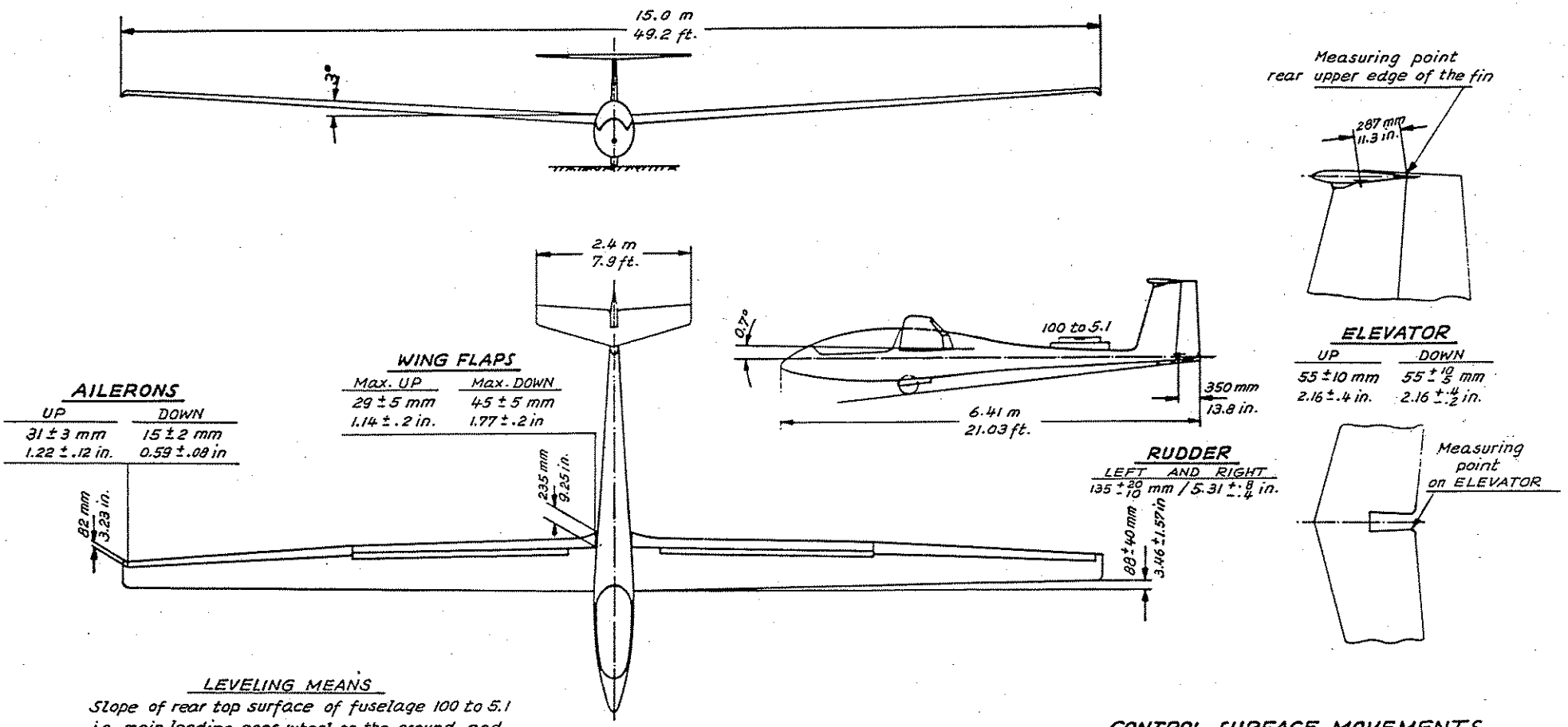
Angle of wing setting 0.7°

Angle of tail setting 0°

Control surface movements

See page 14.

Pay attention to the tolerances if repair work should be necessary.



LEVELING MEANS

Slope of rear top surface of fuselage 100 to 5.1 i.e. main landing gear wheel on the ground and tail skid jacked up about 49 cm (19.3 inches).

CONTROL SURFACE MOVEMENTS

Mini-Nimbus HS 7

3 EMERGENCIES

3.1 Recovery from a Spin

If the sailplane with the C.G. in medium or aft positions enters unintentionally into a spin ease the control stick forward immediately and apply opposite rudder until rotation ceases.
It is very important to ease the control stick forward in order to avoid a rotation to the opposite direction when applying opposite rudder.

3.2 Malfunction

Takeoffs by winch or airplane tow on uncutted grass fields should not be conducted. If a wing is caught in the grass release immediately to avoid a ground loop and therewith damage.

To prevent the sailplane from unintentional and unnoticeable stall in an emergency release in low altitude a speed of 85 to 90 km/h, 46 to 49 knots or 53 to 56 mph (depending on the wing loading and flap position) should be maintained in a straight flight.
In a turning flight the speed is to be increased corresponding to the angle of bank.

If slight oscillations are observed or if the controls become spongy the sailplane is stalled though the ASI indicates 65 to 85 km/h, 35 to 46 knots or 40 to 53 mph (dependent on the wing loading and flap position).
The control stick then is to be released forward immediately.

3.3 Emergency Exit

The roomy and well faired cockpit warrants quick and safe bailing out in emergency.

Jettisoning of the Canopy

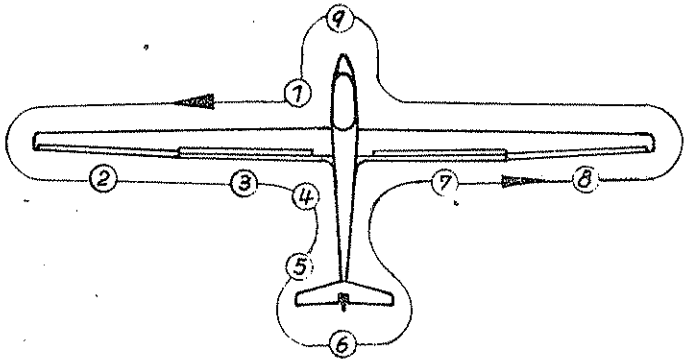
1. PULL BACK the red ball knob at the left-hand side of the canopy frame.
2. PULL BACK the red ball knob at the right-hand side of the cockpit just below of the side fairing.
3. Throw off the canopy.

The cord which holds the opened canopy in place is attached such to rip immediately when throwing off the canopy.

The canopy frame on the fuselage is built of strong glass fibers without sharp edges and is well suited as a support for the pilot to jump off.

4 Normal Operating Conditions

4.1 Daily Inspection



When going around the sailplane for inspection, check all external surfaces for tears, blisters, or dents. In case of doubt ask a FRP-expert.

(1) a) Open the canopy and check if the main bolt is installed and secured.

b) Check the cockpit controls by visual inspection.

c) Remove foreign particles.

d) Check tire pressure of the main wheel (3.5 Atm. (50 psi).

e) Check condition and function of the towing hook.

(2) Check ailerons for free and full movement.

(3) a) Check air brakes for close fit and proper operation.

b) Check trailing edges of flaps and ailerons for damage. Check flaps and ailerons for excessive backlash of attachments by rocking slightly at the

trailing edge.

c) Check the function of the gas spring with flaps in position -7. Push the flaps down at the inner root into neutral position and then release. The flaps must return to the initial position -7.

d) Check hinges for damage.

e) Check if the holes for static pressure intake under the wing are open.

④ a) Check if the holes for static pressure intake in the rear fuselage shell are open.

b) If available install the venturi and check the tubing by blowing into the venturi (the connected variometer must indicate "Climb").

⑤ Check if the attachment of the horizontal tail plane is locked.

⑥ Check elevator and rudder for free and full movement,
trailing edges for damage,
attachments for excessive backlash by rocking slightly at the trailing edge.

⑦ See ③

⑧ See ②

⑨ Check the pitot tube for contamination. When blowing into the tube the ASI must work.

After heavy landings or excessive acceleration the frequency of flexural wing vibration should be checked (about 145/min.).

Disassemble the sailplane and check surfaces of fuselage, wing, and horizontal tail plane. If damages should be observed, e.g.
tears in the painting of the rear fuselage and of the horizontal tail plane,
white spots at the spar stubs or at the root ribs in the area of bearings and attachment bolts,
deformation of the main bolt and of the elevator control fittings etc.

The sailplane is unserviceable until the damages are properly repaired.

4.2 Cockpit Layout

1. Instrument panel

With canopy opened the instruments are well accessible. The instrument compartment cover is fastened by four screws. The instrument panel is attached onto the fuselage canopy frame and is easy to remove.

2. Control stick

Installed onto the control stick are

a) a push to talk switch for radio,

b) the main landing wheel brake lever.

3. Tow release

The yellow handle at the left-hand side of the control stick operates the towing hook.

4. Air brakes

Extension: Pull back the blue handle at the left-hand side of the cockpit.

Retraction: Push the handle forward.

5. Wing flaps

Tilt the grey handle at the left-hand side of the seat inward and choose the desired position.

High speed: Push the handle forward and catch it.

Low speed: Pull back the handle and catch it.

6. Trimming control

The spring loaded trimming control (green knob) is mounted onto the flap control rod at the left-hand side of the cockpit. It is gradually adjustable. Tilt the knob slightly inward, choose the position and lock.

Nose heavy : Push forward.

Tail heavy : Pull back.

7. Canopy

The one-piece plexiglass hood is attached by flush hinges at the right-hand side of the fuselage.

It is opened at the left-hand side of the cockpit. PULL BACK the red ball knob of the locking device on the canopy frame and lift the canopy.
Take care that the cord which holds the opened canopy in place is attached.

The jettisoning device is mounted at the right-hand side of the cockpit, just under the side fairing.

For jettisoning open the canopy as described before, then PULL BACK the red ball knob.

8. Landing gear

RETRACTION : Unlock the black handle at the right-hand side of the seat, pull it back and lock.

EXTENSION : Push the handle forward and lock.

9. Water ballast

Black knob at the right-hand side of the cockpit, just under the side fairing.

Knob in aft position: Dump valve closed.

Knob in front position and locked: Dump valve open.

10. Pedal adjustment

The adjustment device is operated by a Bowden cable with a plastic T-handle at the right-hand side of the control stick.

Adjustment backward: Pull the cable and move the pedals into the desired backward position. Give the pedals a slight forward push with the heels, not with the toes, until the locking pin engages self-acting with a clear clicking noise.

Adjustment forward: Pull the cable slightly back to unlock the mechanism and push the pedals with the heels into the desired forward position and lock as before.

11. Parachute support

A molded glass fiber support, serving as a stowage recess for automatic back-type parachutes, is attached onto the rear

part of the seat by means of four screws.
When using a manual long back-pack parachute it is advisable to take it off.

12. Cockpit ventilation

The ventilator is closed by pulling the small black knob at the right-hand side of the instrument panel.

In addition the sliding window of the canopy or its air scoop can be opened.

13. Cockpit Placards

Identification plate (fire-proof)

Hersteller: SCHEMPP - HIRTH KIRCHHEIM-TECK
Bau-Muster
Werknummer
T.C. No.

Operating limits

Max. take-off weight	450 kg, 992 lb.		
Maximum permitted speeds (I.A.S.)	km/h	knots	mph
Flaps:			
Positions -4 or -7	250	135	155
Positions 0, +6 or +10	180	97	112
In strong turbulence	200	108	124
Maneuvering speed	200	108	124
Airplane tow	180	97	112
Auto and winch tow	150	81	93

Altitude		V_{NE} (IAS)		
m	ft.	km/h	knots	mph
3000	9800	250	135	155
6000	19700	223	120	139
10000	32800	177	96	110

Weak links for towing
600 ± 30 kg, 1320 ± 66 lb.
Landing wheel tire pressure
3.5 Atm., 50 psi

Cockpit load

Payload (pilot and parachute)

The maximum weight must not be exceeded.

Minimum payload: 70 kg, 154 lb.

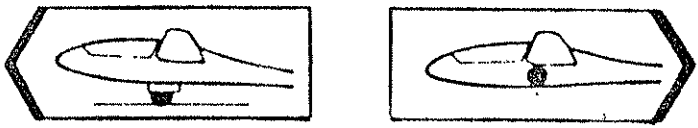
Less weight must be compensated with ballast on the seat.

Check List before take-off

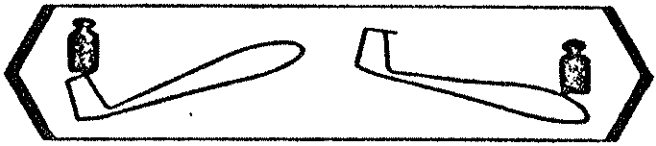
- o Parachute put on properly ?
- o Strapped in safely ?
- o Back rest and rudder pedals in comfortable position ?
- o Operating handles and instruments well accessible ?
- o Air brakes locked after having checked the function ?
- o Movement of control surfaces checked ?
- o Flight controls unrestricted ?
- o Trim adjusted properly ?
- o Wing flaps in take-off position ?
- o Canopy closed and locked ?

The following acrobatic maneuvers are permitted:

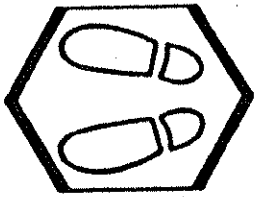
recommended entry speed	km/h	knots	mph
Inside loops	200	108	124
Spins	60	32	37
Turns	200	108	124
Lazy eight	180	97	112



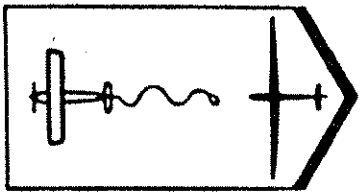
Extended Landing gear Retracted



Trimming (GREEN knob)

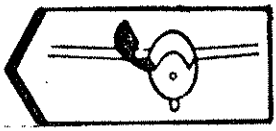


Pedal adjustment

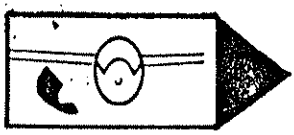


Tow release
(YELLOW T-handle)

Air brakes (BLUE handle)



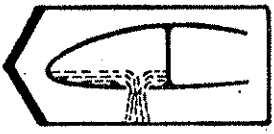
OPENING



JETTISONING

Canopy (RED ball knobs)

Ventilation



Water ballast

4.3 Check before take-off

See cockpit placard on page 24.

4.4 Take-off

Aerotow

Maximum permitted speed on aerotow:

V_T = 180 km/h (97 kt, 112 mph).

Use the C/G hook for aerotow or, if installed, the nose tow hook.
The Mini-Nimbus has been aerotowed using Nylon ropes of between 40 and 60 m length (130-200 ft).
When commencing the ground run apply the wheel brake gently so that the sailplane does not over-run the tow rope.
For take off set flaps at "-4" and the trim to "neutral" for forward to middle C.G. positions, or to "nose heavy" for middle to aft C.G. positions.
With the C.G. in a middle to forward position, the elevator should be neutral for the ground-run; in the case of rear C.G. positions it is recommended that down elevator is applied until the tail lifts.
As the speed increases select flap setting "0". With middle to rear C.G. positions the sailplanes leaves the ground at "0" flap setting, and in the case of forward C.G. positions or if the all-up weight is high, flap setting "+6" should be selected to shorten the take-off run.
After the sailplane left the ground, at speeds of about 70 to 75 km/h (38-40 kt, 43-47 mph), the trim can be set for minimum control stick loads. Normal towing speed is in the region of 100 to 120 km/h (54-65 kt, 62-75 mph) with flap setting "0". At speeds in excess of 120 km/h (65 kt, 75 mph) the appropriate flap setting is "-4". When water ballast is carried the normal towing speed should be increased by up to 15%.

The undercarriage may be retracted during the aerotow; this is not, however, recommended at low altitude, as changing hands on the control stick could easily cause the sailplane to lose station behind the tug.
When releasing the rope, pull the yellow cable release handle fully several times and confirm that you have released successfully before turning.

Winch launch

Maximum permitted winch launch speed :

$$V_W = 150 \text{ km/h } (81 \text{ kt}, 93 \text{ mph}).$$

For winch launching only the C/G hook must be used. The flaps are set at "0" (or at "+6" if the all-up weight is more than 400 kg/882 lb).
Before taking-off the trim should be set to "neutral" for forward to middle C.G. positions or to "nose heavy" for middle to aft C.G. positions.
As the cable tightens, apply the wheel brake gently to prevent the sailplane overrunning the cable.
Ground run and take-off are normal - there is no tendency to climb excessively steeply on leaving the ground. At the moment of lift-off, depending on the C.G., the control stick should be held in a well forward position (in the case of aft C.G. positions) or slightly pulled back (in case of forward C.G. positions).
After climbing gently to a safety height of about 50 m (164 ft), the transition to a typical winch launch climbing attitude is effected by easing the control stick back. If pitching motions occur during the last stage of the tow, ease the control stick slightly forwards.
Climbing take-offs and low towing speeds must be avoided.

With normal cockpit load and without water ballast the towing speed should not be less than 90 km/h, 49 knots, 56 mph, with water ballast not less than 100 km/h, 54 knots, 62 mph.

When using low-powered winches or engines with limitation of RPMs, when towing with the wind, in calm air or with filled water ballast tanks make sure that the winch has enough power reserve to maintain the required minimum towing speed.

Normal towing speed	km/h	knots	mph
without water ballast	105	57	65
with water ballast	120	65	75

When reaching the maximum towing height the tow rope is released automatically, nevertheless pull the release handle several times.

4.5 Free Flight

Test the effectiveness of the air brakes in safe altitude, observe the loss of height at different speeds and get familiar with the operation of the wing flaps.

Since the trim is combined with the flaps it is to be adjusted for zero stick force in straight flight with flaps in position 0. The sailplane then is trimmed for all other flap positions over the optimum speed range (except of high speeds).

The sailplane has well balanced flight characteristics and controls.

With flaps in position 0 and at a speed of 1.4 V_{stall} the time taken to roll from a 45 degr. banked turn through an angle of 90 degrees is 3 seconds.

Flight performances

(W/S = 33 kg/m^2, 6.76 lb./sq.ft.)

Stall speed (flap position +10)
59 km/h, 32 knots, 37 mph

Minimum sink (flap position +6)
0.57 m/sec, 1.87 ft./sec. at 80 km/h, 43 knots, 50 mph

Best gliding ratio Max. L/D (flap position 0) 1 : 41 at 95 km/h, 51 knots, 59 mph

Wing flaps

The flaps have the purpose to adapt the laminar bucket of the wing airfoil to the respective airspeed in the best way. Since the laminar buckets of the applied airfoil are covering eachother widely, the following flap positions can be accepted:

Normal flight - four positions
Landing - one position
High speed flight - one position

Application	Flaps	Airspeed km/h	knots	mph
Approach	+ 10	see page 37		
Thermal flight	+ 10	70-90	38-49	43-56
Turbulent thermals	+ 6	70-90	38-49	43-56
Best glide	0	80-120	43-65	50-75
Flight between thermals	- 4	110-170	59-92	68-106
High speed	- 7	160-250	86-135	99-155

With water ballast the speeds increase about 15 %.

4.6 Low Speed and Stall

To get familiar with the sailplane stalls should first be carried out in high altitude from straight and turning flight, with about 45° bank, with different flap positions. The following stall speeds were measured:

Take-off weight	350 kg (772 lb.)			450 kg (992 lb.)		
C.G. position	355 mm (14 in.)			220 mm (8.7 in.)		
Stall speed	km/h	knots	mph	km/h	knots	mph
air brakes retracted flap positions						
+10	59	32	37	72	39	45
0	67	36	42	81	44	50
- 7	77	42	48	89	48	55
air brakes extended flap position +10	55	30	34	65	35	40

Shortly before reaching the stall speed stall warning occurs with air brakes retracted at speeds of 60 to 89 km/h, 32 to 48 knots, 37 to 55 mph (depending on the wing loading and flap position) by slight vibration of the horizontal tail plane, ailerons become spongy.
With air brakes extended the sailplane vibrates considerably already 5 km/h, 2.7 knots, 3.1 mph before reaching the stall speed.
When pulling the stick gently back the ASI indicates again higher speeds until

(with the C.G. in aft positions) control is lost by wing dropping or (with the C.G. in forward positions) the sailplane pancakes when the control stick reaches the limit of backward travel.
The control stick then is to be eased forward.
With air brakes extended the loss of height during recovery to normal flight is about 50 m, 164 ft.
With the C.G. in aft positions full rudder in a stall brings the sailplane into a spin. It recovers safely from the spin by the standard method which is defined as:

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

b) pause;

c) ease the control stick forward until the rotation ceases and the sailplane becomes unstalled;

d) neutralize the rudder and allow the sailplane to dive out.

4.7 High Speed Flight

When flying at high speed observe the maximum limiting speeds for the respective flap positions as marked on the ASI by corresponding colors.
Full control movements are permitted at speeds up to V_A = 200 km/h, 108 knots, 124 mph only.
At a speed of V_{NE} = 250 km/h, 135 knots, 155 mph only one third of the full control movements is allowed. Avoid sharp elevator control movement in any case.
In strong turbulence, e.g. in wave rotors, thunder clouds, visible vertical whirlwind or when flying over mountain ridges

the speed must not exceed V_B = 200 km/h, 108 knots, 124 mph.
With the C.G. in aft positions the required stick travel at all speeds up to V_{NE} is relatively small, the change of speed however is clearly noticed by a change of stick forces.
The air brakes can be extended at speeds up to V_{NE} = 250 km/h, 135 knots, 155 mph. Since sudden deceleration of about 2 g can occur the air brakes should be used only in emergencies or when exceeding unintentionally the max. permitted speeds (see page 5).
Take care that the safety belt and the harness have a tight fit. Do not push inadvertently against the stick when extending the air brakes. Avoid loose objects in the cockpit.
With air brakes extended do not pull-out too rapidly but gently (see load factors page 7).
Due to the steep flight position the air brakes should not be retracted at speeds exceeding 140 km/h, 76 knots, 87 mph.
The terminal velocity in a dive with an inclination of the flight path of 45° is about 150 km/h, 81 knots, 93 mph, air brakes and landing gear extended.

4.8 Flight with Water Ballast

If an average climbing speed of less than 1.5 m/sec, 3 knots, 5 ft./sec. is expected or when flying in narrow thermals where highly banked circling is required the use of water ballast is not worthwhile.
Before filling water into the wing tanks the maximum permitted water ballast is to be determined following the instructions on page 9.

With wings level the tanks are filled through a hole in the upper wing surface next to the station of the inboard aileron root.
Don't fill under high pressure, e.g. directly from the water main. Both tanks must be filled with the same water quantity. Due to the installed baffles no noticeable shifting of the water is observed.
The filling holes are closed by a cap which has a small 5 mm dia hole for pulling it out by means of the provided pin. The hole in the cap serves also as a vent hole and therefore must be kept open. The tanks have an additional vent by means of plastic tubing leading through the wing with outlet at the outboard aileron root.

When flying at temperatures lower than 0 degr. C (32 degr. F) the water must be drained off to avoid icing.

Drain off the water before landing to reduce the approach speed and therewith the landing run.

Full water tanks are drained off within about 4 minutes.

The water is drained off through a hole in the lower wing surface next to the root rib.

With the dump valve operating knob in the cockpit pushed back (dump valve closed) the connection of the water ballast system of the wing to the fuselage is made automatically when attaching the wings.

Never park the sailplane with filled water tanks. Drain off the water, open the caps and let the tanks dry.

If the dump valves with filled water tanks should leak, coat the closing caps slightly with grease before the next filling; pull the cap down by means of a M6 bolt screwed into the threaded hole in the center of the cap.

4.9 Cloud Flying

The sailplane has sufficient strength and stability for cloud flying. It is easy to control and has stable circling qualities.
Nevertheless observe the following instructions:

Do avoid extreme airspeeds in any case.

To prevent the sailplane from a spiral dive do not execute spins as a rescue action.

It is recommended to extend fully the air brakes already at an indicated speed of 130 km/h, 70 knots, 81 mph or at a load factor exceeding 2 g.

At speeds exceeding 140 km/h, 76 knots, 87 mph the air brakes should not be retracted again, due to its steep position the sailplane then could exceed the maximum permitted speed.

Take care that the required equipment for cloud flying is installed (see page 12).

4.10 Flight below freezing point

At temperatures below 0° C (32° F), e.g. in wave flights or during winter it is possible that the flight controls cannot be operated with sufficient ease and smoothness, therefore all controls should be free from moisture to avoid icing.

This, in particular, applies to the AIR BRAKES.
Experiences have shown that it is very advantageous to coat the full span of the top covers on the air brakes with Vaseline to avoid jamming by icing.
Flaps and control surfaces are to be moved frequently.
When flying with water ballast observe the instructions on page 33.

4.11 Acrobatics

Inside loops

The maneuver should be entered at speeds not less than 180 km/h, 97 knots, 112 mph. A speed of 200 km/h, 108 knots, 124 mph is recommended.
The speed during recovery is 180 km/h, 97 knots, 112 mph.

Spins

Steady spins are possible only with the C.G. in the aftmost position. With the C.G. in forward positions the sailplane goes into a spiral dive.
Recovery then must be initiated immediately by neutralizing all controls and diving out.
Entry to the spin is initiated from dynamic stall by applying rudder in the direction of rotation just before stalling out.
Speed during entry to the spin:
60 km/h, 32 knots, 37 mph.

Speed during recovery from the spin:
140 - 180 km/h, 76 - 97 knots, 87 - 112 mph.

Action for recovery from the spin is initiated by applying opposite rudder and easing the control stick forward.

Turns

Entry to the turn at speeds not less than 180 km/h, 97 knots, 112 mph.
A speed of 200 km/h, 108 knots, 124 mph is recommended.
After entry to the turn apply rudder in the vertical climb at a speed of 130 km/h, 70 knots, 81 mph.
Speed during recovery from the turn: 180-200 km/h, 97-108 knots, 112-124 mph.

Lazy Eight

Entry to the maneuver at a speed of 180 km/h, 97 knots, 112 mph, followed by a climb of about 30 to 45 degrees from which a turn is initiated at a speed of 120 km/h, 65 knots, 75 mph.
Speed during recovery:
180 km/h, 97 knots, 112 mph.

Dependent on the load factor and the angle of bank the speed in steep turns should not be less than the values given in the following table:

Load factor	Angle of bank	Speed km/h	knots	mph
+ 2.0	60°	110	59	68
+ 2.5	65°	125	67	78
+ 3.0	70°	135	73	84
+ 3.5	73°	150	81	93

Acrobatics are permitted only when flying without water ballast.

4.12 Approach and Landing

The very effective air brakes are a combination of spoilers and flaps and allow steep and slow approaches. They do not notably increase or decrease the lift.

The normal flap position during the landing is +10.

Pulling back the air brake handle until a clear resistance is observed means extending only the spoilers by which the sailplane can be controlled during the approach.
When pulling the handle further back the spoilers and flaps are cooperating.

The normal approach speed is about 75 - 80 km/h, 40 - 43 knots, 47 - 50 mph with flaps in position +10, air brakes and landing gear extended.

With water ballast the speeds increase up to 15 %.

The gliding angle is about 1 : 4.5.

In the approach pull-out arc or shortly before landing at speeds less than 70 km/h, 38 knots, 43 mph the air brakes must not be slowly retracted but rapidly and fully, otherwise only the flaps are taken back into normal position (loss of lift) while the spoilers with their full drag and decrease of lift are still fully extended.
Rapid and full retraction of the air brakes does not considerably change the lift and longitudinal inclination of the sailplane; the sinking speed resp. the gliding angle however promptly improve.

With semi-retracted air brakes the Mini-Nimbus pancakes.

Landings always should be carried out with fully extended air brakes, for this configuration ensures the lowest touch down speed.

Steep approaches (e.g. in strong ground turbulence or over high obstacles) should be made with fully extended air brakes while the gliding angle is corrected with elevator control only.

Excessive height can be reduced without gaining much speed by easing the control stick forward.

The sailplane touches down on the landing wheel and the tail skid simultaneously. The wheel brake (drum brake) is sufficiently effective. The brake lever is mounted onto the control stick.

To avoid a long landing run it is advisable to touch down at a minimum speed of 60 - 65 km/h, 32 - 35 kts, 37-40 mph. Touching down at 90 km/h, 49 knots, 56 mph instead means doubling the energy of the sailplane and considerably increases the running distance.

Landings have been demonstrated with cross winds up to 20 km/h, 11 knots, 12 mph.

When off-field landings are inevitable always extend the landing gear.

Flying in rain or with iced-up wings means a loss of performance and aerodynamic qualities. Therefore be cautious when landing!
Come in at a speed of about 95 - 100 km/h, 51 - 54 knots, 59 - 62 mph.

Amendments

No.	Item	Page	Date
1.	Modification Bulletin No. 328-1 Hinge moments and weights of elevator. Affected component No. 19, 35, 37, 43 and on	52	January 1978
2.	Modification Bulletin No. 328-2 Hinge moments and weights of rudder. Affected component No. 52 and on	52	10.01.1978
3.	Technical Note No. 328-2 Installation of a nose tow hook instead of the C/G hook	45, 50, 51	17.02.1978
4.	Technical Note No. 328-7 Inspection program for the extension of the service time	60a, 60b	November 1985
5.	Technical Note No. 328-12 Retrofit of a nose tow release mechanism - optional for all S/N -	45, 51a, 51b	January 1999
6.	Supplement of the equipment and instruments	56, 57, 57a, 57b, 57c	February 2008

5 Storage, Transport, Assembly

5.1 Storage, Parking, Ground towing

The sailplane should be stored or parked in well ventilated rooms.

Closed weatherproof trailers should be equipped with sufficiently large vent holes.

Store or park always with fully drained off water tanks.

Take care to keep the sailplane free from any strain, especially at higher temperatures.

Due to their high fineness ratio the wings with leading edge down must be supported very carefully at the center of the spar stubs and in a section-true wing support at a distance of about 2.4 m from the tip.

The fuselage should be supported on a wide cradle just in front of the C.G. towing hook and on the tail skid.

The horizontal tail plane is to be supported with leading edge down on section-true cradles which should have a distance of about 1.5 to 2.0 m.

In trailers the horizontal tail plane must not be supported at the attachment fittings.

Sailplanes which are kept assembled for longer periods must be maintained so to avoid corrosion of the attachments of the fuselage, wings and tail surfaces.

The use of dust covers on high performance sailplanes should be taken for granted.

When towing the sailplane by car always use a tail dolly to avoid excessive stress and therewith wear of the tail plane attachments due to vibration.

When towing off by hand do not push at the wing tips but at the wing root area.

5.2 Assembly

Wings.

1) Clean and lubricate the attachment bolts and bearings.

2) Adjust the flap control lever in the cockpit on "high speed" position -7°, the air brake control lever and the dump valve operating lever on position "CLOSED".

3) Put the left wing (fork spar root) with the flap in position -7° and lifting it slightly into the cut-out of the fuselage up to a distance from the fuselage of about 1 cm, unlock the air brake control lever, push the wing fully in and insert the main bolt into the front fork spar bushing only.
Be cautious that the bell cranks on the root rib are safely engaged into the funnel-type fittings on the fuselage and that the flap control is catching properly the torsion drive tube.
The wing then can be laid down on a support (e.g. on the tail plane support).
Lock the flap control lever in position 0° and extend fully the air brake.

4) Put in the right wing (tongue spar root) up to a distance from the fuselage of about 10 cm. Open fully the air brake. Push in the wing with aileron in neutral position while moving the wing tip slightly back and forth and lifting the trailing edge a little to avoid a tilting of the attachment bearings on the fuselage. When a distance of 1 to 2 cm between wing root rib and fuselage is reached remove the main bolt.

Take the provided assembly tool, push it through the main bolt spar bushings and pull the wings together. Take care of the proper connection of the controls as described by the instructions No. 3.

5) Push the main bolt through the aligned spar bushings and secure its handle onto the fuselage shell by means of a cowling safety pin.

6) Horizontal tail plane (see sketch page 43).

The horizontal tail plane should be mounted by one person only.
Put the plane from the front onto the fin so that the front bolt bearing fitting (A) is just dipping into the upper opening of the movable glass-fiber fairing on the top of the fin.
Push the tail plane slightly down until its lower surface is fully sitting on the fairing.
Push the tail plane backwards until a clear audible "CLICK" indicates that the locking hooks (B) are engaged onto the axle (C). The hooks (B) then must be tightly locked by moving the locking handle (D) up to the rear stop using the provided 8 mm dia mounting pin.

7) After assembly.

Check the function of all controls.

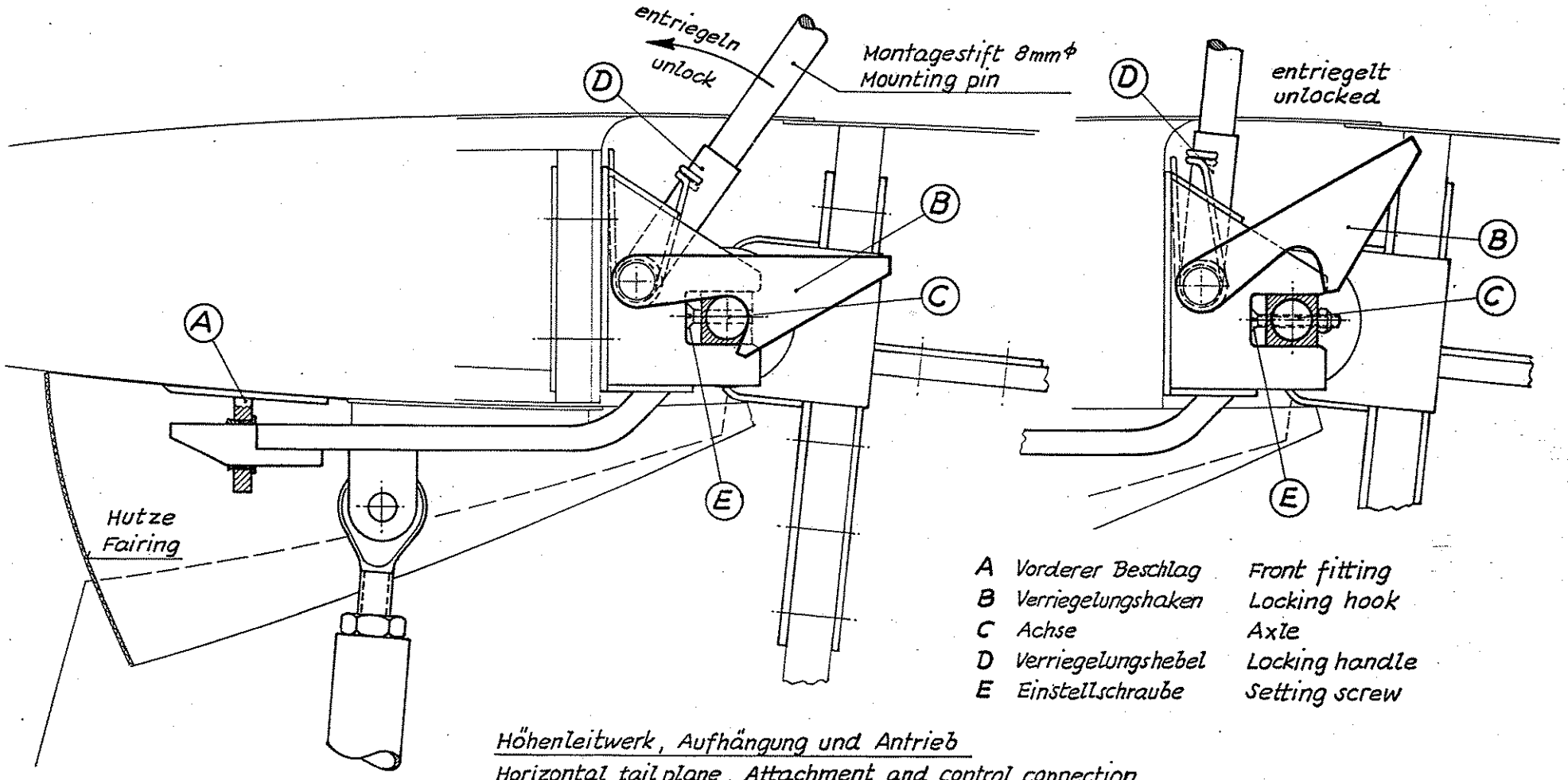
Seal the joints of the wing and fuselage with an adhesive tape. Seal also the access hole for the locking handle of the horizontal tail plane.

The sealing is very important to ensure good flight qualities.

5.3 Disassembly

1) When taking off the horizontal tail plane it is advisable to do it from the rear. Unlock the hooks (B) by pushing the locking handle (D) forward using the 8 mm dia pin.
Push the plane simultaneously forward about some mm (one inch) whilst knocking against the trailing edge until the bolt is disengaged from the bearing fitting (A).
Take off the tail plane.

2) With air brakes semi-extended and flaps in position 0^{o} load the wings and pull out the main bolt.
Disconnect the wing attachment by pulling thoroughly at the wing tips and take off the wings.



A	Vorderer Beschlag	Front fitting
B	Verriegelungshaken	Locking hook
C	Achse	Axle
D	Verriegelungshebel	Locking handle
E	Einstellschraube	Setting screw

Höhenleitwerk, Aufhängung und Antrieb
Horizontal tail plane, Attachment and control connection

6 Maintenance

6.1 Periodic Inspections

Rudder control cables

After every 200 flight hours and at every annual inspection the rudder control cables are to be checked in the area of the S-shaped tubular guide on the pedals with pedals in front and aft position.

The control cables should be replaced if injured, worn or corroded. A wear of single outer strands up to 25 % is permissible.

If a replacement of the cables should be necessary cables 3.2 mm (1/8") LN 9374 made of zinked carbon steel strands are to be used.

The thimble eye-splices are made with Nicopress Oval Sleeves No. 18-3-M or No. 28-3-M using a tool No. 51-M-850 and following the special instructions for making and checking the sleeves.

Gas springs

After removal of the upper fiber-glass fairing on the front steel tube frame the gas springs are accessible behind the front wing attachment tube.

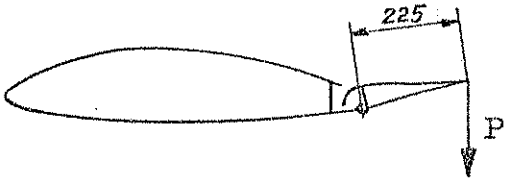
The piston rods must be clean and without any damage.

If a leakage of the piston rod oil seal should be observed the gas spring must be replaced.

The expansion force of the gas spring is to be checked on the assembled sailplane with flaps in position -7°.

It must be possible to hold the flap in this position without moving down when applying a moment of 16 to 19 Nm resp. 1.6 to 1.9 mkg or 11.6 to 13.7 ft.lb.

The required moment is obtained by pulling the trailing edge of the flap in the area of its root using a spring balance or by attaching weights.



The force or the weight should be

P = 7.0 to 8.5 kg or 15.4 to 18.7 lb.

Towing hook

Inspections are to be carried out in accord with the Operating and Maintenance Instructions for Special Towing Hooks "S 72 and SH 72", dated May 1975, LBA-approved.

Instruments

Follow the instructions of the respective manufacturers.

Suppliers

Schempp-Hirth GmbH & Co KG
Krebenstr. 25, D - 7312 Kirchheim-Teck
(Cables, Sleeves, Gas springs, Main landing wheel)

R. Lindemann
Osterrade 12, D - 2050 Hamburg 80
(Nicopress sleeves, Tools)

TOST Flugzeuggerätebau
Thalkirchnerstr. 62, D-8000 München 2
(Towing hook)

6.2 Annual Inspections

Maintenance schedule

(See control system views on pages 61, 62, 63).

Accessibilty of controls for inspection:

- o Wing controls

  Aileron drive accessible through cut-outs in the rear wing spar with air brake opened and aileron dismounted.

  Air brake drive accessible through cut-outs in the rear wing spar with air brake opened.

- o Fuselage controls

  Drives in the fuselage accessible after removal of the seat panel and the fairing on the front steel tube frame.

- o Elevator control

  Accessible after disassembly of the horizontal tail plane.

- o Rudder control

  Accessible through the cut-out in the nose with rudder deflected to the right.

After having cleaned the sailplane proceed as follows:

- o Check all external surfaces for holes, tears, scratches, dents, and detached laminates. If the outer laminate of a sandwich shell is damaged also the inner glass cloth layer is to be inspected. It is advisable to ask an expert's advice.

- o Check all accessible metal parts for damage. As known from experience no damage occurs when operating the sailplane properly.

If any repair should be necessary ask the advice of the manufacturer.

- o Check all accessible metal parts for corrosion. If necessary remove the rust and protect the surface again by a new painting. Corroded fittings, push rods, and levers should be thoroughly cleaned and consequently primed and painted, using a special primer and Nitro paint (primer and paint can be supplied by Schempp-Hirth.
- o If the controls cannot be operated with sufficient ease and smoothness, clean and lubricate the corresponding hinges or bearings.
- o Replace bearings which have an excessive radial clearance.
  The automatic connections of ailerons and air brakes between wing and fuselage can be adjusted free from backlash by correcting screws on the funnel-type levers of the fuselage.
  The backlash of controls and air brake drive is to be checked in accord with paragraph 6.3.
- o All fittings attached onto glass-fiber structure are to be checked for a tight fit. Check the glass-fiber structure for tears, white spots, and broken glass cloth laminate.
- o If a loss of the braking effect of the landing wheel is observed, clean the brake drum, inspect the brake lining, replace the lining if worn. Check the brake Bowden cable and the brake lever, adjust if necessary. Check the wheel hub for lateral clearance. Follow the instructions of the manufacturer TOST.
  Check the wheel axle and landing gear struts for deformation and the attachment fittings for damage.

Check the tire pressure of the main landing wheel (3.5 Atm. or 50 psi).

- o Inspect the static and dynamic pressure intakes, the tubing, and couplings for free air pass and tightness.
  Check instruments for loose glasses.
- o Assemble the sailplane and check the control surface movements and all controls for easy and smooth operation.
  The gap between flap, air brake and aileron should be at least 2 mm, 0.08 in.
  Check the wings and control surfaces for excessive backlash of controls and attachments (see paragraphs 6.3 and 6.4).
  Check the function of the tow release mechanism.

6.3 Backlash of the controls

With controls held fixed the backlash of the control surfaces must not exceed the following values:

Control surface	Backlash		Measuring point aft of hinge axis	
	mm	in.	mm	in.
Elevator	± 3	± 0.12	287	11.3
Rudder	± 5	± 0.2	350	13.8
Flaps	± 5	± 0.2	235	9.3
Ailerons	± 4	± 0.16	136	5.4
* Air brakes	± 2	± 0.08	* 120	* 4.7

* measured above hinge axis at fully opened air brake.

6.4 Backlash of the attachments

Wings

Tangential backlash (movement forth and back) can occur, due to the wear of the washers which are pressed onto the wing attachment bolts. If the movement at the wing tips exceeds 30 mm (1 3/16") additional washers of an inner diameter of 13.95 mm about 0.3 to 0.5 mm thick should be pressed onto the bolts until the backlash is eliminated.

Horizontal tail plane (see page 43)

If tangential backlash should be observed, i.e. if the tail plane can be moved at the tips excessively back and forth, the setting screws (E) must be adjusted. Disassemble the tail plane. Screw out the setting screws little by little until the tail plane cannot be locked any longer. Then the setting screws are to be screwed in about a quarter turn. Tighten the lock nuts using a 5.5 mm socket wrench. When mounting the plane thereafter the locking hooks (B) should snap tightly onto the axle (C).
It may be possible that the adjustment of one setting screw must be different from the other. This is the case when there is still a backlash existing though the locking mechanism has a very tight fit. The setting screws then must be adjusted gradually until both locking hooks are catching the axle with the same tight fit.

6.5 Damages

Before every take-off, especially after a longer period of storage, a ground inspection should be carried out (see Flight Manual, page 17).

Pay attention to damages as tears in the paint, holes, white spots in glass-fiber laminate etc.

In case of doubt about the seriousness of the damage ask the advice of a FRP-expert.

Smaller damages which do not impair the airworthiness of the sailplane can be repaired by the owner himself.

(See Appendix: "Repair Instructions").

6.6 Tow release hook

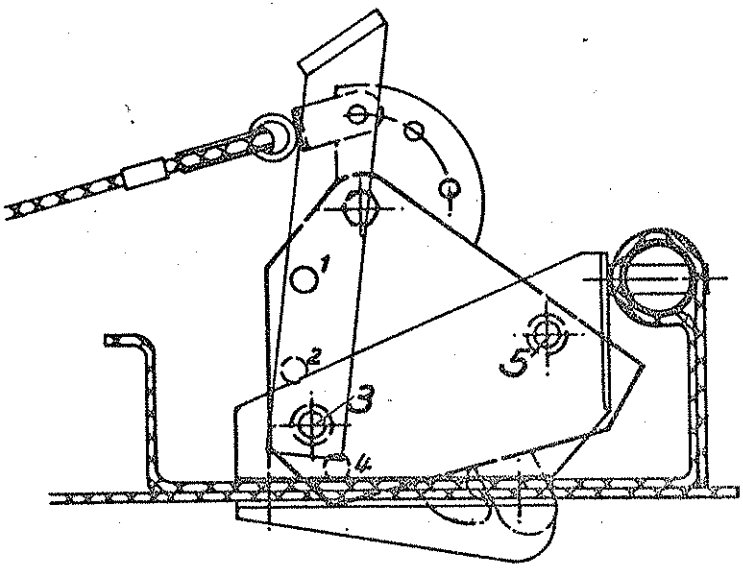
The tow release hook, mounted on the bottom of the fuselage just in front of the landing wheel, is much exposed to dirt and must be checked quite often for damages. Keep it clean and lubricated.

It is easy to take off the tow release hook for inspection or repair.
Remove the seat panel, disconnect the release cable and unscrew the two attachment bolts.

In case of belly landings the towing hook is protected by two angular fittings which are bolted onto the attachment brackets of the hook. If these fittings show an abrasion up to the heads of the attachment bolts, they must be replaced.

When mounting the towing hook again take care to attach it onto the bracket as shown on sketch, page 51.

Attachment of the tow release hook in front of the landing wheel



Towing hook to be attached onto the bracket by the bolt holes 3 and 5.

6.7 Weights and hinge moments of the Control surfaces

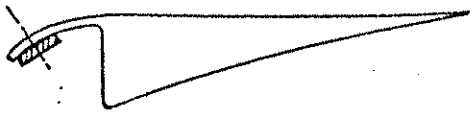
After repair or a new painting the weight and hinge moment of the control surfaces must not exceed the following values:

Control surface	Weight		Hinge moment	
	kg	lb.	mkg	ft.lb.
Flap	4.3	9.48	0.177	1.28
Aileron	3.3	7.28	0.086	0.62
Elevator	6.9	15.21	0.204	1.47
Rudder	5.2	11.46	0.083	0.60

If these values are exceeded a mass balance must be installed in front of the hinge axis.

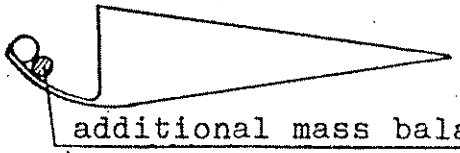
Mass balance on flaps and ailerons

A square bar of lead or of similar heavy material is to be attached onto the inside of the nose strip between the first and second hinge fittings by means of 4 mm or 5/32" counter sunk screws in a distance of 100 to 150 mm, 4 to 6 in. each.



Mass balance on the rudder

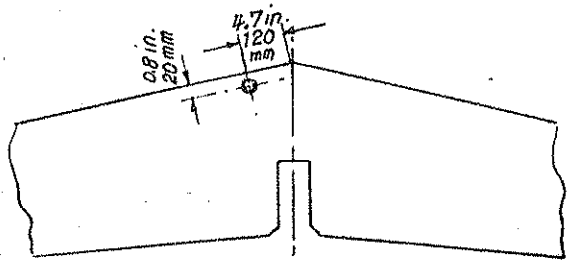
Parallel to the already installed round bar a square or round bar of the required weight is to be glued onto the inside of the nose strip and covered with a glass cloth layer.



Modif. Bulletin No. 328-1, 328-2 10.1.1978

Mass balance on the elevator

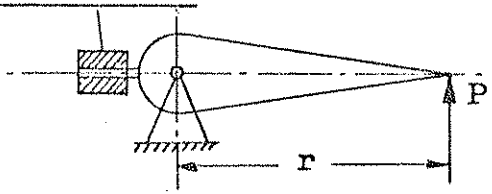
Drill a 20 mm (13/16") dia hole into the lower surface, glue in with Epoxy resin granulated lead mixed with microballoons. Let dry and close the hole following the repair instructions (see appendix).



The hinge moments must be determined on the disassembled control surfaces.

$$M = P \cdot r$$

Mass balance



The control surface should be supported at its hinge axis.

The force P is to be measured by means of a letter or spring balance.

After the installation of an additional mass balance the control surface movements are to be checked for their inlimited travel.

6.8 Maintenance of the surface finish

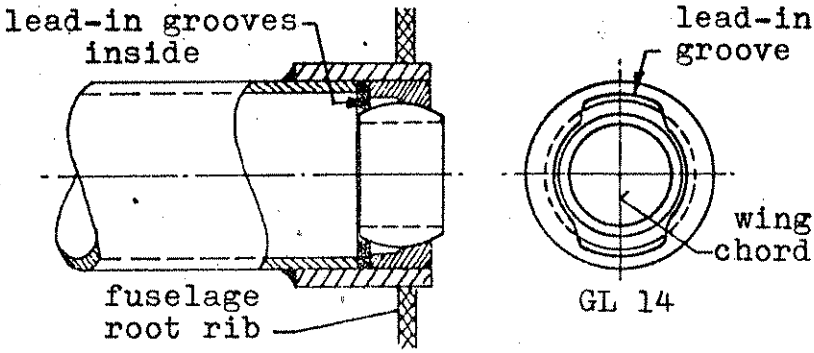
- Wash the surface with clean warm water using a soft sponge and wipe dry with a soft clean chamois.
- Never use gasoline, alcohol or thinner for cleaning.
- Do not add washing agents to the water too often and don't use agents which are containing Silicone.
- Clean the plexiglass hood with a special cleaning agent for plexiglass, or in needs, with lukewarm water.
  Use only soft clean chamois for wiping dry.
  Never try to clean with a dry cloth.
- The sailplane should be protected from moisture.
  If water should be soaked into inner compartments, disassemble the sailplane and let the components dry while turning them over frequently.
- Do not expose the sailplane to extreme sunlight and avoid unnecessary permanent strain.
- Take care that all external portions of the sailplane which are exposed to sunlight are painted white.
  Other colors than white would excessively heat the FRP-structure which may impair the strength qualities of the sailplane.

6.9 Replacement of the ball bearings for wing attachment bolts on the fuselage

Four ball bearings (GL 14) are installed at the ends of the wing attachment tubes of the fuselage steel tube frame. These bearings are to be checked for cracks after heavy landings.

If a replacement of the bearings should be necessary, the repair is to be done as follows:

Turn the inner ball about 90° across and hammer the bearing out of its seat from the opposite side using a bar of about 12 to 14 mm diameter.
Insert a new ball bearing (GL 14) with the lead-in grooves to the inside in the direction of the wing chord.
Peen over or punch the outer bearing race at three spots.



Mount the wings and check the clearance of the wing attachments. If the backlash is exceeding the permitted tolerance, i.e. if the movement at the wing tips is exceeding 30 mm, follow the instructions on page 49.

6.10 **Safety belts**

A four-piece symmetrical safety belt is required.

The following restraint system can be used:

Lap belts

Type	Manufacturer	Data Sheet No.
Bagu IV-D (E)	Gadringer	40.070/16
Bagu FAG-7F/0	Autoflug	40.070/30
4-01-1256	Schroth	40.073/11

Anchorage points:

On the metal bracket by the seat pan.

Shoulder straps

Type	Manufacturer	Data Sheet No.
Schugu II-C	Gadringer	40.071/05
Schugu FAG-7H/0	Autoflug	40.071/21
4-01-1256	Schroth	40.073/11

Anchorage points:

Front wing attachment tube accessible through cut-outs in the upper FRP-fairing.

6.11 Instruments

The following instruments are available for the basic instrumentation of this sailplane:

a) Minimum equipment (no cloud flying)

AIRSPEED INDICATOR
(Range: 50 – 270 km/h, 27 – 146 kt, 31 – 168 mph)
Manufacturer: Gebr. Winter, Jungingen

Model	Code No.			Data Sheet No.
	km/h	mph	kt	
6 FMS 4	6421	6422	6423	TS 10.210/15
7 FMS 4	7421	7422	7423	TS 10.210/19
6 FMS 5	6511	6512	6513	TS 10.210/16
7 FMS 5	7511	7512	7513	TS 10.210/20

ALTIMETER
Manufacturer: Gebr. Winter, Jungingen

Model	Code No.		Data-Sheet No.
	m	ft	
4 HM 6	4060	4200	TS 10.220/44
4 FGH 10	4110	4330	TS 10.220/46
4 FGH 20	4220	4440	TS 10.220/47
4 FGH 40		4550	TS 10.220/48

b) Additional equipment for cloud flying
(supplement equipment for normal operation a)

TURN & BANK INDICATOR with slip ball

Model	Manufacturer	Specif.-No.
WZ 402/31	Apparatebau Gauting	10-241/8
IFR 51-12-2	Instruments and Flight Research Wichita/USA.	TSO C 3 b

MAGNETIC COMPASS

Model	Manufacturer	Data-Sheet No.
FK 16 C 2300 C 2400	Ludolph Airpath Airpath	L-10.410.3

VARIOMETER
Manufacturer: Gebr. Winter, Jungingen

Model	Code-No.	Specif.-No.
5 St VL 5 St VLM 5 St V 5 St VM	all code numbers approved	TS 10.230/11 TS 10.230/12 TS 10.230/13 TS 10.230/14

NOTE:

For strength reasons the weight of the instrument panel must not exceed 10 kg (22 lb).

VHF-TRANSCEIVERS

Model	Manufacturer	Data Sheet No.
FSG 40 S	W. Dittel GmbH.	10.911/45
FSG 50	W. Dittel GmbH.	10.911/71
FSG 60	W. Dittel GmbH.	10.911/72
FSG 70	W. Dittel GmbH.	10.911/81
FSG 71 M	W. Dittel GmbH.	10.911/81
FSG 90, 90H1	W. Dittel GmbH.	10.911/98JTS
FSG 2T	W. Dittel GmbH.	10.911/103JTSO
ATR 720	Avionic Dittel	10.911/70
ATR 720 A	Filser Electronic GmbH.	10.911/74
ATR 720 B	Filser Electronic GmbH.	10.911/80
ATR 720 C	Filser Electronic GmbH.	10.911/83
ATR 500	Filser Electronic GmbH.	O.10.911/113JTSO
ATR 600	Filser Electronic GmbH.	O.10.911/106JTSO
ATR 600R01	Filser Electronic GmbH.	O.10.911/115JTSO
ATR 833	Filser Electronic GmbH.	EASA.210.0193
M760	Microair	CAA LA301068
AR 3201	Becker	10.911/76
AR 3201-( )	Becker	10.911/76
AR 4201	Becker	10.911/87

DILUTER DEMAND OXYGEN SYSTEMS

Model	Manufacturer	Code-No.	Data Sheet No.
Höhenatmer HLa 758	Dräger	E 20088	40.110/1
Miniregler	Dräger	E 24902	40.110/19
Miniregler	Dräger	E 24903	40.110/19

EMERGENCY LOCATOR TRANSMITTER

Model	Manufacturer	Data-Sheet No.
EB-2 B (CD)	Mar Tech Division	10.915/2
ELT 10	Narco Avionics	10.915/3
ELT 8.1	Dorne & Margolin Inc.	10.915/5
3000	Pointer	10.915/6
ACK E01	ACK Technologies Inc.	10.915/9

VOR-LOC (Navigator Receiver)

Model	Manufacturer	Data-Sheet-No.
Nr 3301 S	Becker	10.922/79

Transponder Mode A/C

Model	Manufacturer	Data-Sheet-No.
ATC 2000-(3)-R(XX) (ATC 3401-1-R, CU 3400-1-(XX), CU 5401-1-(XXX)	Becker	LBA.0.10.930/54 JTSO
ATC 4401 (ATC4401-1-175, ATC4401-2-175, ATC441-1-250, ATC4401-2-250)	Becker	LBA.0.10.930/062 JTSO
T2000	Microair	LBA.10.930/066 JTSO
ACK A-30	ACK Technologies	TSO C-88a

Transponder Mode S

Model	Manufacturer	Data-Sheet-No.
BXP 6401-1-(01)+ BXP 6402-1R-(01) BXP 6401-2-(01)+ BXP 6402-2R-(01) AM 6400-1-(01) Address modul CU 6401-1-(01) Control unit	Becker	EASA.21O.322
BE 6400-01(01) Blind Encoder	Becker	EASA.21O.001174
ACK A-30	ACK Techno-logies INC.	TSO C-88a
TRT 600 TRT 800 TRT-800H	Filser	10.930/063 NTS EASA.21O.045 EASA.21O.269
VT-0101 VT-0102-070 VT-01 VT-0102-125 VT-0103-1	Garrecht	EASA.21O.384

Note: concerning the installation of further equipment:

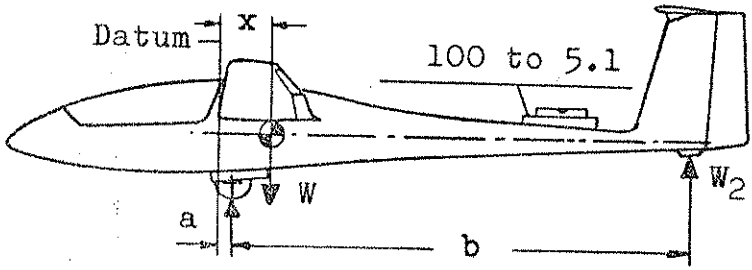
The Luftfahrt-Bundesamt (LBA) will advise with regard to the suitability of equipment not listed herein.
(The installation of oxygen systems must also be approved and their overhaul times are to be observed).

7 Determination of the empty weight C.G.

For the determination of the empty weight C.G. position the sailplane is to be assembled with closed canopy, with the permanent equipment installed and <u>without water ballast</u>.
With main landing wheel on the ground the tail skid is to be jacked up on a balance about 49 cm (19.3 in.) from the ground, i.e. slope of rear top surface of fuselage 100 to 5.1 tail down or rear fuselage center line horizontal.
Then the weight at the tail skid is to be determined with wings held level.
The distances a and b are measured using a plumb or gathered from the last weight and balance report.

The distances a and b measured at the original weighing by the manufacturer are:

a = 129 mm (5.1 in.)
b = 3930 mm (154.7 in.)



Datum : Wing leading edge at root rib.

Leveling means : Slope of rear top surface of fuselage 100 to 5.1 tail down.

Empty weight C.G. position:

$$x = \frac{W_2 \cdot b}{W} + a$$

The empty weight C.G. position must be within the limits given in the Table on page 11 of the FLIGHT MANUAL.

A determination of the empty weight C.G. position is required after the installation of additional equipment, after repair or modifications which are changing the weight of the sailplane.

Changes of weight and C.G. position are to be entered into the log book and confirmed by a designated inspector.

Gross weight C.G. position

Before conducting performance flights it is recommended to determine the true gross weight C.G. position in order to check if it is within the optimum range for high performance.

Optimum gross weight C.G. range:

310 mm to 355 mm (12.2 in. to 14 in.)

aft of datum.

The sailplane is to be weighed as described on page 58 with pilot and parachute and additional equipment as seat cushion, barograph, cameras etc.

Take care that the rudder pedals and back rest have the proper position.

$$x_{(Flight)} = \frac{W_{2(Flight)} \cdot b}{W + W_{(Payload)}} + a$$

Weight and Balance Log Sheet

Date of weighing					
Carried out by Signature					
Empty weight					
Equipment list dated					
C.G. position aft of datum					
Maximum payload					
Water ballast at maximum payload					

Inspection program for extension of service time

1. General

The results of fatigue tests of wingspar sections have demonstrated recently that the service time of GFRP sailplanes may be extended to 6000 hours, if for each individual aircraft (in addition to the obligatory annual inspections) the airworthiness is demonstrated according to a special multi-step inspection program, particularly with regard to the service life. CFRP components are approved for a service time of 6000 hours.

2. Dates

When the sailplane has reached a service time of 3000 hours, an inspection must be done in accordance with the inspection program mentioned under section 3. If the results of this inspection are positive or if any defects found have been duly repaired, the service time of the sailplane is extended by another 1000 hours to a total of 4000 hours (first step).

The above inspection program must be repeated when the sailplane has reached a service time of 4000 hours. If the results of this inspection are positive or if any defects found have been duly repaired, the service time of the sailplane is extended to 5000 hours (second step).

When the sailplane has reached a service time of 5000 hours, the above inspection program again must be repeated. If the results of the inspection are still positive or if any defects found have been duly repaired, the service time may be extended to a total of 6000 hours (third step).

For a possible service time exceeding 6000 hours procedures will be evaluated in the future.

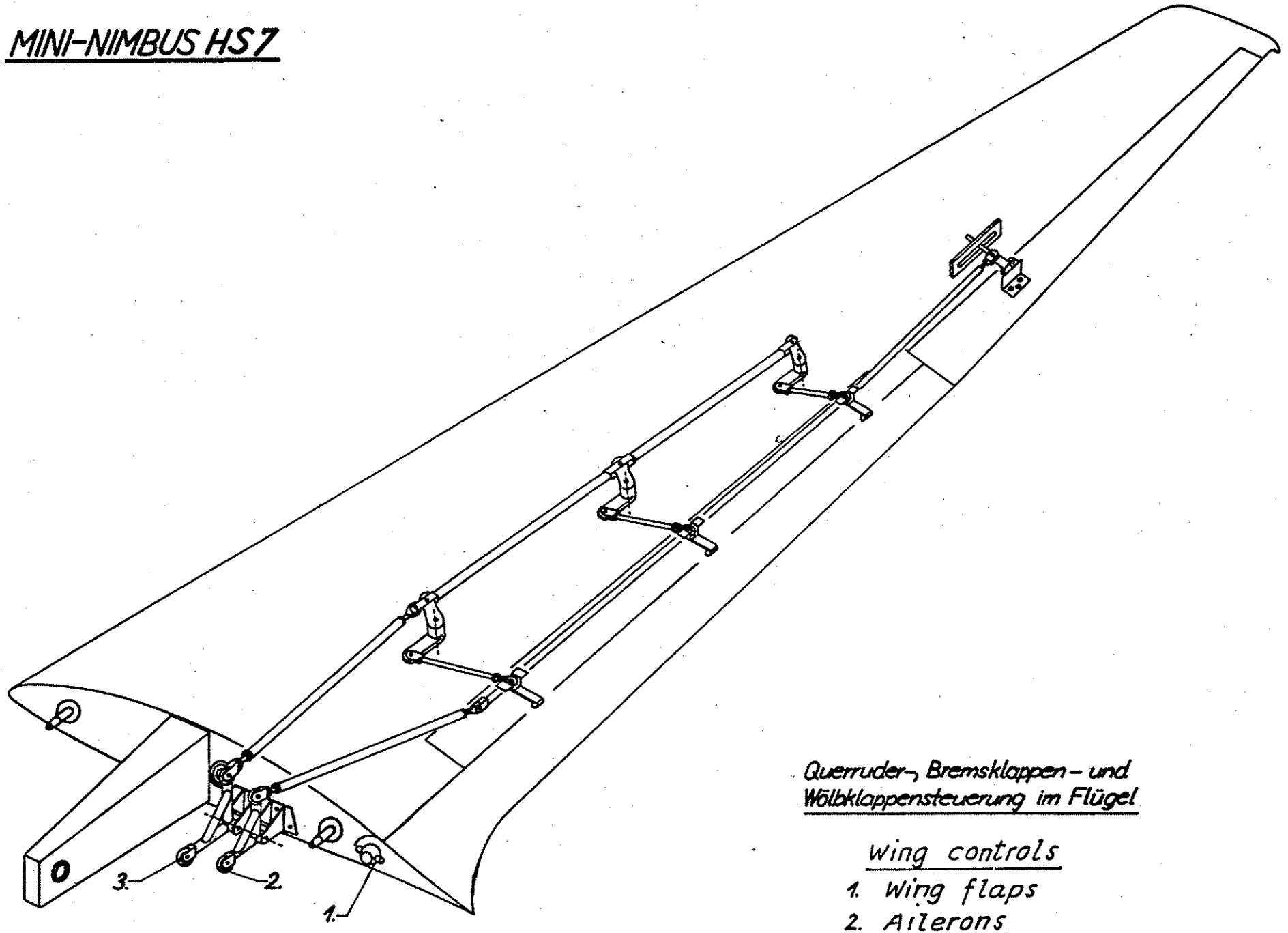
3. LBA-approved Schempp-Hirth Flugzeugbau GmbH document No. XXXX (to be issued and approved in the future) contains the structural inspection procedures and limitations to be used for extending the service life above 3000 flight hours.

4. The inspection must only be done by the manufacturer or by a licensed repair station or inspector.

5. The results of the inspections have to be recorded in an inspection test report wherein comments are required for each inspection instruction. If the inspections are done outside the manufacturer's facilities, a copy of the records must be sent to the manufacturer for his evaluation and information.

6. The annual inspection is not affected by this inspection program.

MINI-NIMBUS HS 7

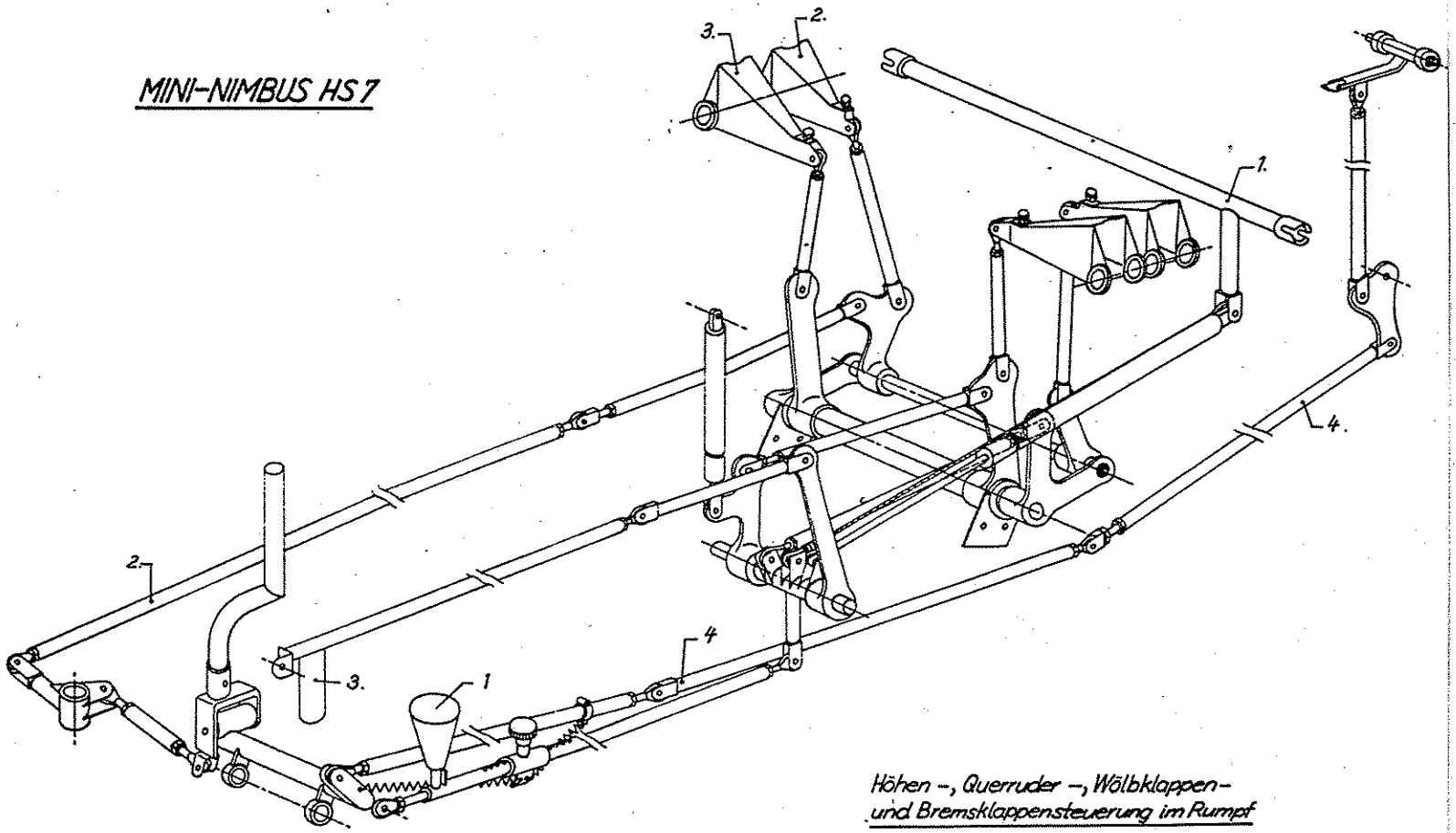


Querruder-, Bremsklappen- und Wölbklappensteuerung im Flügel

wing controls

1. Wing flaps
2. Ailerons
3. Air brakes

MINI-NIMBUS HS 7

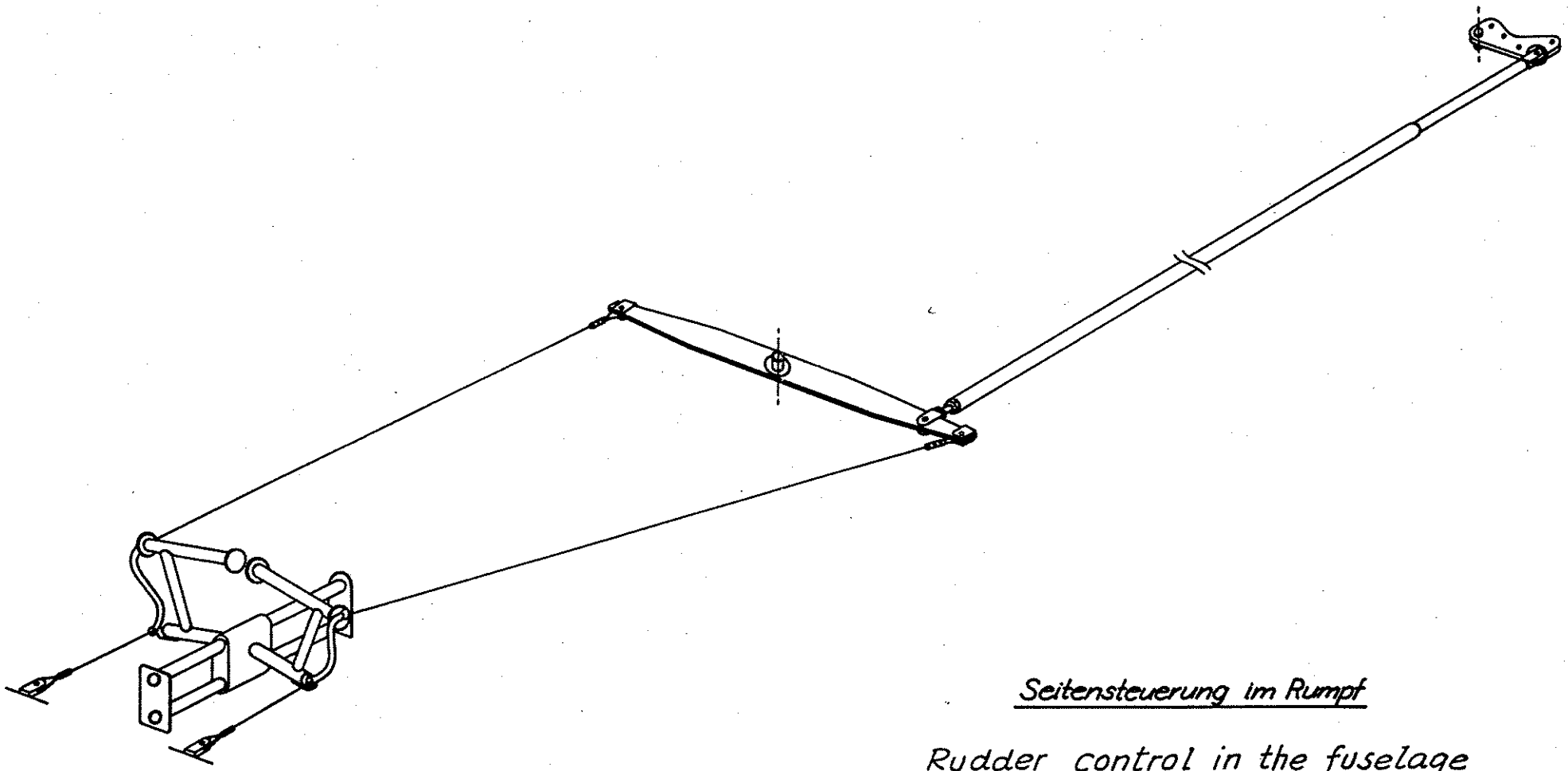


Höhen –, Querruder –, Wölbklappen– und Bremsklappensteuerung im Rumpf

Fuselage Controls

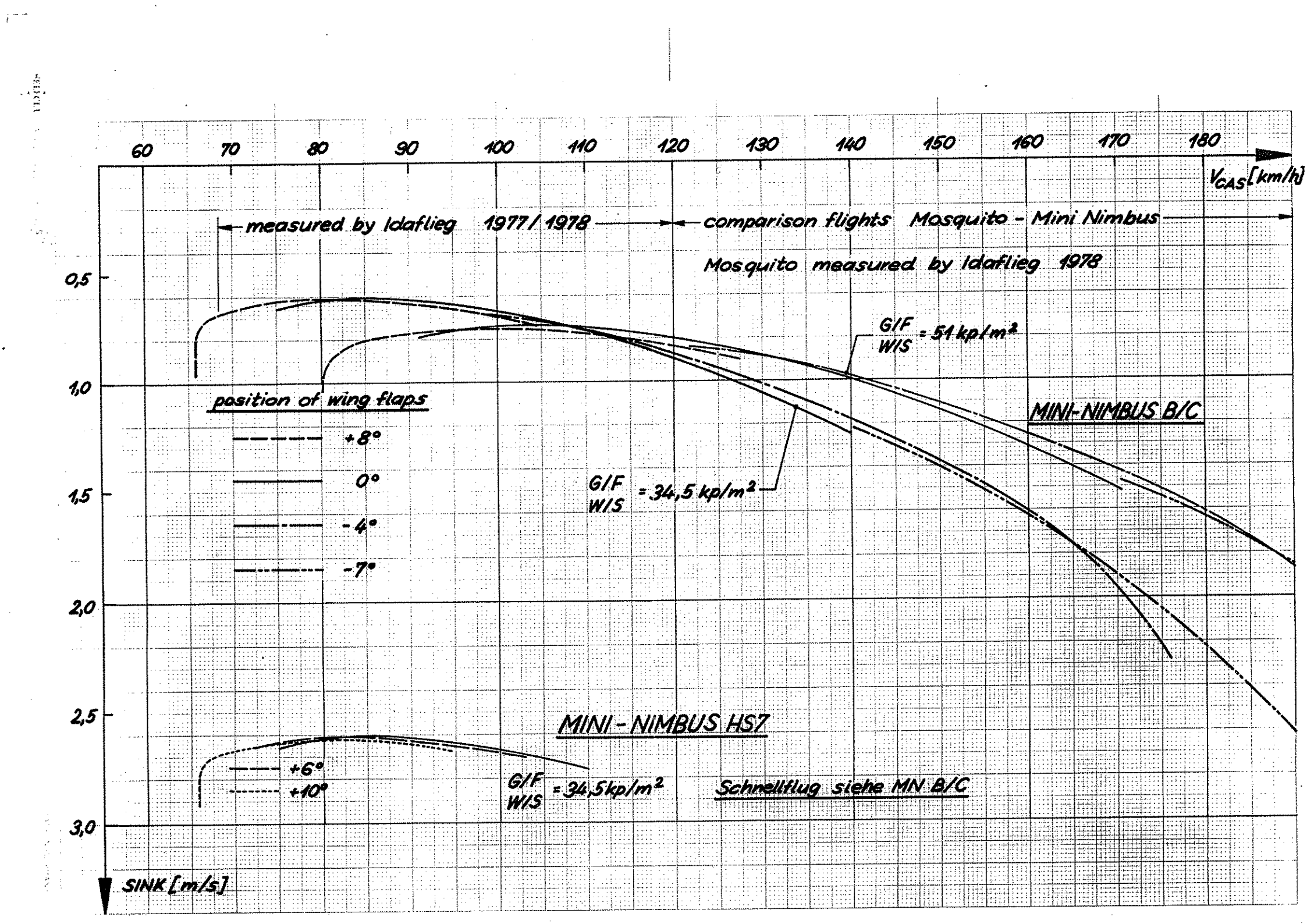
1. Wing flaps
2. Ailerons
3. Airbrakes
4. Elevator

MINI-NIMBUS HS 7



Seitensteuerung im Rumpf

Rudder control in the fuselage


60
70
80
90
100
110
120
130
140
150
160
170
180
V_{CAS} [km/h]
measured by Idaflieg 1977 / 1978
comparison flights Mosquito - Mini Nimbus
Mosquito measured by Idaflieg 1978
0,5
1,0
1,5
2,0
2,5
3,0
G/F
W/S
= 51 kp/m²
position of wing flaps
+8°
0°
-4°
-7°
MINI-NIMBUS B/C
G/F
W/S
= 34,5 kp/m²
MINI - NIMBUS HS7
+6°
+10°
G/F
W/S
= 34,5 kp/m²
Schnellflug siehe MN B/C
SINK [m/s]

Repair Instructions for the FRP-Sailplane Mini-Nimbus HS 7

The construction methods on the sailplane Mini-Nimbus HS 7 are similar to those on the OPEN CIRRUS. Therefore repairs can be carried out in the same way as described by the enclosed instructions for the Cirrus.

In the Mini-Nimbus we find the following construction methods:

1. Inner wing panel and horizontal tail plane

   Glass-fiber foam sandwich
   Foam: CONTICELL 60, 8 mm thick

2. Outer wing panel

   Glass-fiber foam sandwich
   Foam: CONTICELL 60, 6 mm thick

3. Fixed vertical tail plane (fin)

   Glass-fiber foam sandwich
   Foam: CONTICELL 60, in front of spar 6 mm thick
   aft of spar 4 mm thick

4. Rudder

   Glass-fiber foam sandwich
   Foam: CONTICELL 60, 4 mm thick

5. Fuselage, Flaps, Air brakes, Ailerons

   Pure glass-fiber layup

If a fracture or damage occurs to the sailplane, you should first inspect the damaged area to determine exactly the type of construction and to find the appropriate method for the repair.

Note

At the construction of this sailplane Mini-Nimbus B the following CIBA resin system was used :

Resin	XB 2878 A
Hardener	XB 2878 B

Mixing proportions :
by weight - 100 resin to 36 hardener

Curing instructions :
(After precuring or during the cure)

15 hours at 50 °C (122°F) or
10 hours at 80 °C (176°F)

Recommended maximum curing temperature
100 °C (212 °F)

Repairs on this sailplane should be made using the above CIBA resin system.
Do not use the resin system Epikote 162 with Laromin C 260 as specified by the repair instructions for the "CIRRUS".

Schempp-Hirth KG. 7312 Kirchheim-Teck W.Germany

Repair Instructions for the Glass Fiber-Plastic Sailplane "CIRRUS"

Construction

In the CIRRUS sailplane we find three basically different construction methods. Repairs must for this reason be performed differently on the respective parts.

We differentiate

1. Wing and stabilizer
2. Rudder, elevator and ailerons
3. Fuselage

1.) Wings and stabilizer are built in a ribless glass fiber-plastic foam sandwich construction. This means in event of damage that we find a PVC rigid foam (5/16 inch thick, 3.7 lb./cu.ft.) bonded on both sides with a glass cloth laminate.

2.) The controls likewise consist of a sandwich construction. However here the supporting core is not PVC rigid foam but a 5/32 inch thick foamed polystyrene (Styropor) sheet with a specific weight of only one lb./cu.ft.

3.) The fuselage, in contrast to the above parts, is not in sandwich construction but in a pure approximately 1/16 to 3/32 in. thick glass fiber-plastic layup which is reinforced at two locations with bonded-in foam rings.

The following materials apply to all parts:

Resin	Shell Epikote 162
Hardener	BASF Laromin C 260
Mixing proportions by weight	100 resin to 38 hardener
by volume	2 resin to 1 hardener

After proportioning stir until striations disappear. Add filler after stirring.

Glass fibers and cloth

Use only alkali-free "E" glass cloth with Volan A or I-550 finish (INTERGLAS).

INTERGLAS Style	U.S. Style	Weave	Weight lb./sq.ft.	Application
91110	120	↑ Crosstwill	.022	Elevator & rudder
92110	---		.033	Fuselage, ailerons, stabilizer
92125	---		.058	Wings & fuselage
92140	152-150	↓ uni-directional	.082	Fuselage
92145	181-150		.044	Wings

Rovings

GEVETEX Type ES 10-40 x 60 K 43	Textilglas GmbH GEVETEX

Foams

PVC Rigid Foam Conticell 60 5/16 in. thick, 3.7 lb./cu.ft.	Continental AG
Styropor THERMOPETE Super 5/32 in. thick, 1 lb./cu.ft.	PORON Kunststoff Werke

Resin - Fillers

Microballoons, white	Union Carbide
Microballoons, brown	(Brenntag GmbH)
Aerosil	Degussa-Wolfgang
Styropor kernels 1/16 - 3/32 dia. (expanded polystyrene kernels)	BASF
Chopped cotton wool	

Lacquer — Lesonal-Werke

PE - Lackvorgelat, white (resin paint) No. 3-6910

PE - Hardener No. 7-2050 or 7-2051 (100 to 6,5)

Mixing proportions by weight

100 parts Lackvorgelat to 10 parts hardener

PE - Thinner No. 6-3026

PE - Filler, white No. ~~62507~~ 2-6915

PE - Hardener No. 7-2050 or 7-2051 (100 to 6,5)

Mixing proportions by weight

100 parts filler to 10 parts hardener

Resin paint "Lackvorgelat" and filler can be mixed in one-to-one or other proportions.

Repair

Should a fracture or damage occur to the sailplane, you should first inspect the damaged area to determine exactly the extent of damage and type of construction. The type and density of weave can usually be determined by sanding to the cloth. If this is not possible, break off a piece of the laminate and ignite it. After the resin is burned the type, density and direction of the weave will be evident.

I. Damage to Wing or Stabilizer

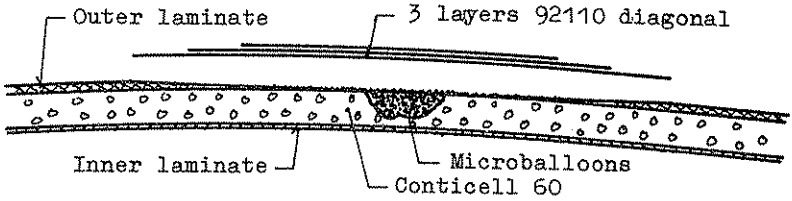
The damages which can be repaired by you fall into two groups.

a) Simple surface damage (only the outer glass fiber laminate damaged)

b) Destruction of the whole shell (also the inner glass fiber laminate destroyed)

a.) If the outer shell receives a puncture or a fracture, tap to determine the extent of delamination from the foam. Follow by removing the lacquer with a sanding disc or block and remove from the foam the portion of the shell which has become delaminated. Around the edge of the damaged area where the shell is still firmly bonded, scarf with an abrasive block or a plane blade at least 1-1/2 inches (for each cloth layer about 3/4 inch is necessary).
After scarfing the shell, blow out thoroughly the whole repair area including the pores of the foam and wash the scarf with carbon tetrachloride or acetone.

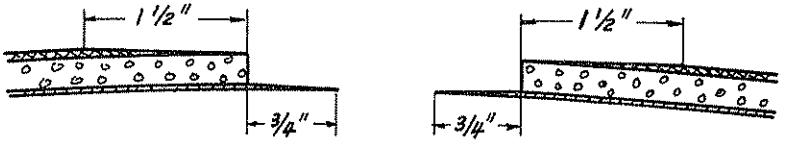
Now fill the hole in the foam with microballoons and simultaneously fill the pores of the exposed foam. Then lay three patches of the 92110 cloth with diagonal weave direction (stepwise largest patch first) over the damaged area. The applied cloth must be dry and dust free.



After hardening (appr. 8 hrs. at 20 deg. C. or 68 deg. F.) the damaged area should be smoothed, filled and painted. In smoothing take care that only the edges of the patches are sanded.

b.) If there is a through hole in the sandwich shell then the inner laminate must be repaired.

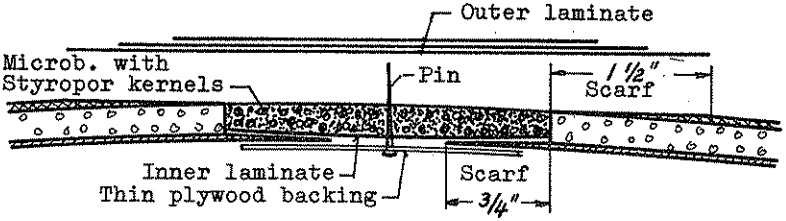
We remove the outer laminate in the region of the damage which is no longer bonded to the foam and enlarge the hole in the foam and inner laminate until good bonding to the foam is evidenced. Then the foam is further removed 3/4 inch around the hole in the inner laminate and the outer laminate scarfed as under paragraph a. Now the projecting inner laminate is cleaned of any foam and feathered.



If the hole in the foam is smaller than a fist then glue with Patex a thin plywood or polyester plate from the inside to the laminate, lay on the inner laminate (1 layer 92125 ※ or 2 layers 92110 ※) and fill the hole in the foam with microballoons mixed with Styropor kernels or crumbled Styropor.

If you are not hurried let it harden (8 hrs. at 68 deg. F.) sand and apply the outer patches.

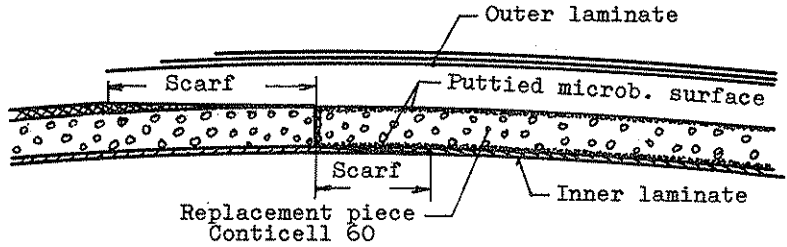
A tip on gluing the plywood plate - the hole in the inner laminate should always be a bit oblong so as to insert the plywood backing plate. Before inserting the plywood drive through the middle of the ply a pin or nail by which it can be drawn against the inner shell. With additional nails or pins it is in this manner possible to close very large holes to the proper contour to lay the cloth patch on.



Basically it is possible to repair also larger shell parts in the foregoing manner. Because of weight you should use a plug of foam in place of the microballoons and Styropor kernels.

In these cases proceed as follows: You cut or sand a plug of foam (Conticell 60) to fit the hole, spread the inner side thinly with microballoons (to close the pores) and lay on it the inner laminate. The inner laminate must harden before doing further work. If the hardening is complete or at least progressed so that the laminate does not separate from the foam, then glue the plug in the hole with thickened resin (chopped cotton wool, microballoons). The foam with laminate on one side is flexible so that it can be fitted to the wing contour (if necessary warm the foam with a hairdryer and bend). Once the foam is glued it can be smoothed, puttied with microballoons and the outer laminate applied.

Caution: Avoid strong heat, otherwise air bubbles form.



II. Damage to the Controls

Basically the same procedure can be used as on the wing. Only in place of the PVC foam a polystyrene foam layer, "Styropor Thermopete Super" 5/32 inch thick, is used. The Styropor piece need not be coated with microballoons, the cloth adheres very well with pure or slightly

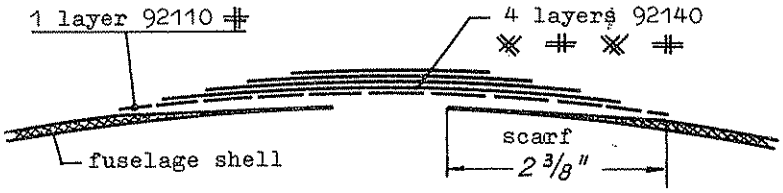
thickened resin which must not harden in any case before doing further work. However with larger replacement pieces you should let the laminate harden on one side and glue the foam thereto in order to keep the surface wave free.

Caution: Do not apply too much heat to freshly laid cloth otherwise it causes ugly blisters and you must start over.

Caution: On the controls minimize weight in the repair. The surface should require very little filling.

III. Damage to the Fuselage

In the repair of the fuselage we save the annoying replacement of the foam. We have here, as already mentioned, only to do with the simple glass laminate which in most places consists of five layers. Therefore we need larger scarfs. These should, for larger holes or cuts, never be less than 2-3/8 inches wide. With all fuselage shell repairs apply resin first to a layer of 92110 ╪ cloth following with four layers of 92140 cloth alternating the weave lengthwise and diagonally. Then you are always on the safe side. Each succeeding layer should be about 3/8 to 1/2 inch smaller than that under it.



For small holes or fractures the repair is no problem. You sand your scarf, clean well with carbon tetrachloride or acetone, lay on the cloth layers and, if the resin is dry, can finish the whole repair with microballoons after 2 or 3 hours.

Caution: If the room is cold or if you are hurried you should nonetheless not use a concentrated hot air stream. Better, make a large tent over the area from aluminum foil and heat the space from a safe distance. There is little likelihood of blisters but overheating can occur and the resin may become brown. If you do not have a source of hot air, put a sheet of foil over the applied cloth and use a heat pad or hot water bottle.

For larger holes in the tailcone not accessible from the inside, we must again fabricate a backing on which to contour the repair cloth. This can be retained as discussed previously with the aid of plywood, a nail and a little Patex. It cannot later fall out, the cloth being directly on the plywood and so is bonded thereto. After the plywood backing is secured proceed as previously discussed.

Lacquer Work

After sanding the edges of the patch or the area filled with microballoons until the original contour is attained the puttying can be abandoned and the lacquer (PE-Vorgelat or PE-Vorgelat and filler in 1 to 1 proportion) applied directly with a brush (not sprayed). After hardening sand the area and wet sand with 360 grit wet-or-dry paper. If at no place the weave shows then final sanding can be done with 600 grit wet-or-dry. Polish with rubbing compound. If the weave shows repaint with lacquer.

Repairs to Fittings

At the appearance of a damage to a fitting, the cause of which is not known, contact the factory.

Welding should be carried out only by an approved aircraft welder.

All weldments made by the factory are by the Argon-arc method using 1.7324.0 welding rod.

Larger Repairs

You should not attempt to make larger repairs of the following types:

If the wing, fuselage or controls are broken apart.

If the spar flanges are damaged.

If the main fittings at the root rib, fuselage or in the controls are broken out.

If in the area of the fittings the laminate shows white areas or cracks.

When you cannot guarantee the repair.

Kirchheim-Teck
26th March 1968
Schempp-Hirth K.G.

ss Klaus Holighaus

Translation by F. H. Matteson

GEGENSTAND: Neues Epoxidharz-System für Glas-, Kohle- und Aramidfaser
SUBJECT: *New epoxy resin-system for glass, carbon and aramid fibres*

BETROFFEN: Siehe Liste aller betroffenen Muster und Baureihen auf Blatt 2 (Schempp-Hirth Segelflugzeuge und Motorsegler in Faserverbundbauweise)
AFFECTED: *See list of affected sailplanes and powered sailplanes on page 2 (Schempp-Hirth sailplanes and powered sailplanes of fibre composite construction)*

DRINGLICHKEIT: Keine
URGENCY: *None*

VORGANG: Die Firma Sika hat das Epoxidharz-System Biresin CR122 mit den Härtern Biresin CH122-3, CH122-5 und CH122-9 entwickelt und nach der vom Luftfahrtbundesamt vorgeschriebenen Prüfung (RHV) qualifiziert. Dieses Harzsystem ist dadurch für den Flugzeugbau zugelassen.
REASON: *The company Sika has developed the epoxy resin system Biresin CR122 with the hardeners CH122-3, CH122-5 and CH122-9. This epoxy resin system has been qualified according to the requirements (RHV) prescribed by the Luftfahrtbundesamt (LBA) and can therefore be used for the production of sailplanes and powered sailplanes.*

MASSNAHMEN: Alternativ zu den bisher verwendeten Epoxidharz-Systemen kann bei Neubau bzw. Reparaturen von Faserverbund-Bauteilen das Epoxidharz Biresin CR122 mit den Härtern Biresin CH122-3, CH122-5 und CH122-9 der Firma Sika verwendet werden.
Die Verarbeitung hat nach den Angaben auf dem Produktdatenblatt zu erfolgen. Es sind die Angaben zur Temperung zum Erreichen der LBA-RHV-Mindestanforderungen zu beachten

Diese Technische Mitteilung und das Datenblatt des Epoxidharz-System Biresin CR122 mit den Härtern Biresin CH122-3, CH122-5 und CH122-9 werden als Anhang in das Wartungshandbuch des jeweiligen Flugzeuges eingefügt.

ACTION: *As an alternative to the commonly used epoxy resin system the epoxy resin system Biresin CR 122 with the hardeners Biresin CH122-3, CH122-5 and CH122-9 can be used for the production and for the repair of fibre composite components.*
The processing of this epoxy resin system has to be done according to the specifications on the product data sheet.
The specification regarding the post-curing-process for reaching the LBA-RHV-minimum requirements have to be observed.

This technical Note and the product data sheet of the epoxy resin system Biresin CR122 with the hardener Biresin CH122-3, CH122-5 and CH122-9 are to be inserted in the respective maintenance manual as appendix.

HINWEIS: Das Epoxidharz-System Biresin CR122 kann unter folgender Adresse bezogen werden:
NOTE: *The epoxy resin system can be purchased at the following address:*

Schempp-Hirth Flugzeugbau GmbH
Krebenstr. 25
73230 Kirchheim unter Teck
Tel. 07021 – 7298-0 oder Fax: 07021 – 7298-199

Liste der von der Technischen Mitteilung Gen-4 betroffenen Muster mit Baureihen:
List of the types with variants affected by Technical Note Gen-4:

Kennblatt Nr. Type certificate data sheet no.	Muster type	Baureihe variant
LBA 265	Cirrus	Cirrus, Cirrus VTC
LBA 278	Standard Cirrus	Standard Cirrus, Standard Cirrus B, Standard Cirrus G, Standard Cirrus CS 11-75L
LBA 286	Nimbus 2	Nimbus-2, Nimbus-2B, Nimbus-2c, Nimbus-3, Nimbus-3/24.5
LBA 295	Janus	Janus, Janus B, Janus C, Janus Ce
LBA 328	Mini Nimbus	Mini Nimbus HS7, Mini Nimbus B, Mini Nimbus C
EASA.A.274	Ventus a	Ventus a, Ventus a/16.6, Ventus b, Ventus b/16.6, Ventus c Ventus-2a, Ventus-2b, Ventus-2c
EASA.A.049	Discus a	Discus a, Discus b, Discus-2a, Discus-2b, Discus-2c
LBA 373	Nimbus-3D	
LBA 380	Nimbus-4	Nimbus-4, Nimbus-4D
EASA.A.025	Duo Discus	Duo Discus, Duo Discus c
LBA 798	Nimbus-2M	
LBA 809	Janus CM	Janus CM, Janus CT
EASA.A.301	Ventus bT	Ventus bT, Ventus cT, Ventus cM, Ventus-2cT, Ventus-2cM
LBA 831	Nimbus-3T	
LBA 847	Nimbus-3DT	Nimbus-3DT Nimbus-3DM
EASA.A.050	Discus bT	Discus bT, Discus bM, Discus-2T, Discus-2cT
EASA.A.063	Nimbus-4M	Nimbus-4M, Nimbus-4T, Nimbus-4DT, Nimbus-4DM
EASA.A.074	Duo Discus T	
EASA.A.532	Arcus T	Arcus T

Kirchheim/Teck ausgestellt / *issued: 05.10.2012* C. Wannenmacher	Zugelassen durch die EASA am: *EASA approved on:* 14.12.2012 Mit Zulassungs-Nr.: 10042722 *under approval-No.:*

Tooling & Composites

Product Data Sheet
Version 06 / 2012

Biresin® CR122

Composite resin system

Areas of Application

- For wet lay-up, pultrusion and filament winding processing
- Specially for applications when higher temperature resistance is required
- **Biresin® CR122** with **Biresin® CH122-3** and **CH122-5** approved by Germanischer Lloyd for the production of components
- **Biresin® CR122** with **Biresin® CH122-3** and **CH122-5** approved by Luftfahrt-Bundesamt (German Aeronautics Federal Office) as resin system for GRP-, CRP- and SRP parts for glider and power glider

Product Benefits

- One resin with two hardeners with different reactivity
- Uniform mixing ratio of 100 : 30
  - the reactivity can be adapted by mixing the hardeners
- Because of optimized mixed viscosity good impregnation and good non draining properties
- Demoulding is possible already after RT curing
- Glass transition temperatures up to 120°C dependent on curing conditions

Description

- Basis: Two-component-epoxy-system
- Resin (A): **Biresin® CR122**, epoxy resin, tranlucent
- Hardener (B): **Biresin® CH122-3**, amine, colourless to brownish
- Hardener (B): **Biresin® CH122-5**, amine, colourless to brownish

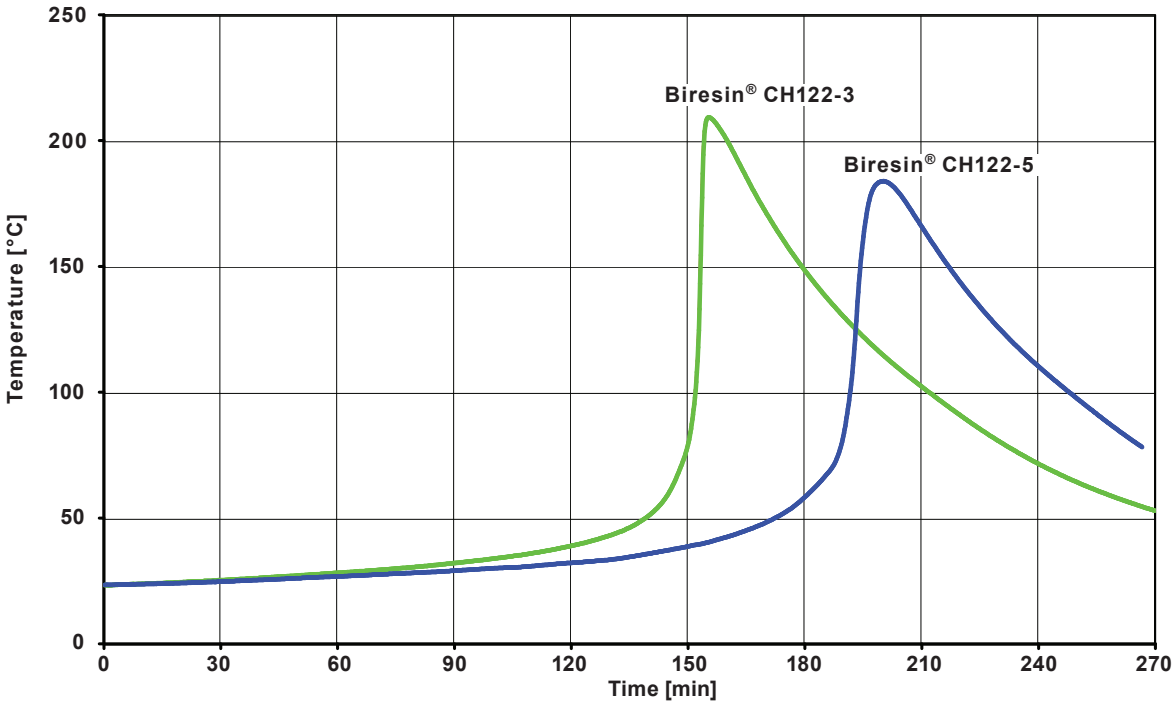
Physical Data			Resin (A)	Hardener (B)	
Individual Components			**Biresin® CR122**	**Biresin® CH122-3**	**Biresin® CH122-5**
Viscosity, 25°C		mPas	850	15	15
Density, 25°C		g/ml	1.17	0.94	0.93
Mixing ratio	in parts by weight		100	30	
				Mixture	
Potlife, 100 g / RT, approx. values		min		150	190
Mixed viscosity, 25°C, approx. values		mPas		370	380

Processing

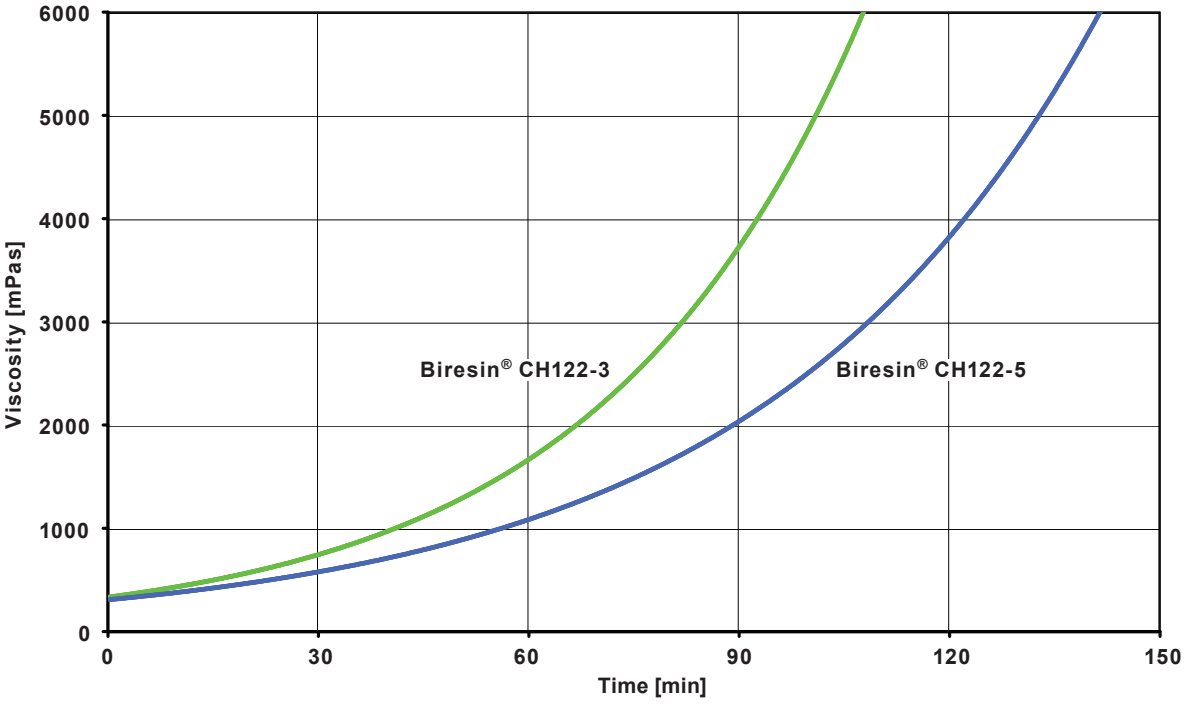
- The material and processing temperatures should be from 18 to 35°C.
- The option of room temperature precuring before demoulding is provided.
- Postcuring is recommended:
  - for achieving of GL minimum requirements: 16 h / 55°C plus 3 h / 70°C
  - for achieving of LBA-RHV minimum requirements with **Biresin® CH122-3**:
    carbon fibre: 12 h / RT plus 8 h / 55-60°C
    glass fibre: 12 h / RT plus 8 h / 60-65°C
  - for achieving of LBA-RHV minimum requirements with **Biresin® CH122-5**:
    carbon / glass fibre: 12 h / RT plus 12 h / 65°C

  With that curing conditions the system achieves the requirements for glider and power glider (temperature range of use -60 up to +54°C)
- To clean brushes or tools immediately Sika Reinigungsmittel 5 is recommended.
- Additional informations are available in “Processing Instructions for Composite Resins”.

Development of Exotherm of Biresin® CR122-Resin(A)-Hardener(B)-Mixtures, 100g / 23°C, insulated,



Development of Viscosity of Biresin® CR122-Resin(A)-Hardener(B)-Mixtures, 25°C



Test conditions: rotation viscosimeter, plate/plate, measuring gap 0,2 mm

Mechanical Data, neat resin specimen at different post curing conditions				
Part 1: approx. values after 16 h / 55°C (source: accredited testing institute)				
Biresin® CR122 resin (A)	with hardener (B)	**Biresin®**	**CH122-3**	**CH122-5**
Density	ISO 1183	g/cm³	1.17	1.17
Flexural E-Modulus	ISO 178	MPa	3,500	3,500
Tensile E-Modulus	ISO 527	MPa	3,300	3,400
Flexural strength	ISO 178	MPa	121	121
Elongation at maximum flexural strength	ISO 527	%	4.9	4.9
Tensile strength	ISO 527	MPa	70	70
Water absorption	ISO 175	%	0.32	0.33

Part 2: approx. values after 16 h / 55°C + 3 h / 70°C (source: accredited testing institute)				
Biresin® CR122 resin (A)	with hardener (B)	**Biresin®**	**CH122-3**	**CH122-5**
Density	ISO 1183	g/cm³	1.17	1.17
Flexural E-Modulus	ISO 178	MPa	3,400	3,400
Tensile E-Modulus	ISO 527	MPa	3,300	3,200
Flexural strength	ISO 178	MPa	122	120
Elongation at maximum flexural strength	ISO 527	%	5.4	5.3
Tensile strength	ISO 527	MPa	70	69
Water absorption	ISO 175	%	0.32	0.33

Part 3: approx. elongation values after post curing (source: accredited testing institute)				
Biresin® CR122 resin (A)	with hardener (B)	**Biresin®**	**CH122-3**	**CH122-5**
Post curing conditions		12 h RT +	8 h / 65°C	12 h / 65°C
Elongation at maximum tensile strength	ISO 527	%	5,1	6,0

Part 4: approx. values after 12 h / 120 °C (source: Sika internal)				
Biresin® CR122 resin (A)	with hardener (B)	**Biresin®**	**CH122-3**	**CH122-5**
Density	ISO 1183	g/cm³	1.17	1.16
Shore hardness	ISO 868	-	D 86	D 86
Flexural E-Modulus	ISO 178	MPa	2,700	2,700
Tensile E-Modulus	ISO 527	MPa	2,800	2,800
Flexural strength	ISO 178	MPa	128	125
Compressive strength	ISO 604	MPa	120	118
Tensile strength	ISO 527	MPa	84	84
Elongation at break	ISO 527	%	5.4	5.6
Impact resistance	ISO 179	kJ/m²	52	59

Thermal data of neat resin specimen at different post curing conditions						
Biresin® CR122 resin (A)	with hardener (B)	**Biresin®**			**CH122-3**	**CH122-5**
	Post curing conditions					
Heat distortion temperature	16 h / 55°C		ISO 75A	°C	68	67
	16 h / 55°C + 3 h / 70°C		ISO 75A	°C	75	73
	12 h / 120°C		ISO 75B	°C	118	120
Glass transition temperature	8 h / 55°C		ISO 11357	°C	78	79
	12 h / 60°C		ISO 11357	°C	82	84
	12 h / 120°C		ISO 11357	°C	114	119

Packaging

Individual components	**Biresin® CR122** resin (A)	1000 kg; 200 kg; 30 kg; 10 kg net
	Biresin® CH122-3 hardener (B)	180 kg; 25 kg; 3.0 kg net
	Biresin® CH122-5 hardener (B)	180 kg; 25 kg; 3.0 kg net

Storage

- Minimum shelf life of Biresin® CR122 resin (A) is 24 month and of Biresin® CH122-3 hardener (B) and CH122-5 hardener (B) is 12 month under room conditions (18 - 25°C), when stored in original unopened containers.
- After prolonged storage at low temperature, crystallisation of resin may occur. This is easily removed by warming up for a sufficient time to 50-60°C.
- Containers must be closed tightly immediately after use. The residual material needs to be used up as soon as possible.

Health and Safety Information

For information and advice on the safe handling and storage of products, users should refer to the current Safety Data Sheet containing physical, ecological, toxicological and other safety related data.

Disposal considerations

Product Recommendations: Must be disposed of in a special waste disposal unit in accordance with the corresponding regulations.
Packaging Recommendations: Completely emptied packagings can be given for recycling. Packaging that cannot be cleaned should be disposed of as product waste.

Value Bases

All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

Legal Notice

Further information available at:

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Stuttgarter Str. 139
D - 72574 Bad Urach
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Tooling & Composites

Product Data Sheet
Version 06 / 2012

Biresin® CR122 with Biresin® CH122-9 hardener
Composite resin system

Areas of Application

- For wet lay-up, pultrusion and filament winding processing
- Specially for applications when higher temperature resistance is required
- **Biresin® CR122** with **Biresin® CH122-9** approved by Luftfahrt-Bundesamt (German Aeronautics Federal Office) as resin system for GRP-, CRP- and SRP parts for glider and power glider

Product Benefits

- Because of optimized mixed viscosity good impregnation and good non draining properties

Description

- Basis: Two-component-epoxy-system
- Resin (A): **Biresin® CR122**, epoxy resin, tranlucent
- Hardener (B): **Biresin® CH122-9**, amine, colourless to brownish (also available in blue)

Physical Data		Resin (A)	Hardener (B)
Individual Components		**Biresin® CR122**	**Biresin® CH122-9**
Viscosity, 25°C	mPas	850	120
Density, 25°C	g/ml	1.17	0.94
Mixing ratio	in parts by weight	100	40
		Mixture	
Potlife, 100 g / RT, approx. values	min	330	
Mixed viscosity, 25°C, approx. values	mPas	680	

Mechanical Data, neat resin specimen			
approx. values after 8 h / 100°C (source: Sika internal)			
Biresin® CR122 resin (A)			with **Biresin® CH122-9** hardener (B)
Density	ISO 1183	g/cm³	1.14
Shore hardness	ISO 868	-	D 86
Flexural E-Modulus	ISO 178	MPa	2,600
Tensile E-Modulus	ISO 527	MPa	2,600
Flexural strength	ISO 178	MPa	119
Compressive strength	ISO 604	MPa	114
Tensile strength	ISO 527	MPa	87
Elongation at break	ISO 527	%	6,9
Impact resistance	ISO 179	kJ/m²	44

Processing

- The material and processing temperatures should be from 18 to 35°C.
- Postcuring is recommended:
  - for achieving of LBA-RHV minimum requirements with **Biresin® CH122-9**:
    carbon / glass fibre: 12 h / RT plus 12 h / 65°C
  With that curing conditions the system achieves the requirements for glider and power glider (temperature range of use -60 up to +54°C)
- To clean brushes or tools immediately Sika Reinigungsmittel 5 is recommended.
- Additional informations are available in “Processing Instructions for Composite Resins”.

Thermal data of neat resin specimen

Biresin® CR122 resin (A)			with **Biresin® CH122-9** hardener (B)
Heat distortion temperature	ISO 75A	°C	114*
	ISO 75B	°C	119*
	ISO 75C	°C	101*
Glass transition temperature	ISO 11357	°C	120*

* values after post curing: 8 h / 100°C

Packaging

Individual components	**Biresin® CR122** resin (A)	1000 kg; 200 kg; 30 kg; 10 kg net
	Biresin® CH122-9 hardener (blue) (B)	180 kg; 20 kg; 4 kg net

Storage

- Minimum shelf life of Biresin® CR122 resin (A) is 24 month and of Biresin® CH122-9 hardener (B) is 12 month under room conditions (18 - 25°C), when stored in original unopened containers.
- After prolonged storage at low temperature, crystallisation of resin may occur. This is easily removed by warming up for a sufficient time to a maximum of 80°C.
- Containers must be closed tightly immediately after use. The residual material needs to be used up as soon as possible.

Health and Safety Information

For information and advice on the safe handling and storage of products, users should refer to the current Safety Data Sheet containing physical, ecological, toxicological and other safety related data.

Disposal considerations

Product Recommendations: Must be disposed of in a special waste disposal unit in accordance with the corresponding regulations.
Packaging Recommendations: Completely emptied packagings can be given for recycling. Packaging that cannot be cleaned should be disposed of as product waste.

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