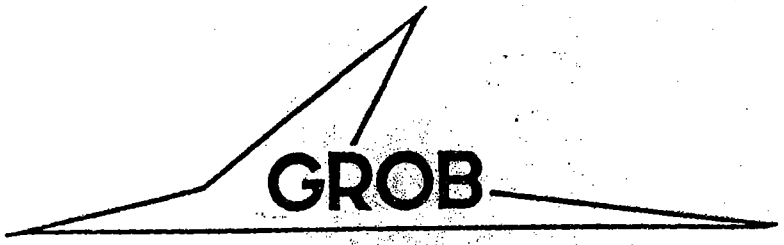


BURKHART GROB
LUFT-UND RAUMFAHRT GmbH & Co.KG
8939 Mattsies

PILOT'S OPERATING HANDBOOK

Model : GROB G 103 C "TWIN III ACRO"

Serial No. : 34176

Registration No. : N41KP

Date of Issue: January 1989

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. G39EU.

Pages identified by "LBA approved" are approved by

SKOV Skov (Signature)

LUFTFAHRT-BUNDESAMT (Authority)

(Stamp)

26. Mai 1989 (Original Date of Approval)

This sailplane is to be operated in compliance with information and limitations contained herein.

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

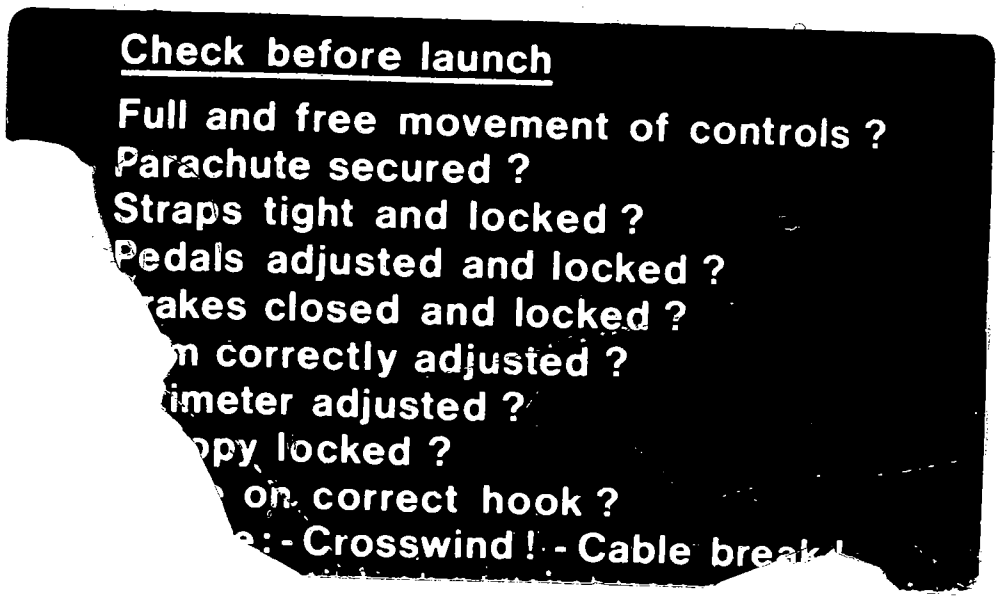
17.09.1992

GROB LBA-Nr. I-821

0.1 Record of Revisions

Any revision of the present manual, except actual weighing data, must be recorded in the following table and in any case of approved Sections endorsed by the responsible airworthiness authority.

The new or amended text will be indicated on the revised page by a black vertical line in the right hand margin, and the Revision No. and the date will be shown on the bottom left hand corner of the page.



Current State of Revision:

Rev. No.	Affected Section	Affected Pages	Date	Reference	Date of Approval	Date Inserted	Signature
1	0	0.3,0.4,0.5	18 July 1989	TM 315-40	Sept. 8/89		
	2	2.3,2.5, 2.11,2.12					
	3	3.3					
	4	4.3,4.15					
	6	6.4					
2	0	0.3,0.4	23 Nov. 1989	TM 315-42	Nov. 24/89		
	2	2.7,2.8					
	3	3.6					
	4	4.15,4.21					
3	0	0.1,0.3,0.4	08 May 1992	ÄM 315-18	03. 06. 92		
		0.5					
	1	1.5					
	4	4.6,4.15					
	7	7.7					

0.2 List of Pages

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S E C T I O N 1

1. General

1.1 Introduction

1.2 Certification Basis

1.3 Warnings, Cautions and Notes

1.4 Descriptive Data

1.5 Three-View Drawing

1.1 Introduction

The Pilot's Operating Handbook has been designed to give all necessary information to pilots and instructors for safe and correct operation to give maximum performance of the GROB G 103 C TWIN III ACRO glider.

This handbook does include not only all data that must be furnished to the pilot according to design regulation LFSM but also supplemental data and considerations for operation, the manufacturer thinks to be of benefit to the pilot.

1.2 Certification Basis

The GROB G 103 C TWIN III ACRO has been certificated by the Luftfahrt-Bundesamt in accordance with LFSM (Airworthiness Requirements for Gliders and Powered Gliders), Date of Issue October 1975.

Type Certification Sheet No. 04.315 was granted on May 26, 1989. The Airworthiness Category is "Acrobatic".

1.3 Warnings, Cautions and Notes

Statements in this handbook which are essential with regard to flight safety or handling are high lighted in the following manner:

"Warning"

means that the non-observation of the corresponding procedure leads to an immediate or important degradation of the flight safety.

"Caution"

means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation of the flight safety.

"Note"

draws the attention on any special item not directly related to safety but which is important or unusual.

1.4 Descriptive Data

The GROB G 103 C "TWIN III ACRO" is a two-seater mid-wing glider with a damped T-type tail. State-of-the-Art technology is used to manufacture the glider in industrial FRP construction. It is used for instruction, training, performance and aerobatic flights.

The 2-section wing is triple tapered with airbrakes (Type GROB) on the upper side.

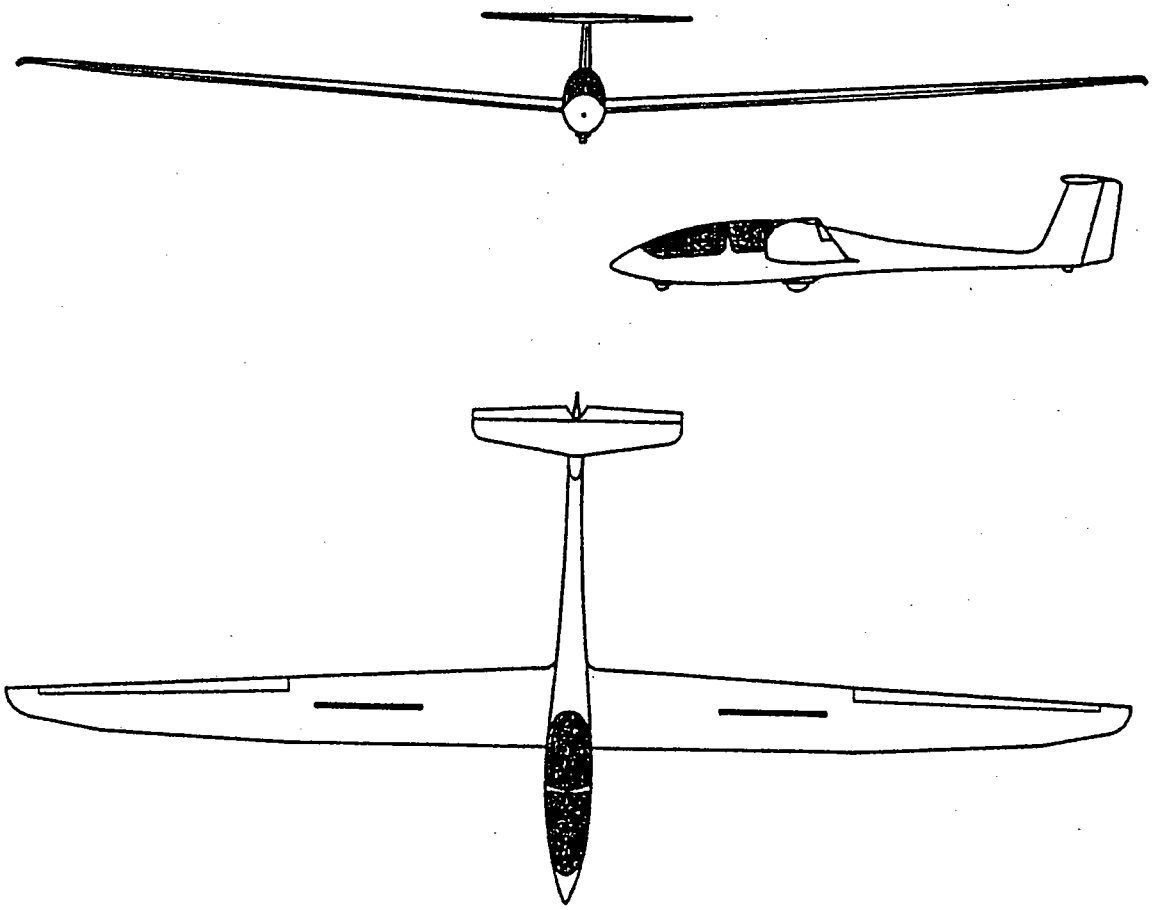
The two seats are in tandem arrangement. The two canopies are independent of each other and open to the right.

The main wheel of the non-retractable tandem landing gear is equipped with a hydraulic disk brake. The nose wheel is steerable (standard as of S/N 34171).

Technical Data:

Wing span	18.0	m	(59.06 ft)
Length	8.18	m	(26.84 ft)
Height	1.55	m	(5.09 ft)
Wing aspect ratio	18.5		
Wing aera	17.5	m^2	(188.4 sq.ft)
Max. flight weight	600.0	kg	(1322.8 lbs)
Max. wing loading	34.3	kg/m^2	(7.03 lb./sq.ft)

1.5 Three-View Drawing



S E C T I O N 2

2. Limitations

2.1 Introduction

2.2 Airspeed

2.3 Instrument Markings

2.4 - reserved -

2.5 - reserved -

2.6 Weight

2.7 Centre of Gravity

2.8 Approved Manoeuvres

2.9 Manoeuvring Load Factors

2.10 Flight Crew

2.11 Kinds of Operation

2.12 Minimum Equipment

2.13 - reserved -

2.14 Aerotow and Winch- and Autotow-Launching

2.15 Other Limitations

2.16 Limitations Placards

2.1 Introduction

This section includes operating limitations, instrument markings, and basic placards necessary for safe operation of the GROB G 103 C TWIN III ACRO, its systems and the equipment installed by the manufacturer.

The limitations included in this section and in Section 9 have been approved by the Luftfahrt-Bundesamt.

2.2 Airspeed

The following table indicates the airspeed limitations and their operational guide:

	Speed	IAS (km/h)	(kts)	Note
V_{NE}	Never exceed speed in calm air	280 265 240 215 190	151 143 130 116 103	Never exceed this speed. Max. contro deflection 1/3. m ft 0-2000 - 6562 -3000 - 9842 -5000 -16404 -7000 -22966 -9000 -29528 altitude
V_{RA}	Max. permissible speed in heavy turbulence	200	108	Never exceed this speed in heavy tur bulence. There is heavy turbulence in lee-waves, cumolonimbus etc.
V_A	Design manoeu-vering speed	185	100	Do not make full or abrupt control movements above this speed. This might overload structure.
V_W	Max. winch-launching speed	140	76	Do not exceed this speed during winch or autotow-launching
V_T	Max. aerotowing speed	185	100	Do not exceed this speed during aero-towing

2.3 Instrument Markings

- Airspeed Indicator

The following table shows the airspeed indicator markings and colour code identification.

Marking	IAS (km/h)	(kts)	Indicates
Green arc	79 - 185	43-100	Normal operating range (lower limit 1.1 V_{S1} at max. weight and most forwardCoG position and upper limit V_A)
Yellow arc	185 - 280	100-151	Manoeuvres must be conducted with caution and only in smooth air.
Red line	280	151	Maximum speed for all operations.
Yellow triangle	96	52	Approach speed at max. weight

- Acceleration Indicator

Red radial lines at n = + 6.5 and n = - 4.0 .

2.6 Weight

Max. permissible take-off mass:	600 kg	(1322.8 lbs)
Max. permissible landing mass:	600 kg	(1322.8 lbs)
Max. permissible mass of all non-lifting parts:	420 kg	(925.9 lbs)
Max. mass in baggage compartment:	10 kg	(22.0 lbs)

2.7 Centre of Gravity Weight X Arm = Moment

CoG position range during flight

max. forward position: 270 mm (10.63 in.) aft of datum

max. aft position: 480 mm (18.90 in.) aft of datum

Datum (BE): Wing leading edge at the root rib

Aircraft attitude: Wedge 600:24 horizontally on upper side of fuselage in front of vertical fin .

The flight weight CoG positions have to be strictly adhered to.

The permissible CoG range is not exceeded if the loading corresponds to the loading limitations according to POH, Sec. 6.2, page 6.5 .

A lack of weight in the pilot's seat shall be compensated by ballast (see POH Sec. 6.2, page 6.4).

For determination of the empty weight CoG position see Maintenance Manual, Section 7.

Arms:

Front Seat:		44.57 In (-)
Rear Seat:		1.38 In (+)
Trim Weights:		
1 Trim Weight	12.3 lb	60.75 In (-)
2 Trim Weights	24.6 lb.	61.42 In. (-)
Baggage:		31.89 In (+)

2.8 Approved Manoeuvres

The glider has been certificated for the following aerobatic manoeuvres according to airworthiness category "Acrobatic":

- Positive loop
- Turn
- Lazy Eight
- Chandelle
- Spin
- Slow roll
- Immelmann Turn
- Split S
- Inverted flight
- Inverted spin

Caution: The description of these aerobatic manoeuvres and the recommended entry speeds have been provided under Sec. 4.5.9 of the Pilot's Operating Handbook.

2.9 Manoeuvring Load Factors

The following manoeuvring load factors shall not be exceeded:

at V_A (185 km/h / 100 kts)	
max. positive load factor	n = + 6.5
max. negative load factor	n = - 4.0

With increasing speed the above values decrease as follows:

at V_{NE} (280 km/h / 151 kts)	
max. positive load factor	n = + 5.3
max. negative load factor	n = - 3.0

The above manoeuvring load factors are valid for operation with retracted airbrakes.

Max. manoeuvring load factor with the airbrakes extended

at V_{NE}	n = + 3.5

2.10 Flight Crew

On solo flights, the pilot has to be in the front seat.

Min. load in the 1st seat	70 kg	(154 lbs)
Max. load in the 1st seat	110 kg	(242 lbs)
Max. load in the 2nd seat	110 kg	(242 lbs)

A pilot's weight in the front seat of less than 70 kg (154 lbs) shall be compensated by ballast. A pilot's weight between 55 and 69 kg (121 - 152 lbs) can be compensated by lead trim weights to be mounted in the supporting device (standard equipment) in front of the control stick frame.

2.11 Kinds of Operation

With the minimum equipment prescribed (see POH Sec. 2.12, page 2.8) the glider is certified for:

- (Day) VFR flights
- Aerobatic flights
  (Positive loop, turn, lazy eight, chandelle, spin, slow roll, Immelmann Turn, Split S, inverted flight, inverted spin)
- Flights in clouds (if permitted by national operational regulations)

2.12 Minimum Equipment

- 2 airspeed indicators up to 300 km/h (162 kts) with colour codings according to POH Sec. 2.3
- 2 altimeters
- 1 G-meter with trailing pointer (front panel)
- 2 symmetrical safety belts (each consisting of 5 parts)
- 2 sets of pedal loops
- back cushions with a min. thickness of 7 cm (2.77 in.) under load or manually or automatically operated parachutes for each occupant

additional equipment for cloud flights

- 2 vertical speed indicators
- 1 turn-and-bank indicator
- 1 magneto compass (compensated with the aircraft)
- 1 VHF transceiver* (ready for operation)

* operational equipment

Instruments and other devices of the minimum equiment shall correspond to a certificated design.

2.14 Aerotow and Winch- and Autotow-Launching

Aerotow

Max. permissible speed:	185 km/h	(100 kts)
Towing cable weak link:	max. 845 daN	
Min. length of cable:	40 m	(131 ft)

Winch-Launching

Max. permissible speed:	140 km/h	(76 kts)
Towing cable weak link:	max. 845 daN	

Warning: The towing cable weak link shall not exceed 845 daN (including tolerance).

2.15 Other Limitations

2.15.1 Restrictions of the Aerobatic Certification

Gliders of the specific type are only certificated for aerobatic manoeuvres and the possible combinations thereof according to Section 2.8 and their descriptions under Section 4.5.9.

2.15.2 Loading of Baggage Compartment

Put only smooth, light objects into the compartment which can neither hinder nor injure the pilot during negative accelerations or in case of crash.

There shall be no baggage in the compartment (no canopy cover etc.) during aerobatic flights.

2.16 Limitations Placards

Maximum flying weight 600 kg (1323 lbs)				
Maximum airspeeds:		km/h	kts	mph
in calm air:	V_{NE}	280	151	174
in rough air:	V_{RA}	200	108	124
Aerotow:	V_T	185	100	115
Winch/Automobile tow:	V_W	140	76	87
Airbrakes extended:	V_{FE}	280	151	174
Manoeuvring speed:	V_A	185	100	115

Right side wall of front and rear cockpit

Towing cable weak link	
aero-, winch- and automobile tow	max. 845 daN max. 1863 lbs

Tire pressure		
main wheel:	36-39.8 PSI	2.5-2.8 bar
nose- and tail wheel:	36 PSI	2.5 bar

Right side wall of front cockpit

Payload (Pilot and Parachute)

Minimum in Front cockpit 70 kg 154 lbs
for all flight

Less must be compensated with
Trim Weights

Maximum load front 110 kg 242 lbs
The maximum weight must not be exceeded

Right side wall of front and rear cockpit

Limitations Placards (continued)

Max. baggage: 10 kg (22 lbs) No baggage permitted during acrobatics	Right side wall above baggage compartment floor
Tire Pressure 2.5 - 2.8 bar (36 - 39.8 PSI)	Main wheel fairing
Tire Pressure 36 PSI 2.5 bar	Nose and tail wheel

Note: Further placards are listed in the Maintenance Manual.

S E C T I O N 3

3. Emergency Procedures

3.1 Introduction

3.2 Canopy Jettison

3.3 Emergency Exit

3.4 Stall Recovery

3.5 Spin Recovery

3.6 Spiral Dive Recovery

3.7 - reserved -

3.8 - reserved -

3.9 Other Emergencies

3.1 Introduction

This section comprises

- check lists which show the recommended emergency procedures (catchwords)

- a detailed description of the emergency procedures

Emergency Procedures (Check List)

(1) Canopy Jettison

- Pull red handles on the right and left side backward
- Push the canopy up

(2) Emergency Exit

- 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 extent after 1-3 seconds

(3) Spin (Normal Attitude)

- Rudder control against spin direction
- Push elevator control slightly
- Aileron control in neutral position or against spin direction
- After spin has been terminated rudder control in neutral position. Pull-out smoothly

(4) Spin (Inverted Attitude)

- Rudder control against spin direction
- Pull elevator control
- Aileron control in neutral position
- After spin has been terminated rudder control in neutral position and positive pull-out

3.2 Canopy Jettison

Pull the red levers on the right side (cockpit wall) and on the left side (canopy frame) backward to the stop and push the canopy up. The airflow will release the canopies. The snap hooks of the canopy attachment open by bending and the lower attaching balls of the gas springs are torn out thus separating the canopies from the aircraft.

Warning: Do not use "more stable" snap hooks or safety pins with the gas springs. If the canopies or parts of them remain on the aircraft during emergency then the exit will be endangered.

3.3 Emergency Exit

If an emergency exit is unavoidable first release the canopies.

The roomy cockpit and its excellent fairing assist in a quick and safe exit in case of emergency.
Use the rigid canopy frames of the fuselage as levers to draw yourself up and out of the cockpit.

If possible, push yourself off vigorously from the glider while jumping out.
! Attention: Wing leading edge and tail unit !

3.4 Stall Recovery

During normal and circle flight, stall is always terminated by pushing the elevator control slightly.

During circle flight, use aileron and rudder control against spin direction, as necessary.

The loss of altitude at sea level is appr. 50 m (164 ft). With increasing altitude the losses will also increase, the max. loss of altitude will be in lee wave aeras at high altitudes (mountain flights).

Caution: Increased vibrations and weak controls are stall characteristics.

3.5 Spin Recovery

- Normal Attitude

Safe termination of spin is made as follows:

a) Rudder control against spin direction (full deflection)
b) Push elevator control
c) Aileron control to neutral position or against spin direction
d) After termination of spin, rudder and aileron control in neutral position and pull-out smoothly from diving.

The loss of altitude from terminating the spin to the bottom point of the pull-out is appr. 280 m (920 ft) (at sea level). Pull-out speed is appr. 190 km/h (103 kts), the manoeuvring load factor appr. + 3.5 g.

Note: At forward CoG positions, it is not possible to stationarily spin the glider. After appr. 1/2 revolution, it is moving into a spiral dive.

Caution: Spinning can be avoided safely by taking the countermeasures for "Termination of Stall".

- Inverted Attitude

Safe termination of spin is made as follows:

a) Rudder control against spin direction (full deflection)
b) Pull elevator control
c) Aileron control into neutral position
d) After termination of spin, rudder and aileron control into neutral position and smooth pull-out from inverted dive.

The loss of altitude from terminating the spin to the bottom point of the pull-out is appr. 250 m (820 ft) (at sea level). Pull-out speed is appr. 210 km/h (113 kts), the manoeuvring load factor appr. + 3.5 g.

3.6 Spiral Dive Recovery

Normal Attitude

Depending on aileron and rudder control position during spin at forward CoG positions (i.e. within the range of non-stationary spinning of the GROB G 103 C TWIN III ACRO), there will be a spiral dive or yawing condition similar to the spiral dive after appr. 1/2 rotation. Both conditions are indicated by a rapid increase in speed and acceleration.

Both flight conditions are terminated as follows:

- Rudder control against spin direction
- Aileron control against spin direction
- Pull elevator control, never exceed permissible manoeuvring load factors

The loss of altitude for recovery is dependent on speed and may be up to appr. 100 m (328 ft) (at sea level). The manoeuvring load factor is + 3.5 g.

Inverted Attitude

Depending on aileron and rudder control position during spin at forward CoG positions (i.e. within the range of non-stationary spinning of the GROB G 103 TWIN III ACRO), there will be an inverted spiral dive or a yawing condition similar to the inverted spiral dive after appr. 1/2 rotation. Both conditions are indicated by a rapid increase in speed and negative acceleration.

Both flight conditions are terminated as follows:

- Rudder control against spin direction
- Aileron control against spin direction
- Pull elevator control, never exceed permissible manoeuvring load factors

The loss of altitude for recovery is dependent on speed and may be up to appr. 150 m (492 ft) (at sea level). The manoeuvring load factor is + 3.5 g.

3.9 Other Emergencies

3.9.1 One aileron not connected

- Flight speed up to max. 120 km/h (65 kts)
- Turn at low bank
- Prepare for longer final approach than usual

3.9.2 One airbrake not connected

An airbrake that is not connected but locked will usually become obvious to the pilot on final approach only. This single-acting moment, being induced by the connected and operated airbrake, can be compensated by aileron and rudder control.

An airbrake that is not connected and unlocked will usually extend abrupty during take-off. A rudder control deflection of appr. 60 % will prevent a single-acting yawing.

- Either launching or towing should be continued until safe altitude is reached.

- Max. airspeed 150 km/h (81 kts)

With one airbrake extended, a side slip at low bank is possible in either direction.

3.9.3 Ground Looping

If the remaining distance between touch-down point and end of field is too short a decision in favour of a controlled ground looping at least 30 m (98 ft) before the end of the landing field should be taken.

- If possible, turn into the wind
- Simultaneous aileron and rudder control deflections into turn direction with control stick fully pulled and wheel brake released.

Ground looping requires the release of the nose wheel which is only possible with released brake and sufficient elevator control efficiency (more than 40 km/h / 22 kts).

3.9.4 Emergency Landing on Water

From experience with emergency landings of FRP powered gliders on water, one can expect the following: gliders with fixed or extended landing gear, touching down at minimum speed (with the airbrakes retracted) and almost at zero rate of descent, do not tend to "dive down". FRP aircraft are capable of floating for a certain period of time.

Warning: An emergency landing on water, however, shall always be the last resort only!

S E C T I O N 4

4. Normal Procedures

4.1 Introduction

4.2 Rigging and De-Rigging

4.3 Daily Inspection

4.4 Preflight Inspection

4.5 Normal Procedures and Recommended Speeds

4.5.1 Launching Techniques
4.5.2 - reserved -
4.5.3 Cruise and Cross-Country Flight
4.5.4 Approach
4.5.5 Landing
4.5.6 - reserved -
4.5.7 High Altitude Flight
4.5.8 Flight in Rain
4.5.9 Aerobatics
4.5.10 Flights in Clouds

4.1 Introduction

This section covers check lists for the daily inspection and the preflight check. In particular, the junctions in the control system (assembly and inspection) have been described in detail.

Furthermore, this section includes a description of the normal operating procedures and the recommended speeds.

Normal procedures relating to additional equipment will be described in Section 9.

4.2 Rigging and De-Rigging

- Rigging

For rigging, hold the fuselage tight in a horizontal position. We recommend to use a fuselage horse or the assembly undercarriage (trailer equipment).

Assembly of the glider can be conducted by 3 or 4 persons as follows:

- Open the 4 sliding sleeves inside the fuselage

- Release the airbrakes in the wings

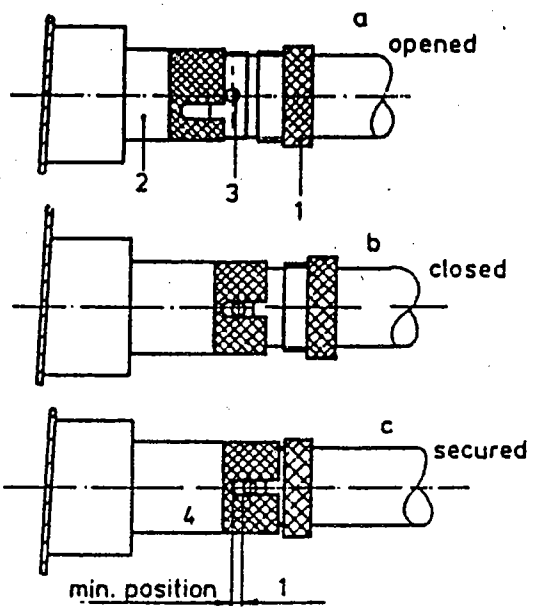
- Insert the right wing into the fuselage

- Turn the sliding sleeves (right side) so that the guide pins engage in the shaft guides of the sleeves. By slightly moving the wing, the sliding sleeves will snap into place with a distinctly audible sound.

- Insert the left wing into the fuselage and arrange the two spar stub bolts by moving the wing tips up and down so that they will enter the corresponding bearings of the root ribs. Move the wing tips circularly to insert the wing bolts into the wing connecting tube. It is advisable to unload the root rib forward and rear.

- Turn the sliding sleeves (left side) so that they snap into place by moving the wing fore and aft.

- Turn the knurled nuts (1) of the wing connecting tubes into the sliding sleeves (2) so that they are drawn against the red rings which are held by the guide pins (3) = protective device.
  By means of moving the wing tips fore and aft, the knurled nuts can be secured tight (4) while securing the guide pins however, must not strike against the end of the milled selector of the shaft guide.



Inspection: The red rings at the fuselage tubes shall be concealed by the sliding sleeves, the knurled nuts shall be tightened hard.

In a closed but not secured position (b), the wing bolt cannot be removed from the locking.

- Connection of ailerons and airbrakes
  The short connecting rods inside the fuselage are equipped with quick-locks which have to be coupled with the joints of the wing push rods.

Inspection: The quick-lock slide shall protrude so that the safety pin is snapped into place. After the quick-locks have snapped into place, try to push the safety pin backward without pressing it down. If you do not succeed the controls have been linked properly.

Horizontal Tail

- Before mounting the horizontal tail, hinge down the leading-edge flap and pull out the butterfly nut up to the stop limit. See that the large opening of the cone-shaped bearings of the horizontal tail spar shows to the rear.

- Mount the horizontal tail so that the automatic elevator joint engages.

- Push the elevator fin rearwards onto the 3 bolts

- Screw the butterfly nut tight.

Correct assembly can be checked when the butterfly nut is so tight that the horizontal tail is free from play in any direction. The horizontal tail shall be secured by mounting the leading edge flap with the butterfly screw in horizontal position. If necessary, tighten or release it by 1/4 turn.

Note: Tighten the butterfly screw manually only, do not use any tool.

Inspection after Rigging

- Check the 4 slide sleeves inside the fuselage are secured

- Check correct setting of the aileron and airbrake quick-locks, as being described above

- Check operating force and functioning of the towing hooks

- Check functioning of the wheel brake and tire pressure

- Check tight fit of horizontal tail

- Check controls with the help of a second person

After the glider is inspected, adhesive tape should be added to the wing-fuselage and the fuselage-horizontal tail joints.

Note: Always add adhesive tape to the horizontal tail joint to avoid airflow separations at the fitting holes of the horizontal tail which may result in slight control stick vibrations.

De-Rigging

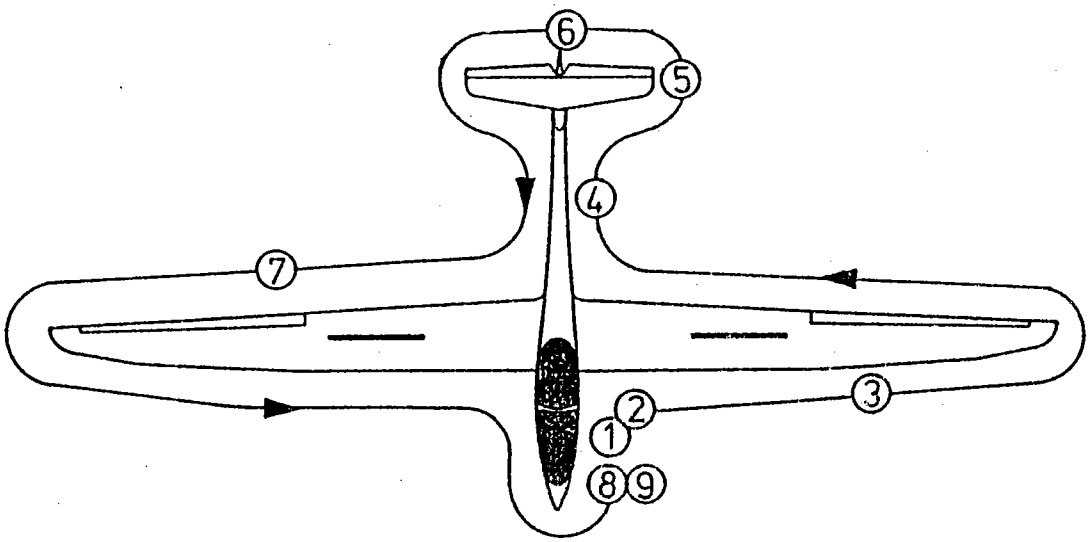
De-rigging is achieved in reverse order thus making no difference which wing is removed first.

If the glider is parked outside with the horizontal stabilizer removed, the elevator control rod in the vertical fin must be covered properly in order to prevent the ingress of moisture.

4.3 Daily Inspection

It is essential that a full inspection is carried out after each rigging prior to readiness for takeoff and before each days flying.

Walk around the airplane



While walking around the glider, check the surface for cracks, bucklings or unevenness or any unusual feature. In case of doubt call an expert for a professional opinion.

(1) Canopies

- open canopies
- check the 4 slide sleeves inside the fuselage are secured
- visual inspection of all control installations and joints
- check controls for free motion
- check condition and functioning of the towing hooks
- check functioning of the wheel brake
- check canopy locking device and canopy emergency release
- check for foreign objects

(2) Front part of fuselage

- check fuselage shell for damages, in particular the lower side of the fuselage and the landing gear area
- check tire pressure main wheel (2.5 - 2.8 bar/36 - 39.8 PSI) and nose wheel (2.5 bar/36 PSI) and state of wheels
- check cleanliness and functioning of the towing hooks

(3) Left wing

- check upper and lower surface of the wing for damage
- visual inspection of all control installations
- aileron (check state, free motion and play)
- airbrakes (check state, fit and locking mechanism)

(4) Rear part of fuselage

- check fuselage tube and vertical fin for damages, in particular the lower surface and the tail wheel area
- check multi-probe for cleanliness and correct mounting
- check tire pressure tail wheel (2.5 bar/36 PSI)

(5) Horizontal tail

- check elevator fin for damages, correct mounting and verify it is secured properly
- elevator (check state, free motion and play)

(6) Vertical Tail

- check state, free motion and play

(7) Right wing

- see Item (3)