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.

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 mainwheel.
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.

IV. 5 **Free flight**

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

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 flight and stalling**

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 = 1034 lbs	66 km/h (36 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 develope 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.

IV. 8 **Cloud flying**

The minimum instrumentation required for flying in cloud is:

Air speed indicator	Variometer	Turn and Slip
Altimeter	Compass	

Experience to date shows, that the ASI does not get affected by icing.

If the maneuvering speed is exceeded unintentionally, pull out the airbrakes to avoid overstressing.

In emergency open brakes and leave cloud at about 170 km/h ((92 kts, 105 mph).

Spin should not be used for rescue provision.

IV.9 Simple Aerobatics

The glider is licensed 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 accidently 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 height loss of about 80 m (262 ft.) per turn.

   Recovery: opposite rudder, neutralise stick and recover gently.

   It is necessary, to install canards on the fuselage nose to achieve stationary spinning during dualseater operation (e.g. for spin training). The canards will cause a nose up moment and therefore destabilize the glider during spinning. Nevertheless the heavier pilot should sit in the rear seat during flight, because stationary spinning is not possible with extreme forward C.G. locations (less than 337 mm/ 13.3 in.).
   The canards can be used through the complete permitted flight envelope. Nevertheless the canards should be removed during "normal" (non aerobatic) flights.
   During installation of the canards please note that the marking R/H and L/H on the canards is in reference to the flight direction.

4. Chandelle

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

Pull up to fly 90° 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. 10 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.
Fully extended the airbrakes increase the stalling speed: do not extend the airbrakes fully during the roundont to avoid heavy landings. Dont 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).

V. Rigging and derigging

S/N 3651

V. 1 Rigging

The fuselage must be held firmly in a horizontal position when rigging. It is recommended to use a fuselage stand or the trailer fittings are used.

The glider can be rigged by 4 people.

1. Wings

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

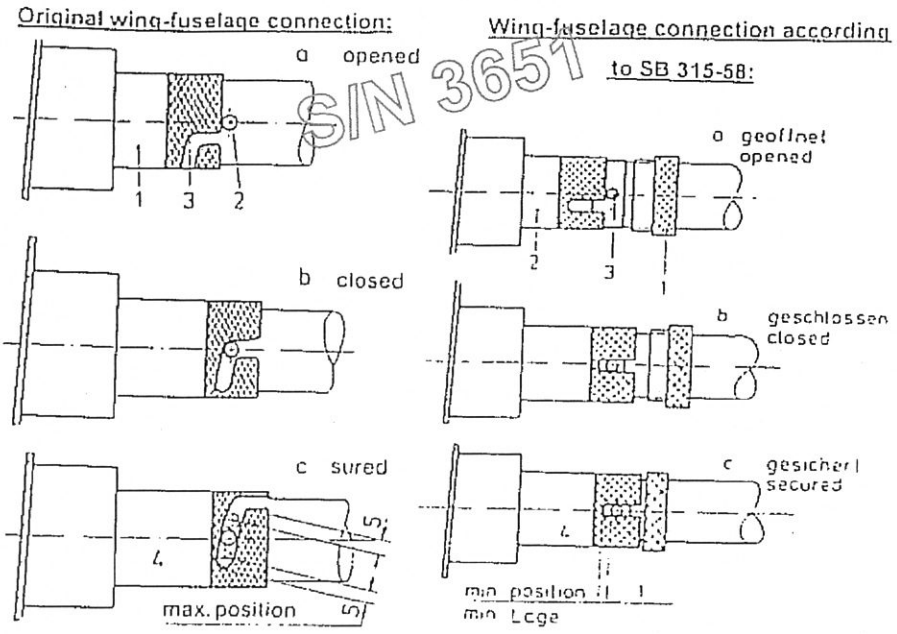
   Original wing-fuselage connection:

   To secure the wing fittings the safety catches (1) have to be turned so that the pins (2) are pressed to the angled slots.

   Moving the wing tip strongly to and fro enables the safety catches to be sufficiently turned (4). They should be hand tight and should not reach the end of the angled slot.

   Wing-fuselage connection according to SB 315-58:

   To secure the wing-fuselage connection in the closes position, the knurled nut (1) must be turned into the threaded socket (2) so that the socket is drawn against the red rings which are held by the guide pins (3).
   By means of moving the wing tips for and aft, the knurled nut 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.



Check: The red rings at the fuselage connection rods must be covered by the threaded sockets, the socket (or the knurled nut acc. to SB 315-58) must be tightened hand tight.

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

2. The aileron and brake connections lie behind the spar.

   The short connecting rods in the fuselage are fitted with quick lock fasteners which must be coupled onto the balls on the linkages that move inside the wings.

   After rigging the connections should be examined to check that the sprung catches are properly inserted so that they project some mm out of the locks.

   Also after coupling the quick-lock fasteners, check that the ball can not be extracted by twisting the lock back and forth. Do this gently with not more than 10 lbs pull. Check all the control connecting rods and locks in a methodical order.

3. Tailplane

S/N 3651

Before assembly is commenced the front cover must be opened and the rotating wing bolt pulled out to the limit. It is important to ensure, that the larger opening of the conical crillings in the inner rings of the horizontal stabilizer spar bearing fall to the rear. The tailplane can be positioned by standing behind the rudder. The tailplane can be rested on top of the fin with the elevator angled upwards so that the quick lock (System Hotellier) on the trimm tab push rod can be attached to the ball on the trimm tab horn and the quick lock (System Grob) on the elevator push rod can be attached to the bearing on the elevator horn. The front of the tailplane can then be lowered and pushed back onto the three pins. It is then necessary to tighten the wing bolt clockwise to secure the tailplane. The assembly is complete when the wing bolt is sufficiently tight that there is no play in any direction. The cover provides a safety measure as it can only be attached with the wing bolt horizontal. If necessary the wing bolt has to be turned a 1/4 turn to suit. Derigging is carried out in the opposite order and the wing bolt is turned anticlockwise and pulled fully out.

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

Checks to be made after assembly

S/N 3651

1. Check that the 4 main wing fittings are locked.
2. Check that aileron and brake quick-actions locks are properly located on the knobs.
3. Ensure that the tow hook is functioning correctly.
4. Test the operation of the wheelbrake and the tire pressure
5. Check that the tailplane is securely seated and that the elevator push-rod is connected, control the 4 markings.
6. Rudder movement.

Derigging

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

V. 2 **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.

V. 3 Transport

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

1. Fuselage

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

2. Wings

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

   The mounting under the aileron inboard end should be a shaped mounting block with a minimum length of 300 mm and height of 400 mm. The mounting must be padded with felt.

3. Tailplane

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

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

V. 4 Maintenance of the glider

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

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

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

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

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

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

The cables and pulley for the nose and belly hooks should be checked for wear during the yearly inspection.

The main wheel tyre pressure should be kept at 2.5 to 2.8 bar
nosewheel and tailwheel 2, 5 bar

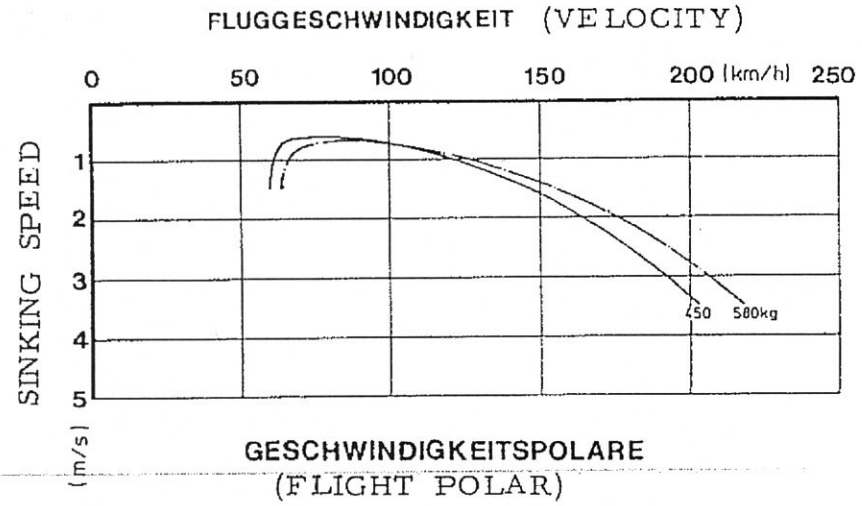
The wheelbrake of the "TWIN II" is a disk brake.
The master brake cylinder with the brake fluid reservoir is located under the baggage compartment.
The marks for the lowest and highest level of the hydraulic brake fluid have to be observed.

To fill up use ATE hydraulic brake fluid DOT 3.

VI. Appendices

VI. 1 Flight Performance

Flying weight	450(902)	580(1213)	kg (lbs)
Wing loading	25,3(5, 2)	32,6(6, 7)	kg/m² (lbs/ft²)
Best glide Angle	36,5	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)



GESCHWINDIGKEITSPOLARE
(FLIGHT POLAR)

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VI. 2 **Service and Maintenance Instructions**

S/N 9651

Regular service.

The following schedule of service should be carried out every 100 hours or at the annual inspection, which ever occurs first.

1. The entire glider should be checked for cracks, holes and bumps.
2. All fittings should be inspected for satisfactory condition (play, scores and corrosion).
3. All metal parts should be examined for corrosion, cracks, deformation and if necessary reconditioned and freshly protected.
4. Check that there is no play in the wing and tailplane to fuselage fittings.
5. The control linkages (Bearings, stops, fittings, hinges and control cables) should be inspected and replaced if there is evidence of bending or corrosion.
6. The controls including the brakes should be submitted to a functional test and the control deflections checked.
7. If the controls do not move free throughout their range, search for the cause and correct.
8. The mainwheel, nosewheel, tailwheel and the brake have to be checked.
9. The tow hooks should be treated in accordance with their appropriate maintenance manual.
10. Check the pitot for the ASI is clear and that the tubing to all instruments is in good condition and free of leaks or kinks.
11. The condition and calibration of all instruments should be checked and any other equipment inspected.

S/N 3651

VI. 3 Reference to Repairs

The attached repair instructions give information for the execution of minor repairs.

Major repairs, in accordance with the glider information sheet are only permitted to be carried out by an authorised aircraft works. Grob will name a company with the appropriate qualifications in any individual case.

VI. 4 Installation, maintenance and examination of the release hooks

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

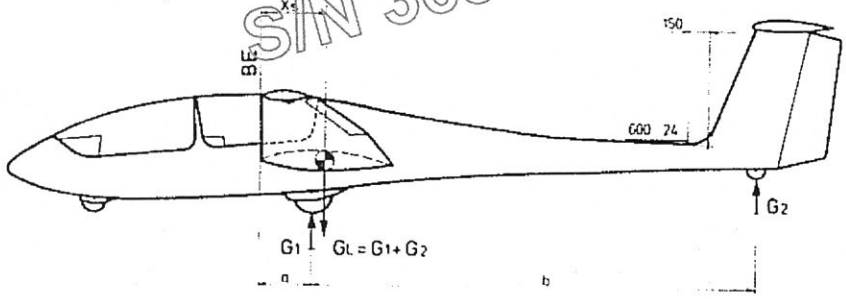
VI. 5 Determination of the Center of Gravity

The determination of the center of gravity is made with the undercarriage lowered and 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.

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 in front of the Datum Line (1. Seat)
40 mm behind the Datum Line (2. Seat)

Procedure for determining C. of G. empty



Datum Line: Front edge of the wing at the root

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.

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

The measurements to determine the empty weight, the empty weight C. of G. and the loading limitations must always be taken with the glider empty of waterballast.

	from	to	multiply with
Convertion	kg	lbs	2,2
	mm	inches	0,0394

Dezember 1980

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			
		Forward		Aft	
kg	lbs	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 admissable load for non-lifting parts must not be exceeded.

The weight of the non-lifting parts is the sum of the fuselage, tailplane and maximum load in the fuselage and must not exceed ~~400~~ 396 kgs (~~882~~ lbs) or 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.

Dezember 1980

FLIGHT MANUAL SUPPLEMENT

G103 Twin II

Serial No 3651

VH-GPF

OPERATING AT INCREASED FLYING WEIGHT

ISSUE: October 2004

ISSUED TO REFLECT CHANGES IN OPERATIONAL LIMITATIONS

G2001
15.12.04

compiled by
R. Gaissmaier

12/11/04`

Caution: This supplement applies **only** to the G103 Serial No 3651 VH-GPF

1. General

This aircraft has considerably heavier wings than normal for this type.
To enable it to carry a reasonable cockpit load, the wing bending moments have been recalculated for the actual component weights of the aircraft.
An increase of the maximum flying weight from 580 to 600 kg is possible without increasing the flight loads of the aircraft wing structure.

The max. weight of non lifting parts is reduced to 396 kg.
The permitted Centre of Gravity range remains unchanged.

For aerobatic flight the previous weight limit of 580 kg remains unchanged.

This Flight Manual supplement lists the changes to the:
Flight Handbook GROB G103 issued December 1980, last update Jan. 1984
It must be read in conjunction with this handbook.

Number of effective pages: 5

compiled by
R. Gaissmaier

12/11/04`

The following changes to the
'Flight Handbook G 103' apply:

I. General

I. 5 Description
Page 6,
Maximum Flying Weight **600** kg
Maximum Wing Loading **33.7** kg/sqm

II. Operating limits:

II. 1 Airworthiness Group
No changes

II. 2 Permitted operating conditions:
Page 6
2. Simple aerobatics as described are permitted only up to a flying weight of 580 kg.

3. Cloud flying is not permitted.

II. 3 Minimum Equipment
No changes

II. 4 Maximum speeds
No changes.

compiled by
R. Gaissmaier

12/11/04`

II. 5 Flight envelope
No changes

II. 6 Weight Limits
Page 8
Maximum Flying Weight **600** kg.
Maximum weight of non-lifting parts **396** kg

II. 7 Centre of Gravity Position
No changes

II. 8 Load scheme Twin II
Page 8
The maximum flying weight of **600** kg must not be exceeded.

II. 9 to II. 12
No changes

III. Emergency procedures

No changes

IV. Normal Operation

IV. 1 to IV. 5
No changes

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R. Gaissmaier

12/11/04`

IV. 6 Slow flight and stalling
Page17
The stall speeds at 600 kg are about 1.7% higher than stated for 580 kg
The stall speed without airbrakes is **41.2** kts
The stall speed with airbrakes is **46.8** kts

IV. 7 High speed flying
Page 17
The airbrakes limit the speed to under VNE in a 45° dive **up to a flying weight of 580 kg.**

IV. 8 Cloud flying
Page 17
Cloud flying is not permitted.

IV. 9 Simple Aerobatics
Page 18
Aerobatics as described are permitted only up to a flying weight of 580 kg.

IV. 10 Approach and Landing
Page 19
Normal flying practise is to approach at **52** kts

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R. Gaissmaier

12/11/04`

V. Rigging and Derigging

No changes

VI. Appendices

VI .1 Flight Performance

Page 24

At a flying weight of 600 kg the following data apply:

Wing Loading:	**33.7** kg/sqm
Best glide angle:	**37:1**
At a speed of	**58** kts
Minimum sink of:	**0.71 m/s (1.4 kts)**
At a speed of	**47** kts

VI. 2 to VI. 4

No changes

VI .1 Determination of Centre of Gravity

Page 28

The weighing procedures remain unchanged.

The permitted CofG range remains unchanged.

The maximum weight of the non-lifting parts must not exceed **396** kg….

compiled by
R. Gaissmaier

12/11/04`