- Zugvogel III B -

Scheibe-Flugzeugbau-GmbH
(Scheibe Aircraft Manufacturing Company, inc.)
23 August-Pfaltz Strasse
Dachau
Germany

Flight and Maintenance Handbook
for sailplane type
Zugvogel III, series B
March 1963 Edition

This handbook is to be kept aboard the aircraft.

This handbook pertains to the following
Zugvogel III, Series B:

Registration No.:	D-8482
Manufacturer's No.:	1086
Owners:	Sander van den Berg
	Jeroen Eikema
	Olivier Rekers
	André Somers
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Flight handbook

1. Operating and Limiting Airspeeds:

Maximum airspeed	200 km/h
Maximum airspeed	
in gusty weather	140 km/h
during airplaine-tow	140 km/h
during auto- or winch-launch	100 km/h

Weights:

Empty weight, approx.	ca. 262 kg.
Maximum flying weight	365 kg.
Maximum gross weight of non-lifting parts	215 kg.

Stressing Specifications: (Cat.2, BVS)

Maximum positive load factor	4.0
Maximum negative load factor	- 2.0

Center of Gravity in Flight:

Reference line	Line through trailing edge and tangent to undersurface of reference section Y[1]

[1] Wing reference section Y lies y = 550 mm from the plane of symetry.

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Reference point (RP) Leading edge of ref. section Y

Forewardmost position of cg.	343	mm behind RP
Rearmost position of cg.	513	mm behind RP

Weak links in the Tow Cable:
Winch-launch min. 640 kg.; max. 720 kg.
Airplaine-tow min. 365 kg.; max. 550 kg.

Flight Certification:
1. Cloudflying is permissible (see page ?)
2. The sailplane is not certified for aerobatics.

2. Operating Instructions

Pre-flight Check:
The pre-flight check is of particular importance. Many an accident has occurred because it was omitted or done carelessly. The pre-flight check must be made after each assembly and on each flying day before the first take-off. It is good practice to designate each day an experienced gliding pilot or mechanic who will go though the check-list point-by-point in a reliable manner.

1. Has the main spar bolt been inserted clear to the stop and is it safetied? Do the main spar bolt bearing surfaces project at least 1 to 2 mm below the spar flange fittings?
2. Are the aileron controls and airbrakes connected and safetied?

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3. Has the stabilizer been rigged properly and is it safetied?
4. Is the elevator connected to the controls and safetied?
5. Test the operation of all controls: do the control surfaces move normally? Is control movement smooth clear to the control stops?
6. Test functioning of the airbrakes: with the lever in the “closed”position, are the airbrakes locked in?
7. Is there excessive play in control system bearings? Are all control surface and control system bearings and hinges properly safetied?
8. Test the operation of the tow-coupling. If necessary, have cleaned and lubricated.
9. Does the canopy lock work?
10. Examine the tension of the rudder cables and correct if necessary. If the springs on the rudder-pedals are weak, the should be replaced. Are the turnbuckles safetied? Examine cables for wear, especially at guide rollers and guide bushings.
11. Does the sailplane possess the minimum required instrument complement (airspeed indicator and altimater)? Test the airspeed indicator.
12. If flying without a parachute, check that the parachute well is filled with a sufficiently large, hard pillow at least 10 cm. thick.
13. Are the inspection doors on the lower surface of the wing and in the tail below the elevator closed?

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14. Is the pilot’s safety belt, including fastenings, in order?
15. Does the landing gear tire have sufficient pressure (2,5 bar)?
16. Inspect for foreign objects aboard: This is to be performed with particular care in the fuselage. Pay attention to the smoothness of contol operation.
17. Inspect for damage! Are any steel tubes cracked from hard landings, transportation damage, etc.? Are there rustspots? Or, are there any fractures or tears in the plywood or fabric covering?

Winch-launching:
Maximum permissible winch-launch airspeed is 100 km/h. Slight tendencies to pitch and ground loop can be avoided through appropriate stick and rudder operation. The climb is executed with stick in the neutral position or with slight back pressure.

Airplane-tow:
Maximum permissible airplane-towing speed is 140 km/h. The center-of-gravity coupling is also used for airplane-towing. Approved cable length (textile cable) is about 40 meters. For release, pull the tow-coupling knob all the way and immediately turn clear.

Adjustment of the Rudder Pedals:
The cotter pins securing the aparature plated to the rudder pedals are pulled, and the aperature plates are

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removed from the pedals. The safety wire is then drawn from the two hexagonal bolts of the pedal carrier, the bolts are removed, and the pedal carrier is moved to the position desired and again bolted down and safety-wired. Then the aparature plates are reinserted over the rudder pedal pins at the appropriate hole and secured.

Fastening of the Parachute Ripcord:
The ripcord is fastened to the fuselage cross tube on the pilot's right at the upper end of the back-rest (at the gold mark).

Indicated Airspeed:
All airspeed indicators are falsified to some extend by "position error". This erroneous indication is produced by the fact that the pitot tube is located within a stream which is disturbed by the fuselage. The position error for the Zugvogel IIIb is shown in the following table:

Indicated Airspeed, V_A	60	70	80	90	100	120	140	160	200
Corrected Airspeed, V_W	57	68	79	90	102	124	146	167	211

All airspeeds in this manual are indicated (V_A) values. For new airspeed indicators, the calibration curve supplied with it by the manufacturer indicates the precision of the airspeed indications in undisturbed air. Errors in indicated airspeed greater than one or two

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km/h must be considered during flying operations. Old airspeed indicators must sometimes be recalibrated.

Flight:
Minimum speed in strait flight is approximately V_A = 56 km/h (gross weight = 330 kg.) To V_A = 60 km/h (gross weight = 365 kg.). Normal flight speed is approximately 75 to 80 km/h.

The airspeed indicator readings should be checked in any case at minimum airspeed, and the indicated normal flight speed then adjusted on this basis.

When stalled in calm air, the Zugvogel-IIIb can generally be kept pointed straight ahead. In gusty weather, however, a tendency for one wing to drop cannot always be avoided. Any tendency to spin out of the stall can be stopped at once by relaxing stick pressure, centering ailerons, and applying opposite rudder. When critical speed is reached, there is a noticeable change in the sound of the air flowing over the canopy. An occasional slight buffeting of the tail may be observed.

Landing:
Approach at about 85 to 90 km/h. The landing is very simple with airbrakes. The airbrakes permit such effective control of the L/D ratio that landings even in

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small fields present no problems. The Zugvogel IIIb also side-slips well.

A slight nose-up pitching effect takes place when the airbrakes are extended, so that the stick has to be pushed forward a little. Once unlocked, the airbrakes tend to be sucked out by aerodynamic forces, especially at speeds of 100 km/h and over.

In order to avoid sudden opening, the airbrake lever has to be held very firmly in the hand after unlocking and eased slowly toward the open position.

The final part of the movement of the airbrake lever operates the wheel brake.

Because of the impairment of profile quality and performance by rain or ice-formation, landing speed should be increased under these conditions by about 10-15 km/h above normal.

Dangerous Conditions:
With some skill in manipulating the control stick, the sailplane can be held in stalled flight. In gusty weather, however, a spin out of the stall may occur, which can be ended immediately by relaxing stick pressure and applying opposite rudder.
Should the sailplane fall into a spin, relaxing stick pressure and applying opposite rudder will end the spin

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without significant further rotation (about 1/4 turn). In the ensuing dive, airspeed builds up very quickly.

It should be recognized that the position of the center of gravity has considerable effect on spinning characteristics. It is absolutely necessary that the center of gravity lie within the certified limits.

Canopy Jettison:
Pull the canopy knob and twist so that it remains unlatched. Push forward and up on the canopy with both hands. The necessary hand movements should be practised on the ground until they are automatic.

3. Minimum Equipment

Airspeed indicator with range of 50-250 km/h,
altimeter,
Four-piece pilot's safety belt,
Parachute or back pillow (10 cm. thick when compressed),
Flight limitations Placard, and
Flight and Maintenance Handbook.

4. Rigging Information

Rigging angles and control surface deflections are given in paragraph 7.2 of the appendix, "Rigging Information." In repairing, refer to that section when checking control surface tolerances.

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The control and airbrake linkages have the following stops:

Rudder: Stop on the rudder driving lever.
Ailerons: Stops on the torque-tube behind the control stick (adjustable).
Elevator: Stops on the torque-tube under the seat (adjustable).
Airbrakes: (Retracted) Stop on bell-cranck at the wing-fuselage junction (necessary for locking mechanism!)
(Extended) Wheel brake acts as an elastic stop.

5. Weight and Center-of-Gravity Position

After repairing, installing auxiliry equipment, a new paint job, etc., it must be determined that the empty- weight center of gravity remains within the permissible limits; in special cases, balancing weights must be added. In each of these instances, of course, an examiner of the governmental aviation authority is called in.

The center-of-gravity positions for various empty weights are as follows:

Empty weight	250	260	270	280	290
Forwardmost cg position	696	682	653	611	571

Rearmost cg position	765	756	747	738	731

Reference line: Line trough trailing edge and tangent to the undersurface of reference sectionY[1]

Reference point (RP): Leading edge of the reference section Y[1]

If the empty-weight center-of-gravity position falls within these limits, then it is guaranteed that the center of gravity in flight will be within allowable limits if the load in the cockpit is as specified in paragraph 6 below.

The center-of-gravity position in flight has considerable influence on flight characteristics. For this reason, observance of the stipulated center-of-gravity range is very important.

The following range of flying-weight center-of-gravity positions is approved:

Forwardmost 343 mm behind the RP
Rearmost 513 mm behind the RP

[1] Wing reference section Y lies 21,6 inches from the plane of symetry

6. Loading for Flying Trim

Loading in the pilot's seat (pilot weight including parachute):

Maximum 100 kg.; Minimum 60 kg.

With less loading then 60 kg., balancing through ballast is necessary. If a lead- or sand-cushion is used, it is to be fastened securely to the seat (using leather straps, for example).

7. Data Placards

In addition to the Flight Limitations Placard, the following data placards are to be displayed in the cockpit:

7.1 On the left cockpit wall above the airbrake lever:

- AIRBRAKES -
PULLING ALL THE WAY BACK
OPERATES WHEEL BRAKE

7.2 At the trim lever:

- ELEVATOR TRIM -
NOSE-DOWN ... NEUTRAL ... NOSE-UP

7.3 In an especially conspicuous place (cockpit wall or instrument panel):

CANOPY EMERGENCY JETTISON:
PULL CANOPY KNOB AND ROTATE 1/4 TURN
PUSH CANOPY FORWARD AND UP

7.4 Beside the tow-coupling control:

- TOW RELEASE KNOB -
AIRPLANE-TOW AND WINCH LAUCHING

7.5 On the rear wall of the baggage compartment:

CONTENTS MUST BE SECURED!
MAXIMUM WEIGHT: 20 KG

8. Cloudflying

The minimum complement of flight instruments for cloudflying is stipulated in the following list:

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No.	Instrument
1	Airspeed indicator (50 to 250 km/h)
1	Sensitive Altimeter (0 to 10.000 m)
1	Variometer (± 10 m/s)
1	Compass
1	Elect. Turn-and-Slip Indicator with ball
1	Clock

Installation of an artificial horizon and an accelerometer is advisable.

In flights over 3.000 meters, oxygen equipment must be carried.

The licensing of sailplanes for cloudflying is concerned only with compliance with technical prerequisites. Apart from these, the necessary flight clearances must be obtained frm the air traffic control agency, and for this the pilot is responsible.

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Maintenance Handbook

1. Assembly

Before beginning assembly, clean and grease all fittings. Assembly begins with the left wing. One man holds the fuselage on the right side wile three helpers bring the win into the correct position at the fuselage. First, by moving the wing tip so that a *slight* sweepforward is produced and by moving it up and down so that an appropriate dihedral angle is formed with the fuselage, the front suspension fitting can be inserted over the corresponding stud in the fuselage; then, by moving the wing tip backwards, the rear fitting is pushed over the mating stud on the fuselage. A slight variation in the dihedral will now enable the assembly retaining pin to be inserted.

Assembly of the right wing is done in the same way as the left. When moving the right wing tip backwards, the tip must be raised or lowered as necessary to allow the tow main fittings to slide into one another. The fuselage should be held from tilting from the vertical plane while doing so. Now the assembly can proceed best if one man climbs into the seat and gives the two helpers at the wing tips instructions until the holes in the main spar fittings are properly alined. The main bolt can now be inserted *by hand*, using slight rotation. Check that the main bolt is inserted clear to the stop on the upper end. Now, the bolt is secured with the large Fokker safety pin

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(it may be necessary to turn the bolt a little), the handle is unscrewed and removed, and the assembly retaining is pin is withdrawn.

At this time, the rods for the ailerons and the airbrakes are connected ands secured with wing-nuts and Fokker pins. Finally, the cover is screwed down over the wing center section.

To complete the assembly, the horizontal tail has to be mounted. This work is best done by two man. The bolts which stick out below the stabilizer are inserted in the two eyes in the fuselage, and for this the stabilizer leading edge must be slightly raised. When these bolts are completely inserted, then the leading edge of the stabilizer can be lowered down over the threaded bolt. The castle-nut is screwed down with the assembly key, secured with a Fokker pin, and the small cover plate fastened in place.

The push-rod is connected with the elevator lever by a bolt with a wing nut and safetied with a Fokker pin.

To assemble the trim control system, place the trim lever in the “nose-down” position, insert the trim control cable sheath in its support, press the trim tab down against the spring pressure, and place the trim control cable nipple in the drive lever.

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2. Disassembly

The assembly of the Zugvogel-IIIb is in reversed sequence to the assembly. First the horizontal tail is taken off. After removing the wing cover plate, *first* make sure the aileron and airbrake controls are disconnected. The handle is then attached to the main bolt and the large Fokker pin removed; the main bolt can now be withdrawn easily if two helpers hold the wings at the tips so that the main fittings are not under tension. After pulling the main bolt, be careful to hold the fuselage from tipping from the vertical plane.
The right wing is removed first, the left wing being attached to the fuselage by the assembly retaining pin. The wing tip is moved forward far enough to free the rear stud from the wing fitting; however, do not go too far forward since the front stud then becomes wedged in the fitting and the wing is difficult to remove. Also, when pushing against the leading edge to separate the wing and fuselage at the front fitting, be careful that the wing does not suddenly become free and move backward too far since this could cause the spar root to strike the airbrake control linkage and eventually to bend it. It is best if the airbrake lever is placed in the full extended position.
If necessary, the wing can be moved backward by prying with a screwdriver between the front stud and fitting. After pulling the assembly retaining pin, the left wing is easily removable in a similar manner.

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3. Storage

If the Zugvogel-IIIb is to be stored disassembled, make certain that the wings are not underframed at too large intervals. In any case, one frame is placed under the wing root and the second one approximately between the airbrakes and aileron.

The interval should also be maintained with vertical storage, since otherwise the trailing edge will inevitably be warped. When underframing the fuselage, take care that the bottom member of the fuselage frame is supported at a truss intersection, since otherwise bending may result.

4. Servicing and Care

4.1 Protection of Surface

It is characteristic of laminar profiles that they achieve their good efficiency only with perfectly smooth and true surfaces. It is mainly a matter of holding the flow laminar for as long a distance as possible. Therefore, the surface of the wing, especially the upper and lower sides back spar, must be serviced carefully. Even the slightest roughness, be it only dust that settles in the hanger, will cause premature transition from laminar flow. Therefore, the flannel covers should always be put on while the sailplane is on the ground. Road transportation on an open trailer is quite unthinkable. The protective covers are also used, of course, with a covered trailer.

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Comparable care is also recommended for the fibreglass nose and the blown canopy. For the care of this plexiglass canopy, “Plexipol” is most suitable. The utmost caution is recommended when choosing polish for the wings! The majority of polishes given an excellent finish, it is true, but they are all more or less water repellent, and thus promote the formation of large drops on the surface which appreciably worsens flight performance as well as stalling behaviour.

4.2 Controls

For the most part, the controls run in ball-bearings and require practically no servicing. Should the ball-bearings become very dirty, they must be cleaned and lubricated with either ball-bearing grease or Vaseline.
After 50 to 100 flights, all control system bearings (other than ball-bearings) and control surface hinge bearings must be oiled or greased (see the Lubrication chart, page 25). At similar intervals, the cables for the rudder and tow-coupling have to be checked for abrasion and broken strands. Keep cable guide tubes free from sand and dirt!

The rudder control cables can be drawn from the fuselage for inspection if a strong cord is tied to one end of each cable so that the old or new cables can be drawn back in again after inspection.

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It is recommended. that the aileron deflections be measured now and then and compared with the values indicated in the data sheet; occasionally the ailerons may need to be adjusted.

4.3 Elevator Trim

The elevator trim system is adjusted so that the trim-tab can be moved a substantial distance downward, but only a fraction of an inch upward. This is necessary because the reduced dynamic pressure at low airspeeds makes the tab less effective than when the dynamic pressure is greater.
CAUTION: Out-of-tolerance positions of the center of gravity cannot be compensated for with the elevator trim, but only by ballasting!

4.4 Miscellaneous

Cracks through which air may leak (such as at the wing-fuselage junctions) should be avoided without fail, and can if necessary be sealed using foam-rubber strips.

When making a special examination after a crash, keep in mind that though brief overloading hidden damage may have occurred on structural parts throughout the entire sailplane, and often in unexpected places!

5. General information on the Maintenance of the Sailplane

5.1 Transportation

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When moving the assembled sailplane on the flying field, and especially when towing ofer uneven ground with a vehicle, make sure that the stick has been secured with the pilot's safety belt in order to avoid banging the elevator.

When transporting on a trailer, the aileron push-rods must be secured with a rope or large rubber band to the wing root fittings and the elevator push-rod must be secured to the tail in order to avoid banging; otherwise tears near the swinging levers may result. Aileron and rudder should also be locked, which can be done with simple baffles. Drive carefully cross country!

When building or buying a trailer, special attention should be given to the position of the supporting points for the wing. If, for example, the wing is supported at the root rib, the second support should be located at a distance of 4,5 to 4,8 m from the root, since otherwise the wings could tear at the inboard end of the ailerons due to the overhanging mass of the tips.

For protection of the finish of the Zugvogel-IIIb, it should never be transported on an open trailer. Furthermore, flannel covers shoudl be used to protect the wings and the nose including canopy during transport as well as in the hanger.

5.2 Supplemetary Equipment

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When installing auxilary equipment, attention must be given as a matter of principle to keeping the center of gravity within the limits stipulated in the airworhiness data. Of course, any such installation must be approved by an Examinor of the governmental aviation autority.

Radio installations:
As a rule, this will be made in accordance with the installation instructions prepared by the Scheibe Co. In exceptional cases wherein another, deviate installation is made, the owner concerned must handle the stress analysis, drawings, costs, etc., required for the necessary official installation approval.

Electrical:
In the installation of an artificial horizon, make sure that the mounting is sufficiently solid and that the battery possesses sufficient capacity.
Batteries for electrical equipment can be housed in the baggage compartment.

Oxygen-equipment arrengement:
This must be in accordance with the installation instructions prepared by the Scheibe Co.
Some compasses must be recompensated after this installation. A deviation card should be mounted in the vicinity of the instrument.

6. Overhaul and Repair

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The entire sailplane should be thoroughly overhauled at least as frequently as the annual inspection. Fabric or paint damage is to be corrected. The entire control system should be checked for freedom from play. After overhauling, the local office of the governmental aviation authority (Federal Aviation Agency in the United States) is called in and inspects and relicences the sailplane.

Repairs must be carried out in accordance with the regulations of the governmental aviation authority. Welding must be done only by a licenced aviation welder. Minor repairs can often be performed by the owner in consultation with an Examiner. Major repairs such as broken wing spars, fuselage damage with marked deformation, etc., must be done by the manufacturer or a licenced workshop. For advice regarding repair problems, submit particulars to the Scheibe Aircraft Manufacturing Co., Dachau, West Germany.

Jacking-up the fuselage:
If the fuselage should need to be jacked-up for repair or overhaul, this should be done if possible in dismantled condition, without wings and horizontal tail. The fuselage can then be supported upside-down on the cockpit frame and fin, or right-side-up ahead of and behind the wheel at the rear transport fitting, or at each fuselage truss intersection. If some part of the sailplane,

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e.g., the main wheel, must be dismantled during flight operations with the plane in assembled condition, then the fuselage can be supported directly ahead and behind the main wheel. In this case, provision should be made for adequate supporting area because of the greater weight involved.

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7. Appendix

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