

- S H K -

SCHEMPP-HIRTH K.G., KIRCHHEIM-TECK

Flight and Service Manual
for the sailplane
Schempp-Hirth "SHK"

Translation of the German Manual
Issue: March 1965

This manual should always be carried in
the sailplane.

It belongs to the Sailplane:

"SHK"

Series: SHK 1

Identification No.:

Serial Number:

Schempp-Hirth K.G.

7312 Kirchheim/Teck

LBA-NR. 1-B5

Manufacturer:

Owner:

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

Flight and Service Manual

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1. Operating data and limitations

Airspeed limits	km/h	m.p.h.	knots
Glide or dive	200	124	108
In rough air	140	87	75
Airplane tow	140	87	75
Auto-winch tow	100	62	54

Weights

Empty weight appr. 260 kp, 573 lbs.
 Max. gross weight 370 kp, 816 lbs.
 Max. weight of
 non-load-carrying 212 kp, 467 lbs.
 structure incl. payload

Suited for cloud flying yes

(See comments on page 7)

Stress classification:

Class 2 according to the German Glider
 Airworthiness Requirements (BVS).

Max. permitted positive load factor 4.0
 Max. permitted negative load factor - 2.0

C.G. range in flight:

Leveling means: Slope of top edge fuselage
 100 to 8, horizontal

Datum: Wing leading edge at root rib No.1

Permitted C.G. range:

330 to 490 mm or 13.0 to 19.3 in.
 aft of datum.

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Weak link in tow cable:

for winch launching	max. 700 kp,	1543 lbs.
	min. 648 kp,	1429 lbs.
for airplane tow	max. 555 kp,	1224 lbs.
	min. 370 kp,	816 lbs.

2. Flying operations

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Winch launching:

Max. tow speed: 100 km/h, 62 m.p.h., 54 knots.
Ground run and leaving the ground is normal.
The glider enters the climb with controls in neutral position.

Airplane tow:

Max. tow speed: 140 km/h, 87 m.p.h., 75 knots.
There is only one tow release for both winch and airplane tow. Use only textile ropes for airplane tows with a max. length of 100m or 328 ft. Pull the yellow painted knob twice in releasing for safety and all the way back.
During the take-off with the C.G. in the extended aft position a certain caution is necessary. At this condition the glider tends to slight pitching oscillation during the ground run and leaving the ground.

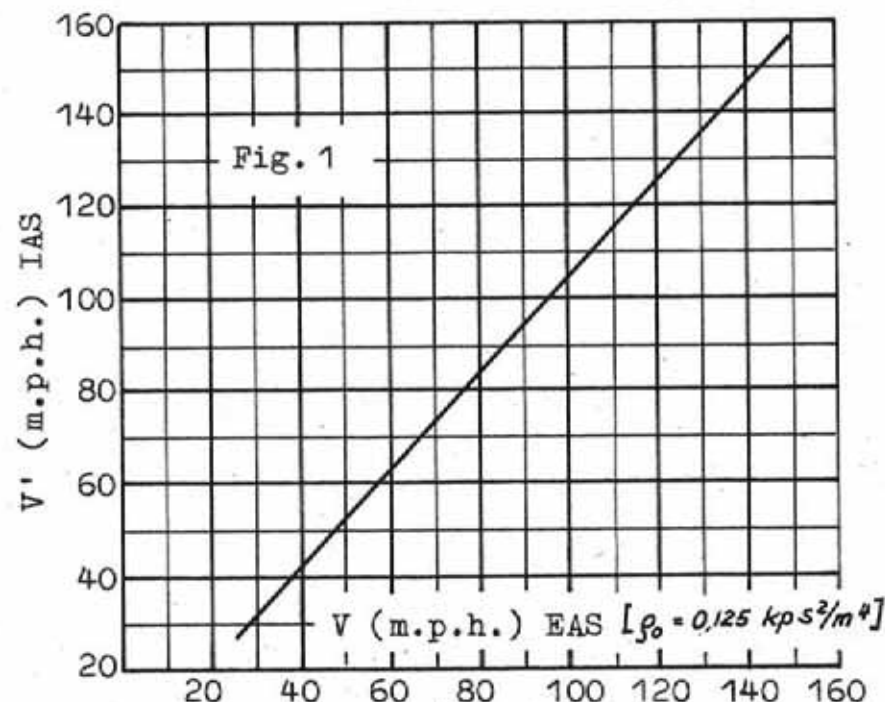
Adjusting rudder pedals in flight: Push both pedals simultaneously while pulling the black knob and choose the proper position of pedals.

Adjustment of the back rest: The back rest made of canvas is suspended on a pivoted steel tube on back side of the main bulkhead. A locking device prevents the tube from rotating. For adjustment pull the tube to release the lock and turn the tube in order to wind the canvas up or off as desired. Make sure of locking again.

Caution. Keep the landing wheel extended during airplane tow or winch launching, due to the attachment of the tow release mechanism on the landing gear strut.

Free flight:

Pay attention to the difference between your airspeed and the speed shown on your speed indicator instrument, due to the placing of the pitot tube. (See Fig. 1).



The instrument may show zero in an extreme sideslip, since the fuselage is in an oblique position to the airstream in sideslipping.

Stalling speed at max. gross weight:

65 km/h, 40 m.p.h., 35 knots.

Min. sinking velocity in straight flight:

0.6 m/sec at 75 km/h

1.96 ft./sec. at 47 m.p.h., 40 knots

Max. gliding ratio (L/D):

38 at 87 km/h, 54 m.p.h., 47 knots.

The stick forces are comparatively small and will increase almost equally with increasing speed. Therefore a certain caution is necessary for pilots used to fly slower sailplanes.

Landing:

Recommended landing speed: 80 km/h, 50 m.p.h. or 43 knots. The gliding angle can be controlled well with the effective airbrakes. The touch-down with open airbrakes is quite normal with full elevator. The additional handle on the airbrake operating handle controls the drum brake of the landing wheel.

Operation of the retractable landing wheel:

The operating handle is at the right side of the cockpit (see page 21).

Handle in forward position: EXTENDED

Handle in backward position: RETRACTED

Retraction: Open the lock by pushing down the lock knob on the handle and pull the handle backwards with knob let off until the lock device has engaged automatically.

EXTENSION: Open the lock as before and push the handle forward until the front lock has engaged.

Caution! Do not operate the handle of the landing wheel being in ground contact.

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Emergencies:

The sailplane can be held in a stalling position with fully applied elevator and necessary rudder control. Applying harder rudder in a stall brings the plane into a spin. Recovery from the spin is effected by the Standard Method, which is defined as:

- a) apply opposite rudder (i.e. against the direction of the spin);
- b) pause;
- c) ease the control stick forward until rotation ceases and the glider becomes unstalled;
- d) centralize the rudder and allow the glider to dive out.

The approximate loss of height in one complete turn is 80 meters or 260 feet.

The "SHK" as all high performance sailplanes speeds up very fast after having initiated action for recovery. Therefore be cautious to dive out smoothly.

The position of the C.G. has quite an influence on the spinning qualities. Keep the C.G. within the permitted limits.

Take care about the limits in airspeed. If the speed should exceed 140 km/h, 87 m.p.h., 75 kn. accidentally in rough air (10 m/s or 33 ft./s.) apply slowly the dive brakes.

In rain or snow or at icing the aerodynamic qualities of the sailplane suffer considerably and caution must be taken in landing. Increase landing speed about 10 km/h, 6 m.p.h., 5 knots.

Emergency release of the cabin hood: Unlock the hood and push it upward.

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Cloud flying: This sailplane has sufficient strength qualities for cloud flying. Nevertheless observe the following instructions:

- a) Do avoid extreme airspeeds in any case. Make it a rule to extend the dive brakes already at speeds of 110 to 130 km/h, 68 to 81 m.p.h. or 59 to 70 knots.
- b) Cloud flying is permitted only when the following approved instruments are installed.
 - (1) Airspeed indicator; (2) Altimeter;
 - (3) Turn & Bank; (4) Variometer; (5) Compass.
- c) Take care to follow the official regulations about cloud flying.

3. The required minimum equipment:

Airspeed indicator 250 km/h, 160 m.p.h.,
Altimeter,
Safety belt with additional shoulder straps,
Placards indicating operation limits,
Flight and service manual.

4. Wing and tail setting:

The angles of wing and tail setting as well as the adjustment of the control surface movements are to be gathered from page 19. Pay attention to the tolerances if repair work is necessary.

The deflections of controls are limited.

Rudder: Stop at the differential fitting on bulkhead No. 4.

Elevator: Adjustable stop on the stick.

Ailerons: Adjustable stop on the stick.

Dive brakes: Stop at the wing root.
Lock within the operating mechanism in the wing.

Richter

5. Weight and C.G. range:

After repair work, after having installed additional equipment, after a new painting etc. it must be observed that the empty weight C.G. is still within the limits. If not, equalizing weights must be added. It is advisable to make a new weight and balance determination in connection with the annual overhaul.

The following empty weight C.G. range has to be observed:

Empty weight C.G.range		Empty weight C.G.range	
kg	mm	lbs.	inches
260	627 - 738	573	24.7 - 29.0
265	608 - 733	584	24.0 - 28.8
270	590 - 728	595	23.3 - 28.6
275	572 - 724	606	22.6 - 28.5
280	555 - 720	617	21.9 - 28.3
285	539 - 716	628	21.3 - 28.1
290	524 - 712	639	20.7 - 28.0
295	508 - 708	650	20.0 - 27.8

The C.G. ranges indicated above are located aft of datum (i.e. aft of wing leading edge at rib No.1).

If these limits for the C.G. are followed it is certain that the C.G. in flight is also within the demanded limitation and in the scope of the given trimming plan.

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The location of the C.G. has a great influence on the flying characteristics. Therefore it is important that the demanded limits are observed.

The following limits of C.G. positions in flight have been approved:

- a) foremost position: 330 mm or 13.0 inches
 - b) aftmost position: 490 mm or 19.3 inches
- aft of datum: wing leading edge at rib No.1
at a slope of top edge fuselage 100 to 8.

6. Trimming plan:

Payload (pilot plus parachute)

maximum: 110 kp or 242 lbs. The max. weight may not be exceeded.

minimum: 75 kp or 165 lbs.

If the weight of the pilot should be insufficient, an equalizing ballast (lead cushion) must be carried, safely attached to the seat.

C.G. arm of the pilot plus parachute:

37 cm or 14.6 inches

ahead of datum (i.e. wing leading edge at rib No.1).

Moment is negative.

Rec. in

A s s e m b l y

1. Clean and lubricate all bolts and automatic control connections between fuselage, wings, and rudders. (See page 22, 24, 25)
2. Insert left wing first with root into the fuselage taking care about the proper connection of control levers for aileron and dive brakes. The dive brakes have to be unlocked before and ailerons must be neutral. Line up at first rear spar fitting. When pushing in the bolt move the wing at the tip slightly back and up. To facilitate the driving in of the bolt use the tool of the main bolt automatic (see under No. 4). Put the tube handle of the tool onto the vertical pin of the bolt and hammer against the shaft. Connect nose fitting onto the pin of the corresponding fuselage attachment fitting and hold the wing in place.
3. Insert now right wing accordingly, taking care to bring the main spar attachment fittings in line.
4. Take special tool for the main bolt automatic which is fixed to the main bulkhead on its right side. Put the tool through the hole on top of fuselage into the main bolt. Expand the bolts by turning the tool clockwise. Move the wings at the tips slightly forward and up and down until the bolts are sliding smoothly through the holes of the main fitting. Be sure that the bolts are fully extended, their cylindrical ends must protrude the outer surfaces of the fitting about 1 to 1.5 mm (1/16"). (See page 25)
5. Lock the rear attachment bolts and safety with cowlings pins. Install fairings between wings and fuselage.

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6. Put the tail planes with trailing edge up as in a fully pulled condition onto their steel tube spars and take care about the proper connection of the control fittings of rudders and trim tabs. Lock rudder control connections and safety with wire.
(See page 24 and 28)
7. Seal the small slots between wings and fuselage with thin adhesive tape. Seal also the four holes in the wing surface which are provided for supports in the trailer as well as the hole for the main bolt tool on top of fuselage.
8. Check the function of all controls and of the tow release.

Disassembly

Disassembly in reverse order. After unlocking the rudder control, pull rudders off the spars in a twisting and pulling motion. When pulling out the rear wing attachment bolts use again the main bolt tool. Lubricate all attachment fittings to prevent corrosion.

Maintenance

Take good care of the finish. Clean with warm water and a soft sponge. Use no polish which might attack the paint. Use filler for any scratches.

Never try to clean the plexiglass hood with a dry cloth. Use special plexiglass polish after cleaning the hood with warm water and soft tissue or clean soft deer-leather.

Check the safety belts frequently for cuts and the metal parts for rust.

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The tow release which is attached to the front strut of the landing gear is much exposed to dirt and must be checked quite often for damages. Keep it clean and lubricated.

The tail cone of the fuselage, made of fiberglass, should be taken off for regular inspection, cleaning, and lubricating the rudder connections. Remove the six flat head screws for attachment to the tail bulkhead and pull the end cone off taking care that the protruding connection bolts pass through the provided slots.

Clean also the tail wheel and check its attachments. Lubricate wheel axle and shock absorbing leg with glycerine or vaseline grease.

Before every assembly clean and lubricate the main bolt automatic at the main spar fitting, also the assembly connections for the controls. Lubricate all other bearings at least once a year.

If there is any larger repair work to be done, ask the manufacturer or his representative for advice.

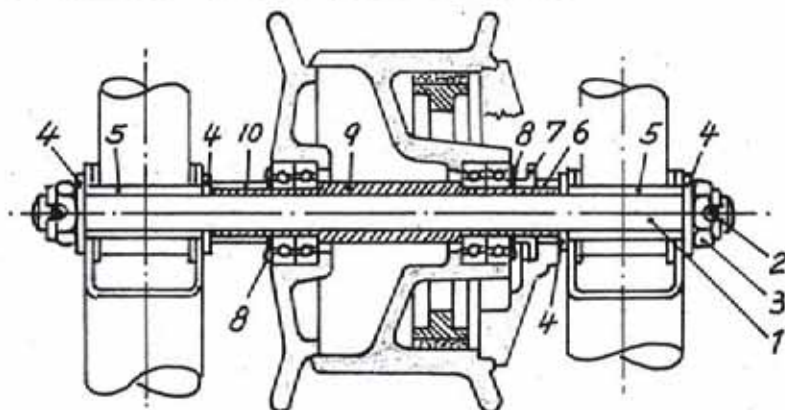
The tyre pressure of the landing wheel should be kept at 3.5 atü (49 p.s.i.).

The landing wheel has a drum brake. Its Bowden cable can be adjusted as usual by a screw in the cable attachment fitting on the front wheel strut.

To take the landing wheel off loosen the Bowden cable from the brake lever on the brake drum.

Remove the cotter pin and unscrew the castle nut on the right side of the wheel axle. Push the axle out of the wheel and fork. Be cautious that no washers or bushings will get lost. Clean all parts and lubricate the bearings, bushings, and the axle.

Reassembly of the landing wheel



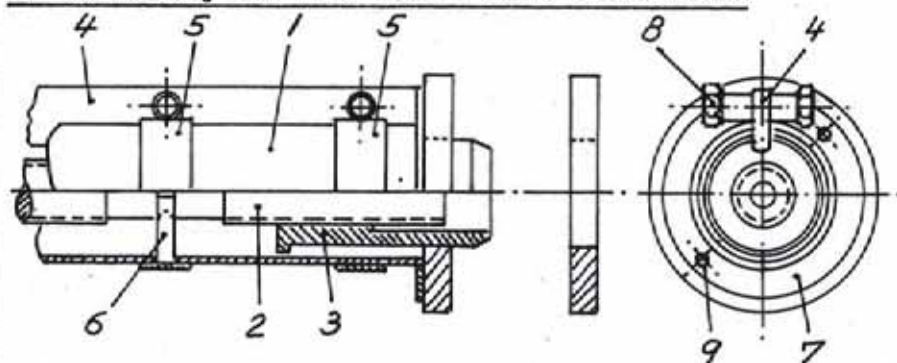
- | | |
|------------------|--------------------|
| (1) wheel axle | (6) spacer |
| (2) cotter pin | (7) flange bushing |
| (3) castle nut | (8) sealing ring |
| (4) plain washer | (9) tube axle |
| (5) bushing | (10) spacer |

Reassemble the two wheel halves together with the tube axle (9). Mount the tyre. Insert the ball bearings and seal with sealing rings (8). Put flange bushing (7) with the flange outside onto the protruding tube axle at the brake side. Mount the brake drum and insert spacer (6) into the bore of the brake casing. Put spacer (10) onto the other end of the tube axle. Insert the wheel with the brake drum on right-hand side into the fork adding a washer (4) on each side. Take care that the guide pin on the right front strut gears into the slot of the brake lock device. Push in the wheel axle (1), add washer (4) and screw on the castle nut (3).

Check correct position of the brake lever on the drum (marking on the brake lever shaft). Tighten the castle nut and safety with cotter pin (2).

Slacken cable tension by adjusting the screw of the cable attachment fitting on the front wheel strut. Pull the brake lever using a screw driver or any suitable bar and connect the Bowden cable to the brake lever. Adjust cable tension and check the correct function of the wheel brake.

Disassembly of the main bolt automatic



Take off the three bolts (8) from the clamps (5) and remove the key (4). Slide the center clamp aside and remove the two-piece center lock washer (6). Turn the spindle (2) with the tool until the bolts (3) are retracted as far as possible. Back off the screws (9) from upper and lower flange (7). Push the clamps (5) towards the flanges. Turn the casing tubes (1) so that they can be pushed into one another through their key slots in order to obtain sufficient clearance for removing the unit from the main fitting. The unit can be entirely dismantled now for inspection, cleaning, and lubricating.

Reassemble in reverse order taking care to insert the unit with the square recess of the spindle to the upper side.

Disassembly of the ailerons

If it should be necessary to detach the ailerons for inspection or repair work, remove the slot sealing tape. Deflect the ailerons fully up in order to have better accessibility. Disconnect the control connection and also the first hinge connection at aileron rib No. 1. Take off the second hinge fitting on the wing rib. Bend the aileron at the root slightly up until it clears the upper wing surface for pulling it off in wing root direction.

Attach the ailerons in reverse order. After having checked the control movements, seal again the slot on the upper surface with thin adhesive tape.

Equipment

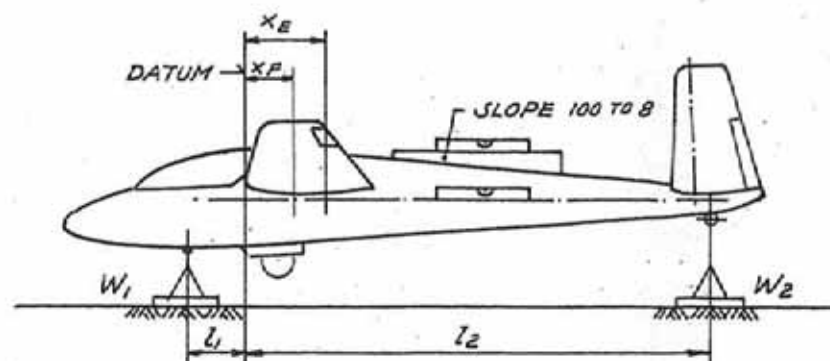
Place for the barograph has been provided between bulkhead No. 1 and 2, behind the head rest. Push the head cushion upward and take it off. Suspend the barograph at the four ring screws.

A socket for a hanging antenna is installed on the top longeron of the fuselage between bulkhead No. 4 and 5 (No. 4 is the rear wing attachment bulkhead).

An aluminium foil is already glued onto the fuselage skin serving as antenna counterweight sheet.

Check list before take-off

- 1.) Main bolt automatic: Do the cylindrical ends of the main bolt actually protrude 1.5 mm or 1/16"?
- 2.) Check the fork connections for ailerons and dive brakes between fuselage and wings.
- 3.) Check the control connections for rudders and trim tabs at the V-tail.
- 4.) Are the two control connections for the rudders locked and safety-wired?
- 5.) Are the rear wing attachment bolts locked and secured by the cowling pins?
- 6.) Test the function of the tow release.
- 7.) Test function of ailerons, rudders, and dive brakes.
- 8.) Test the secure fit of the canopy and its lock.
- 9.) Check the safety belts.
- 10.) Test the wheel brake.



DATUM: WING LEADING EDGE AT RIB No. 1
 LEVELING MEANS: SLOPE OF TOP EDGE FUSELAGE 100 TO 8
 FRONT JACK POINT: TOW HOOK
 REAR JACK POINT: TAIL WHEEL

W_1, W_2 WEIGHT AT JACK POINTS
 l_1, l_2 DISTANCE BETWEEN JACK POINTS AND DATUM
 $M_1 = W_1 \cdot l_1$ MOMENT AT FRONT JACK POINT (NEGATIVE)
 $M_2 = W_2 \cdot l_2$ MOMENT AT REAR JACK POINT (POSITIVE)

EMPTY WEIGHT C.G. X_E (SEE PAGE 9 FOR LIMITS)

	WEIGHT lbs. kg	DISTANCE inches mm	MOMENT in. lbs. mm kg
W_2			
W_1			
$W_1 + W_2$			

$$\text{EMPTY WEIGHT C.G. } X_E = \frac{M_2 - M_1}{W_2 + W_1} = \dots \text{ inches mm}$$

GROSS WEIGHT C.G. X_F

C.G. ARM OF THE PILOT INCL. BACK TYPE PARACHUTE
 37 cm OR 14.6 INCHES AHEAD OF DATUM
 MOMENT IS NEGATIVE

	WEIGHT lbs. kg	C.G. ARM inches cm	MOMENT in. lbs. cm kg
*EMPTY WEIGHT			+
PILOT + PARACHUTE			-
GROSS WEIGHT			+

*(EMPTY WEIGHT INCL. COMPLETE EQUIPMENT)

GROSS WEIGHT C.G.

$$X_F = \frac{\text{GR. WEIGHT MOMENT}}{\text{GROSS WEIGHT}} = \dots$$

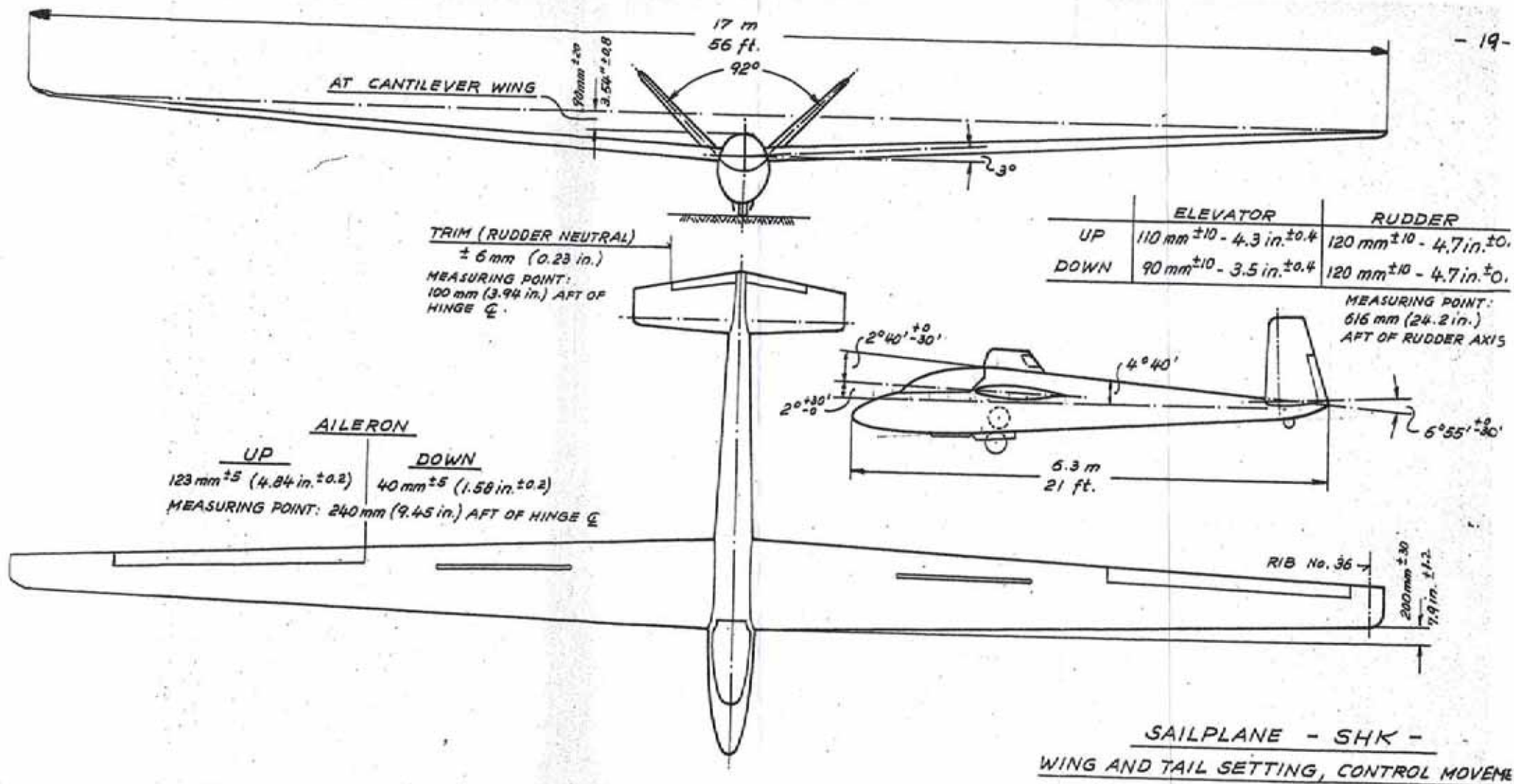
$$X_F = \dots \text{ inches/cm AFT OF DATUM}$$

PERMITTED C.G. RANGE IN FLIGHT:

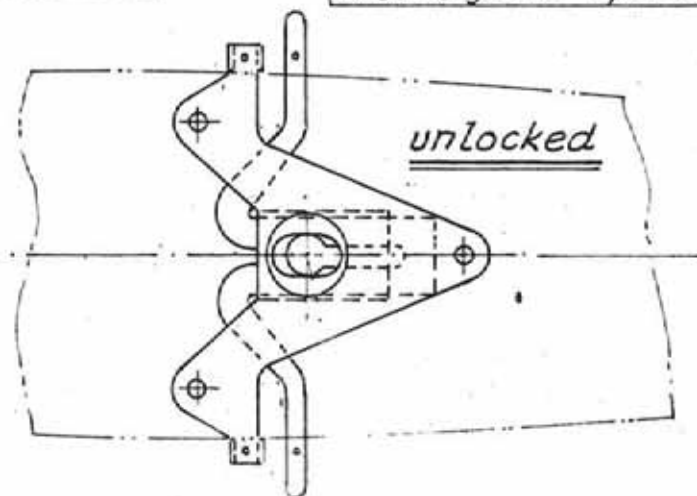
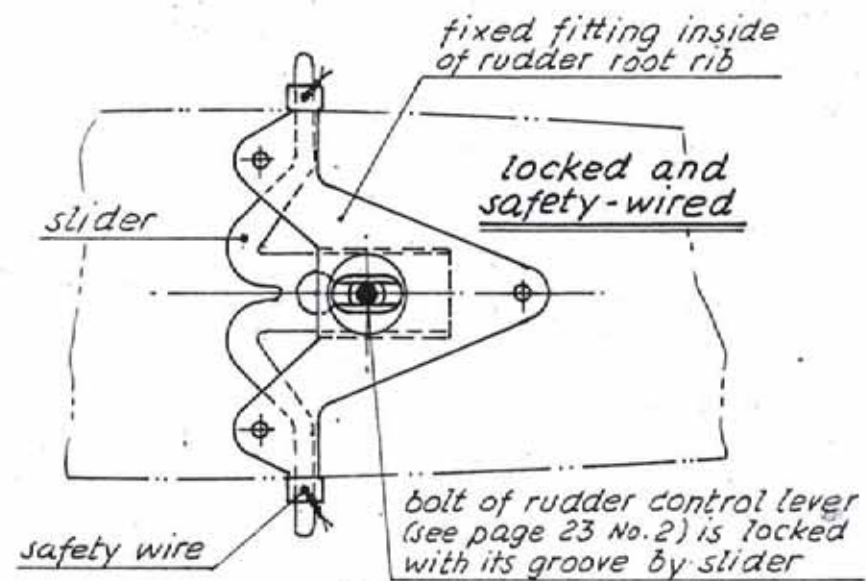
13.0 TO 19.3 inches (33 TO 49 cm) AFT OF DATUM.

SAILPLANE - SHK -

WEIGHT AND BALANCE



Lock for rudder connection



Sailplane SHK 1 with drag parachute

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Operation in flight

The drag parachute acts as an additional landing aid and as dive speed reducing device especially for cloud flying.

The parachute can be released at all airspeeds up to the max. permitted speed of 200 km/h or 124 m.p.h. or 108 knots.

PULL the handle with the blue painted knob at the left side of the cockpit BACKWARD in release position. The parachute opens within 1 to 2 seconds. The sailplane can be normally controlled with open parachute. The control movements are slightly damped.

Releasing the drag parachute during spinning, effects a prompt and smooth recovery from the spin.

PUSHING the handle FORWARD means JETTISONING the parachute. When jettisoning the chute, the sailplane speeds up rather fast. Therefore a certain caution is necessary.

Packing of the parachute

The drag parachute is placed in the separated lower part at the end of the fuselage tail cone (1). The chute canopy is fastened to a ring (2) on the small rear bulkhead of the cone box (1). Care is to be taken, to keep the chute thus attached in order to avoid loss of the cone box after releasing.

To put the parachute into the cone box (1), stretch it to its full length and fold it up in a zigzag way (back to front). Connect the ring of the untwisting device (3) at the end of the chute cord into the release hook (5)

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of the jettisoning mechanism (4).
Insert the cone box with its wedges into the corresponding grooves in the bulkhead of the firm cone part and lock the box by means of the release bolt (6).

Maintenance

Take the drag parachute out of its box when the sailplane is out of operation for a longer period. Save the chute from moisture and air it frequently. Do not use a wet parachute!

Removal of the entire tail cone for inspection

Take off the parachute cone box (1) and release the ring of the untwisting device (3) by pushing the handle in the cockpit.

Disconnect the cable from the release bolt (6), accessible through a hole in the bottom of the upper part. (See footnote).

Due to the bracing (7) with the tail wheel leg, it is necessary to detach the fittings of the jettisoning mechanism (4) from the bulkhead by unscrewing the four nuts (the bolts are welded firmly onto the front fittings).

Remove the screws for attachment of the cone onto the fuselage and pull off the cone, taking care that the rudder and trim connection bolts pass through the slots in the cone.

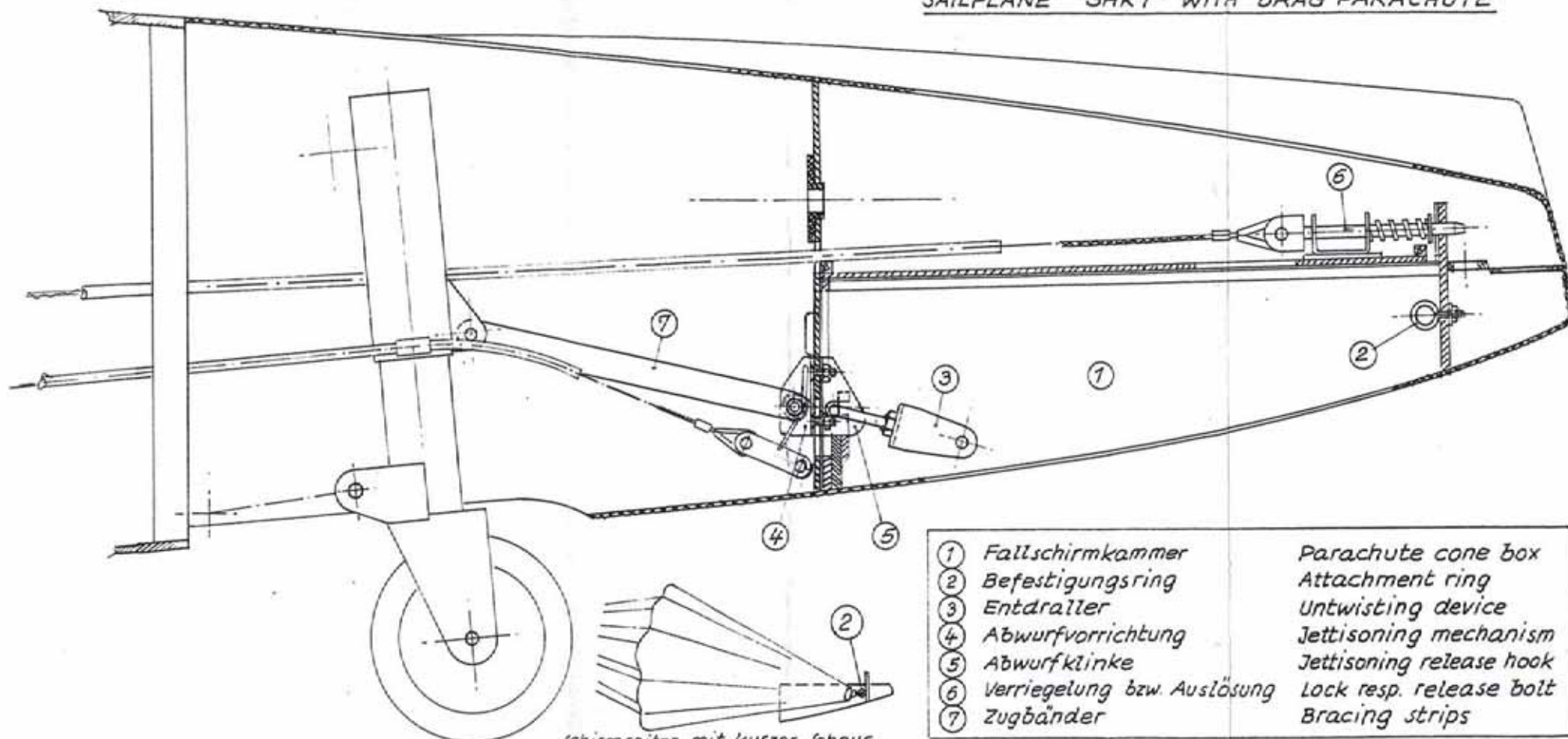
Assembly in reverse order. An access hole in the bulkhead is provided for the reattachment of the jettisoning mechanism (4).

(See sketch on page 3 - installation of the drag parachute in the fuselage tail cone).

Note! Disconnect cables from the cockpit handle first, in order to loosen cable tension.

Reinhardt

SAILPLANE "SHK1" WITH DRAG PARACHUTE

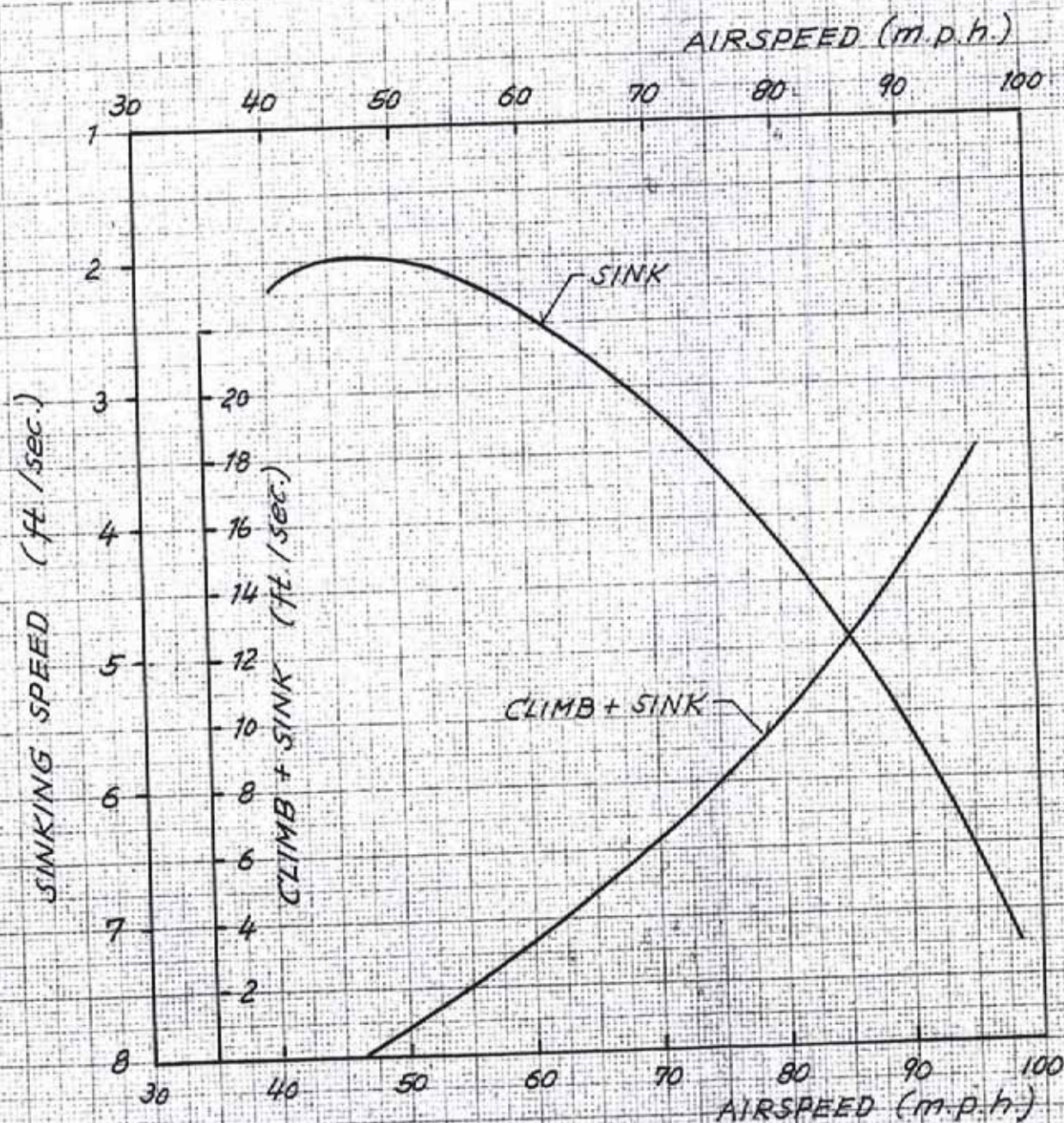


Schirmspitze mit kurzer Schnur
an Ringöse (2) festbinden.

Tie top of the brake chute onto
the ring (2) by means of a short cord.

SEGELFLUGZEUG „SHK1“ MIT BREMSFALLSCHIRM

SAILPLANE SCHEMP-HIRTH "SHK"



VARIOMETER ft./sec.	A.S.I. m.p.h.
1.0	50.8
2.0	54.9
3.0	58.7
4.0	62.3
5.0	65.6
6.0	68.9
7.0	72.1
8.0	75.1
9.0	77.7
10.0	80.1
11.0	82.5
12.0	84.7
13.0	86.8
14.0	88.9
15.0	90.7
16.0	92.5
17.0	94.1
18.0	95.6

sailplane "STANDARD AUSTRIA SH"

and Schempp-Hirth "SHK"

Max. flight speed in rough air
m.p.h. (E.A.S.)

