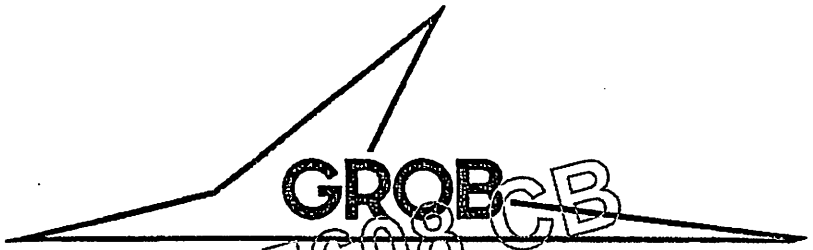

GROB WERKE GMBH & CO. KG
Unternehmensbereich
Burkhart Grob Flugzeugbau
8939 Mattsies
Flugplatz Mindelheim-Mattsies
Telefon 08268/411
Telex 539623

GLIDER FLIGHT MANUAL

GROB G 102

CLUB ASTIR III

CLUB ASTIR III b

STANDARD ASTIR III

This handbook is to be kept on board the aircraft at all times.
This Glider Flight Manual is FAA approved for U.S. registered gliders in accordance with the provisions of 14 CFR Section 21.29 and is required by FAA Type Certificate Data Sheet No. G 33 EU.
It refers to the serie: _____

Registration: _____ Factory Serial Number: _____

Owner: _____

_____

_____

German edition of operating instructions are approved under § 12(1) 2. of LuftGerPO.
Published October 1982
LBA approved December 6, 198

Approval of translation has been done to our best knowledge and judgement. In any case the original

I. General

I.1. Log of revisions

Revision No.	Pages affected	Description	LBA approval signature	Date

All Manuals for GROB G 102 can be ordered at:

- Burkhart Grob of America, Inc.
  1070 Navajo Drive, Bluffton Airport Complex
  Bluffton, OH 45817 (419)358-9015 or 9025
- Grob-Werke GmbH & Co. KG
  Unternehmensbereich Burkhart Grob Flugzeugbau
  Flugplatz Mindelheim-Mattsies
  8939 Mattsies, West-Germany
  (08268) 411

December 6, 1982

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I.2. Pages included:

1	Dec. 6, 82	27	Dec. 6, 82
1a	Dec. 6, 82	28	Dec. 6, 82
2	Oct. 82	29	Dec. 6, 82
3	Oct. 82	30	Dec. 6, 82
4	Oct. 82	31	Dec. 6, 82
5	Oct. 82	32	Dec. 6, 82
6	Dec. 6, 82	33	Dec. 6, 82
7	Dec. 6, 82	34	Dec. 6, 82
8	Dec. 6, 82	35	Oct. 82
9	Dec. 6, 82	36	Oct. 82
10	Dec. 6, 82	37	Oct. 82
10a	Dec. 6, 82	38	Oct. 82
11	Oct. 82	39	Oct. 82
12	Dec. 6, 82	40	Oct. 82
13	Dec. 6, 82	41	Oct. 82
14	Dec. 6, 82	42	Oct. 82
15	Dec. 6, 82		
16	Dec. 6, 82		
17	Dec. 6, 82		
18	Dec. 6, 82		
19	Dec. 6, 82		
20	Dec. 6, 82		
21	Dec. 6, 82		
22	Dec. 6, 82		
23	Dec. 6, 82		
24	Dec. 6, 82		
25	Dec. 6, 82		
26	Dec. 6, 82		

December 6, 1982

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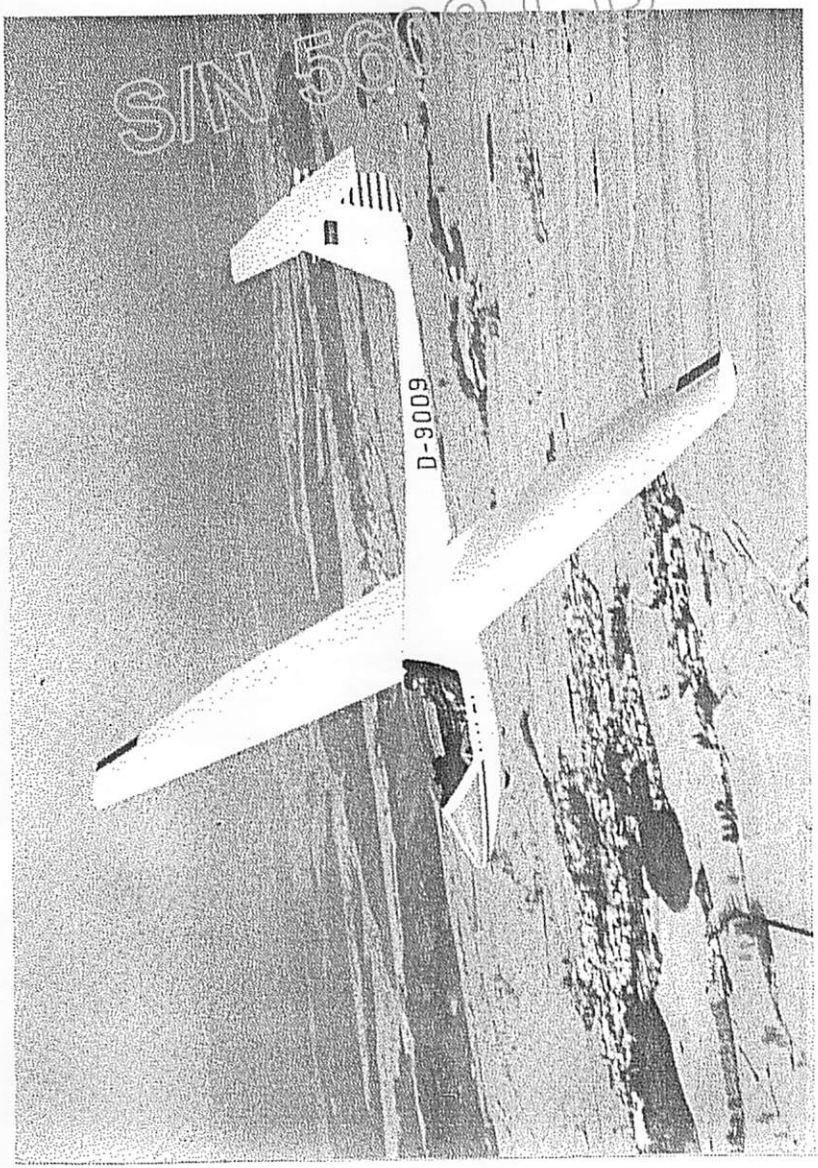
I.3. Contents

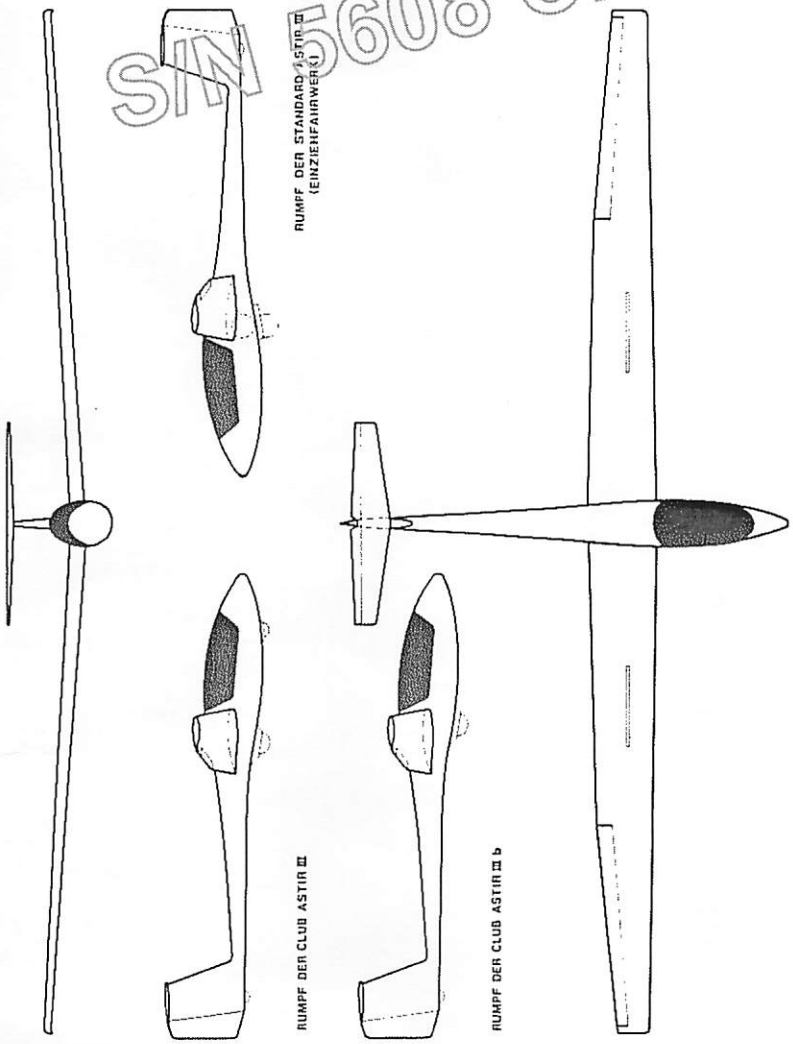
October 1982

I.4. Total view (photo)



October 1982

I.5. Three-side view



October 1982

I.6. Description

The CLUB ASTIR IIJ and IIJb a single seat performance glider for the club class with a T-tail and airbrakes on the upper wing surface.
The STANDARD ASTIR III is the equivalent high performance glider for the standard class, with retracting undercarriage and ballast tanks in the wings.
The glider incorporates the most modern fibre reinforced plastic technology. The fuselage ~~belts~~ stringers are fabricated from Carbon fibre; all other surfaces and shells are glassfibre.

Technical Data

Wingspan	15,0 m	(49,2 ft)
Length	6,75 m	(22,1 ft)
Height	1,26 m	(4,1 ft)
Aspect ratio	18,2	(18,2)
Wing area	12,4 m^2	(133,5 sq.ft.)
Maximum flying weight		
with waterballast	450 kg	(992 lbs)
without waterballast	380 kg	(838 lbs)
Maximum wing loading	36,3 kg/m^2	(7,4 lbs/sq.ft)

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II. Operating limitations

II.1 Category of airworthiness:

U (Utility) according to JAR 22

Certification Basis: 14 CFR Sections 21.23 and 21.29 effective 1 February 1965; and Joint Airworthiness Requirements for Sailplanes and Powered Sailplanes (JAR-22), dated 1 April 1980.

II.2 Permitted operations:

1. VFR day
2. Simple aerobatics (loop, stall turn, lazy eight, chandelle, spin)

II.3 Minimum equipment

1. Air speed indicator reading to 300 km/h (162 knots, 187 mph)
2. Altimeter
3. Four part safety harness
4. Back cushion of at least 3" depth when compressed, or parachute
5. Loading limit placard
6. Flight limits placard
7. Flight Manual

II.4 Airspeed limitations

Never exceed	VNE	250 km/h(135 kts,155mph)
Maximum Rough Air	VB	250 km/h(135 kts,155mph)
Manoeuvring speed	VM	170 km/h(92 kts,105mph)
Maximum on winch launch	VW	120 km/h(65 kts, 74mph)
Maximum on aerotow	VT	170 km/h(92 kts,105mph)
Maximum for operating landing gear, and L.G. extended	VT	250 km/h(135 kts,155mph)

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"Rough air" includes the turbulence likely to be encountered in wave rotors, clouds, whirlwinds, and while flying over mountain ridges.

The manoeuvring speed is the maximum speed at which full control deflections are permissable. At VNE only one third of the available movements may be used. True airspeed is higher than indicated airspeed at altitude.

This fact has no influence on the strength and the aerodynamic loads on the sailplane. But for flutter prevention VNE must be decreased according to the following table.

Altitude (ft)	0-6500	10000	13000	16500	19000
VNE (indicated knots)	135	128	121	115	109
(indicated km/h)	250	237	225	213	202

Air speed indicator markings

72-170 km/h	39-92 kts	45-106mph	Green arc (normal range
170-250 km/h	92-135 kts	106-155mph	Yellow arc (caution range)
At 250 km/h	135 kts	155 mph	Red line (max. speed)
At 90 km/h	49 kts	56 mph	Yellow triangle (minimum approach speed at max. flying weight)

December 6, 1982

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Installation Errors of ASI
The airspeed indicator must be connected to the following sources: Pitot head in the tail fin, static vents side of the fuselage near the seat.
Using a calibrated ASI the position error is not greater than ± 2 km/h or 1 kt or 1,2 mph.
A calibration curve is therefore not necessary.

II.5 Flight envelope

The following g-loads must not be exceeded.

At VM + 5.3 - 2.65 At VNE + 4.0 - 1.5
(Airbrakes closed)

II.6 Weight limits

Empty weight	appr. 260 kg (573 lbs)
Max. permissible without waterballast	380 kg (838 lbs)
Max. permissible with waterballast	450 kg (992 lbs)
Maximum permissible weight of non lifting parts	250 kg (551 lbs)

II.7 Center of gravity position

Permitted center of gravity positions in flight lie in the range

from 310 mm (12,20 inches) to
480 mm (18,90 inches)

behind the datum line, equivalent to 24% to 44% of the M.A.C. of the wing.

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A/c attitude: incidence board of 600:26 angle horizontal on the back of the fuselage.

The datum line is the wing root leading edge.

The permitted center of gravity range will not be exceeded if the loading is carried out according to the loading plan in section II.8.

II.8 Loading limitations

Minimum weight in the seat	70 kg	(154 lbs)
Maximum weight in the luggage space	10 kg	(22 lbs)
Maximum weight in the seat	110 kg	(242 lbs)

Pilot weights lower than 70 kg (153 lbs) must be compensated by ballast carried in the seat.

The maximum flying weight of 380 kg (838 lbs) without waterballast and of 450 kg (992 lbs) with waterballast must not be exceeded. Water ballast can only be loaded until this maximum weight is reached (see diagram on side 10a).

Water ballast can not be used to compensate locking weight in the seat.

December 6, 1982

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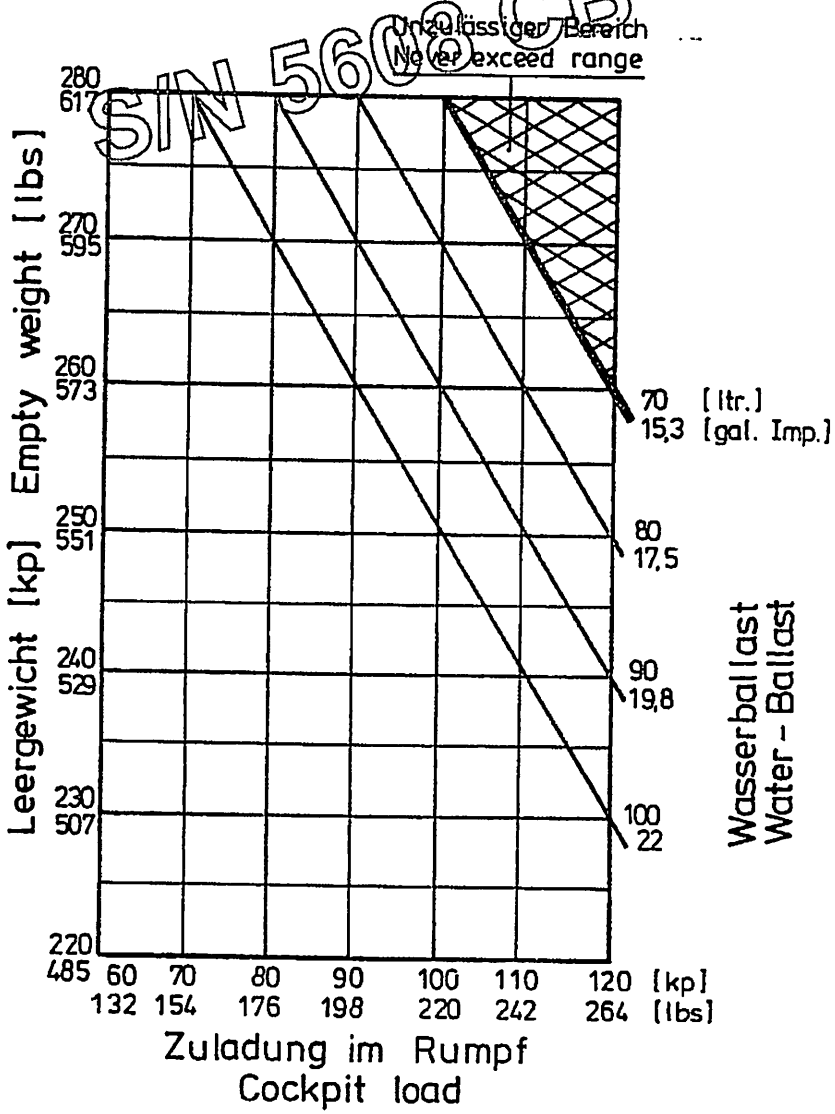
Waterballast chart (only Standard Astir III)



(einschließlich Gepäck; Baggage inclusive and ballast in ballast box)

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Weighing report

Date of weighing: carried out by.	Equipment list used for weighing (date)	Empty (Weight) kg/lbs	Position of cg empty behind reference mm/inches	Maximum total payload kg/lbs

II.9 Tow hooks and cable length

For Aerotow: Optional nose hook E 75 with modification 1-79

For Aerotow and winch launch: Europa G 73 safety hook.

Minimum aerotow cable length 40 m (130 ft)
Minimum launch cable length 600 m (1970 ft)

II.10 Weak link in launching cable

Aerotow and winch launch 500 kg (1100 lbs) ±10%
(e.g. Weak link no. 5,
colour code white)

II.11 Tire pressure

Tire size Main wheel 5.00-5 / Tire pressure 2,5 bar
Nose wheel and Tail wheel Ø 210 x 65 mm. 2,5 bar

II.12 Crosswinds

The maximum approved crosswind component for take off and landing is 20 km/h (11 knots, 12 mph).

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II.13 Placards and markings

Maximum weight	kg	lbs
without water ballast:	380	836
with water ballast:*	450	990

Airspeed limits	km/h	m.p.h.	kts
Never exceed	250	155	135
In rough air	250	155	135
Manoeuvering	170	105	92
On aerotow	170	105	92
On winch tow	120	74	64
Airbrakes	250	155	135
Gear extension	250	155	135

cockpit *(no valid for CLUB ASTIR III and IIIb)

Payload
Payload (pilot and parachute)
The maximum weight must not be exceeded.

Minimum payload: 70 kg, 154 lbs.
Less weight must be compensated with ballast in the seat or in the ballast box

Maximum load 110 kg 243 lbs

The maximum weight must not be exceeded.

cockpit

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Check before launch

Wing and tailplane connections checked?
Full and free movement of controls?
Parachute secured?
Straps tight and locked?
Pedals adjusted and locked?
Brakes closed and locked?
Trim correctly adjusted?
Altimeter adjusted?
Canopy locked?
Cable on correct hook?

Beware: — Crosswind! — Cable break!

cockpit

Simple aerobatics manoeuvers

Recommended entry speed	km/hr	knots	mph
Loop	180	97	112
Stall turn	180	97	112
Chandelle	150	81	93
Lazy eight	120	65	75
Spins	--	--	--

Aerobatics with waterballast is not allowed.

Cockpit

TIRE: 2,5 bar (36psi)

Nose and Tail wheel cover

Weak links for towing
500 kp, 1100 lbs. max.
Tire: 2,5 bar 36 psi.

Main wheel cover

Altitude(ft)	0-6500	10000	13000	16500	19000
VNE (KIAS)	135	128	121	115	109

near airspeed indicator

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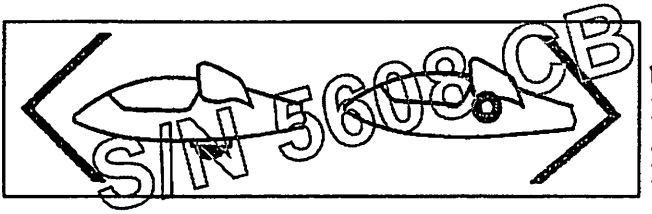
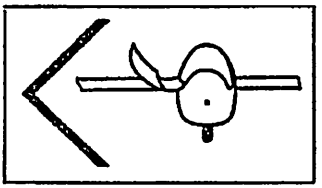
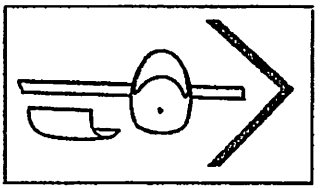


Undercarriage lever (only Stand. Astir III)

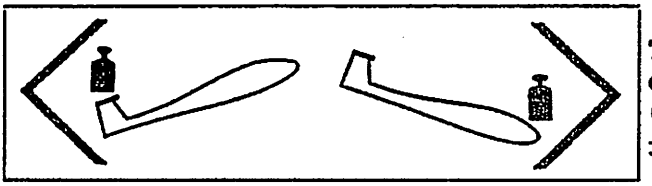


Left

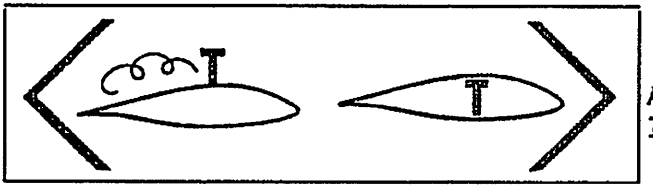


Canopy catch

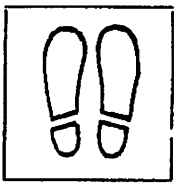
Right side



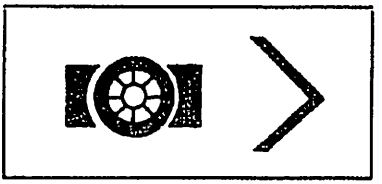
Trimmer green lever (left side of fuselage)



Airbrake lever



Rudder pedal adjustment (Instrument panel)



Wheel brake (Airbrake lever)

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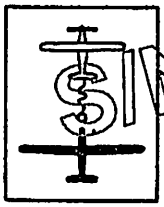
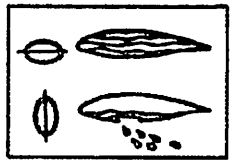


Baggage maximum
22 lbs 10 kg

(luggage compartment)

Cable Release
(Instrument panel)

Ventilation
(Instrument panel)



Water ballast jettison
(Instrument panel)
(Standard Astir III)

Don't push or lift here

Fin
(both sides)

Elevator quick lock connected
Markings notice
Rotating knob turned in
Tailplane secured (cover closed)

Tailplane checklist (Fin)

For	N	30	60	E	120	150
Steer						
For	S	210	240	W	300	330
Steer						
DATE						

near magnetic direction indicator

December 6, 1982

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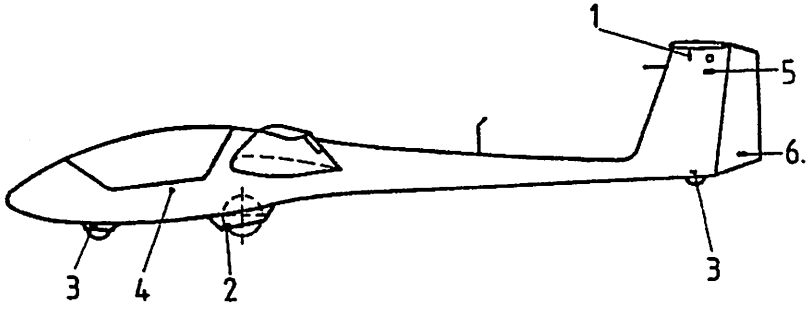
Number of ballast weights		
Weight of pilot (parachute incl.)	55-69,9 kg	70-110 kg
Number of weights	1	0
1 ballast weight: 8,6 kg		

cockpit

Lables and Markings outside of the fuselage



1 Control Markings for the correct rigging of the tailplane

2 Lable of Tire pressure and weak link strength

3 Lable of Tire pressure

4 Red rings around static pressure port.

5 Placard for elevator fastening

6 "Don't push or lift here"

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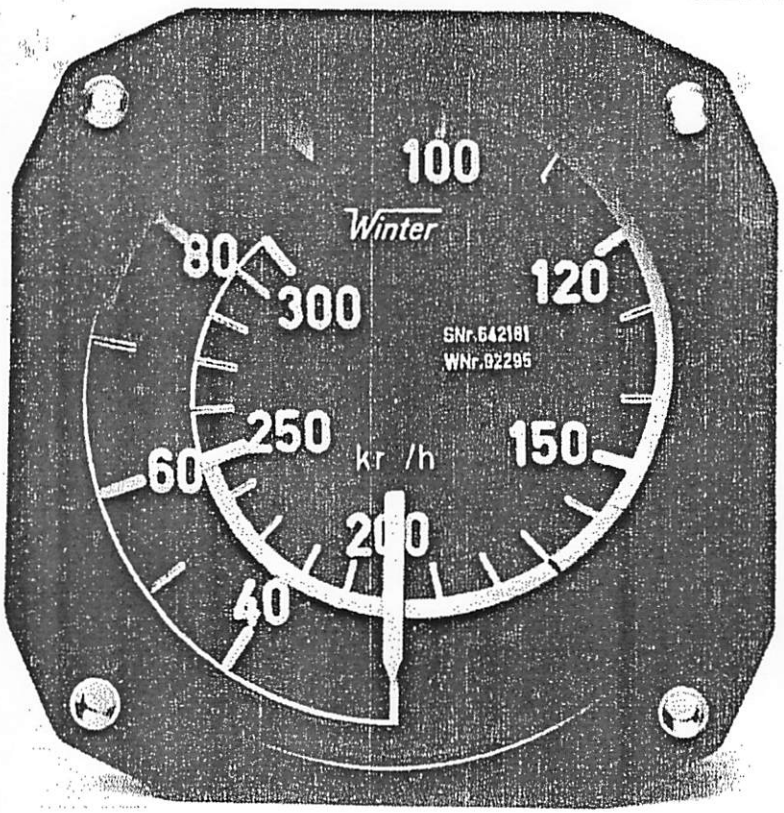
Air Speed Indicator Markings

km/h	knots	mph	Marking	Significance
72-170	39-92	45-105	Green arc	Normal range of flying speed
170-250	92-135	105-155	Yellow arc	Range of flying speeds to be used with care
250	135	155	Radial Red line	Maximum speed (VNE)
90	49	56	Yellow triangle	Minimum recommended landing speed at maximum all up weight

72 km/h(39 kts/45 mph) = Vs 1,1 under max. flight weight conditions



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III. Emergency procedures

SIN 5608 CB

III.1 Spin recovery

Exit from spin can be accomplished by the standard recovery procedure:

- Full opposite Rudder
- Neutralize stick
- Ailerons should be neutral
- when rotation stops neutralize rudder and pull out gently.

III.2 Canopy jettison and exit

The freedom of movement in the cockpit makes exit easy in an emergency. The point to fix the parachute is the red ring on the central tube behind the seatback.

a) Pull red knob back on the left and disengage the pin.
b) Pull red knob back on the right and with the left hand push canopy upwards.
c) Unbuckle seat harness.
d) EXIT over left or right side.
e) Wait only 1-3 seconds before pulling the rip cord.

December 6, 1982

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LUFTFAHRT-BUNDESAMT BRAUNSCHWEIG

III.3 Landing with the undercarriage retracted (only STANDARD ASTIR III)

It is possible to land on soft and hard surface without risk of nosing over.
Approach normally and align in 2 point attitude.
Avoid a high roundout.

III.4 Miscellaneous

Flying in rain

There is a noticeable deterioration of flying characteristics by wet or lightly iced wings, which raises the stall speed by about 5 km/h (3 knots).
Increase take off and approach speed by 6 knots.

Wing dropping

If the wing drops in a turn or straight flight, leave the stick neutral and apply rudder against the direction of rotation.

Ground looping

The aircraft is not prone to ground loop on take off. However if one wing touches the ground or the aircraft changes direction by more than 15 degrees during take off release towcable immediately.

December 6, 1982

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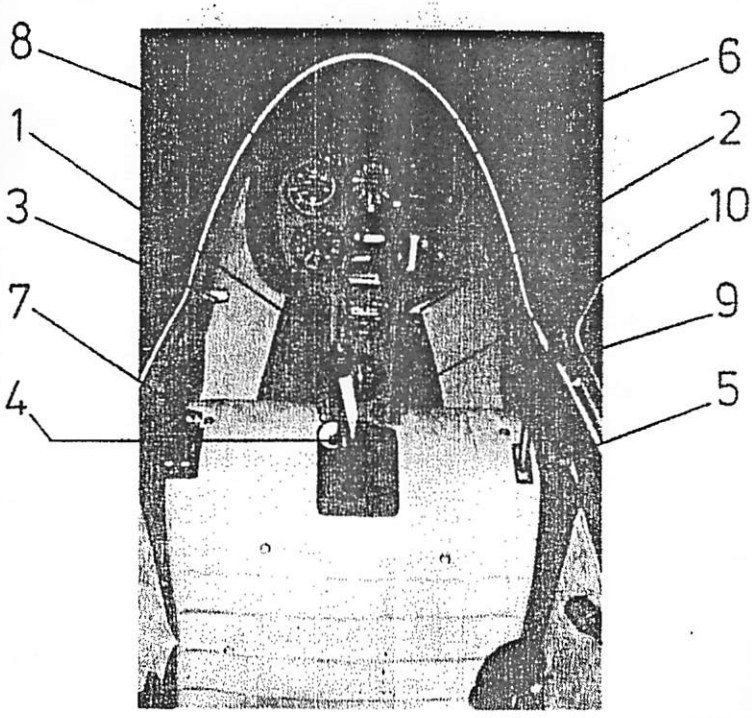
IV. Normal procedures

IV.1 Cockpit and control layout

Seat of Standard Astir III (Club Astir III and IIIb)



1 Controlstick
2 Rudder pedals
3 Airbrakes w. wheel brake
4 Cable release knob
5 Canopy jettison
6 Rudder pedal adjustment
7 Trimhandle
8 Ventilation
9 Undercarriage handle
10 Waterballast jettison

The seatback is adjustable.
(Point 9 and 10 are not valid for CLUB ASTIR III and IIIb)

December 6, 1982

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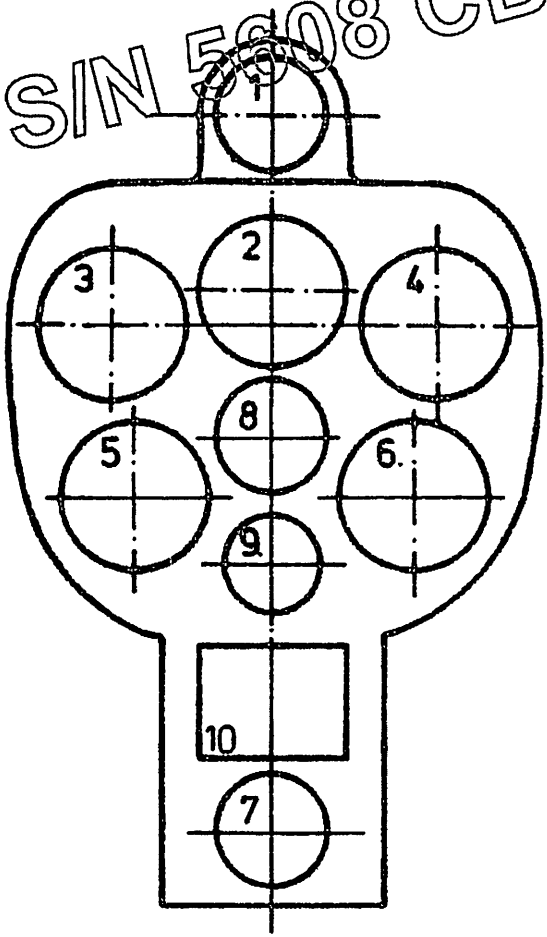
Standard instrument positions



1 Magnetic compass
2 Electrical vario indicator (optional)
3 Airspeed indicator
4 Variometer
5 Altimeter
6 Electrical vario control (Optional)
7 G-Meter or variable
8 Ball
9 Temperature (outside) or variable
10 Radio

IV.2 Daily inspection

Complete check round aircraft

1.a) Open canopy
b) Check the 4 wing to fuselage quick locks are secure
c) Visual check of all control mountings and linkages in cockpit area
d) Check for loose objects (also through the access door for the main control linkages)
e) Check full and free movement of all controls
f) Check tire pressure (2,5 bar = 35,6 PSI) and condition
g) Check condition of towhooks
h) Check operation of towhooks and wheelbrake

2.a) Check upper and lower wing surfaces for damage
b) Aileron (Check condition, free movement, play)
c) Airbrakes (Check condition, fit and lock)

3. Check fuselage for damage, particularly on underside

4. Check tailplane for correct mounting and security

5. Check tail wheel, pressure (2,5 bar = 35,6 PSI) and condition

6. Check pitot and venturi

7. Check static holes are free of obstructions

8. See "2"

9. Check static holes

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The aircraft should be checked particularly thoroughly after heavy landings or excessive demands have been placed on it in flight. Remove the wings and tailplane. If damage is discovered an inspector should be called in. The aircraft should not under any circumstances be flown until the damage has been repaired.

December 6, 1982

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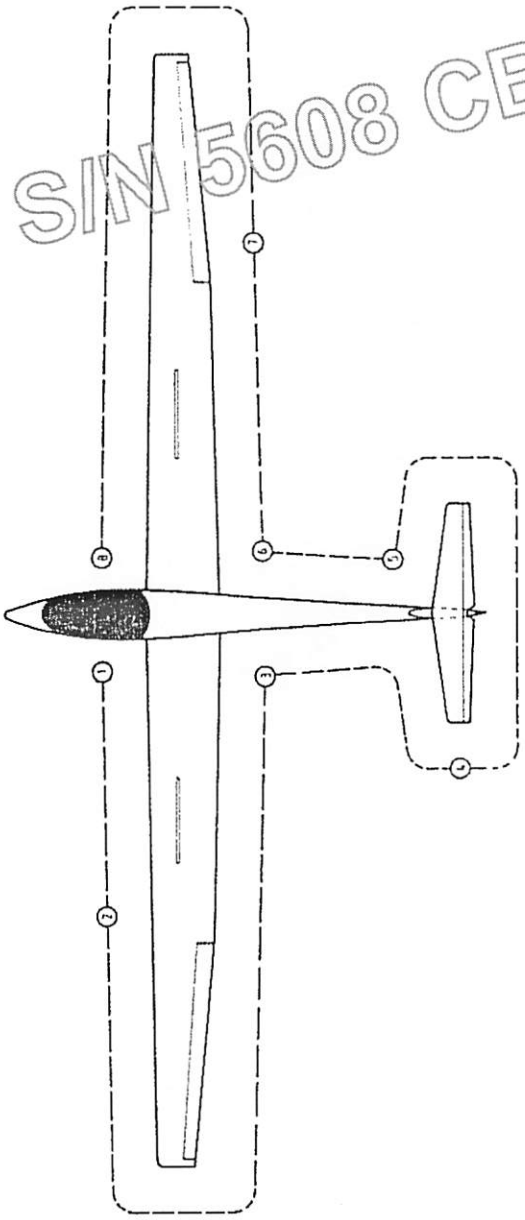
Complete check round the aircraft (cf IV.2)



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IV.3 Pre flight check

1. Wing and T-tail attachments secured?
2. Parachute and safety straps secured?
3. Pedals adjusted?
4. Undercarriage lever locked in fully forward position? (only Standard Astir III)
5. Brakes closed and locked?
6. Full and free control movement?
7. Trim set to neutral?
8. Altimeter set to zero or to field elevation?
9. Radio switched on and set to the correct base frequency?
10. Canopy locked?
11. Cable on correct hook?
12. Beware: - Crosswind - Cable break!

IV.4 Take off

Trim

The trimhandle is on the left-hand side of the cockpit and can be progressively adjusted.

Winch launch

Trim neutral or nose heavy if the pilot is light.

Maximum winch launch speed is 120 km/h (65 knots, 74 mph).
The glider has a release hook in front of the wheel.
Winch launches cause no difficulties at all allowed centre of gravity positions and wing loadings.
The plane has no tendency to balloon up or to swing on the ground. One should push forward slightly on the stick below about 100 metres (330 ft) in the case of fast launches from a powerful winch. When the cable slackens pull the release firmly to its limit.

Aerotow launch

Recommended line length is 40 - 60 m (140-200 ft).
Trim neutral.

Max aerotow speed 170 km/h (92 knots, 105 mph).
Use the nose hook for aerotow if it is installed.

Aerotow from the belly hook presents no problems to experienced pilots. In this case the undercarriage of the Standard Astir III can not be retracted during the aerotow. The aircraft can be controlled during the whole ground run by means of aileron and rudder using full deflections if required. There is no tendancy to ground loop, even in strong cross winds. The aircraft can be lifted off at an IAS of 65 km/h (35 kts); it takes off on its own, with the stick held neutral at an IAS of 70-74 km/h (38-40 kts). The yellow release knob is mounted on the instrument panel and must be pulled right back to release.

IV.5 Normal flight

The aircraft can be flown in all configurations throughout the permitted speed range. Full aileron and rudder movements are only permitted up to the manoeuvring speed of 170 km/h (92 knots). At higher speeds the controls are to be used with corresponding care. For the elevator movements only the g-loads II.5 are appropriate.

December 6, 1982

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IV.6 Slow flying and stalling

The stall warning is given by a noticeable buffeting of the tailplane. The stalling speed depends on the configuration and weight of the aircraft. The following standard values are appropriated to:

	Weight	Without brakes	With brakes
Without water ballast	380 kg	60 km/h	65 km/h
	838 lbs	32 kts	35 kts
With water ballast	450 kg	70 km/h	75 km/h
(only Standard Astir III)	992 lbs	38 kts	40 kts

Regard the increasing stalling speed in relation to the bank angle.

On further rearward movement of the stick the aircraft goes into a controllable "mush", which can be controlled with ailerons and rudder. On forward movement of the stick the aircraft at once returns to its normal flying attitude. A swift backward movement of the stick will produce a nose drop; the ailerons will provide lateral control.

IV. 7 High speed flight

The aircraft has no flutter problems in the permitted speed range. Above 170 km/h (92 kts) the controls must be moved no more than one third of the available movement. VNE is not exceeded in a 45 degrees dive with the airbrakes fully extended even at maximum all up weight.

December 6, 1982

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IV. 8 Simple aerobatics

Aerobatics should only be carried out by pilots who have the necessary permission.

Aerobatics may only be carried out without water ballast.

The following aerobatics are permitted:

1. Inside loop

Entry speed	180 km/h (97 kts)
G load	ca. 2 g
Exit speed	180 km/h (97 kts)

2. Stall turn

Entry speed 180 km/h (97 kts)

At 70 knots (130 km/h) slowly apply rudder. Shortly before the stall assist with aileron. In the case of an unintentional hammerhead stall hold the controls firmly central.

3. Spins

Reduce speed slowly to 70 km/h (38 kts): pull the stick back and give full rudder. The aircraft spins slowly at one turn every 5 seconds. The height loss is 220 ft. per turn.

Recovery: opposite rudder, pause, stick forward till rotation stops, recover gently at about 160 km/h (86 kts).

4. Chandelle

Entry speed 150 km/h (81 kts)

Pull up to fly turn with 90 degrees bank. During turn decrease speed and exit from turn with rudder and aileron. The chandelle should be complete heading in the opposite direction at minimum speed.

5. Lazy eight

Entry speed 120 km/h (65 kts)

Manoeuvres that involve negative g loads are prohibited. Unorthodox manoeuvres are likewise prohibited.

December 6, 1982

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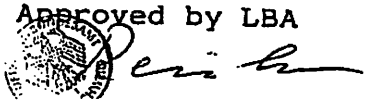

IV. 9 Approach and landing

The approach may be carried out at 90 km/h (49 kts). The brakes are effective enough to carry out steep approaches. They cause a slight nose down trim change, so that the aircraft maintains the chosen airspeed automatically. Fully extending the airbrakes increases the stalling speed: do not extend the brakes fully during the roundout, to avoid heavy landings.

During touchdown do not fully extend the airbrakes due to a very strong wheelbrake effect.

The side-slip is quite controllable and, if needed, this manoeuvre can be used for steeper approaches. But the side-slip is only effective by using a large angle of side-slip and should be finished at a safe height. (90 km/h; 56 mph).

Rudder effect reversal have not been observed.

The temporary control force to overcome the force reversal or rudder lock is calculated approximately 2 to 5 daN (rudder pressure). The aileron does not change its force direction, rather it returns independently from the full deflected position.

Rudder lock can be relieved without pilot input on the rudder. After moving the aileron into neutral position, the Sailplane rolls out of the Slip into wing level position. Thereafter the rudder frees itself from the full deflected position and the force reversal is relieved. Using this method to end the Slip no bucking of forward pitching is evident. During roll out the Sailplane deviates only slightly from its original flight course. This leveling out manoeuvre takes only a few seconds.

December 6, 1982

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IV.10 Flight with water ballast (only STANDARD ASTIR III)

A flight with maximum pay-load and additionally full amount of water ballast is comparable with a standard two-seat glider. Therefore the flight characteristics of slow flying and stalling are different with water ballast flights to flights without water ballast. The stalling speed increases to about 70 km/h (38 kts). Greater control deflection are needed to correct the attitude. The entry to the spin is more abrupt than without water ballast, but it will be recovered by the standard procedure immediately. Slow flying and stalling with maximum gross weight should be practised at a safe height.

The water ballast tanks are located in the wings and contain approximately 45 litres per wing. They are filled through the plugs on the top surface of the wings, which can be removed with a rod.
Built in baffles ensure that no noticeable movement of the water occurs in flight, when the tanks are partially filled.
The water has to be poured in and not filled in under the pressure of the water-pipe.
Equal amounts of water must be put in each tank to make up the required amount, so that lateral stability is not impaired.
Water ballast is dumped through an opening under the fuselage behind the wheel-box. The valve is opened by pulling and turning the black knob at the right side of the instrument panel. Dumping of full water ballast takes about 3 minutes.
Air from the tanks escapes through an overflow pipe that runs down to the cleft of aileron.

December 6, 1982 Approved by LBA

When flying with water ballast the adhesive tape that covers the gap between fuselage and wings, should not cover the gap on the underside in the region of the spar, so that leaking water which may appear cannot run down into the fuselage.

Before longer flights at temperatures around 0° C (32° F) the water must be jettisoned because of the danger of freezing.
It is strongly recommended that water ballast is jettisoned before landing.

The glider has to be parked over-night without water ballast due to the danger of freezing.
When de-rigging the water ballast tanks will empty themselves through the wing root connecting pipes.
If the glider has to be towed for a long way on a bumpy ground, the water tanks should be emptied to take care of the wing suspensions.

IV.11 Storage

When the glider is stored the canopy should be locked. To tie down the wing, a rope can be pulled through the wing tip skids.

December 6, 1982

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V. Performance

All up weight	380 (838)	450 (992)	kg (lbs)
Wing loading	30,6(6,3)	36,3(7,4)	kg/m^2 (lbs/sq.ft)
Best glide angle	36	38,0	
at flying speed	92 (50)	105 (57)	km/h (kts)
Minimum sink	0,62(122)	0,7 (138)	m/sec (ft/min)
at flying speed	76 (41)	85 (46)	km/h (kts)

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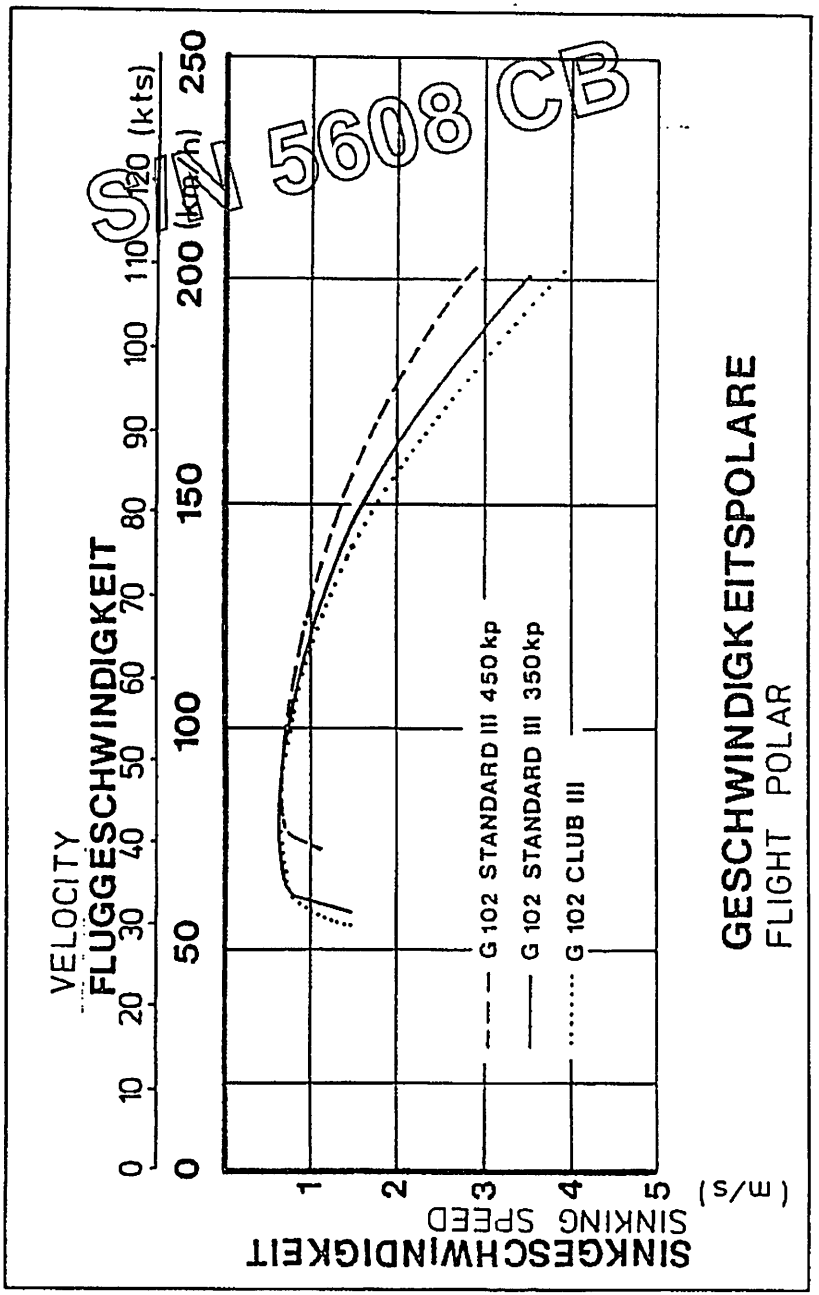

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VI. Rigging and derigging

VI.1. Rigging

The fuselage must be held firmly in an upright position when rigging. It is recommended that a fuselage stand or the trailer fittings are used. The glider can be rigged by 3 people.

1. **Wings**

Unlock the 4 main wing fittings in the fuselage (a). Unlock the air-brakes on the wings. . Guide the right wing into the fuselage. The safety catches on the fuselage fittings should now be released ,and on gently moving the wing to and fro will be heard to snap into place (b). Next guide the left wing into the fuselage. Move the wings tips up or down so that the pin on the end of the spar stub is lined up with the appropriate hole in the opposite wing root and slide into place. Next release the safety catches on the left hand fuse-lage fittings and by gently moving the wing tip forwards and backwards they too can be made to snap into place (b).

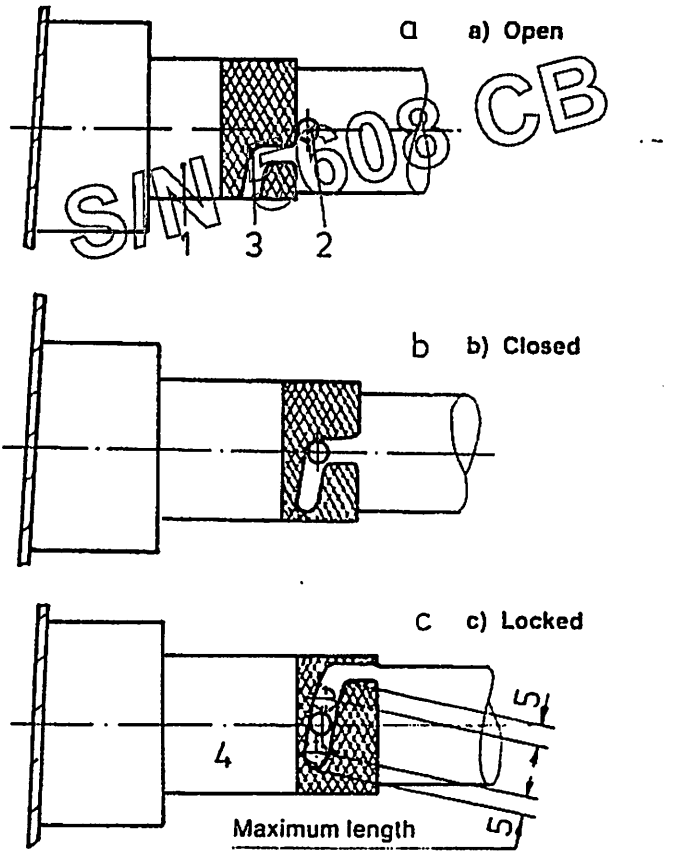
To lock the fuselage fittings turn so that the pins are engaged in the slots. A slow but firm fore and aft movement of the wing tip will allow the collar to be turned sufficiently. They should not however reach the end of the slot (c).

Check – The red rings on the fuselage sides must be covered by the rotating collars. The collars should be finger tight.

In the closed but not secured position (b) the wings cannot be with-drawn.

2. **The aileron and airbrake connections are behind the spar**

The connecting rods can be connected by means of the quick lock fasteners through the inspection cover. If necessary the aileron has to be moved up and down to get the linkages into the right position.



After rigging the following check must be carried out to check the connections are secure:

After connecting the quick lock couplings make a visual check that the collar is extended forward over the bearing far enough for the safety pin to engage.

October 1982

Having engaged the quick locks check that the safety pin cannot be moved without pressing it down. If it cannot be slid without pressing down the controls are properly connected.

3. Tailplane

Before assembly is commenced the front cover must be opened and the rotating wing bolt pulled out to the limit. **It is important to ensure, that the larger opening of the conical crillings in the inner rings of the horizontal stabilizer spar bearings fall to the rear.** The tailplane can best be positioned by standing behind the rudder. The tailplane can be rested on top of the fin with the elevator angled upwards so that the quick lock on the elevator push rod can be attached to the bearing on the elevator horn. The front of the tailplane can then be pushed back on to the three pins. It is then necessary to tighten the wing bolt clockwise to secure the tailplane. The assembly is complete when the wing bolt is sufficiently tight for there to be no play in any direction. The cover provides a safety measure as it can only be attached with the wing bolt horizontal. If necessary the wing bolt has to be turned a quarter turn to suit. Derigging is carried out in the opposite order and the wing bolt is unscrewed anticlockwise and pulled fully out.

To control the correct mounting of the horizontal stabilizer it is important to ensure that the peaks of the mark-arrows at fin and elevator tabs face each other.

Checks to be made after rigging.

1. Check that the four collars in the fuselage are engaged and secure.
2. Check that the aileron, airbrake and flap connections are engaged.
3. Check the towhooks for correct function and operating forces.
4. Test the operation of the wheel brake and the tire pressure.
5. Check that the tailplane is securely seated, control the 4 markings.
6. Check the elevator is coupled correctly through the clear panel.
7. Check sense and full and free movement of controls with an observer.

VI.2. Derigging

Derigging is carried out in the reverse order and in this case it does not matter which wing is removed first. Excessive fore and aft rocking of the wing tips should be avoided.

VI.3. Transport

We recommend the use of a closed trailer for transporting the glider. The parts must be carefully supported and secured so they cannot slide.

1. Fuselage

   A fuselage trolley moulded to the shape of the fuselage and positioned in front of the main wheel. The minimum length of the trolley should be 400 mm and it can be attached to the wing fittings if required. The tail skid should be secured so that it cannot slide sideways.
   (400 mm = 16 in.)

2. Wings

   The minimum length for the spar support should be 200 mm and should start at the face of the root rib. The mounting must be padded well with foam rubber or felt.

   The mounting under the aileron inboard end should be a shaped mounting block with a minimum length of 300 mm and height of 400 mm. The mounting must be padded with felt.
   (200 mm = 8 in.; 300 mm = 12 in.)

3. Tailplane

   Either horizontal on padded supports with the upper surface downwards and secured with straps or vertical supported on the leading edge in shaped mounting blocks.

   Profile drawings are available for the manufacture of fuselage, wing and tailplane fittings.

VI.4. Simple Maintenance

The entire surface of the glider is coated with weather resistant white polyester gelcoat.

The greatest care should be taken in maintaining the fibre glass surface of the glider. Luke warm water should be used to wash off dust, grease, dead flies and other dirty marks. More resistant dirt should be removed by using a mild cleaning agent. Only special silicon-free preparations should be used in maintaining the painted surfaces. (1 Z-Spezialreiniger – D 2, Fa. W. Sauer and Co., 5060 Bensberg or Reinigungspolish Fa. Lesonal).

Although very resistant the glider should be protected as much as possible against rain and dampness. Water that has seeped in should be dealt with by storing the glider in a dry place, frequently turning over the dismantled parts.

The most effective way to clean the canopy is to use a special perspex cleaner but if necessary luke warm water can be used. A soft, clean cloth or chamois-leather should be employed to wipe the canopy down. Never rub perspex with anything dry.

The Safety harness should be regularly checked for damage and general wear. The metal parts of the harness should be frequently checked for corrosion.

Because of its position, the winch launch hook is susceptible to getting very grimy and muddy. It must therefore be frequently inspected for damage, cleaned and greased. When the seat-well is removed the hook can easily be taken out. Remove the connecting wire from the lever and take out the retaining screws. For reconditioning, the tow hook should be sent with the record card to the tow hook manufacturer, Tost. For further details the manufacturers manuals should be consulted.

The cables and pulley for the nose and belly hooks should be checked for wear during the yearly inspection.
The wheels tyre pressure should be kept at 3,5 atmospheres 2,5 bar (36 psi).

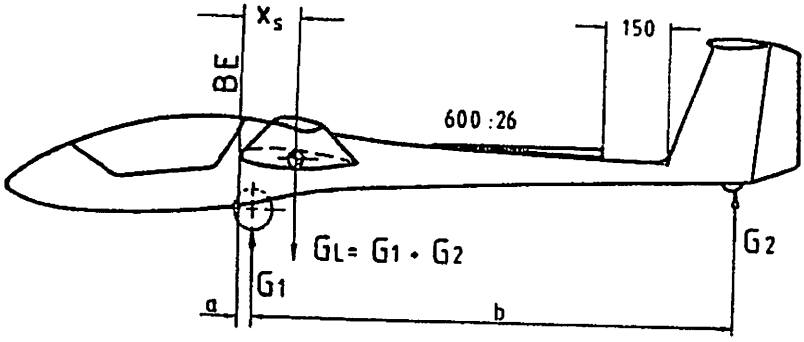
Before assembling the glider the pins and sockets at the joints between wings and fuselage, and tailplane and fuselage, should be cleaned and greased.

October 1982

VII. Measurement of centre of gravity

The determination of the center of gravity is made with the undercarriage extended and the glider supported on two scales in such a way that an incidence board of 600 : 26 angle is set horizontal on the back of the fuselage.

The reference plane is situated at the front of the wing at the root. The distances a and b measured with the help of a plumb line . The empty weight is the sum of the two weights G_1 and G_2.



Datum line: Front edge of the wing at the root rib (BE)

Level means: With a 600 : 26 incidence board set up horizontal on the top of the rear fuselage.

Weight on main-wheel	G_1 =		kg / lbs
Weight on tail-skid	G_2 =		kg / lbs
Empty Weight G_L	= G_1 + G_2 =		kg / lbs
Distance to main-wheel	a =		mm / inches
Distance to tail-skid	b =		mm / inches

Empty weight C. of G.

$$X = \frac{G_2 \times b}{G_L} + a = \frac{\quad}{\quad} + = \quad \text{mm/inches behind datum line}$$

The measurements to determine the empty weight, the empty weight C of G and the loading limitations must always be taken with the glider empty of water ballast and without removable ballast weights.

Convertion	from	to	multiply with
	kg	lbs	2.2
	mm	inches	0.0394

If the limits of the empty weight C of G positions and the loading limitations chart are adhered to, the C of G of the loaded glider will be within the permitted range.

STANDARD and CLUB ASTIR III

Empty Weight kg	Range of C. of G. behind Datum (mm)	
	Forward	Aft
250	702	769
255	693	763
260	685	758
265	677	753
270	670	748
275	648	743
280	626	738

It should be noted that to make use of the maximum load the minimum admissable load for non lifting parts must not be exceeded.

The weight of the non lifting parts is the sum of the fuselage, tailplane, and maximum load in the fuselage and must not exceed 250 kg (551 lbs) or the maximum load permitted in the fuselage must be correspondingly decresed. This refers to the load of the fuselage.

The Centre of Gravity should be rechecked after repair, repainting, the installation of additional equipment or when a period of 4 years has elapsed from the time of last weighing.

October 1982

The empty weight, empty weight C of G position and the maximum load should be recorded after each weighing on page 11 of the Flight Manual.

To find out the Center of Gravity of the loaded sailplane:

- C. of G. of the pilot is located 552 mm in front of the datum line
- C. of G. of the water ballast is located 276 mm behind the datum line.

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SIN 5508 CB

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

GROB G 102

CLUB ASTIR III

CLUB ASTIR III b

STANDARD ASTIR III

This manual is for U.S. registered gliders.

It refers to the serie: _____

Registration: _____ Factory Serial Number: _____

Owner: _____

_____

_____

Published October 1982

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

I. General

I.1. Log of revisions

S/N 5608 CB

Revision No.	Page affected	Description	Date	Signature LBA approval
1	1, 22	Increase of mass balance (MSB 308-36/3)	18.04.2002	25. 06. 02

All Manuals for GROB G 102 can be ordered from:

- GROB SYSTEMS, Inc.
  1070 Navajo Drive
  Bluffton, OH 45817
  FaxNo: 419-369 3328

- GROB-WERKE
  Aerospace Division
  Lettenbachstr. 9
  86874 Tussenhausen
  Germany
  FaxNo: 0049-8268-998 200

I.2 Pages included:

1	Oct. 82
1a	Oct. 82
2	Oct. 82
2a	Oct. 82
3	Oct. 82
4	Oct. 82
5	Oct. 82
5a	Oct. 82
6	Oct. 82
7	Oct. 82
8	Oct. 82
9	Oct. 82
10	Oct. 82
11	Oct. 82
12	Oct. 82
13	Oct. 82
14	Oct. 82
15	Oct. 82
16	Oct. 82
17	Oct. 82
18	Oct. 82
19	Oct. 82
20	Oct. 82
21	Oct. 82
22	Oct. 82
23	Oct. 82

LBA approved pages
24 through 28
(See pages included at page 26)

I.3. Contents

October 1982

I.4. Technical Data

Wings

Profile Eppler		E 603	E 603
Span	b	15.0 m	49.2 ft
Area	F	12,4 m²	133,5 sq.ft
Aspect Ratio		18,2	18, 2

Allerons

Span	bQR	2,96 m	9,7 ft
Chord inner	ti	0,168 m	0,56 ft
outer	ta	0,127 m	0,46 ft
Area	FQR	0,873 m²	9,69 sq.ft
% of chord		20%-25%	20%-25%

Fuselage

Length (SPEED II B)	l	6,75m	22.13 ft
Width, of cockpit	b	0.65 m	2,13t
Height of cockpit	h	0.90 m	2,95 ft
Height of tailplane	h	1.26 m	4.13 ft

Fin

Height	h	1.09 m	3.61 ft
Area	F	1, 04 m²	11, 14sq.ft
Aspect ratio		1, 14	1,14
Chord bottom	tu	1.15 m	3,77ft
top	to	0.75 m	2.46 ft

Rudder

Area	F	0,349 m^2	3.75 sq.ft
% of fin		33-35%	33-35%

Tailplane

Span	b	3.00 m	9.84 ft
Area	F	1.44 m^2	15.5 sq.ft
Aspect ratio		6.25	6,25
Chord inner	ti	0.62 m	2.03 ft
outer	ta	0.34 m	1.12 ft

Elevator

Area	F	0.40 m^2	4.31 sq.ft
% of tailplane		27.5 %	27,5%

Brakes (Grob system)

Area (both)	FBK	0,338 m^2	3,66 sp. ft
Span	b	1,2 m	3,9 ft
Height	h	0,14 m	0,46 ft

Weights

Empty	ca.	260 kg	570 lbs
Max load with water ballast		195 kg	418,9 lbs
Crew max.		110 kg	243 lbs
Baggage max.		10 kg	22 lbs
Ballast max.		90 kg	198,4 lbs
Minimum cockpit load		70 kg	154 lbs
Max. AUW without water ballast		380 kg	837,7 lbs
Max. AUW with water ballast		450 kg	992,1 lbs
Loading in percent AUW		42 %	
Wing loading		26,2-36,3 kg/m^2	5,5-7,4 lbs/sq.ft
Max weight of non lifting parts		250 kg	551 lbs

II. Description of Components

II.1. Control Linkages

The flying controls of the aircraft are based on a push rod system. The control levers and sticks are welded of steel-tubes and the push rods are of aluminium tube, riveted to the connectors.

Elevator

The control stick force is transfered from the control stick via the mounting frame to the elevator push rods. A single elevator push rod leads from the join at the master frame to the elevator horn at the bottom of the fin. A vertical push rod with quick connector drives the horn in the elevator. All the components of the elevator system in the fuselage can be dismantled. The elevator horn is laminated into the elevator. Stops for the elevator are on the stick under the seat.

Aileron controls

Lateral control movements are transfered from the control stick via a short connecting rod to the aileron control bellcrank on the right side of the fuselage. Push rods lead from there to the arm on the control spider in the middle of the fuselage via an intermediate bellcrank at the main spar to the aileron lever. The aileron horns of the spider and the push rods in the wing are moved by intermediate connectors with quick-joints. The outboard aileron control differential bell crank in the wing drives the aileron directly via a short push rod.

All components of the aileron linkage in the fuselage may be dismantled. The aileron control differential bell crank and the push rods in the wing may only be dismantled through an opening made in the fibre-glass skin. Stops for the aileron linkage are mounted.

Rudder linkage

The pedals are designed for cable control and are adjusttable without preset positions. The cables are on the inside of the pedals and are routed to the stick frame where pedalforces are transferred. The whole of the rudder control system may be dismantled. The stops for the rudder are mounted to the pushrod and via a linkage leverat the mainspar and one in the tail to the rudder.

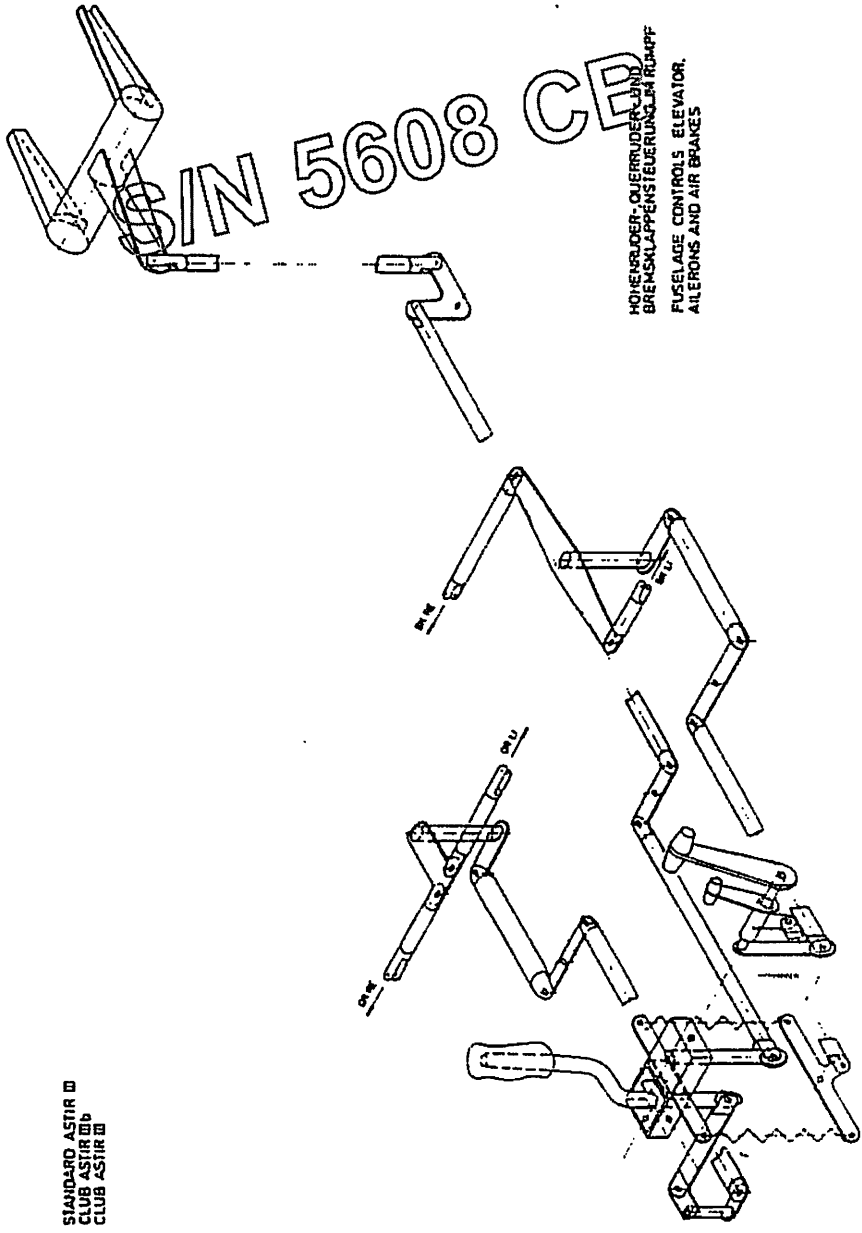
S/N 5608 CB

Airbrakes

Movements of the airbrake lever on the left of the cockpit are carried by control rods with an intermediate bell crank at the master frame to the lower horn of the control spider. The push rods in the wing are driven by the upper horns of the spider. An inverting bell crank is mounted inboard in the wing. from which push rods drive the two pivoted arms in the airbrake box which carry both brake plates. All parts of the airbrake control system in the fuselage can be removed. The inverting and transfer bell cranks and the internal push rods in the wing can only be reached by opening the skin of the wing.

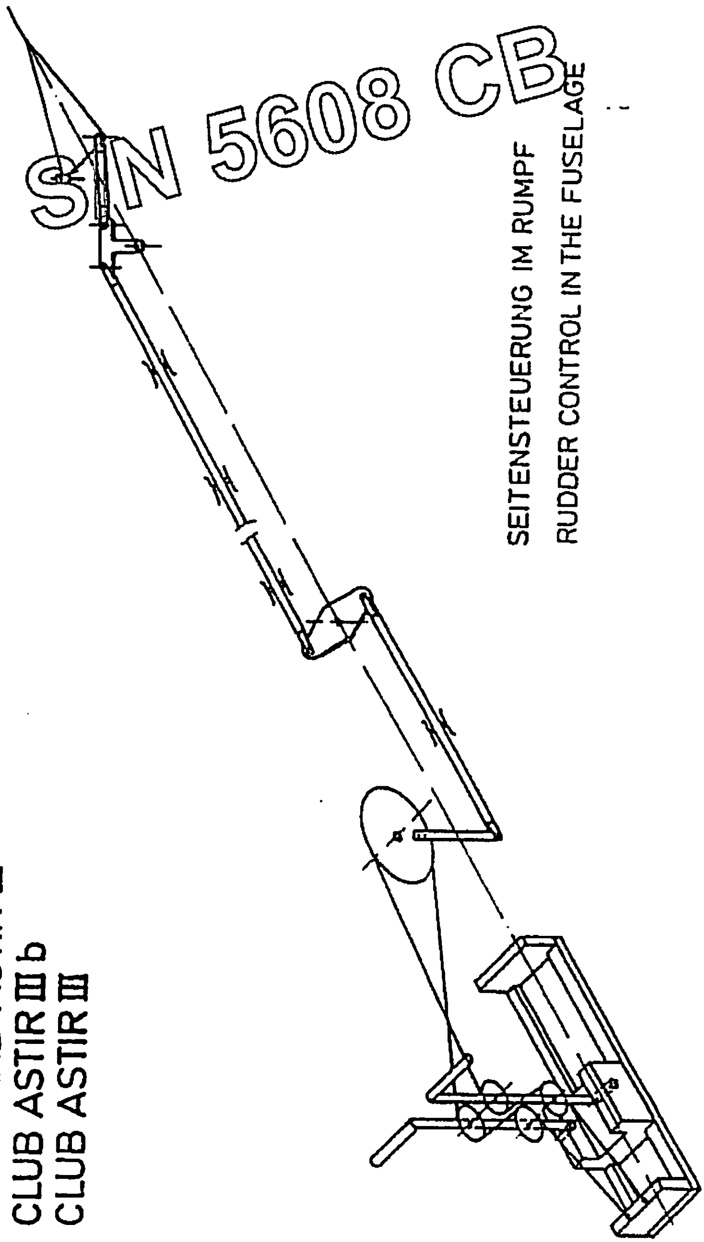
Undercarriage of Standard Astir III

Movements of the undercarriage lever on the right of the cockpit are carried by a control rod to the locking gear at the side of undercarriage box. Another control rod carries to the transfer bellcrank at the knee joint of undercarriage.



October 1982

S/N 5608 CB



STANDARD ASTIR III
CLUB ASTIR III b
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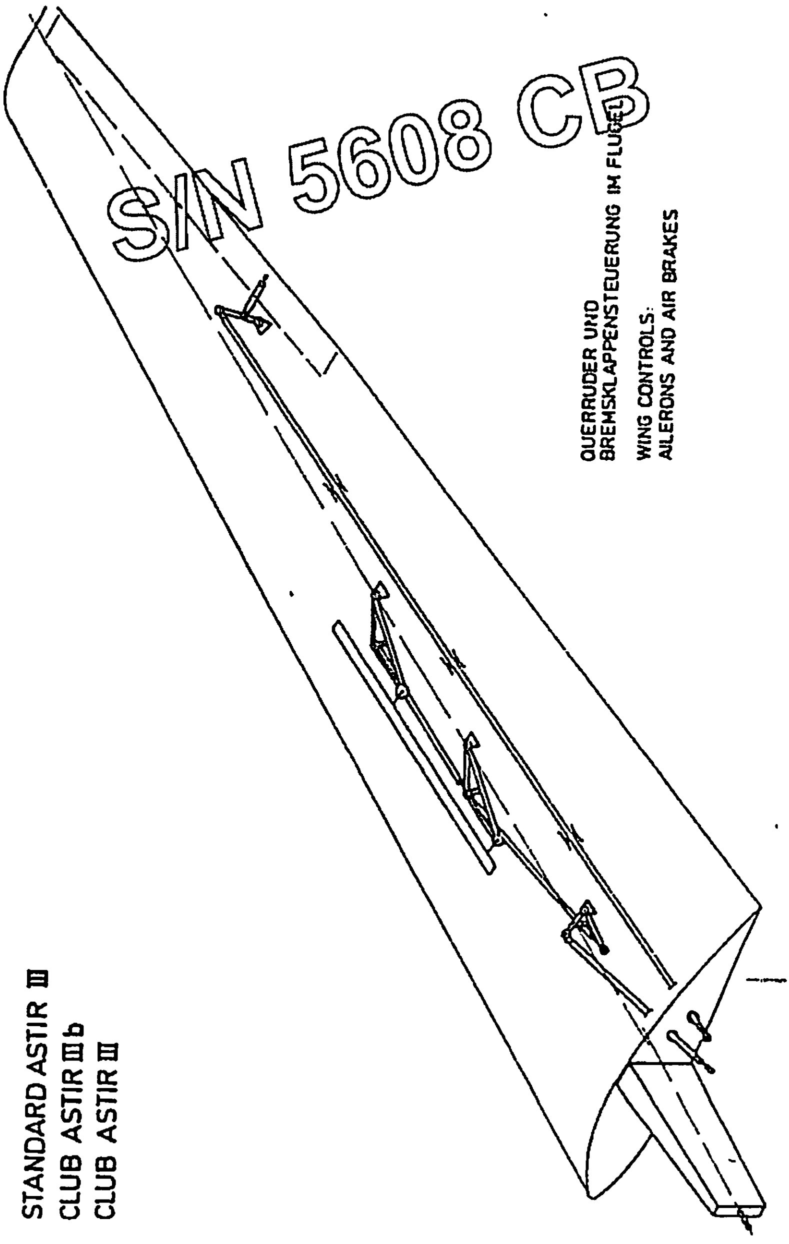


STANDARD ASTIR III
CLUB ASTIR III b
CLUB ASTIR III

October 1982

II.2. Installation of Radio

The instrument panel may be obtained in two layouts which can accomodate rectangular instruments of 60 x 80 mm. and 146 x 47 mm. The speaker should be mounted in the baggage compartment. A "Swan neck" microphone boom can be attached to the cockpit frame to the right of the pilot. Batteries can be mounted on the shelf of the baggage compartment. Drawings for installation of the radio unit can be obtained by request from the manufacturer or his agents.

II.3. Installation of Oxygen

An Oxygen cylinder may be mounted at the top of the baggage area. Drawings for installation of Oxygen equipment may be obtained from the manufacturer or his agents on request.

At every additional mounting of equipment, which influences the centre of gravity, a new weighing has to be carried out, to guarantee, that the centre of gravity is within the allowed range.

II.4. Instruments specifications for basic equipment

Airspeed Indicator

The original certification was carried out using 2 Winter 6FMS4-2 Airspeed indicators.

A similiar FAA approved airspeed indicator to meet TSO C 2 reading to 300 km/h (162 kts, 187 mph) may be used. (For example PZL PR-400 S).

Altimeter

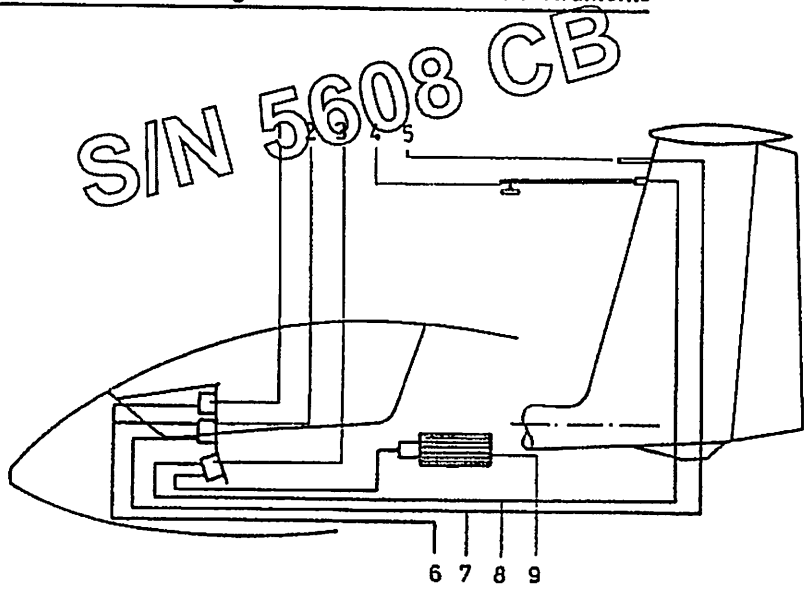
The original certification was carried out using a Winter 4FGH 10

A similiar FAA approved altimeter to meet TSO C 10 with a range to 35.000 feet may be used. (For example PZL W-12 S)

Magnetic Compass (compensated inside the glider)

The original certification was carried out using a Airpath C 2300.
A similar FAA approved magnetic compass to meet TSO C 7 may be used.
(For example PZL BS-1)

II.5 • Pressure tubing and connections to the instruments



1. Altimeter
2. Air speed indicator
3. Variometer
4. Total energy tube
5. Pitot tube
6. Static pressure (colourless)
7. Pitot pressure (green)
8. Total energy (red)
9. Flask (blue)

The position of the "Total energy tube" is at the fin or on the top of the rear fuselage.

III. Maintenance Instructions

III.1. Check lists

See flight manual for daily inspection (section IV.2) and preflight check (section IV.3) and also simple maintenance (section VI.4).

III.2. Checks in specific cases.

After a heavy landing:

Check the undercarriage mechanism under the seat, check the undercarriage mountings in the wheel box, check the spar and root rib for white patches in the glass fibre reinforced plastic (GFK).

Check the wing fittings in the fuselage and in the root rib.

Check all mounts of control surfaces.

After a ground loop:

Check the undercarriage mounting, check the rudder control rod and bellcrank behind the wheel box. Check the GFK tube at the base of the fin. Check the wing fittings in the fuselage and the connecting pins in the root rib.

Check the T-tail fittings.

III.3 Regular service

The following schedule of service should be carried out regularly, and at the minimum during the annual airworthiness inspection.

1. The entire glider should be inspected for cracks, dents and bumps.
2. All fittings should be inspected for satisfactory condition (play, scores and corrosion).
3. All metal parts should be examined for corrosion, cracks, deformation and if necessary reconditioned and freshly protected.
4. Ceck that there is no play in the wing and tailplane to fuselage fittings.
5. The controls including the brakes should be submitted to a functional test and the control deflections checked.
6. The control linkages (Bearings, stops, horns, hinges and control cables) should be inspected and replaced if there is evidence of bending or corrosion.
7. If the controls do not move freely throughout their range, search for the cause and correct.
8. The undercarriage should be inspected and the wheel and brake checked to be in good condition.
9. Tow hooks should be treated in accordance with their appropriate maintenance manual.
10. Check that the pitot for the ASI is clear and that all tubing to the instruments is in good condition and free of kinks or leaks.
11. The condition and calibration of all instruments should be checked and any other equipment inspected.
12. The wing bending mode has to be established and checked with the figure stated at the approval report (Stückprüfbericht). The glider has to be supported at mainwheel and tail. The tire pressure must be 2,5 bar (36 psi)

13. Equipment and Instruments should be checked against the equipment list.

14. After repair or change of equipment, particularly after addition of a radio or Oxygen equipment, the weight table should be updated with the new empty weight and C of G by weighing or calculation.

    After extended storage check accordingly to regular service and inspect for evidence of rodents and birdness.

III.4. Annual Inspection Checklist

- ☐ WING
- ☐ Finish
- ☐ Shell
- ☐ Cracks in shell
- ☐ Root rib
- ☐ Spar stub
- ☐ Drain holes
- ☐ Fittings at root rib
- ☐ Aileron bearings
- ☐ Aileron drive
- ☐ Divebrake drive
- ☐ Water ballast reservoir

- ☐ TAILPLANE
- ☐ Finish
- ☐ Shell
- ☐ Crakes in shell
- ☐ Drain holes
- ☐ Bushes for mounting
- ☐ Elevator bearings
- ☐
- ☐
- ☐

- [ ] FUSELAGE
- [ ] Finish
- [ ] Shell
- [ ] Cracks in shell
- [ ] Drain holes
- [ ] Rudder bearings
- [ ] Bushes for wing root pins
- [ ] Stabilizer mounting
- [ ] Cockpit
- [ ] Seat
- [ ] Frames
- [ ] Canopy
- [ ] Canopy mechanism.
- [ ] Canopy emergency release
- [ ] Canopy window
- [ ]
- [ ] Control stick
- [ ] Elevator drive
- [ ] Divebrake drive
- [ ] Aileron drive
- [ ] Aileron connectors
- [ ] Divebrake connectors
- [ ] Trim control
- [ ]
- [ ] Pedals
- [ ] Pedal adjustment
- [ ] Steering cables
- [ ] Earth connections
- [ ] Water ballast system
- [ ] Cockpit ventilation
- [ ] Backrest adjustment
- [ ] Headrest adjustment

- [ ] Control surfaces (Aileron, Elevator, Rudder)
- [ ] Finish
- [ ] Shell
- [ ] Rudder ventilation
- [ ] Rudder drive
- [ ] Bearings
- [ ] Connecting means
- [ ]
- [ ] LANDING GEAR (Mainwheel, Tailwheel, Nosewheel
- [ ] Undercarriage and axle
- [ ] Tyre
- [ ] Preset load at folding strut
- [ ]
- [ ] Bearings and joints
- [ ] Drive rod
- [ ] Connecting means
- [ ] Locking
- [ ] Overcenter
- [ ] Wheel brake system
- [ ]
- [ ] EQUIPMENT
- [ ] Minimum Instrumentation
- [ ] Additional Instrumentation
- [ ] Operating range
- [ ] Limit marks
- [ ] Oxygen bottles
- [ ] Working of Instrumentation
- [ ] Tubing
- [ ] Total energy unit
- [ ] Pitot system leakfree
- [ ] Static system leakfree
- [ ] T.E. system leakfree
- [ ] Electrical cables
- [ ] Battery and fitting
- [ ] Radio
- [ ] Antenna
- [ ] Compass deviation list

- [ ] Seat belt harness
- [ ] C. G. release
- [ ] Nose release
- [ ] Weight and balance plan
- [ ] Data placard
- [ ] Cockpit placard
- [ ] Placard with serial number
- [ ] Cockpit pocket
- [ ] Baggage compartment cover

- [ ] ADJUSTMENT
- [ ] Wings and horizontal tail
- [ ] Play at root ribs
- [ ] Zero setting of control surfaces
- [ ] Control surfaces deflections
- [ ] Dive brake deflection
- [ ] Wheel brake
- [ ] Trim control
- [ ] Nose release function
- [ ] C. G. release function
- [ ] Automatic C. G. release
- [ ] Aileron differentiation

III.5. Maintenance for undercarriage with disc brake (no valid STANDARD ASTIR III)

The brake cylinder with the storage tank for brake fluid is mounted on the left side of the undercarriage frame below the baggage room. The marks for minimum and maximum reserve must be observed.
For refilling use brake fluid DOT 3 (amber).

1. Changing the brake shoes.

   a) Remove the wheel housing.
   b) Loosen the 2 M8 screws in order to remove the brakes. The brake hose must not be taken off at the same time, otherwise it will be necessary to bleed the system.
   c) Remove the two split pins from outside and change the brake linings. The old brake linings can be used again after cleaning with steel brushes, if their dust grooves are still clearly visible.
   d) Re-install in reverse order.

2. Bleeding the brake system.

   a) Attach a clear plastic tube to the bleed screw, with the other end dipped in a container of brake fluid.
   b) While using the brake lever to force the fluid through the system via the brake cylinder, loosen the bleed screw.
   c) The bleeding process is completed when no more air bubbles are visible in the plastic tube.

Note
The brake fluid DOT 3 (amber) is available everywhere at garages. It is standardized within Europe

III.6. Maintenance for brake of drum type (STANDARD ASTIR III)

If required the point at which the brake begins to drag can be adjusted. The adjustment is carried out by moving the Bowden cable at the drum end.
When the main wheel is being taken off for the purpose of cleaning, greasing or changing the tire, the Bowden cable should be disconnected from the brake-lever. Remove the screw cover on one side of the axle and take out the screws and the spindle. Remove the screws that hold the brake-lever in place. Take the wheel out by pulling it downwards. Clean all the parts and before reassembly smear all of them with grease.

III.7. Lubrication

Ball bearings

All ball bearings installed are sealed with a permanent grease filling. Greasing of bearings is therefore unnecessary.

Sliding bearings

All the sliding bearings in the control runs need no maintenance or lubrication, except for those in the wing root and fin which should be washed off with petrol when dirty and relubricated.

Lubrication areas

The pins and bushes on the wing fittings should be regreased when necessary during rigging. The pins on the tailplane fittings and the screw thread should be lubricated periodically. The hinge and catches of the canopy should be oiled occassionally. Dirty release hooks are best cleaned using a brush and compressed air whilst operating the mechanism. The belly hook is accessible from inside and can be lubricated with spray oil or similar.

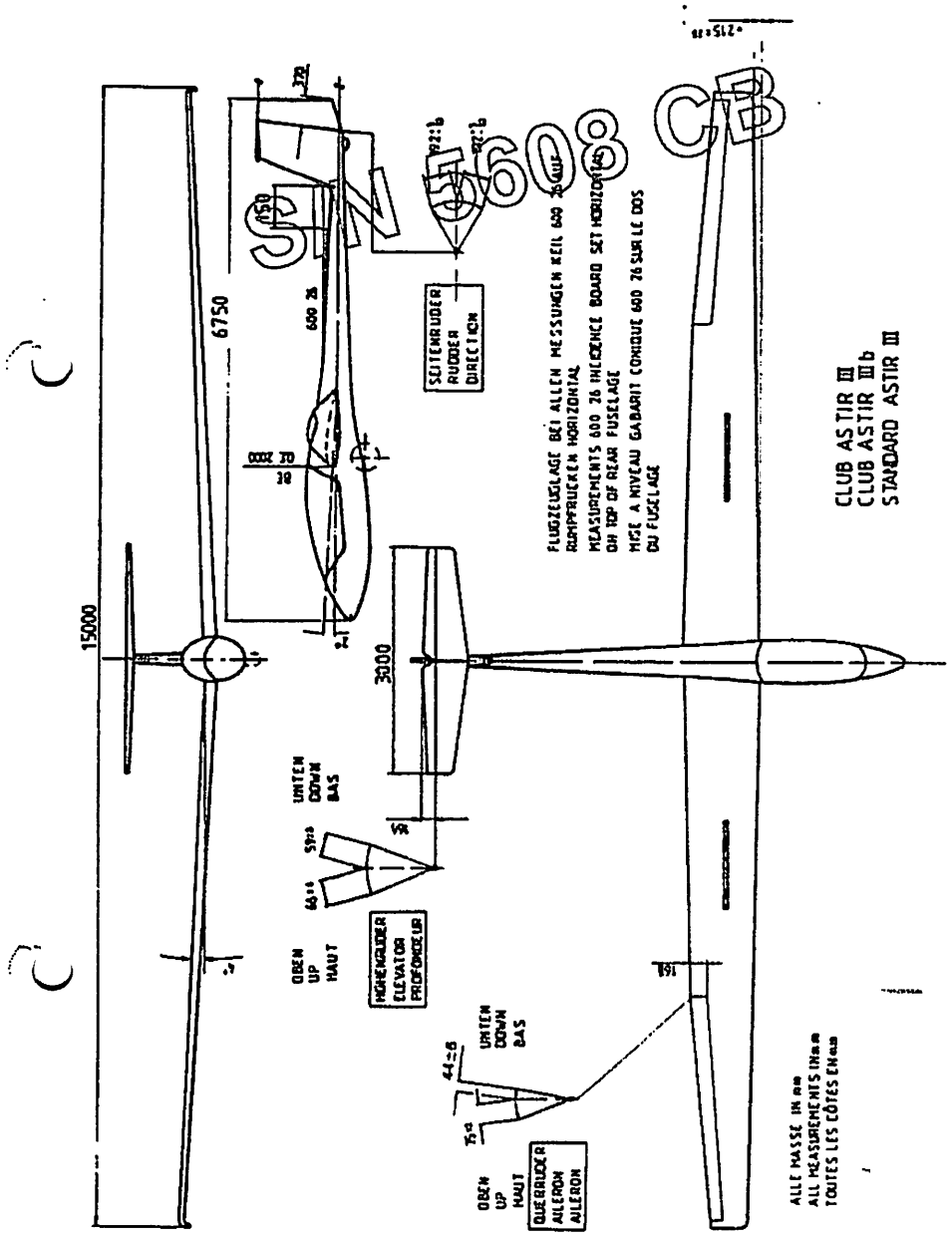
III.8. Rigging data

Adjustment	Reference line	Value	Tolerance
Wing – incidence angle	Angle between the centre line of the wing and the longitudinal axis of the fuselage	2°	+ 15' — 15'
Wing – sweep back	Distance of the line joining the wing tips from the reference line	215 mm (8,49 in)	20mm +- (0,79in)
Wing – dihedral	Angle between the top surface of the wing and horizontal	4 deg	+ 30' — 30'
Tailplane – incidence angle	Angle between the chord of the tailplane and the longitudinal axis of the fuselage	0 deg	+ 15' — 15'
Reference line	Front of the wing at root rib	QE 2000 (78,7in)	

Control deflections	Upwards (Right) Value	Upwards (Right) tolerance	Downwards (Left) Value	Downwards (Left) tolerance	Measurement point from centre of rotation
Aileron (both)	75	+ 8 - 8	44	+ 6 - 6	168 mm (6,6 in)
Elevator	66	+6 —6	59	+6 —6	166 mm (6.54 in)
Rudder	192	+5 —10	170	+5 —10	370 mm (14,6 in)

Convertion	from	to	multiply with
	mm	inches	0,0394

October 1982


SZ 15608 CB
CLUB ASTIR III
CLUB ASTIR IIIb
STANDARD ASTIR III
6750
15000
3000
SEITENRUDER
RUDDER
DIRECTION
HÖHENRUDER
ELEVATOR
PROFONDEUR
QUERRUDER
AILERON
AILERON
OBEN
UP
HAUT
UNTEN
DOWN
BAS
FLUGZEUGLAGE BEI ALLEN MESSUNGEN KEIL 600 26 QUER
RUMPFRÜCKEN HORIZONTAL
MEASUREMENTS 600 26 INCIDENCE BOARD SET HORIZONTAL
ON TOP OF REAR FUSELAGE
MISE A NIVEAU GABARIT CONIQUE 600 26 SUR LE DOS
DU FUSELAGE
ALLE MASSE IN mm
ALL MEASUREMENTS IN mm
TOUTES LES CÔTES EN mm

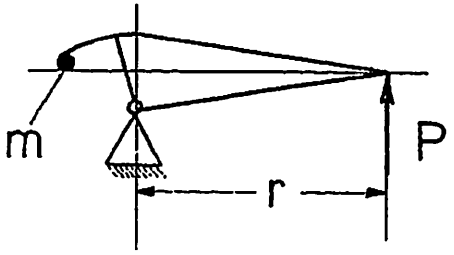
III.9. Weights and moments of the control surfaces:

Control surface moments

After repainting or repairs the moments and weights of the control surfaces must not exceed the following values:

	Weight	Moment
Elevator	2,80 kg - 3,60 kg	85 Ncm - 108 Ncm
	2,50 kg – 2,80 kg	75 Ncm – 90 Ncm
Rudder	5,6 kg + 8 % - 10 %	8,0 kgcm + 4 % - 15 %
Aileron	5,00 kg - 6,60 kg	- 45 Ncm - -15 Ncm

The control surface must be removed to measure the moments. To determine the moment M = P x r the surface should be mounted at the hinge line with the minimum friction possible. The force P can be measured, for example using a letter scale. If these values are exceeded the mass balance should be increased. Before carrying out repairs which for example involve changing the mass balance on a surface or his repair agent should be consulted.



III.10.General care

Dampness

As far as possible the glider should be protected from damp. All the metal parts of the glider, with the exception of the wing and tailplane fittings are protected against damp. However, this will not prevent corrosion during extended exposure to moisture. Following any flights in rain any water which has entered the glider should be dried up and the exterior surfaces dried with a chamois leather. Polished metal parts should be regreased. Beware of condensation.

Sunlight

All structural parts of GFK gliders should have white surface to avoid heating up in sunlight.

Protection of the finish

The Gelcoat surface layer is very resistant and can therefore be cleaned using a mild detergent. Ingrained dirt, such as dead flies and grease, is best removed with a SILICONE FREE polish such as 1 Z Spezial-Reiniger – D 2, Fa. W. Sauer and Co., 5060 Bensberg, or "Reinigungspolish", Fa. Lesonal, Stuttgart. Sticky tape used for sealing the wing and tailplane joints may be removed using petrolium thinners (Beware thinners may remove the markings).

Cleaning the canopy

The canopy should only be cleaned using a soft clean cloth and a mild soap solution. It should be rinsed with clean water and dried with a clean chamois leather. "Plexipol" is a suitable polish. Never rub perspex with anything dry.

IV. Airworthiness Limitations

This Airworthiness Limitations section is FAA approved for U.S. registered gliders in accordance with the provisions of 14 CFR section 21.29. In addition, this section is required by FAA Type Certificate Data Sheet No. G 33 EU and it specifies maintenance required under 14 CFR sections 43.16 and 91.163 unless an alternative program has been FAA approved.

SN 5608 CB

LBA approved on:.....

December 6, 1982

Approved by LBA

LUFTFAHRT-BUNDESAMT BRAUNSCHWEIG

IV.1. Log of revisions for the Airworthiness Limitation Section

Revisions No.	Pages affected	Description	LBA approval signature	Date

December 6, 1982 Approved by LBA

LUFTFAHRT-BUNDESAMT BRAUNSCHWEIG

IV.2. Pages included of Airworthiness Limitations Section

24	Dec. 6, 82
25	Dec. 6, 82
26	Dec. 6, 82
27	Dec. 6, 82
28	Dec. 6, 82

December 6, 1982 Approved by LBA

Note:

Repair damaged wings, fuselage and tail surfaces prior to next flight. Repairs outside the scope of LBA-approved Grob G102 ~~G 109~~ repair instructions, dated ~~5 april 1982~~ October 1982, and major repairs must be accomplished at FAA certificated repair stations rated for composite aircraft structure work in accordance with Burkhart Grob repair methods approved by FAA.

SIN 5000 CB

IV.3. Inspection procedures to extend lifetime

The approved life limits of the GRP airframe is 3000 flight hours. The life limits may be increased by the FAA, Aircraft Certification Office, Brussels, Belgium, upon receipt of the necessary substaining data.

December 6, 1982

Approved by LBA

LUFTFAHRT-BUNDESAMT
BRAUNSCHWEIG

IV.4. Components with a limited life time

a) Tow hooks

The E 75 and the G 73 Tost hooks are limited to 36 months after installation or 2000 launches which ever occurs first, at which time they are to be recertified by the manufacturer.

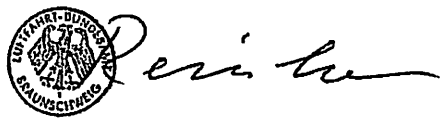
One is bound by the Maintenance Manuals for the nose hooks "E 72" and "E 75" published in May 1975 and the Maintenance Manual for the belly hooks "Europa G 72" and "Europa G 73" published in May 1975.

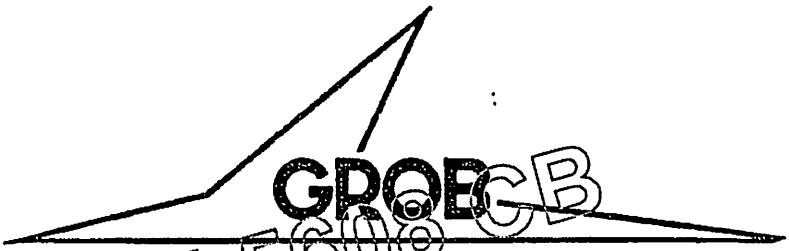
b) Oxygen Equipment

Overhaul times for specific Oxygen equipment is given in their test certificates.

Oxygen bottles must also be checked by the technical service every 5 years or according to the local lanes on use of pressurized gases.

December 6, 1982 Approved by LBA





REPAIR INSTRUCTIONS

GROB G 102
CLUB ASTIR III
CLUB ASTIR III b
STANDARD ASTIR III

This Repair Instructions is for
U.S. registered gliders.

GROB-Werke GMBH & CO. KG
Unternehmensbereich
Burkhart Grob Flugzeugbau
8939 Mattsies
Flugplatz Mindelheim-Mattsies

Telefon 08268/411
Telex 539 623

Published October 1982

INDEX

1. Foreword

The Gliders are constructed from Glass-Fibre reinforced Plastic (GFK). The fuselage consist of GFK laminate, and is localy reinforced by carbon fibre ribbons at wings and tailplane the laminate is f oam supported. The rudder consists of GFK-Styropur-Sandwich.

October 1982

2. Authorized materials and suppliers

Resin:	BASF Glycidäther 162 O 100 parts	or	Rütapox L 20 100 parts
Hardener:	BASF Laromin C 260 38 parts		Rütapox VE 2896 18 parts

SIN 5608 CB

Ratio by weight parts

Glass Fibre Cloth

Supplier: Interglas Textil GmbH. Söflinger Str. 246, 7900 Ulm

Use	Cloth	Weight g/qm	Interglas-Nr.
Fuselage	Double Twill	161	92 110
	Double Twill	390	92 140
	Chain Reinforced	433	92 146
	~~Cross Twill~~	~~106~~	~~91111~~
Wings	Double Twill	161	92 110
	Double Twill	276	92 125
	~~Cross Twill~~	~~106~~	~~91111~~
Elevator, Rudder and Ailerons	Double Twill	276	92 125
	Double Twill	161	92 110

All Glass-Fibre cloth is Alcholine free E-Glass with volan A-Finish or Finish I.550.

Glass Fibre Rovings

EC 10 -2400 K 43
or
EC 9-756 K 43

Supplier:

Gevetex
4000 Düsseldorf
Postfach 1205

Foam Material

PVC-Hartschaum
Conticell 60
6 and 8 mm large
Spec. Weight 60 kg/m³

Continental AG
3000 Hannover

October 1982

S/N 5608 GB

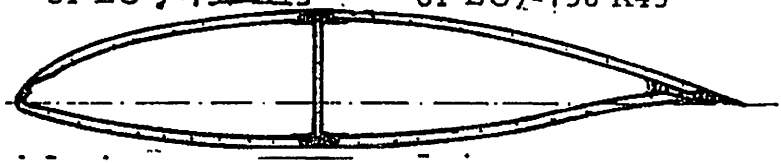
Styropor:	
Thermopete 4 mm large Spec. Weight 15 kg/m³	Poron-Werke GmbH 6122 Erbach Brunnenstraße 5
Depron 3 mm large Spec. Weight 15 kg/m³	Firma Kalle 6202 Wiesbaden/Bibrich
Filling Material for Resin	
Microballoons brown	Lackfabrik Bäder KG 7300 Eßlingen Schließfach 25
Cotton Flock Type FL 1 f	Schwarzwälder Textil-Werke 7623 Schenkenzell Postfach 12
Paint	
PE-Schwabbellack White. No. 03-69066 UP-Hardener No. 07-20510 100 Schwabbellack Paint (Gel-Coat) 3 Hardener mix ratio by Weight. Thinner No. 06-30260	Lesonal-Werke 7000 Stuttgart 30 Postfach 30 07 09
Red Paint	
Nitro-Cellulose-Kombilack Orange RAL 2004	Lackfabrik Bäder KG 7300 Eßlingen Schließfach 25
Carbon Fibre Cloth:	
Sigratex KDU/NF 46-7,5 (6000 Filamente)	Fa. Sigri Elektrographit GmbH. D-8901 Meitingen

October 1982

3. Simplified "Texture" plan

Reinforced regions for special loads and stress conducting are not shown.

1. Flügel	Wing
Außenlaminat	Outer laminate
1 Lage 91111 längs	1 Layer 91111 lengths
1 Lage 92 125 diagonal	1 Layer 92 125 diagonal
Kern	Core
Conticell 60, 8 mm	Conticell 60, 8 mm
Innenlaminat	Inner laminate
1 Lage 92 125 diagonal	1 Layer 92 125 diagonal
Membrane des	Membrane of
ELASTIC Flap	Elastic Flap
2 Lagen 92 110 diagonal	2 Layer 92 110 diagonal
1 Lage 92 110 längs	1 Layer 92 110 lengths
Holmgurt	Spar
Glasseidenroving	Glas fibre
EC 10 -2400k43	EC 10 -2400k43
or EC 9-756 K43	or EC9-756 K43



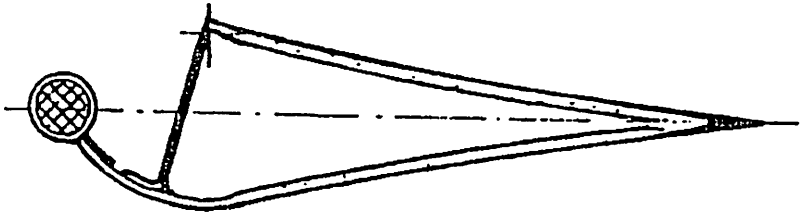
2. Rumpf	Fuselage
von außen nach innen	From outside to inside
1 Lage 92 110 längs	1 Layer 92 110 lengths
1 Lage 92 146 längs	1 Layer 92 146 lengths
3 Lagen 92 140 diagonal	3 Layers 92 140 diagonal

3. Ruder

Seitenruder rechts und links
2 Lagen 92 110 diagonal
Kern: Depron 4 mm
1 Lage 92 110 diagonal

Controls

Rudder left and right
2 Layers 92 110 diagonal
Core: Depron 4 mm
1 Layer 92 110 diagonal



Höhenruder oben und unten
1 Lage 91 111 längs
2 Lagen 92 110 diagonal
Kern Depron 4 mm
Querruder oben wie Flügel
Querruder unten
1 Lage 91 111 längs
1 Lage 92 110 diagonal
Kern: Depron 4 mm

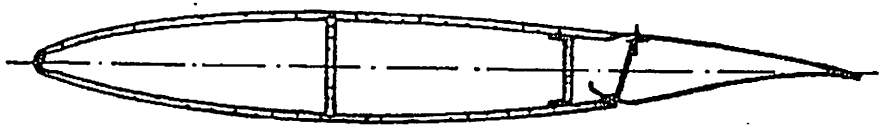
Elevator a bove and below
1 Layer 91 111 length
1 Layer 92 110 diagonal
Core Depron 4 mm
Aileron above like wing
Aileron below
1 Layer 91 111 length
1 Layer 92 110 diagonal
Core: Depron 4 mm

4. Höhenflosse

1 Lage 91 111 längs
1 Lage 92 110 diagonal
Kern: Conticell 60/6 mm
1 Lage 92 110 diagonal

Fin

1 Layer 91 111 length
1 Layer 92 110 diagonal
Core: Conticell 60/6 mm
1 Layer 92 110 diagonal



4. Repair of GFK material

If the glider is damaged, first examine the outer surface very carefully, frequently other structural parts are involved, fractures can run unseen under the outer surface.

Carry out repairs with extreme care. As the outer surface of GFK gliders is stressed (loading bearing), failure of this skin can lead to structural failure.

Keep to the Resin-Hardening mixing ratio exactly (± 0.5%) using a clean mixing pot. The ratio of Glass fibre – to Resin mix is approximately 1 to 1. Grind or splice the repair, before laying damp laminate on it, so that dirt cannot penetrate and stop safe adhesion.

As in plywood, the direction of the fibre glass cloth lay (length or diagonal) is of extreme importance to its strength. It is necessary to know approximately how many fibre and their direction in the damaged part with reference to the simplified texture plan, so it may be restored to the correct wall strength. If a small piece of the damaged laminate is broken off and burnt, the remaining glass-fibres can be counted and identified.

Splicing and grinding are time consuming, to save trouble, grind only as much away as necessary, only to the size of the cloth patch. When it is necessary to shorten the repair time it may be done with a hot air blower to speed the resin hardening time.

Warning. A too high temperature will produce large air bubbles in the cloth. A tent can be built out of foil, through which hot air can be guided, and thereby avoiding local overheating. In making repairs to control surfaces, be careful not to increase their weight as there is danger of creating flutter conditions.

5. Damage to section GFK Foam-Sandwich
(GFK Hard-Foam-Sandwich)

It can appear that only the outer surface (the outside laminate) is damaged but it can also happen that the whole skin (outside and inside hard foam laminate) is destroyed.

a) Important (Figure 1, Page 9)

With a split or fracture, the laminate can become detached from the supporting foam. Start by removing loose laminate until firm laminate is reached. To remove the foam laminate use a grinding disk, grinding block or sharp knife. With a grinding block or sharp knife only remove the cloth around the damage. Splice ratio per cloth covering approximately 20 mm. Ratio laminate thicknes to splice: approximately 1:50.

After grinding out the splice, the repair must be thoroughly cleaned. Remove the dirt (also out of the foam pores) with compressed air. Wash the splice with carbon tetrachloride or Acetone, in case it has been contaminated with dirt or grease.

Fill up the pores of the foam with Resin and Microballoons until it is smooth. Then join the laminates with the correct cloth, laying it in the right direction.

Repairs must be dirt and grease free.

At room temperature the resin will harden in about 8 hours.

The repair can now be ground smooth and be painted.

Warning: Grind only to the edge of the repair.

b) Damage to the whole of the Sandwich (Figure 2, Page 9)

When the inner laminate is destroyed, so there is no binding with the foam, widen the hole so far as foam material is secure, then it is possible to repair the inner laminate. A edge of at least 20 mm must be obtained (retaining laminates thickness : splice ratio approximately 1:50).

The inner laminate must be carefully ground and cleaned.

The outer laminate is repaired as described in section a).

With „minor" damage a piece of thin plywood support can be glued with Pattex from within on the inner skin, the cloth patch of the inner laminate can then be layed in and the hole filled with resin and Microballons mixed with Styroporballs. When hardend (app. 8 hours room temperature) the outer surface can be ground smooth and the outer cloth put on.

The plywood support should remain as part of the repair. When the hole is of large or of long size the plywood support should be held in place with thin nails which can be removed later, by pushing them out from the top surface.

Warning: The plywood support must be well jointed to avoid wrinkles in the cloth. (Figure 3)

With large holes in the sandwich, the weight of the Microballoons filler must be considered. A piece of Conicell hard foam is made before-hand, which exactly fits into the existing hole. The inside pores are closed with resin and Microballoons and laid on the inner cloth to harden, until the foam is just bendable (hot air). Then the foam with thickened resin (cotton flock-Microballoons) can be glued in the hole. Microballoons are used to close the outside pores, the repair is then ground and the outside cloth is then laid on.

6. Damage to section of GFK Styropor-Sandwich (Figure 3, Page 9)

Repair of Styropor damage of section.

The Styropor has a closed upper surface, the cloth is held with pure or lightly thickened resin. Splits in the upper surface pores can be filled. With large damage put a patch inside and allow to harden first before working further. This will stop the structure wrinkling.

Warning: Do not use strong heat to speed up hardening time, or Styropor will develop blisters and the repair must be done again.

7. Damage to section of GFK laminate (Figure 4, Page 9)

Repairs to GFK laminate are simple. Splice the laminate around the hole, lay the cloth in layers on (largest patch first) and after 2–3 hours, when the resin has partially hardened smooth over with resin and Microballoons. Splice length pro cloth layer app. 20 mm. Retaining laminate thickness : Splice ratio 1:50. In case the splice is dirty it can be cleaned with Carbon Tetrochloride or Acetone.

With large damage an under laying support (plywood) should be used. Wet laminate should not bridge a gap of more than 20 mm unsupported. The plywood support can be held in place with Pattex glue and nails (e. g. metal fitting in fuselage) which can be removed afterwards.

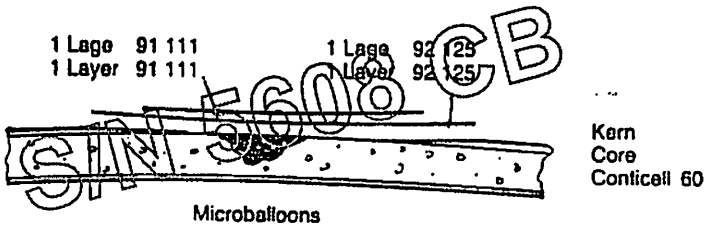


Abb. 1
Fig. 1

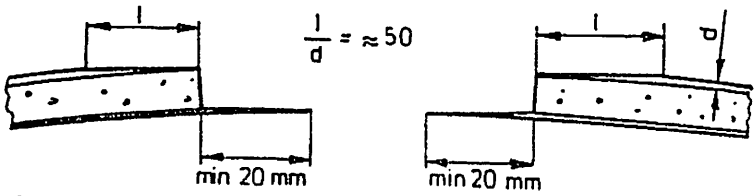


Abb. 2
Fig. 2

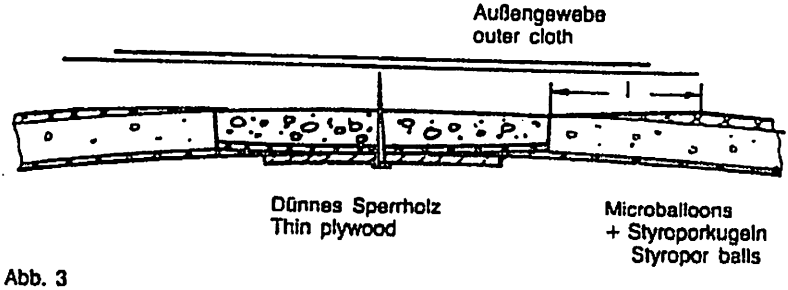


Abb. 3
Fig. 3

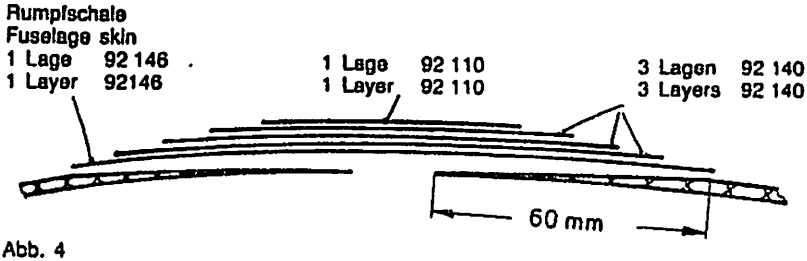


Abb. 4
Fig. 4

8. Damage to parts with Carbon Fibre reinforcement

The fuselage is reinfirced with Carbon fibre tape. Repairs are carried out as described in sections 7. Here too the depth to length ratio of the scarf must be 1 : 50.

9. Damage to Spar Caps

The spar caps are made of Glas rovings. In the outer wing (starting at 6 m spread area) they are made of Glas fibre tapes. Whenever a spar cap is broken it necessitates a major repair (See under section 12). Before repairs consult the manufacturer.

10. Paint-work

As soon as the laminate of the repaired section is hard, it can be rough ground with (80 grit) sandpaper. Large uneveness must be filled and smoothed with white polyester filler. Then with fine dry-grinding paper (150 grit) until a moderately smooth outer surface is produced. Before painting, the repaired section must be perfectly cleaned from grinding dust, separated mediums and other foreign bodies.

For successful painting, with Gel-Coat (Schwabbellack + hardener) a not too large brush should be used, putting on several thin coats, until the laminate can no longer be seen.

The first coat should be allowed to harden and then ground with (360 grit wet paper) additional coats should then be added and likewise ground.

The final finish should be carried out with 600 grit or 800 grit Wet and Dry grinding paper and then polished with a silicon-free car polish or with hard-wax, using a polishing machine.

11. Repair of Metal Fittings

a) Damage to Steel Fittings

Repair of damage to fittings made of steel should only be accomplished after approved procedures are obtained from the manufacturer.

Welded steel fitting (push rods) out of 1.7734.4 or 1.0308.1 (St. 35.4). Welding only to be carried out with WIG Welding method (Wolfram-Inert-Gasschmelzschweißung) and with welding material 1.7734.2 (for 1.7734.4) and 1.7324.0 (for 1.0308.0 or combination of 1.7734.4 and 1.0308.1)

b) Damage to Aluminium Castings

Repair of Aluminium castings 3.2374.6 (GALSi7 Mgwa) cannot be carried out. Fractured or bent Aluminium castings must be replaced by new ones.

Warning: Bent or chipped Aluminium castings are not under any circumstances to be straightened.

c) Main Wing and Fuselage fittings

The main fitting between wing and fuselage (4x in the fuselage) 6 steel balls (ø 6 mm) are contained in each fitting. The balls are forced by a sliding cover through the lock shell into a groove in the moveable lateral axis force bolts in the spar caps thus securing the wings.

Faults of one or more balls, the connecting fitting should be changed.

d) Control rods

The Control Rods are made from:

Aluminium tube 20x1 Type 3. 3214. 5 or ALMg Si 0, 5F20

Steeltube 16x1 Type 1. 7734. 4

Aluminium control rods that have been buckled, kinked or badly bent must not be straightened.

12. Major repairs

Major repairs are only to be carried out by the manufacturer or by an agent (who has the authorization of the manufacturer.).
Major repairs are:

- — **Broken** off wing, fuselage, tailplane, control surface, spar stumps (spar caps)
- — **Ripped or torn-out** - Main fittings (in fuselage ø 45 x 3, Fitting of the tailplane in fin. In the wing, aileron securing both ø 18 mm, joining bearing GE 20. Spar cap bolts ø 20 mm).
- — Destruction of main rib (vertical frame)
- — Damage to the GFK laminate (tear, splits, cracks immediately near the main fittings).

13. Construction details of extra equipment attachment fittings

The fittings for the oxygen bottles are built in as standard on the right side of the luggage compartment. Bearing stands and quick action lock can be obtained from the manufacturer.

Other fitting points can be installed by the owner. (Figure 5)

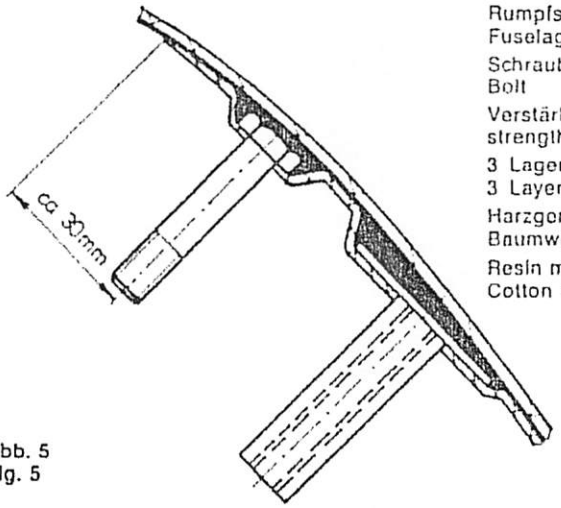


Abb. 5
Fig. 5

The fitting must be made as shown in the drawing so as to take the weight of the additional equipment. Fittings made in this manner must stand a load 10 g without failure.

When additional equipment is fitted the glider must be re-weighed to check if the C of G is within the permitted limits.

Blueprints for the installation of radio and oxygen equipment are obtainable from the manufacturer.