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FLIGHT MANUAL
FOR THE SAILPLANE

Glasflügel 304 C

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FLIGHT MANUAL
FOR THE SAILPLANE

Model: *Glasflügel 304 C*

Serial No.: .....

Registration: .....

Type Certificate No.: 98-03

Date of Issue: 12/01

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This English edition of the ***Glasflügel 304 C*** Flight Manual has been translated with care and is accurate to best of our knowledge. However, in all official matters the original Czech text is the authoritative and definite document.

This sailplane is to be operated in compliance with information and limitations contained herein.
This Flight Manual must be located aboard the sailplane at all times.

Document No.: G304C/AFM

Date of Issue: 12/01

0.1 Record of revisions

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

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

Rev. No.	Affected Section	Affected Pages	Date of Issue	Approval	Date of approval	Date of Insertion	Signature

0.2 List of Effective Pages

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0.3 Table of Contents

SECTION 1

1. General

1.1 Introduction

The sailplane flight manual has been prepared to provide pilots with information for the safe and efficient operation of the ***Glasflügel 304 C*** sailplane.

This manual includes the material required to be furnished to the pilot by JAR-22. It also contains supplemental data supplied by the sailplane manufacturer.

1.2 Certification basis

This type of sailplane has been approved by Civil Aviation Authority of the Czech Republic in accordance with LSFM regulation, issued by LBA on 23rd October, 1975 and with
Section F and G of JAR-22, 28th October, 1995, Change 5

Type Certificate No.:	98-03
Issued on:	2nd April, 1998
Category of airworthiness:	UTILITY

1.3 Warnings, cautions and notes

The following definitions apply to warnings, cautions and notes in the flight manual.

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 of any special item not directly related to safety but which is important or unusual.

1.4 Descriptive data

Glasflügel 304 C is single-seat all-fiberglass construction (GRP) sailplane of FAI standard class.

Sailplane description

Fuselage

The fuselage tapers behind the wing, the faired-in one piece canopy is hinged forward.

The fuselage shell is of GRP single skin construction, therefore capable of large energy absorption. The fuselage shell is supported by GRP profile frames.

The pilot is seated in a semi-reclining position.

The landing gear is retractable.

A C.G. release is fitted as standard, and an Aerotow nose release can be fitted on request.

Wing

The two-piece wing is cantilever and double trapezoidal. It is constructed as a GRP-Foam-Sandwich shell with spar caps of parallel glass fibers, extruded by a method developed by Hütter and Hänle, and shear webs of reinforced GRP-Foam-Sandwich. The air brakes are located only on the wing upper surface aprox. in one third of wing semi-span. The ailerons have an internal drive thus the wing skin is not disturbed.

The two replaceable water ballast bags can carry up to 115 liters i.e. 25.3 Ukgal, 30.4 USgal.

Horizontal Tail Unit

The horizontal tail unit consists of a stabilizer and elevator. Trimming is by means of a leaf spring on the control column, adjustment is possible by a touch-button on the handgrip of the control column. The stabilizer is of GRP-Foam-Sandwich construction.

Vertical Tail Unit

The fin and the rudder are similarly as the stabilizer of GRP-Foam-Sandwich Shell construction. The rudder has an internal drive thus the fuselage outline is not disturbed.

Cockpit interior

Headrest, backrest and rudder pedals are adjustable in flight. Seat cushions are as well the sailplane standard equipment.

The instrument panel is tilted together with the cockpit canopy, which make possible easy boarding.

The cockpit ventilation is provided by the slots through the instrument panel support. Fresh air is brought to the pilot by the butterfly outlets located on both sides of the instrument panel. If necessary the canopy sliding window (DV) may be also used for ventilation.

A battery box, barograph tray, and a water ballast system are installed in the cockpit, as well.

Basic Technical Data

Wing

Span	15	m	*49.21 ft*
Wing area	9.88	m^2	*106.35* ft^2
Aspect ratio	22.78		

Fuselage

Length	6.45	m	*21.16 ft*
Width	0.62	m	*2.03 ft*
Height	1.36	m	*4.46 ft*
Cockpit height	0.83	m	*2.72 ft*

Horizontal Tail Unit

Span	2.1	m	6.89 ft
Area	0.99	m^2	*10.66* ft^2
Aspect ratio	4.42		

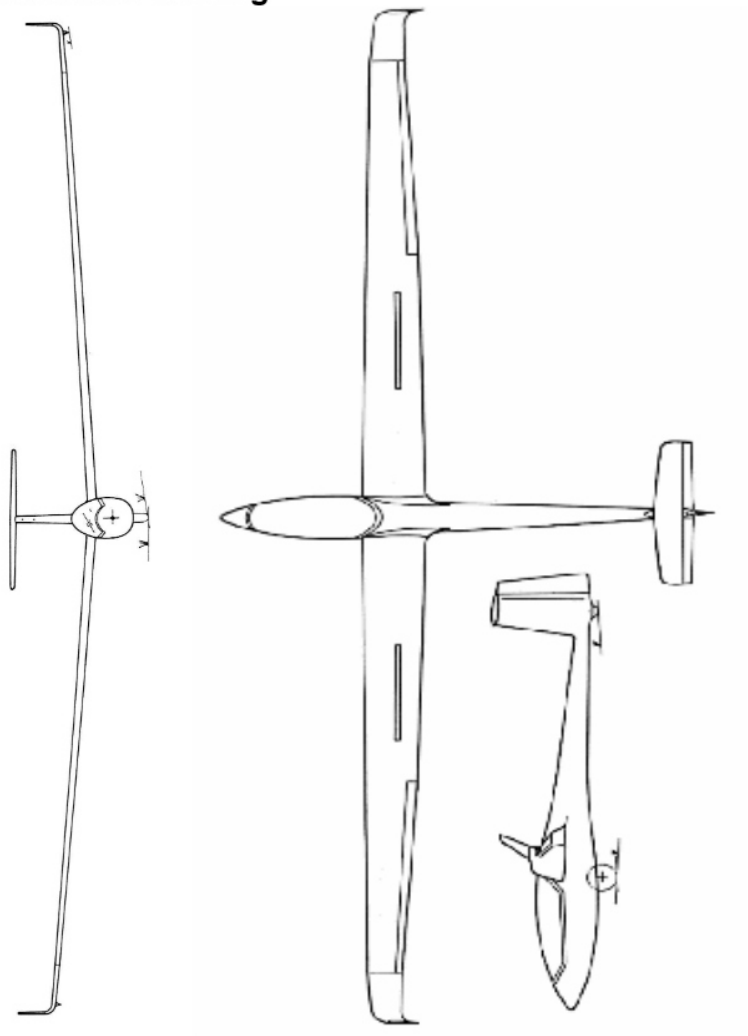
Vertical Tail Unit

Height	1.15	m	*3.77 ft*
Area	0.89	m^2	*9.58* ft^2
Aspect ratio	1.49		

Landing gear

Main wheel	5,00x5
Tail wheel	210x65

1.5 Three-view drawing



SECTION 2

2. Limitations

2.1 Introduction

Section 2 includes operating limitations, instrument markings, and basic placards necessary for safe operation of the sailplane, standard systems and standard equipment.

The limitations included in this section and in Section 9. have been approved by the CAA, Czech Republic.

2.2 Airspeed

Airspeed limitations and their operational significance are shown below:

	Speed	IAS [km/h]	*KIAS*	IAS [mph]	Remarks
V_{NE}	Never exceed speed	250	*135*	155	Do not exceed this speed in any operation and do not use more than 1/3 of control deflection
V_{RA}	Rough air speed	200	*108*	124	Do not exceed this speed except in smooth air, and then only with caution. Examples of rough air are lee-wave rotor, thunderclouds etc.
V_A	Maneuvering speed	200	*108*	124	Do not make full or abrupt control movement above this speed, because under certain conditions the sailplane may be overstressed by full control movement.
V_T	Maximum aerotowing speed	150	*81*	93	Do not exceed this speed during aerotowing
V_W	Maximum winch-launching speed	150	*81*	93	Do not exceed this speed during aerotowing

CAUTION

Keep in mind, that a difference between Indicated Air Speed (IAS) shown by your airspeed indicator and True Air Speed (TAS) is increasing with an altitude increase.

This has no influence on the sailplane strength or load, however due to flutter safety the IAS limits shown in table below must not be exceeded in given altitudes.

Altitude		**Never exceed speed v_{NE} IAS**		
[m ISA]	***[ft ISA]***	**[km/h]**	***KIAS***	**[mph]**
0 - 4 000	*0* - *13 000*	250	*135*	*155*
5 000	*16 000*	240	*130*	*149*
6 000	*19 500*	226	*122*	*140*
7 000	*22 900*	214	*116*	*133*
8 000	*26 000*	202	*109*	*126*
9 000	*29 500*	191	*103*	*119*
10 000	*32 700*	179	*97*	*111*
12 000	*39 300*	159	*86*	*99*

2.3 Airspeed indicator markings

Airspeed indicator markings and their color-code significance are shown below:

Marking	Value or range IAS			Significance
	[km/h]	*KIAS*	[mph]	
Green arc	94-200	*51-108*	58-124	Normal operating range
Yellow arc	200-250	*108-135*	124-155	Maneuvers must be conducted with caution and only in smooth air
Red line	250	*135*	155	Maximum speed for all operation.
Yellow triangle △	85	*46*	53	Approach speed at maximum weight without water ballast

2.4 Weight

Max. take-off weight ..... 450 kg *992 lbs*
Max. landing weight ..... 450 kg *992 lbs*
Max. weight of all non-lifting parts..... 240 kg *529 lbs*
(i.e. all parts incl. cockpit and baggage compartment load, with water ballast inside the wing)
Maximum weight at basic aerobatic maneuvers..... 380 kg *838 lbs*
Maximum weight without water ballast ..... 380 kg *838 lbs*
Maximum weight in baggage compartment . 10 kg *22 lbs*
(incl. all installed equipment)

Maximum water ballast weight is shown in table as follows:

Empty weight	Cockpit load					
	65 kg *143 lbs*	70 kg *154 lbs*	80 kg *176 lbs*	90 kg *198 lbs*	100 kg *220 lbs*	110 kg *242 lbs*
230 kg *507 lbs*	115 kg *254 lbs*	115 kg *254 lbs*	115 kg *254 lbs*	115 kg *254 lbs*	115 kg *254 lbs*	110 kg *242 lbs*
240 kg *529 lbs*	115 kg *254 lbs*	115 kg *254 lbs*	115 kg *254 lbs*	115 kg *254 lbs*	110 kg *242 lbs*	100 kg *220 lbs*
250 kg *551 lbs*	115 kg *254 lbs*	115 kg *254 lbs*	115 kg *254 lbs*	110 kg *242 lbs*	100 kg *220 lbs*	90 kg *198 lbs*
260 kg *573 lbs*	115 kg *254 lbs*	115 kg *254 lbs*	110 kg *242 lbs*	100 kg *220 lbs*	90 kg *198 lbs*	80 kg *176 lbs*
270 kg *595 lbs*	115 kg *254 lbs*	110 kg *242 lbs*	100 kg *220 lbs*	90 kg *198 lbs*	80 kg *176 lbs*	70 kg *154 lbs*
280 kg *617 lbs*	105 kg *231 lbs*	100 kg *220 lbs*	90 kg *198 lbs*	80 kg *176 lbs*	70 kg *154 lbs*	60 kg *132 lbs*

CAUTION

The shaded cockpit load requires a check, whether the maximum weight of all non-lifting parts (240 kg, 529 lbs) will not be exceeded.

The maximum baggage weight is 10 kg, 22 lbs including installed equipment and must be considered when establishing the maximum water ballast weight according to the table above.

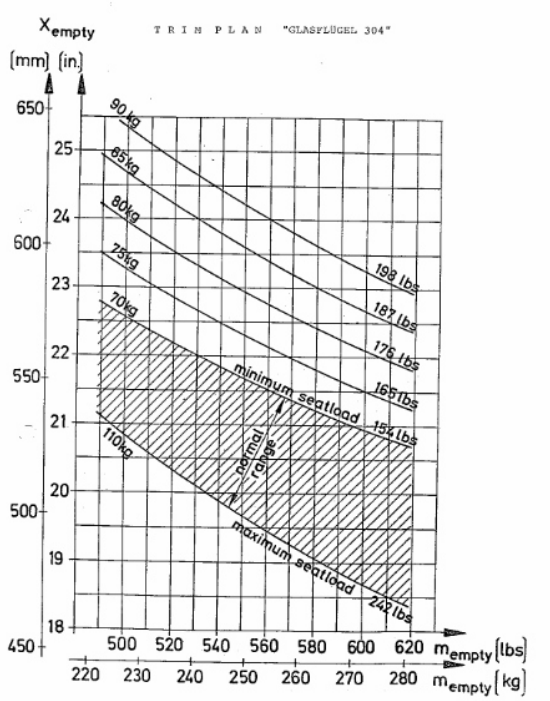
2.5 *Center of Gravity*

Permitted C.G. range in flight.....24.5-42.8 %MAC

i.e.....200-325 mm

behind a reference point – point on the leading edge of the wing root section.

Empty sailplane C.G. position for the cockpit load within 70-110 kg (154-242 lbs) must fit into the crosshatched area in the following diagram:



If the pilot with a parachute does not reach the placarded minimum cockpit load, the appropriate amount of lead ballast must be carried in the nose. One kg of lead ballast (2.2 lbs) in the ballast box will compensate for 2.4 kg (5.3 lbs) of the pilot's weight. Maximum lead ballast capacity of the ballast box is 6 kg (13.2 lbs).

Suitable lead ballast plates are available from HPH Ltd. .

The empty sailplane C.G. may fit in some cases above or below the crosshatched area of the diagram and the maximum cockpit load is less than 110 kg (242 lbs) or minimum cockpit load is higher than 70 kg (154 lbs). In such case the modification should be approved, at first, as well as recorded in the appropriate documents.

2.6 Approved maneuvers

This sailplane is certified in the UTILITY category.

Approved maneuvers and input air speeds are shown in the following table:

Maneuver	Input IAS		
Spin	60 km/h	32 KIAS	37 mph
Lazy eight	180 km/h	97 KIAS	112 mph
Inside loop	200 km/h	108 KIAS	124 mph
Stall turn (Hammerhead)	200 km/h	108 KIAS	124 mph

2.7 Maneuvering load factors

This sailplane is certified in the UTILITY category.

The following load factors may not be exceeded during maneuvers:

n = +5.3 at air speed V_A = 200 km/h, 108 KIAS, 124 mph

-2.65 air brakes retracted

n = +4.0 at air speed V_{NE} = 250 km/h, 135 KIAS, 155 mph

-1.5 *air brakes retracted*

n = +3.5 *air brakes extended*

2.8 Flight crew

Number of seats 1
Minimum cockpit load..... 70 kg 154 lbs
Maximum cockpit load..... 110 kg 242 lbs

WARNING

If the weight of pilot with parachute does not reach the minimum cockpit load placarded, than appropriate amount of lead ballast must be installed.

2.9 Kinds of operation

There are permitted day VFR flights and cloud flying, only.

WARNING

Intentional flights in icing conditions are PROHIBITED.

2.10 Minimum equipment

The instruments as well as the appropriate parts of the minimum equipment must be of an approved type.

Minimum equipment

- 1 Airspeed indicator (color marked as in par.2.3.)
- 1 Altimeter
- 1 set of four-point safety harness
- 1 automatic or manual parachute, otherwise back-cushion of 100 mm (4 in) thickness if compressed
- 1 Sailplane Flight Manual
- Limitation placards in the cockpit

Minimum equipment for cloud flights, additionally to the Minimum Equipment :

- 1 Magnetic compass
- 1 Vertical speed indicator
- T/B indicator

as well as other equipment as required by the national regulations

Equipment for the basic aerobatic maneuvers

(Refer to 2.6 for approved maneuvers)

Next to the minimum equipment the following is recommended:

- 1 g-meter marked with the red radials at +5.3 and –2.65 g.

WARNING

Basic aerobatic maneuvers may be performed only without water ballast (max. weight 380kg, 838 lbs).

2.11 Aerotow and winch-launching

The standard sailplane is fitted with the C.G. release for a towing rope.

Maximum aerotowing speed V_T ..... 150 km/h, 81 KIAS, 93 mph

Maximum rope or weak-ling strength6400 N

For aerotow takeoffs the approved synthetic or natural ropes of 30-60 m (98-296ft.) length may be used.

If a nose hook is installed, we recommend to use this one.

Nevertheless the C.G. hook is approved for aerotow, too.

Winch-launching takeoff

Maximum winch-launching speed V_w. 150 km/h, 81 KIAS, 93 mph

WARNING

Never use the nose release (if installed) for winch-launching takeoff

2.12 Other limitations

No smoking inside the sailplane !

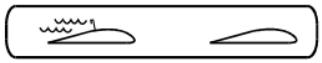
Maximum weight of instrument panel .....10 kg..... 22 lbs

2.13 Limitations placards


CANOPY JETTISON

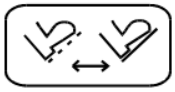

CANOPY LOCK


TOW RELEASE

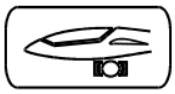

AIRBRAKES


VENTILATION

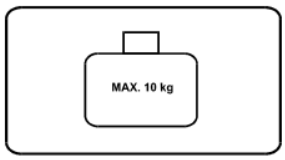

UNDERCARIAGE


RUDDER PEDAL ADJUSTMENT


BACK-REST ADJUSTMENT


WHEEL BREAK

TRIM



MAX. LUGGAGE COMPARTEMENT

WEIGHT

MAX. TAKEOFF WEIGHT	450	kg	992	lbs
MAX. WEIGHT FOR AEROBATIC	380	kg	838	lbs
MAX. WEIGHT OF NON-LIFTING PARTS	240	kg	529	lbs
PERMITTED COCKPIT LOAD	70÷110	kg	154-242	lbs

NOSE BALLAST

BALLAST		MIN. WEIGHT OF PILOT	
1.5 kg	3.3 lbs	66.4 kg	146 lbs
3 kg	6.6 lbs	62.8 kg	138 lbs
4.5 kg	9.9 lbs	59.2 kg	131 lbs
6 kg	13.2 lbs	55.6 kg	123 lbs

PERMITTED AEROBATIC MANOEUVRES

SPIN — LAZY EIGHT

STTALL TURN — INSIDE LOOP

AEROBATIC MANOEUVRES ARE PERMITTED ONLY WITHOUT WATER BALLAST

MAX. WEIGHT 380 KG 838 LBS

AIRSPEED IAS

V_{NE}	Never exceed speed						
up to	4000 m / 13000 ft	250	km/h	135	KIAS	155	mph
up to	7300 m / 24000 ft	210	km/h	113	KIAS	130	mph
up to	10950 m / 36000 ft	170	km/h	92	KIAS	106	mph
V_A	Maneuvering speed	200	km/h	108	KIAS	124	mph
V_{RA}	Rough air speed		200 km/h	108	KIAS	124	mph
V_T	Max. aerotowing speed	150	km/h	81	KIAS	93	mph
V_W	Max. winch-launching speed	150	km/h	81	KIAS	93	mph

SECTION 3

3. Emergency procedures

3.1 Introduction

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur.

3.2 Canopy jettison

1. Grasp (from below) the red grips (right and left of the canopy frame)
2. Pull them back
3. Push the canopy upward.

3.3 Bailing out

1. Direct the sailplane to an uninhabited place
2. Canopy jettison acc. to 3.2
3. Release safety harness and spread them aside
4. Bend you legs under the body
5. Roll over the cockpit frame

3.4 Stall recovery

1. Push the control stick forward
2. After stall recovery transit to gliding.

3.5 Spin recovery

1. Control stick - ailerons in neutral position
2. Rudder pedals - full deflection opposite to the direction of the spin
3. Control stick - Release back pressure on the control stick until the rotation stops
4. Neutralize rudder and recover the dive

3.6 *Spiral dive recovery*

1. Balance the bank by coordinate use of rudder and ailerons controls
2. Recover the dive

3.7 *Other emergencies*

3.7.1 Wingtip catching in high grass during takeoff

Take-Off's from not mowed grass runways should be avoided both for aerotow and winch-launching.

Should a wingtip be caught in high grass, release immediately, delaying this may result in a ground loop.

3.7.2 Cable chute opening during winch-launching

In the early phase of a winch-launching, the cable chute may open if it's size is too large or if the climb is too flat.

In such case release immediately and land straight ahead.

3.7.3 Towing rope release at low height

A speed within 85-90 km/h (46-49kts, 53-56mph) should be maintained after release at low height in straight and level flight (the speed increases up to 15 % with water ballast!). In a turn the speed should be increased according to the angle of bank. In this manner the unintentional and unnoticed stalled flight will be avoided.

3.7.4 Slight vibrations and spongy controls before the stall

Should you detect a slight vibration, with "spongy" controls and the air speed indicator varying between 65- 85 km/h (35-46 KIAS, 40-53 mph), the sailplane is in stalled flight. Move the control stick forward, at once.

SECTION 4

4. Normal procedures

4.1 Introduction

Section 4 provides checklist and amplified procedures for the conduct of normal operation. Normal procedures associated with optional systems can be found in section 9.

4.2 Rigging and de-rigging

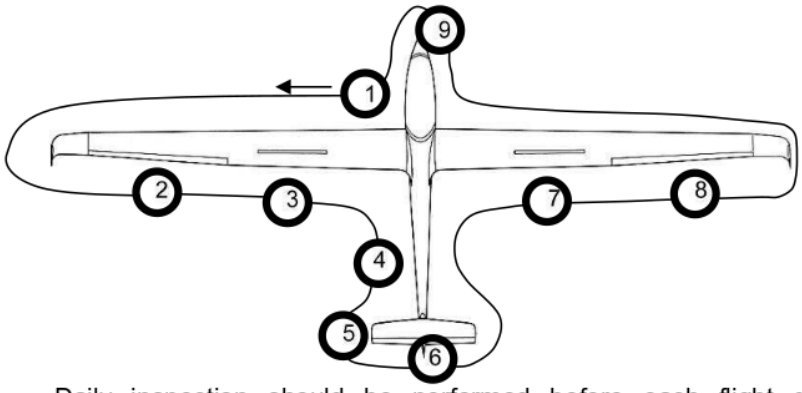
Rigging

1. Clean and grease pins and bearings.
2. In the cockpit, the airbrake lever is set in the central position, and the water ballast lever set in the closed position.
3. First rig Port wing, temporarily lock with the main pin by engaging it only into the front spar fork bush.
   Pay attention that the bellcranks on the root rib are in their neutral position and are actually engaging into the opposing socket fittings on the fuselage.
4. Rig Starboard wing with the same lever settings as Port wing, and pull together with rigging tool.
   Ensure correct engagement of control as with Port wing.
5. Momentarily remove main wing spar pin. When bushes line up push pin in and lock.
6. Check aileron and airbrake functions.
7. Push tailplane onto the rigging - drive pins and pull out front connection pin with tool, push tailplane L.E. down and push front connection pin fully into position, remove tool. Check that the elevator rigging-drive pins are actually correctly engaged into their opposing elevator fittings (move elevator).
8. Tape off gaps.

De-rigging

1. Pull front tailplane connection pin out, with the help of the tool, and lift up tailplane.
2. Lift wingtips and remove main pin.
3. With the help of the rigging tool, or by pulling on the wingtips, separate the wings from the fuselage.

4.3 Daily inspection



Daily inspection should be performed before each flight day opening, both after rigging the sailplane and parking in a hangar. When inspecting the sailplane check for cracks in surface finish, blisters or uneven surface, and if in doubt, check with authorized, specialized personnel.

1

a) Open the cockpit, check if the main pin is installed and locked.
b) Visual cockpit control inspection.
c) Remove foreign material from fuselage.
d) Check tire pressure of main wheel

Tire size	*5.00-5*
Takeoff weight [kg]	**Main wheel pressure [kPa]**
350	250
400	300
450	350

e) Check function of tow release, condition and spacing of cable deflector plates.

2

a) Check ailerons for full and free movement.

3

a) Check air brakes for free movement and close fit.

b) Check aileron trailing edges for damage.
Lightly shake ailerons on the trailing edge to detect unusually large play in the system.

c) Check hinges for any damage.

4

a) Check if the holes for static pressure on the fuselage shell are clear.

5

a) Check if the front stabilizer attachment bolt is engaged.

b) Check for blocked Pitot, gently blow into the Pitot to check ASI function.

c) Fit compensatory tube and check line. When blowing against tube, the connected vertical speed indicator registers "climb".

d) Check tire pressure in tail wheel...150 kPa.

6

a) Check elevator and rudder for free and full movement.

b) Check elevator and rudder for damage,
lightly shake by hand on trailing edge to check for unusually large play in system.

7

Refer to 3.

8

Refer to 2.

9

Check the function of the nose release mechanism (if installed).

After a hard landing, or excessively high "G" loads,

the bending frequency of the wings must be checked and the sailplane carefully examined for any indications of damage.

Dismantle the sailplane and check surface finish for cracks. Look for white areas (that may indicate delamination) at the wing spar root ends, wing root rib fittings, landing gear attachments, tail fittings, and all areas of concentrated loads. Also inspect the central wing pin and tail attachments for distortion. If damage is found, the sailplane should be grounded until any repairs have been completed.

4.4 Preflight inspection

- Parachute correctly fitted?
- Safety harness correctly and firmly adjusted?
- Backrest and pedals locked in comfortable position?
- All controls and instruments within easy reach?
- Airbrakes locked?
- Control check?
- Free, full and correct movements of controls?
- Correct trim position?
- Canopy locked?
- Release check?
- Towline on correct release - correct weak-link?
- Set Altimeter!

4.5 Normal procedures and recommended speeds

4.5.1 Takeoff and climbing

Aerotow

Approved ropes made of synthetic and natural fibers with length from 30 to 60 m (98 - 196ft.) may be used for aerotowing.

If a nose hook is installed, we recommend to use this one.

Nevertheless the C.G. hook is approved for aerotow, too.

When commencing the take-off run, use wheel brake slightly to prevent rolling over tow rope.

Before takeoff adjust the trim depending on the cockpit load. The trim should be in neutral position if the sailplane C.G. ranges from forward to medium position. If the C.G. ranges from medium to rear position, then trim "nose heavy".

After lift-off and when a speed of about 75-80 km/h (40-43KIAS, 47-50 mph) is reached (this speed is increasing up to 15 % with the water ballast), adjust the trim to decrease elevator control forces.

Normal towing speed ..	100-120	km/h	54-65	KIAS	62-75	mph
Max. aerotowing speed.....	150	km/h	81	KIAS	93	mph

The main landing gear can be retracted during tow.

Should the sailplane be unintentionally displaced laterally, it should be cautiously but immediately steered back to normal aerotow position. Should the sailplane be displaced vertically too high, with a danger of over-flying the tow aircraft, the air brakes should be open.

Rope release:

Pull the release knob several times to be sure, that the rope was released.

Winch-launching

WARNING

NEVER use the nose release mechanism (if installed) for winch-launching!

Before takeoff adjust the trim depending on the cockpit load. The trim should be in neutral position if the sailplane C.G. ranges from forward to medium position. If the C.G. ranges from medium to rear position, then trim "nose heavy".

When commencing the take-off run, use wheel brake slightly to prevent rolling over tow rope.

This sailplane shows normal behavior during winch-launching and even with rear C.G. positions has only a minor tendency to enter into a steep climb after take-off. Depending on the trim-setting, a correction with the elevator may be necessary to prevent a steep climb in the early take-off phase.

After a safety height of approx. 50m (150ft) is reached, the sailplane can be brought into a steeper climb by more back pressure on the control column. If too much back pressure is applied and proposing occurs (elevator stall), release some of the back pressure.

Avoid rapid lift-off maneuvers or low towing speeds.

The high wing loading of this sailplane requires the pilot to abort the take-off and release, if the towing speed drops below 95 km/h, 51 KIAS.

WARNING

The low performance winches with limited engine RPM and other limitations, as well as the takeoff at the tail wind conditions, calm air, filled water tanks etc., require special attention before take-off, to ensure that the winch is providing enough power in reserve to maintain the safe towing speeds.

If possible, use small cable chutes to prevent deploying at flat climb angles.

Max. winch-launching speed V_W	150	km/h	81	KIAS	93	mph
Normal minimum towing speed..	105	km/h	57	KIAS	65	mph
with water ballast.....	120	km/h	65	KIAS	75	mph

At maximum towing height, the cable will back release automatically, however, you should not neglect to pull the release knob several times.

4.5.2 Flight

At a safe altitude, experiment with the air brakes and note loss of height at various speeds.

This sailplane has very well balanced flight characteristics and controls. The rate of roll from 45° bank at 1.4 times stalling speed is 3.5 sec.

On the other hand, it is possible to fly with free controls in straight and level or circling flight without the sailplane changing its attitude or speed. All control movements require only very low operating forces.

4.5.3 Approach and landing

The normal approach speed with air brakes fully extended and the extended landing gear is approx. 85-90 km/h (46-49 KIAS, 53-56 mph) at the landing weight of 380 kg (838 lbs).

The corresponding gliding ratio is then approx. 1:5. The minimum approach speed is 80 km/h (43 KIAS, 50 mph).

Immediately before touch-down, the air brakes should be always open fully.

The approach speeds have to be increased of approx. 10 km/h (5.4 KIAS, 6.2 mph) at the landing weight of 450 kg (932 lbs).

For steep approaches (e.g. in strong ground turbulence or when approaching over high obstacles) the air brakes are fully extended, and the glide angle is controlled with the elevator.

Excessive height can thus be reduced without increasing approach speed noticeably.

WARNING

The water ballast (if filled) should be emptied before landing.

If a sideslip is used to reduce the approach height with air brakes and landing gear extended, than apply only 1/2 of rudder pedal deflection. If higher deflection is used than the rudder is affected by the wake behind the air brakes and the vibration of the sailplane may occurs. If the rudder full deflection is applied than the rudder suction will occur.

If the vibration during a sideslip occur, reduce the air brakes extension to 1/2 of full deflection and recover level flight, than the air brakes may be fully extended again.

4.5.4 Flying with water ballast

The use of water ballast is not of benefit when climbing at the average climbing speeds less than 1.5m/sec (300 ft/min).

This is valid also for flights in tight thermals, which require steep angles of bank.

Prior to adding water ballast, check the table in 2.4 for the maximum weight of water ballast. The total capacity of the bags in the wings is 115 liters (25.3 UKgal, 30.4 USgal). Fill through the valves in the lower surface of the wings. Let the actuating lever in "close" position, fill left bag, disconnect the filler tube from the valve (it will be closed automatically), fill right bag by the same steps as the left.

WARNING

Bags must not be pressurized, e.g. fill directly from the water hose.

Both bags must be filled equally.

Do not add water ballast below O℃ (32 °F), because of freezing danger.

The water ballast should be emptied before landing.

It takes about 4 minutes when the bags were full.

Never store the sailplane with filled bags. Always drain off water and open the valves to vent the water bags.

4.5.5 High speed flight

During high speed flight, pay attention to the never exceed speed. Refer to 2.2 and 2.3 for the Airspeed limits and Airspeed Indicator Marking.

Aileron and rudder full deflections may be applied up to the Maneuvering speed Full control deflections of aileron and rudder are allowable up to V_A=200 km/h IAS (108 KIAS, 124 mph).

Only 1/3 of the aileron and rudder full deflections may be used at Never exceed speed V_A=250 km/h IAS (135 KIAS, 156 mph).

Elevator deflections must be limited, as well, to not exceed the load factors shown in 2.7.

During extreme turbulence, as it may occur for instance in wave rotors, thunderclouds, visible up-currents (stubble fire), or while crossing mountain ranges, the maximum speed in rough air V_{RA} 200 km/h (108 KIAS, 124mph) should not be exceeded. The necessary control column travel is relatively small from the stalling speed to the maximum speed, in particular at rear C.G. positions, however any speed change will be noticed by a change of the control forces.

The air brakes can be open up to V_{NE} = 250 km/h (135 KIAS, 155 mph), however this should only be done in an emergency or when unintentionally exceeding the maximum permissible speeds shown in 2.2, which is indicated by a sudden deceleration.

For this reason, ensure that your harness is tight, and that you do not unintentionally move or jolt the control column while operating the air brake lever. Loose objects in the cockpit should be avoided, as well.

4.5.6 Slow speed flight – stall characteristics

For familiarization with ***Glasflügel 304 C*** sailplane, we recommend to perform stalling tests from a straight and level flight, and from a turn of 45° bank.

The tests should be done of course at a safe altitude.

Refer to Section 5. par. 5.2.2 for the sailplane stalling speeds.

With closed air brakes, a stall warning occurs as a light buffeting and vibration and oscillation of the ASI needle towards the stalling speed. If the air brakes are extended, the airframe vibrates noticeably at approx. 5km/h (2 kts, 3mph) above the stalling speed. If the control column is slowly pulled back, a stall occurs, which is evidenced by a downward pitching motion or rolling motion.

The back pressure on the control column should then be immediately released. If the air brakes are extended, the loss of altitude after wing drop is approx. 50m (150 ft).

With medium and forward C.G. positions you can produce and correct roll and yaw during stall. This is shown itself by "spongy" controls, increasing of the sinking speed and oscillation of the ASI needle.

4.5.7 Cloud flying

The spin should not be used as a safety escape outside a cloud, as the sailplane may change over into a spiral dive.

It is rather recommended to open the air brakes fully at speed of 130 km/h IAS (70 KIAS, 81mph) and at load factor above 2 "G". At speeds above 150 km/h IAS (81 KIAS, 93 mph) the air brakes should not be closed, as this sailplane, owing to its very steep glide path, may exceed the never exceed speed.

Minimum equipment for the cloud flying is listed in 2.10.

4.5.8 Flights below zero

The control system friction may increase when the temperature is below zero degrees of Centigrade, as well as during winter flying.

Ensure that all control elements are free of moisture to prevent freezing. This, in particular, applies to the AIR BRAKES.

Continuously operate controls and air brakes at short intervals. During flights with water ballast, note the recommendation under 4.5.4.

4.5.9 Flight in rain

Neither any special actions are required when flying in rain nor the flight characteristics are significantly affected.

4.5.10 Aerobatics

Refer to 2.6 for Approved maneuvers

Inside loop

Slightly push the control stick forward to increase sailplane speed above 180 km/h IAS (97 KIAS, 112 mph) (recommended is 200 km/h, 108 KIAS, 124 mph). Then continuously pull the stick so that the sailplane nose will be lifted and g acting on the pilot will increase continuously. After reaching the position with nose up, the control stick force will be slightly reduced due to speed decrease.

Continue to pull the stick and the speed will start to increase when exceeding the loop culmination point. To smoothly recover the loop release back pressure on the control stick, so that the loop remains smooth

Spin

Spins may be performed only at rear C.G. positions. With forward C.G. positions, this sailplane will enter a spiral dive. It should be terminated immediately by neutralizing all controls and recover.

To enter the spin, a dynamic stall has to be produced, and before nose drop, full rudder has to be applied into the direction of spin.

Entry speed: 60 km/h IAS, 32 KIAS, 37mph

Recovery speed: 150-180km/h, 81-97 KIAS, 93-112mph

The spin recovery is achieved by neutralizing the elevator and applying rudder against the rotation.

Stall turn(Hammerhead)

Slightly push the control stick forward to reach entry speed not less than 180 km/h IAS (97 KIAS, 112 mph) (recommended is 200 km/h, 108 KIAS, 124 mph). Lift the sailplane nose 60°-70° above horizon. When the speed drops at 130 km/h IAS (70 KIAS, 81 mph) start to gradually apply the rudder deflection into the required stall turn direction. As the rudder control force is decreasing, speed up the rudder deflection until its full deflection is reached.

Proportionally opposite ailerons may help to maintain the plane of turning.

After the sailplane turns its nose downward into opposite direction, neutralize ailerons and rudder, so that the sailplane flies out accurately into opposite direction (180°).

Recover gently without exceeding the load factors.

Lazy eight

Slightly push the control stick forward to reach entry speed not less than 180 km/h IAS (97 KIAS, 112 mph) (recommended is 200 km/h, 108 KIAS, 124 mph). Gradually pull the control stick while coordinately applying the ailerons and rudder to perform a climbing turn in required direction. At a speed of 120 km/h IAS (65 KIAS, 75 mph) change to gliding at 180 km/h IAS (97 KIAS, 112 mph) and gradually pull the stick while coordinately applying the ailerons and rudder to perform opposite climbing turn. The trajectory intersection is in the lowest point of the eight.

In steep turns, the following speeds, depending on load factor, and degree of bank, should not be less than :

Load factor	Angle of bank	speed
+2,0	60°	110 km/h 59 KIAS 68 mph
+2,5	65°	125 km/h 67 KIAS 78 mph
+3,0	70°	135 km/h 73 KIAS 84 mph
+3,5	73°	150 km/h 81 KIAS 93 mph

SECTION 5

5. Performance

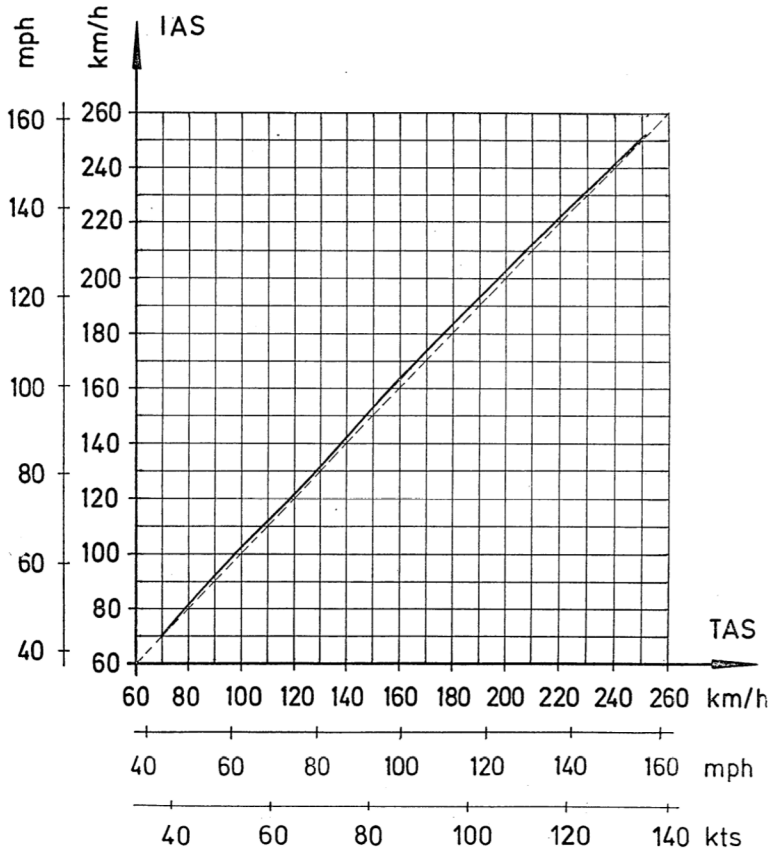
5.1 Introduction

Section 5 provides approved data for airspeed calibration, stall speeds and non-approved further information.

The data in the charts has been computed from actual flight tests with the sailplane using average piloting techniques.

5.2 Approved data

5.2.1 Airspeed indicator system calibration



5.2.2 Stall speeds

Air brakes	Takeoff Weight		
	350 kg 175 lbs	**400 kg 200 lbs**	**450 kg 225 lbs**
Retracted	60 km/h	75 km/h	81 km/h
	32 KIAS	40 KIAS	44 KIAS
	37 mph	47 mph	50 mph
Extended	67 km/h	80 km/h	85 km/h
	36 KIAS	43 KIAS	46 KIAS
	42 mph	50 mph	53 mph

With closed air brakes, a stall warning occurs as a light buffeting and vibration and oscillation of the ASI needle towards the stalling speed.

If the air brakes are extended, the airframe vibrates noticeably at approx. 5km/h (2 kts, 3mph) above the stalling speed.

If the air brakes are extended, the loss of altitude after wing drop is approx. 50m (150 ft).

5.3 Non-approved further information

5.3.1 Demonstrated crosswind performance

Winch-launching takeoff.....	25	km/h	6.9	m/s	13.5 kts
Aerotow takeoff	23	km/h	6.4	m/s	12.4 kts
Landing.....	23	km/h	6.4	m/s	12.4 kts

5.3.2 Speed polar

Not measured so far

SECTION 6

6. Weight and Balance

6.1 Introduction

6.2 Weight and Balance Record and permitted payload-range

6.1 Introduction

This Section contains the payload range within the sailplane may be safely operated.

Procedures for weighing the sailplane and the calculation method for establishing the permitted payload range and a comprehensive list of all equipment available for this sailplane and the installed equipment during the weighing of the sailplane are contained in the applicable Maintenance Manual, Document Number G304C/MM.

6.2 Weight and Balance Record and permitted payload-range

valid for Serial No.:

Date	Empty weight	Permitted cockpit load [kg] or [lbs]				Approved	
		with water ballast		without water-ballast			
		Max.	Min.	Max.	Min.	Date	Signature

Refer to Operating, Maintenance and Repair Manual, Document Number G304C/MM for minimum and maximum pilot weight calculation.

SECTION 7

7. GENERAL SAILPLANE AND SYSTEMS DESCRIPTION

7.1 Introduction

This Section provides description and operation of the sailplane and its systems. Refer to Section 9, Supplements, for details of optional systems and equipment.

7.2 Cockpit controls

The below listed controls marked by the appropriate placards (refer to 2.13) are installed in the cockpit.

More detailed description of some of the systems may be found below.

Control Column

The elevator is moved by a parallelogram system which prevents unintentional movements induced by gusts. The following buttons are mounted on the control column:

a) Radio button
press to transmit.

b) Spring trim button
depress with the little finger and release in any selected control column position.

c) Trim lever
can be adjusted manually when trim button is depressed.
Lever forward: nose heavy
Lever rearward: tail heavy

d) Wheel brake
It is controlled by means of the rudder pedals.

e) Tow Release
The yellow grip under the Port side of the instrument panel is activating both releases.

f) Air brakes
Air brakes are operated by a blue lever located on the port side of the cockpit
EXTEND: Unlock (inwards) blue lever on the Port cockpit side and pull towards the rear.
RETRACT: Push lever forward and lock.

g) *Canopy Lock*
The white grips on both sides of the cockpit frame serve for the canopy opening-closing.
Closing: Handle the canopy frame, pull it downward and push white grips forward until they snap.
Opening: Pull both white grips rearward and push canopy frame upward.

h) Cockpit Ventilation
Cockpit ventilation is operated with a black knob located on the instrument panel.
Pull the knob to open ventilation
Push the knob to close ventilation
Butterfly valve closed - air supply to the canopy only
Butterfly valve open - air supply to the pilot as well as to the canopy

i) *Water ballast*
Water ballast system is operated with a small lever located on the starboard cockpit side.
Lever at rear position: Valves open
Lever in forward position: Valves close

j) *Backrest adjustment*
Backrest position may be adjusted with a black "D" lever on the starboard cockpit side.

k) *Knee rests*
May be adjusted by means of the two air pumps

l) *Rudder pedal adjustment*
By pulling the black "T" - grip under the instrument panel, the panel adjustment is unlocked.
Forward adjustment: Pull black "T"-grip while pushing pedals forward with heels, release grip and let pedals lock into position.
Rear adjustment: Pull pedals back with black grip.

7.3 Instrument panel

7.4 Landing gear system

The sailplane is fitted with a retractable main wheel and auxiliary tail wheel.

The main landing gear is operated with a black lever located on the cockpit starboard side.

to retract: Unlock black handle, pull backwards, then lock.
to extend: Unlock, push black handle forward and lock.

To apply brake on the main wheel push by your heels on rudder pedals (if necessary the pedals position may be adjusted rearward of 1-2 notches prior to landing).

7.5 Seats and safety harness

The sailplane is fitted with an adjustable backrest as well as headrest.

The backrest position may be adjusted with a black "D" lever on the starboard cockpit side. To adjust the backrest position release the lever, release weight on the backrest and move your body forward; the backrest moves forward.

To adjust the headrest: Lift notched bar and adjust headrest position.

Both backrest and headrest may be adjusted in flight.

There are four-points safety harness.

7.6 Pitot and static system

The static pressure orifices are located on both sides of the fuselage. Total pressure is read in the fuselage nose. Keep the static pressure holes clean, refer to 0

Daily inspection.

7.7 Airbrake system

The air brakes are controlled with the blue lever located on the port side of the cockpit.

To extend the air brakes pull the lever rearward

To retract the air brakes push the lever forward

7.8 Baggage compartment

The baggage compartment may carry up to 10 kg (22 lbs) of baggage including all installed equipment, from that 5 kg (11 lbs) may be placed loose i.e. without fastening with the straps.

7.9 Water-ballast system

The water-ballast system is operated with a small lever located on the starboard side of the cockpit.

open valves – lever in rearward position

closed valves – lever in forward position

The two replaceable water ballast bags can carry up to 115 liters (25.3 UKgal, 30.4 USgal).

SECTION 8

8. Sailplane handling, care and maintenance

8.1 Introduction

This Section contains manufacturer's recommended procedures for proper ground handling and servicing of the powered sailplane. It also identifies certain inspection and maintenance requirements which must be followed if the sailplane is to retain that new-plane performance and dependability. It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered.

8.2 Sailplane inspection periods

Refer to the Operating, Maintenance and Repair Manual, Document Number G304C/MM for more information on the sailplane periodical inspections.

8.3 Sailplane alterations or repairs

It is essential that the responsible airworthiness Authority be contacted prior to any alterations on the sailplane to ensure that the airworthiness of the sailplane is not compromised.

Refer to the Operating, Maintenance and Repair Manual, Document Number G304C/MM for more information on the sailplane repairs.

8.4 Ground handling / road transport

The sailplane should only be stored or parked in well ventilated areas. Closed trailers should be equipped with sufficiently large ventilation. Always store with empty water tanks.

Take note to store the sailplane without stresses. This is particularly important at higher temperatures.

Because of their slim shape, it is particularly important to store the wings correctly. They should be stored with the L.E. pointing downwards and supported under the wing root spar at approx. 2.4 m (7.9 ft) from the wingtip, in a profile true wing sling.

Fuselage is correctly stored in a wide fuselage molding in front of the C.G. release, and supported by the tail wheel.

The Tailplane is stored in two profile true slings, separated 1.5-2m (5 -6.6 ft.), and with the L.E. pointing downward.

Under no circumstances attach the tailplane into the trailer by using the tailplane main attachment fittings.

Sailplanes which stay rigged for the whole year or longer periods, should be attended to, so that rigging elements on the fuselage, wing and tailplane do not corrode.

Dust covers should be used and are highly recommended.

The sailplane should not be parked in the open with the canopy in the open position, as this may act as a concave mirror, and depending on direction of sun-radiation, constitutes a fire hazard.

A tail dolly should always be used for ground-handling this sailplane, to prevent unnecessary vibration of the tailplane, and stresses and wear to its attachment fittings.

When ground-handling, do not push at wingtips, but rather close to the fuselage.

8.5 Cleaning and care

Wash the surface only with clean water, sponge and chamois.

Never use petrol, alcohol or thinners.

Soap additives in water should not be used too often.

Polish as often as you wish, but take care not to heat up the surface when using a polishing machine, as otherwise the surface quality will suffer.

Exposure to moisture should be avoided, as with all other sailplanes.

Protect from intensive sun-radiation (heat), and unnecessary permanent load.

Please note that the surface of all parts which are exposed to sun-radiation must be colored white.

Colors other than white will increase the heat build-up in the GRP, so that insufficient strength will result.

SECTION 9

9. Supplements

9.1 Introduction

9.2 List of inserted supplements

Date of insertion	Doc.No.	Title of inserted supplement

9.3 Supplements inserted