



**GROB**

GROB-WERKE GMBH & CO. KG

Unternehmensbereich

Burkhart Grob Flugzeugbau

8939 Mattsies

Am Flugplatz

Telefon 08268/411

Telex 539 623'

## FLIGHT MANUAL

# GROB G 103 »TWIN II«

This manual must be carried on board of the sail-plane at all times.

This 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 39 EU.

Registration: N4426F.. Factory Serial No.: 3821

Owner: B. Grob of America, Inc.

1070 Navajo Drive, Bluffton Airport Complex

Bluffton, OH 45817 / USA

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Date 17th march 1982

Approval of translation has been done by best knowledge and judgement - in any case the original text in German language is authoritative. 12.02.83





List of effective pages

Page	Date
1	16.10.2003
1a	16.10.2003
2	Sept. 81
3	Sept. 81
4	Sept. 81
5	Sept. 81
5a (*)	16.10.2003
6	17 <sup>th</sup> March 82
7	17 <sup>th</sup> March 82
8	16 <sup>th</sup> June 82
9	Sept. 81
10	16 <sup>th</sup> June 82
11	17 <sup>th</sup> March 82
12	16 <sup>th</sup> June 82
12a	26 <sup>th</sup> Sept. 84
13	17 <sup>th</sup> March 82
14	16 <sup>th</sup> June 82
15	17 <sup>th</sup> March 82
16	17 <sup>th</sup> March 82
17	16 <sup>th</sup> June 82
18	17 <sup>th</sup> March 82
19	16 <sup>th</sup> June 82
20	17 <sup>th</sup> March 82
21	26 <sup>th</sup> Sept. 84
22	Sept. 81
23	17 <sup>th</sup> March 82
24	17 <sup>th</sup> March 82
25	17 <sup>th</sup> March 82
26	17 <sup>th</sup> March 82
27	17 <sup>th</sup> March 82
28	17 <sup>th</sup> March 82
29	17 <sup>th</sup> March 82
30	17 <sup>th</sup> March 82
31	17 <sup>th</sup> March 82

(\*) only for GROB G 103A TWIN II ACRO

## I. 2 Contents

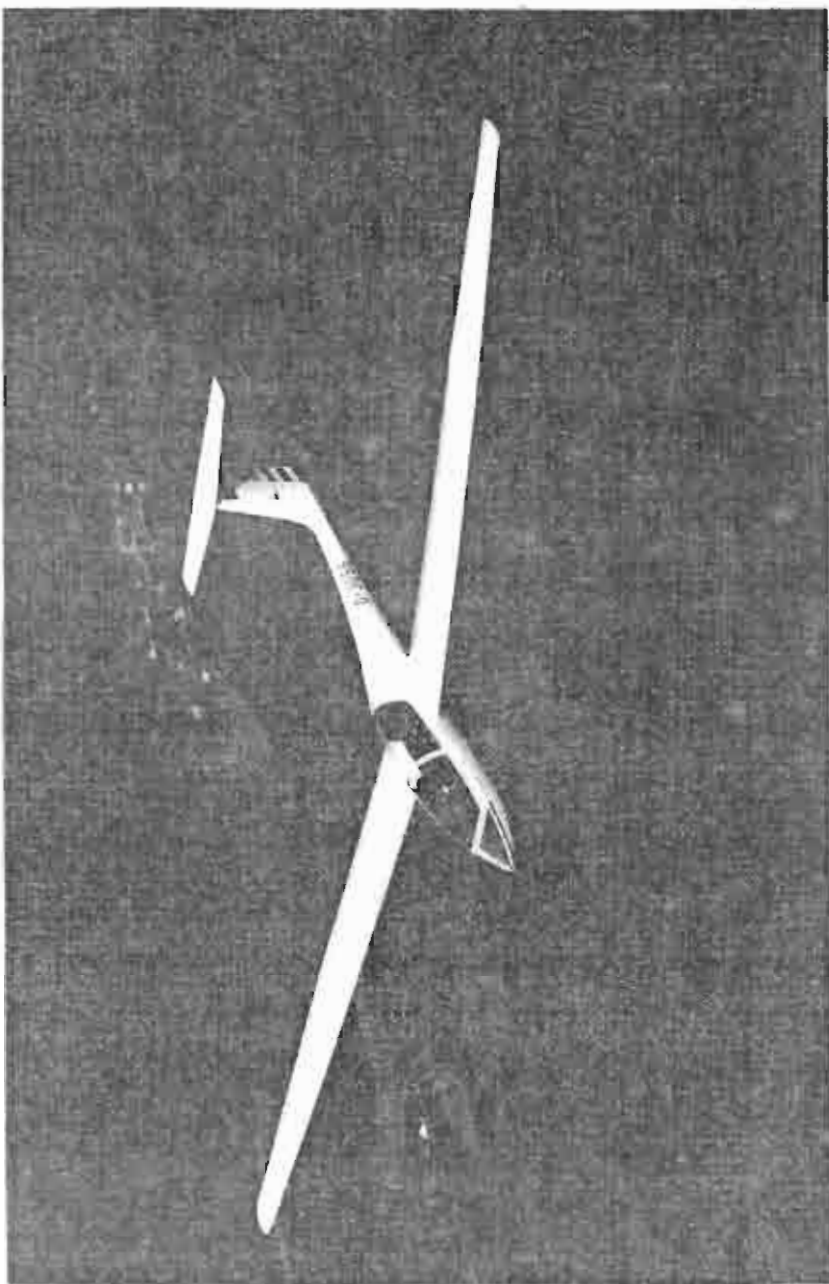
	page
I. General	
I. 1 Log of revisions	1, 1a
I. 2 Contents (LBA approved pages: 1, 1a and 6 through 31, except 9 and 22)	2, 3
I. 3 Photograph	4
I. 4 Drawing	5
I. 5 Description	6
II. Operating limitations	
II. 1 Airworthiness Group	6
II. 2 Permitted operating conditions	6
II. 3 Minimum equipment	6
II. 4 Maximum Speeds	7
II. 5 Flight envelope	7
II. 6 Weight limits	8
II. 7 Centre of gravity position	8
II. 8 Load scheme, weighing report	8, 9
II. 9 Tow hooks and cable length	10
II. 10 Weak link strength	10
II. 11 Tire pressure	10
II. 12 Crosswinds	10
II. 13 Placards, control markings and instrument markings	11, 12, 12a, 13, 14, 15
III. Emergency procedures	
III. 1 Recovery from the spin	16
III. 2 Emergency canopy jettison and exit	16
III. 3 Miscellaneous (Rain, ice, groundloops)	16

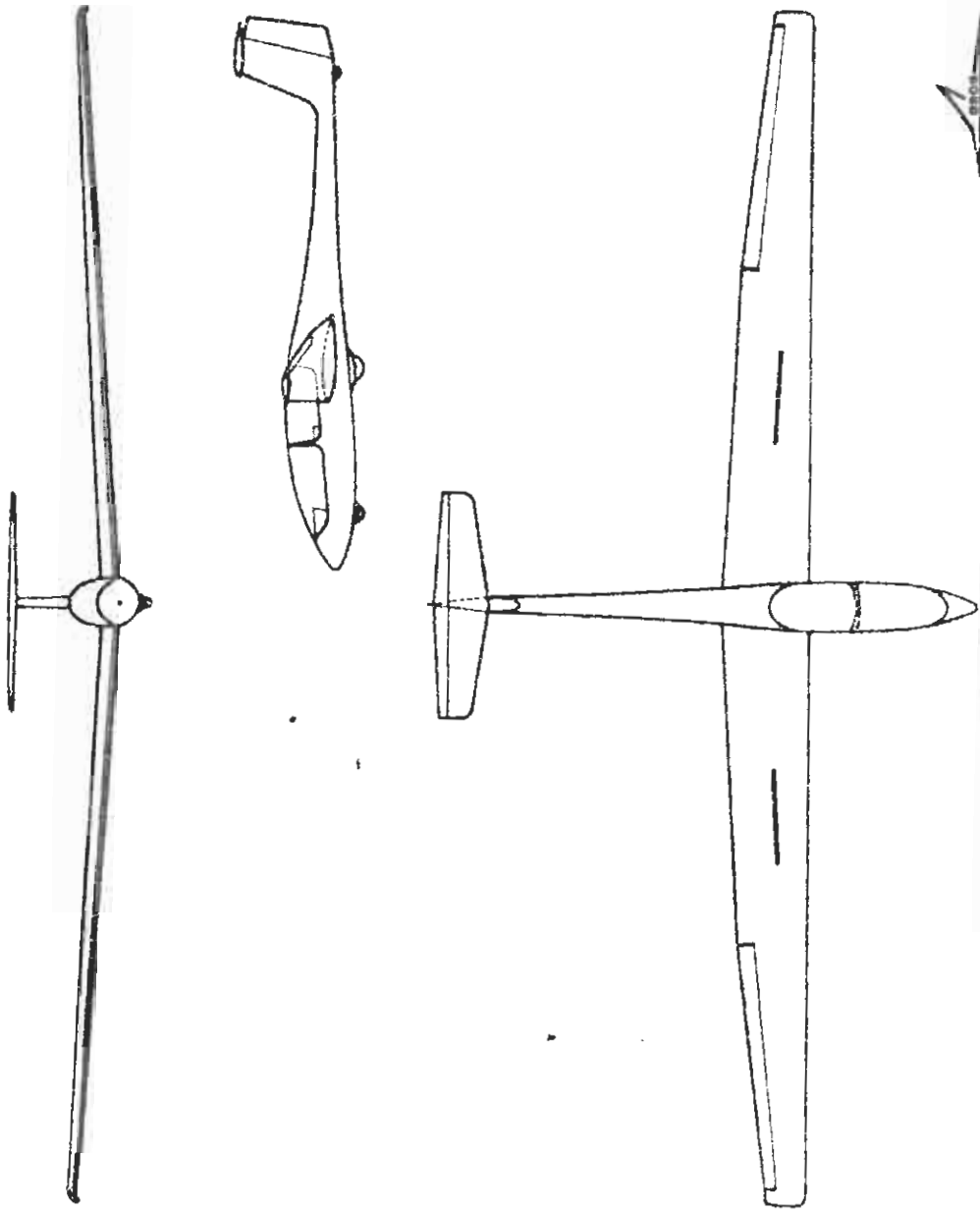
## IV. Normal procedures

IV. 1	Cockpit and controls (Picture)	17, 18, 19, 20
IV. 2	Daily preflight inspection	21, 22
IV. 3	Control checks before take off	23
IV. 4	Take off	23
IV. 5	Free Flight	24
IV. 6	Slow flying and stalls	24
IV. 7	High speed flight	24
IV. 8	Simple Aerobatics	25
IV. 9	Approach and landing	26
IV. 10	Storage	27

## V. Appendices

V. 1	Flight performance	28
V. 2	Determination of the center of gravity	29, 30, 31





**If the fuselage reinforcement according to OSB 315-66 had not been performed the following is applicable:**

The glider GROB G 103A 'TWIN II ACRO' is derived from the GROB G 103 'TWIN II'. Due to structural reinforcements the "TWIN II ACRO" is approved in the category "Acrobatic". According to MSB 315-65 only "simple aerobatics" (Loop, Turn, Lazy Eight, Chandelle, Spin) is approved (refer to II.2 and IV.9)

The  
Flight Handbook for Aerobatics  
GROB G 103A "TWIN II ACRO"  
Edition February 1984  
LBA approved

is invalid according to MSB 315-65 and must be removed from the Flight Handbook.

**If the fuselage reinforcement according to OSB 315-66 had been performed the following is applicable:**

The glider GROB G 103 A "TWIN II ACRO" is derived from the GROB G 103 "TWIN II". Due to structural reinforcements the "TWIN II ACRO" is approved and certified for aerobatics in conjunction with the following valid operating instructions:

Flight handbook for aerobatics,  
GROB G 103 A "TWIN II ACRO",  
edition February 1984,  
LBA approved.

These operating instructions must be added to the flight manual and contain special instructions valid for acrobatic operations. Main modifications to the "normal" flight manual are contained in the following sections:

- |  |        |
|--|--------|
| - Airworthiness group (II. 1)            | page 6 |
| - Permitted operating conditions (II. 2) | page 6 |
| - Minimum equipment (II. 3)              | page 6 |
| - Maximum speeds (II. 4)                 | page 7 |
| - Flight envelope (II.5)                 | page 7 |
| - Load scheme (II. 8)                    | page 8 |

The following items were modified in the maintenance handbook with respect to the acrobatic version:

- Weights and moments of control surfaces (VI)

References to the flight handbook for aerobatics are shown on the affected pages of the "standard" flight manual.

**I. 5 Description**

The "TWIN II" is a high performance two seater sailplane with a T-tail, fitted with a nonretractable tandem undercarriage and upper surface airbrakes.

This sailplane is manufactured using the latest techniques in industrial Glass fibre construction.

It is designed for training, high performance and simple aerobatic flying.

**Technical Data:**

Span	17.5 m (57.4 ft.)	Wing Area	17.8 m <sup>2</sup> (191.8 ft. <sup>2</sup> )
Length	8,18m (26,8ft)	Maximum Flying Weight	580 kg (1279 lbs)
Height	1,55m (5,1ft)	Maximum Wing Loading	32,6 kg/m <sup>2</sup> (6,68 lbs/ft. <sup>2</sup> )
Aspect Ratio	17.1		

**II. Operating limitations:****II. 1 Airworthiness Group**

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 operating conditions.**

The plane is licensed for:

- 1 VFR Day
2. Simple Aerobatics (Loops, Stall turns, Lazy eight, Chandelle and Spin).

**II. 3 Minimum equipment**

1. 2 Air speed Indicators reading to 300 km/hr (162 kts, 187 mph)
2. 2 Altimeters.
3. Full Harness Straps in front and back cockpit.
4. Parachute or back cushion at least 7 cm (3 inch) thick for each occupant.
5. Loading limit plaque in front and back cockpit.
6. Flight Limits plaque.
7. Flight Manual

17 th march 1982



*Perle*  
17. März 1982

## II. 4 Maximum Speeds

Maximum permitted speed in calm air	VNE = 250 km/h (135 kts, 155 mph)
Maximum permitted speed in rough air	V <sub>B</sub> = 170 km/h (92 kts, 105 mph)
Manoeuvring speed	V <sub>M</sub> = 170 km/h (92 kts, 105 mph)
Maximum winch launch speed	V <sub>W</sub> = 120 km/h (65 kts, 74 mph)
Maximum Aerotow speed	V <sub>T</sub> = 170 km/h (92 kts, 105 mph)

Conditions in rough air are similar to those encountered in rotors, clouds, whirlwinds and when overflying mountain ranges.

Manoeuvring speed is the maximum speed at which full control deflections may be used. At maximum speed (VNE) the control deflections should be restricted to 1/3 of the full range.

True airspeed is higher than indicated airspeed at altitude. VNE decreases according to 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

77-170 km/h=42-92 kts=48-105 mph	- Green arc (normal range)
170-250 km/h=92-135 kts=105-155 mph	- Yellow arc (caution range)
at 250 km/h=135 kts=155 mph	- Red line (max. Speed)
at 95 km/h=51 kts=59 mph	- Yellow triangle
	(recommended minimum appr. speed)

## Installation Errors

The airspeed indicator must be connected to the following sources: Pitot head in the tail fin, static vents side of the fuselage between the two seats.

Using a calibrated ASI the position error is not greater than  $\pm 2$  km/h or 1 kt or 1.2 mph. A calibration curve is therefore not necessary.

## II. 5 Flight envelope.

The sailplane design limit load factors are as follows:

At manoeuvring speed	+ 5.3 — 2.65
At VNE	+ 4.0 — 1.5

(Brakes closed and calm air)

17 th march 1982

  
17. März 1982

**II. 6 Weight limits**

Empty weight . . . . . about 380 kg( 838 lbs)  
 Maximum flying weight . . 580 kg( 1279 lbs)  
 Maximum permitted weight of non lifting parts 400 kg( 882 lbs)

**II. 7 Centre of gravity position**

The approved range of centre of gravity positions during flight is 260 mm (10.24 inches) to 460 mm (18.11 inches) behind the datum line, equivalent to 24.7% to 43.8% of the M.A.C. of the wing.

A/c attitude: incidence board of 600:24 angle.  
 The datum line is the front edge of the wing at the wing root.

The approved centre of gravity range does not get exceeded by the payload distribution specified in the loading plan II. 8.

The exact position of the centre of gravity at flying weight can be calculated according to VI 5.

**II. 8 Load scheme „TWIN II“**

Minimum load in the front seat for all flight . . . . .	70 kg (154 lbs)
Maximum load in the front seat . . . . .	110 kg (242 lbs)
Maximum load in the back seat . . . . .	110 kg (242 lbs)
Maximum load in the baggage compartment . . . . .	10 kg ( 22 lbs)

The maximum flying weight of 580 kg ( 1279 lbs) must not be exceeded.

Trim weights must be used at the suspensions in front of stick bulkhead to compensate if the front seat load is lower than 70 kg ( 154 lbs ). See page 14.

16th june 1982

  
 25. June 1982

Date of weighing: carried out by.	Equipment list used for weighing (date)	Empty (Weight) kg/lbs	Position of cg empty behind refer- ence mm/inches	Maximum total payload kg/lbs
12.07.83	12.07.83	381	740	199
CALCULATED 01-16-84		880.7 lbs	28.51 ins.	398 lbs
5/20/93		883.2 lbs	28.54 ins.	396 lbs.
2/24/01		910.5	27.87	370 lbs



**II. 9 Tow hooks and cable length**

For Aerotow: Nose hook "E 75" with modification 1-79.

For Winch launch: Safety back release hook "G 72" or "G 73".

Minimum aerotow cable length 40 m (130 ft)

Minimum launch cable length 600 m (1970 ft)

**II. 10 Weak link strength**

Winch launch and aerotow max 754 daN , max 1662 lbs

**II. 11 Tire Pressure**

mainwheel	6.00-6	2,5-2,8	bar
nosewheel	260x85	2,5	bar
tailwheel	210x65	2,5	bar

**II. 12 Crosswinds**

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

16th june 1982



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25. Aug. 1982

### II.13. Placards, control markings and instrument markings

<b>Maximum flying weight</b>	<b>580kg 1260lbs</b>			
<b>Airspeed limits</b>		<b>km/hr</b>	<b>knots</b>	<b>mph</b>
<b>Never exceed</b>	<b>V<sub>NE</sub></b>	<b>250</b>	<b>135</b>	<b>155</b>
<b>In Rough Air</b>	<b>V<sub>B</sub></b>	<b>170</b>	<b>92</b>	<b>105</b>
<b>On Aerotow</b>	<b>V<sub>T</sub></b>	<b>170</b>	<b>92</b>	<b>105</b>
<b>On Winch or Auto Launch</b>	<b>V<sub>W</sub></b>	<b>120</b>	<b>64</b>	<b>74</b>
<b>Airbrakes Open</b>	<b>V<sub>DF</sub></b>	<b>250</b>	<b>135</b>	<b>155</b>
<b>Manoeuvring</b>	<b>V<sub>A</sub></b>	<b>170</b>	<b>92</b>	<b>105</b>

both cockpits

<b>Payload (Pilot and Parachute)</b>			
<b>Minimum in Front cockpit</b>	<b>70kg</b>	<b>154 lb</b>	
<b>for all flight</b>			
<b>Less must be compensated with ballast secured in the seat</b>			
<b>Maximum load front</b>	<b>110kg</b>	<b>242lb</b>	
<b>The maximum weight must not be exceeded</b>			

both cockpits

<b>Simple aerobatics air speeds</b>			
<b>Recommended entry speed</b>	<b>km/hr</b>	<b>knots</b>	<b>mph</b>
<b>Loop</b>	<b>180</b>	<b>97</b>	<b>111</b>
<b>Stall turn</b>	<b>180</b>	<b>97</b>	<b>111</b>
<b>Spin</b>	<b>80</b>	<b>43</b>	<b>50</b>
<b>Chandelle</b>	<b>170</b>	<b>92</b>	<b>105</b>

Required placards (front and back cockpit)



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17. März 1982

Altitude (ft)	0-6500	10 000	13 000	16 500	19 000
VNE (KIAS)	135	128	121	115	109

near speed ind.

both cockpits

#### Check before launch

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!

Front cockpit

#### Canopy Jettison and Emergency Exit

- Pull red handles on right and left of canopy fully back together
- Push canopy up and away with the left hand
- Release safety harness
- Stand up and get out over left or right side depending on the altitude
- When using a manual parachute grip release and pull firmly to full extent after 1-3 seconds

By Canopy release front and back

**Tire Pressure**  
**36 PSI 2,5 atm**

mainwheel  
nosewheel  
tailwheel

16th June 1982

*Reinhold*  
25. AUG. 1982



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

Rudder fin

Baggage maximum  
 22 lbs 10 kg

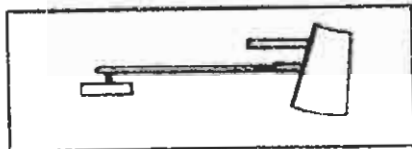
Baggage compartment

Don't push or  
 lift here

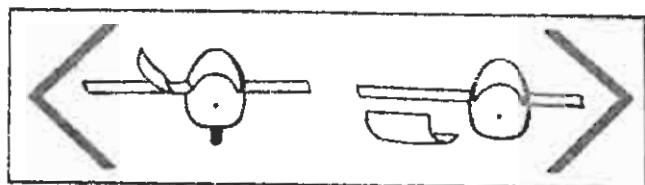
Rudder



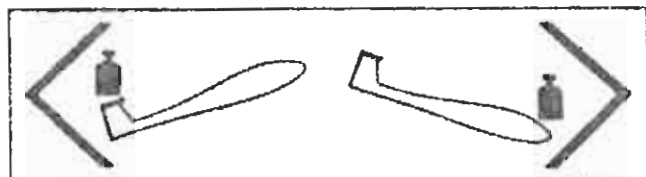
near magnetic direction  
 indicator



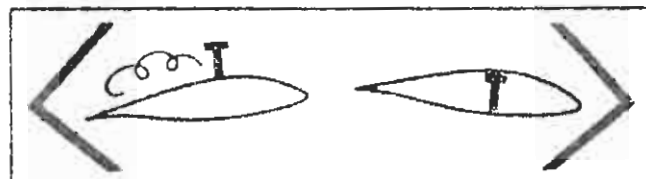
Total energy  
 compensation tube



Canopy open  
Canopy jettison



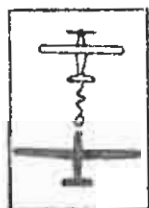
Trim



Airbrakes



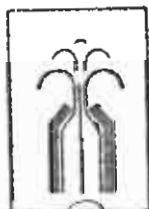
Wheelbrake



Cable  
release



Pedal adjustment  
Top right of front  
instrument panel



Air-vent  
Top left of front  
instrument panel



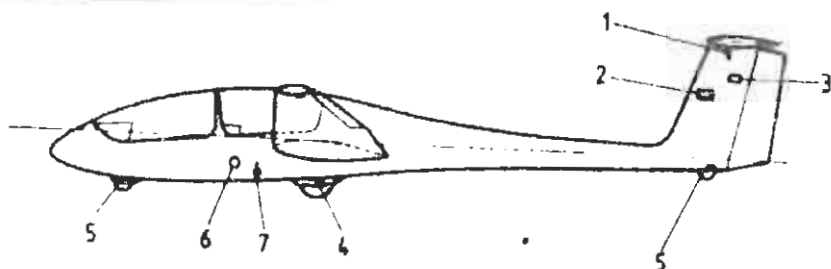
## TRIM WEIGHTS

Pilotsweight including parachute	kg	55-62,4	62,5-69,9	70-110
	lbs	121-137	138-153	154-242
Number		2	1	0

1 Trim weight: 5,6kg (12,3 lbs)

front cockpit

## Labels and Markings outside of the fuselage



1. Marking controlling the correct rigging of the tailplane.
2. Label for the total energy tube.
3. Label for tailplane security
4. Label for tyre pressure
5. Label for tyre pressure
6. Red ring round the static pressure port
7. Marking to find the belly hook

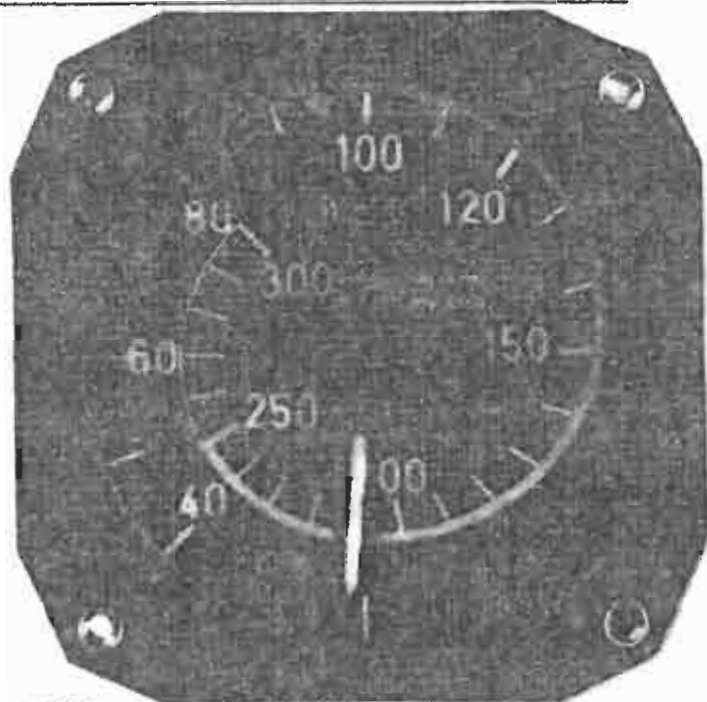
16th june 1982



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25. Aug. 1982

## ASI Markings

mph	Speed		Mark	Significance
	knots	km/h		
48-105	42-92	77-170	Green Arc	Normal range of flying speed
105-155	92-135	170-250	Yellow Arc	Range of flying speeds to be used with care
at 155	135	250	Radial Red Line	Maximum Speed
at 59	51	95	Yellow Triangle	Minimum recommended landing speed at full load



17 th march 1982

*Heinrich*  
17. März 1982

### III. Emergency procedures

#### III. 1. Recovery from the spin

Recovery 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. Emergency canopy jettison and exit

- Pull red handles on right and left of canopy full back simultaneously.
- Push canopy up and away with the left hand.
- Release safety harness.
- Stand up and get out over left or right side depending on the attitude.
- When using a manual parachute grip release and pull firmly to full extend after 1-3 seconds.

#### III. 3. Miscellaneous

##### Flying in rain, iced wings

There is a noticeable deterioration of flying characteristics by wet or lightly iced wings, which raises the stall speed by about 6 knots:

Increase take off and approach speed by 6 knots.

##### Wing dropping

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

##### Groundloops

The aircraft is not prone to ground loop in take off, If one wing touches the ground or the aircraft changes direction by more than 15 degrees, release cable immediately.

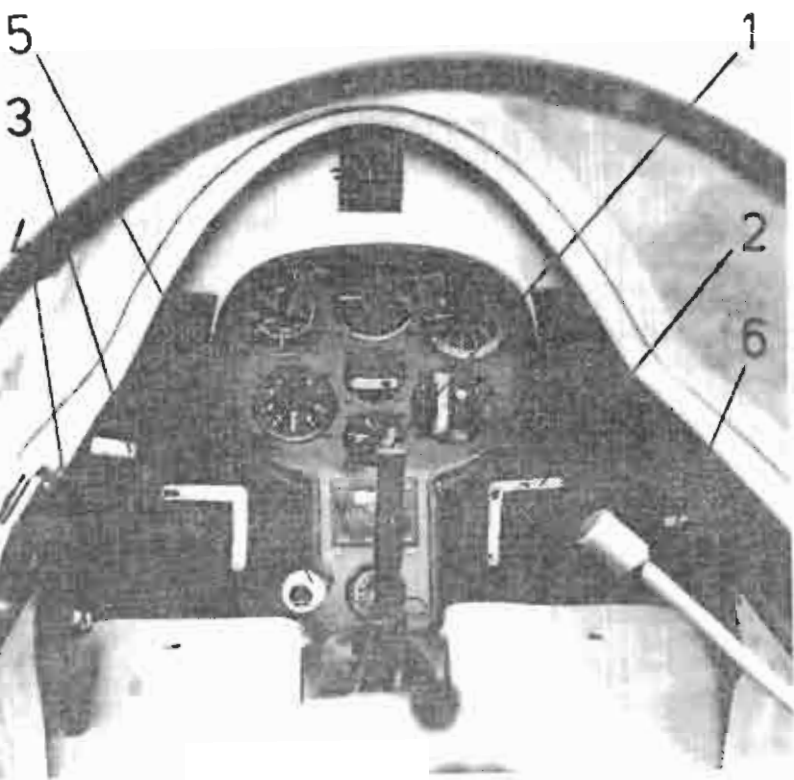


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17. März 1982

## IV Normal procedures

## VI. 1 Cockpit and controls

Front Seat.



- |   |                               |   |                 |
|---|-------------------------------|---|-----------------|
| 1 | Stick                         | 5 | Release knob    |
| 2 | Rudder pedals                 | 6 | Canopy jettison |
| 3 | Airbrake lever and wheelbrake |   |                 |
| 4 | Trim lever                    |   |                 |

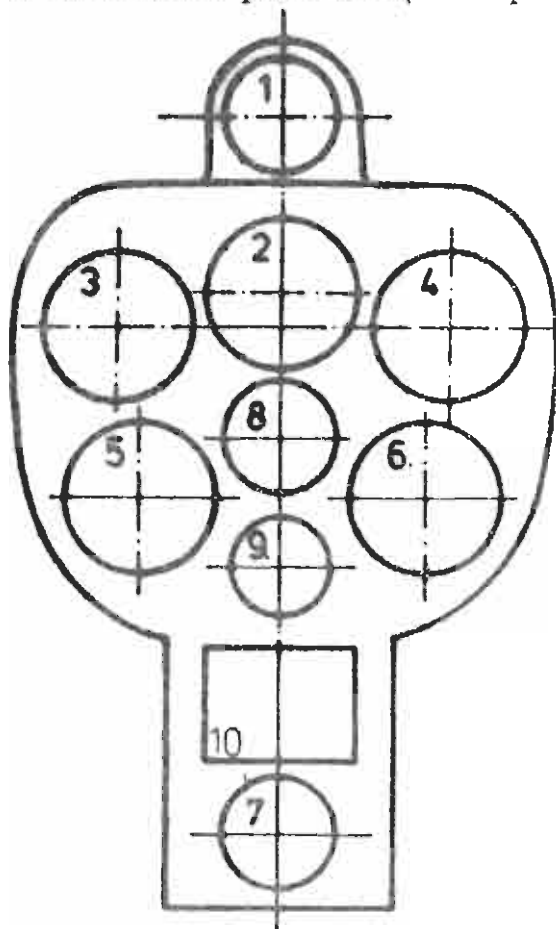
Ventilator top of instrument panel left side

Rudder pedal adjustment top of instrument panel right side.

16th June 1982


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 25. AUG. 1982

## Standard instrument positions (front panel)

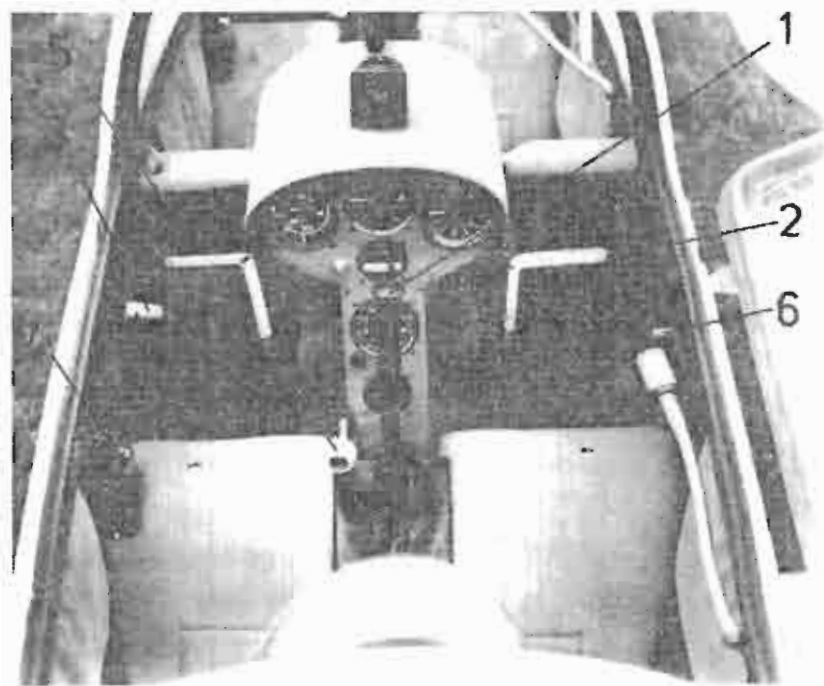


- 1 Magnetic compass
- 2 Electrical vario indicator (optional)
- 3 Airspeed indicator
- 4 Variometer
- 5 Altimeter
- 6 Electrical vario control (optional)
- 7 G-Meter or variable
- 8 Ball
- 9 Temperature (outside) or variable
- 10 Radio

17 th march 1982


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 17. März 1982

## Rear seat

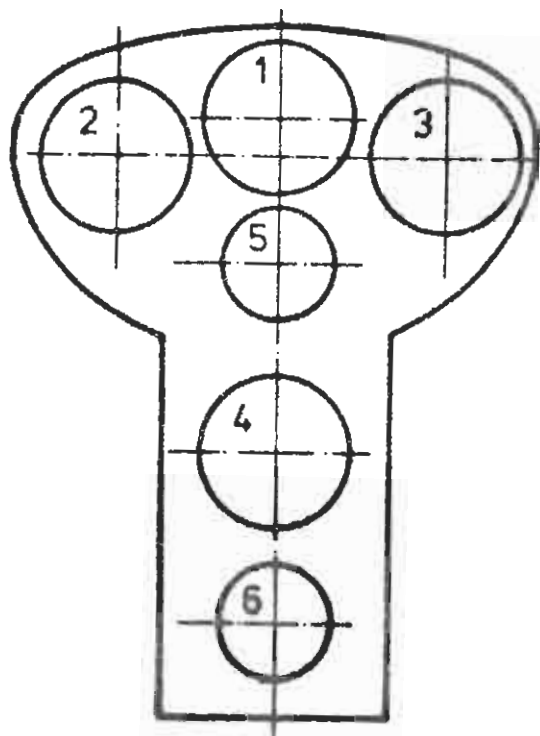


- |   |                               |   |                 |
|---|-------------------------------|---|-----------------|
| 1 | Stick                         | 4 | Trim lever      |
| 2 | Rudder pedals                 | 5 | Release knob    |
| 3 | Airbrake lever and wheelbrake | 6 | Canopy jettison |

16th june 1982

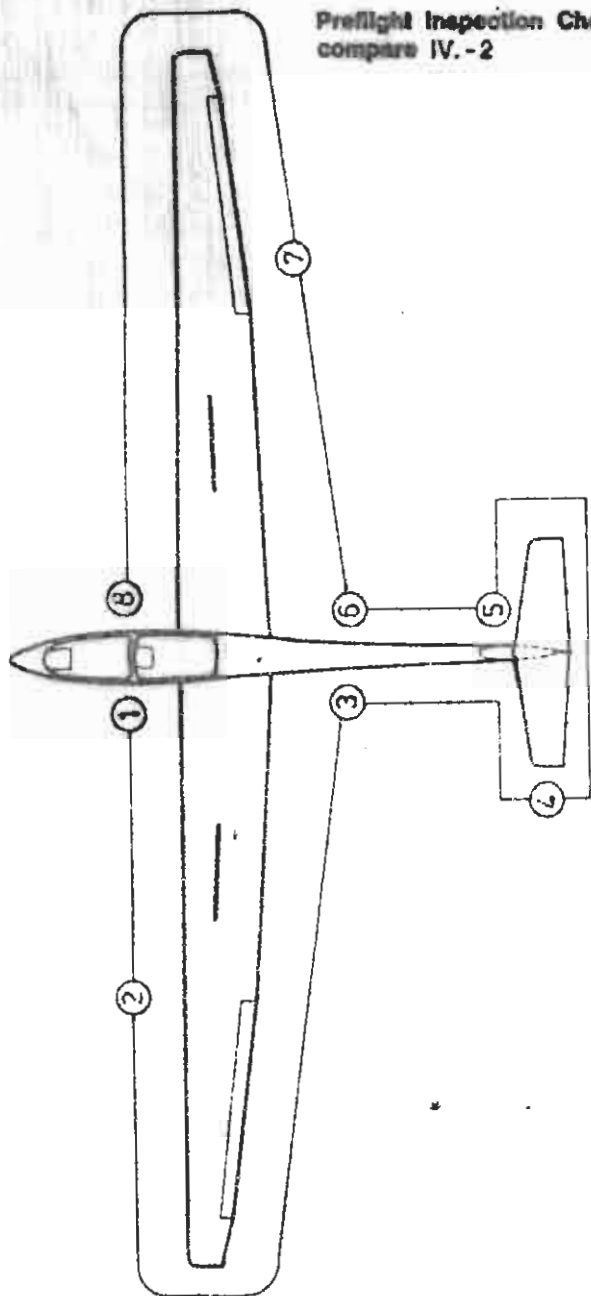

*Peri*  
 25. Aug. 1982

## Standard instrument positions (rear panel)



- 1 Altimeter
- 2 Airspeed indicator
- 3 Variometer
- 4 Electrical vario (optinal)
- 5 Ball
- 6 Variable

Preflight Inspection Checkpoints  
compare IV.-2



## IV. 3 Control checks before take off

1. Check all controls for full and free movement.
2. Check that the ballast limitations are being adhered to.
3. Check safety straps and parachute are firmly fastened.
4. Check altimeter is adjusted to zero or airfield height.
5. Check that transmitter is switched on and set to airfield frequency.
6. Check trim is neutral.
7. Check canopy is closed and locked.
8. Check airbrakes are closed and locked.
9. Rudder-pedals adjusted correctly and locked.

## IV. 4 Take off

**Winch launch**

Trim lever should be in central position.

Maximum winch launch speed is 120 km/h (65 kts, 74 mph).

The glider has a release hook in front of the main 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**

Trim lever should be in central position.

Maximum aerotow speed is 170 km/h (92 kts, 105 mph).

Aerotow should preferably use the nose hook.

The recommended length of tow rope is 40 — 60 m (120 — 200 ft.).

The glider can be controlled with coordinated rudder and aileron using full movements if required.

There is no tendency to swing in a strong crosswind.

The glider can be lifted off at about 70 km/h (38 kts, 44 mph).

The glider lifts off without assistance at a speed of about 80 km/h (43 kts, 50 mph) if the stick is kept in the neutral position.

The yellow release handle is mounted on the instrument panel and must be pulled to its limit when releasing.

17 th march 1982



*Seifert*  
17. März 1982

## IV. 5 Free flight

It is possible to fly the glider over the entire speed range in all altitudes.

Full control movements are only allowed up to the manoeuvring speed 170 km/h (92 kts, 105 mph). At higher speeds the controls should be used with the appropriate care.

## IV. 6 Slow flying and stalls

The glider gives clear warning when about to stall by a distinct shaking of the elevator.

The stalling speed depends on the wing loading and the condition of the plane. The following are guidelines:

## Single seater

Weight	Without Airbrakes	With Airbrakes
470 kg = 1036 lbs	68 km/h (38 kts, 41 mph)	75 km/h (40,5 kts, 47 mph)

## Double seater

Weight	Without Airbrakes	With Airbrakes
580 kg = 1279 lbs	75 km/h (40,5 kts, 47 mph)	85 km/h (46 kts, 53 mph)

If the stick is pulled back further the glider goes into a controllable high rate of sink, during which rudder and aileron turns can be flown at up to 15 degrees of bank. When the stick is released the glider returns to a normal flying attitude immediately.

After the stick is pulled back quickly the glider pitches nose down and the bank can still be controlled with aileron.

## IV. 7 High speed flight

There is no tendency for flutter to develop within the permitted speed range. Above 170 km/h (92 kts, 105 mph) control movements should be restricted to 1/3 of full range. The airbrakes limit the speed to under VNE in a 45° dive even at maximum flying weight.



*Peris*  
17. März 1982

#### IV.8 Simple Aerobatics

The glider is licenced for the following aerobatics

##### 1. Loop

Entry speed	180 km/h (97 kts, 111 mph)
Maximum g	ca. 3 g
exit speed	ca. 180 km/h (97 kts, 111 mph)

##### 2. Stall turn

Entry speed 180 km/h (97 kts, 111 mph)

At 140 km/h (76 kts, 87 mph) slowly apply rudder.

Shortly before the top apply opposite aileron.

Note: The stall turn is difficult to carry out because of the high moment of inertia. If a tailslide is accidentally initiated during the climb hold all controls in the centred position firmly.

##### 3 Spin (possible in aft C.G. positions only)

Preparation. Decrease speed slowly to 80 km/h (43 kts, 50 mph) pull stick back and apply full rudder. Glider spins slowly. Rotation rate is one turn every 3 seconds with a height loss of about 80 m (263 ft) per turn. The glider has no tendency to turn into a spiral dive.

Recovery : opposite rudder, neutralise stick and recover gently.

17 th march 1982



*Peri*  
17. März 1982

## 4. Chandelle

Entry speed            170 km/h (92 kts, 105 mph)

Pull up to fly  $90^{\circ}$  bank turn. During turn decrease speed and exit from turn with rudder and aileron. Chandelle should be completed heading in opposite direction.

## 5. Lazy Eight

Entry speed            140 km/h (76 kts, 87 mph)

## IV. 9 Approach and landing

Normal flying practice is to approach at 95 km/h = 51 kts. The airbrakes are sufficiently powerful for steep approaches. The use of brakes causes the glider to be slightly nose heavy, so that the glider holds the required speed by itself.

Caution note:

Fully extended the airbrakes increase the stalling speed: do not extend the airbrakes fully during the roundout to avoid heavy landings. Don't use the airbrakes to full extension during touch-down due to strong effect of the wheel-brake.

If the nosewheel touches the ground the direction can be controlled by rudder until 40 km/h (22 kts, 25 mph).

The side-slip is quite controllable and, if needed, this manoeuvre can be used for steeper approaches. It is effective by using a 15 degrees angle of side-slip and should be finished of a safe hight (98 km/h; 54 kts; 61 mph). Rudder effect reversal have not been observed.



*Peri*  
17. März 1982

The temporary control force to overcome the force reversal or rudder lock is calculated approximately 5 to 6 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 the Sailplane does not adopt unusual flight attitudes and deviates only slightly from its original flight course.

#### V. 10 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.

17 th march 1982

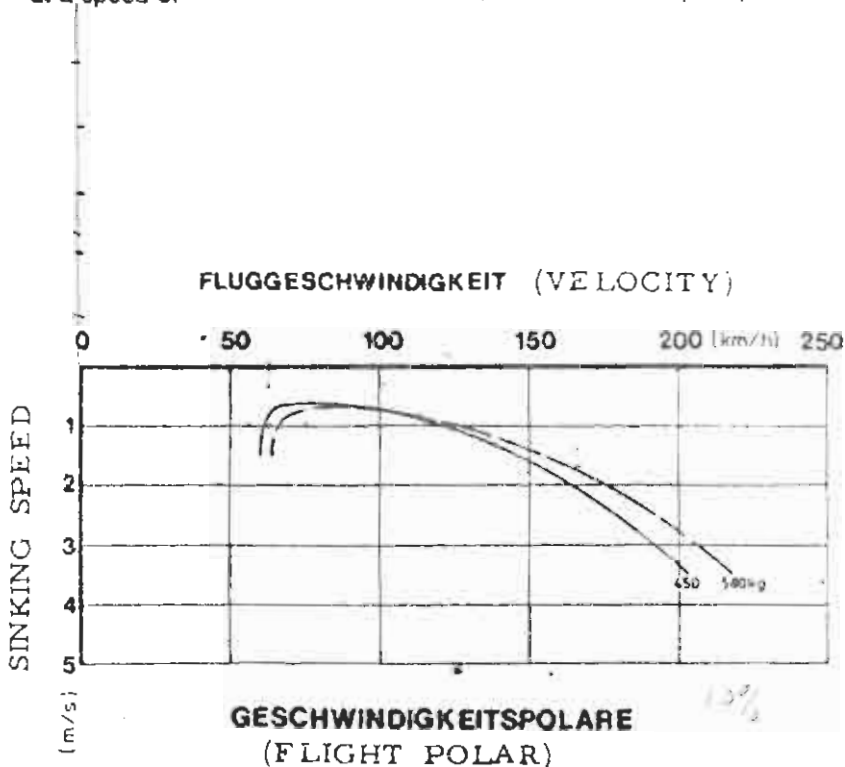


*Peris*  
17. März 1982

## V. Appendices

## V. 1 Flight Performance

Flying weight	450 (992)	580 (1279)	kg (lbs)
Wing loading	25,3 (5, 2)	32,8 (6, 7)	kg/m <sup>2</sup> (lbs/ft <sup>2</sup> )
Best glide Angle	38,5	37,0	
at a speed of	95 (51)	105 (57)	km/h (kts)
Minimum sink	0,64 (126)	0,70 (138)	m/sec (ft/min)
at a speed of	80 (43)	85 (46)	km/h (kts)



17 th march 1982


*Peri*  
 17. März 1982

## V. 2 Determination of the Center of Gravity

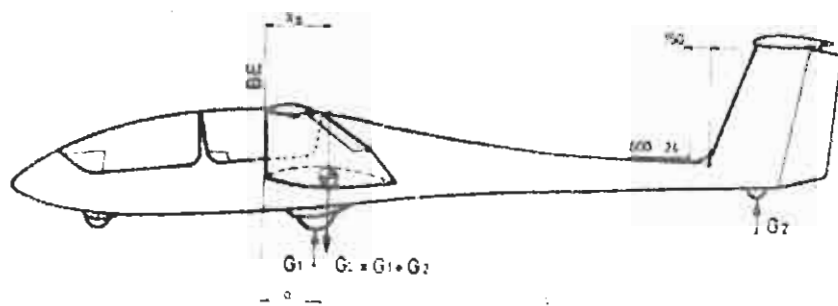
The determination of the center of gravity is made with the glider supported on two scales at heights such that an incidence board of  $600 : 24$  angle is set horizontal on the back of the fuselage. (Position on the fuselage see sketch at page 23). The reference plane lies at the front of the wing at the root. The distances  $a$  and  $b$  are measured with the help of a plumb line. The empty weight is the sum of the two weights  $G_1$  and  $G_2$ .

The Center of Gravity of the pilots is located:

1150 mm (45,3 inch) in front of the Datum Line (1. Seat)

40 mm (1,6 inch) behind the Datum Line (2. Seat)

## Procedure for determining C. of G. empty



Datum Line: Front edge of the wing at the root rib.

Level Means: With a 600:24 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.

$$X = \frac{G_2 \times b}{G_L} + a = \text{mm/inches behind Datum Line}$$

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.

Conversion	from	to	multiply with
	kg	lbs	
	mm	inches	0,0394

17 th march 1982



*Perin*  
17. März 1982

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.

Empty Weight		Range of C. of G. behind Datum			
kg	lbs	Forward		Aft	
		mm	inches	mm	inches
360	794	758	29.84	773	30.43
365	805	748	29.45	769	30.28
370	816	739	29.09	765	30.12
375	827	729	28.70	761	29.96
380	838	720	28.35	757	29.80
385	849	711	27.99	753	29.65
390	860	703	27.68	749	29.49
395	871	694	27.32	745	29.33
400	882	686	27.01	742	29.21

It should be noted that to make use of the maximum load the maximum admissible 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 400 kgs (882 lbs). Otherwise the maximum load permitted in the fuselage must be correspondingly decreased.

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

The empty weight, empty weight C. of G. position and maximum load, should be recorded after each weighing on page 9 of the Flight Handbook.

17 th march 1982



*Perin*  
17. März 1982