

GROB

BURKHART GROB

LUFT- UND RAUMFAHRT GmbH & Co. KG
8939 Maitries

FLIGHT MANUAL

(PILOT'S OPERATING HANDBOOK)

Model : G 103 C TWIN III SL
Serial No. : 35037
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KOPP *U. Kopp* (Signature)

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

15. 12. 1992

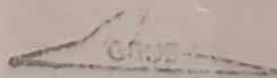
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Revision 3 + 4

09. 12. 1993

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LBA-Nr. I-B21

2.2 Airspeed

Airspeed limitations and their operational significance are shown below:

	Speed	IAS (km/h)(kts)		Remarks
V _{NE}	Never exceed speed	248	134	Do not exceed this speed in any operation and do not use more than 1/3 control deflection Altitude: 0-2000 m 0- 6562 ft -3000 m - 9842 ft -5000 m -16404 ft -7000 m -22966 ft -9000 m -29528 ft
V _{RA}	Rough air speed	175	94	Do not exceed this speed except in smooth air, and then only with caution. Examples of rough air are lee-wave rotors, thunderclouds etc.
V _A	Manoeuvring speed	175	94	Do not make full or abrupt control movement above this speed, because under certain conditions the motorglider may be overstressed by full control movement.
V _W	Max. winch-launching speed	140	76	Do not exceed this speed during winch- or autotow-launching
V _T	Max. aerotowing speed	140	76	Do not exceed this speed during aerotowing
V _P	Max. speed with engine power on	175	94	The max. permissible engine speed (6800 rpm) must not be exceeded (propeller in CRUISING position, engine at full power)
V _{POmin}	Minimum powerplant extension and retraction speed	90	48	Do not extend or retract the retractable powerplant outside of this speed range
V _{POmax}	Maximum powerplant extension and retraction speed	110	59	

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2.7 Center of Gravity

Center of gravity range: (for flight)	280 mm to 490 mm (11 to 19.3 in.) aft of reference datum
Reference datum:	Wing leading edge at the root rib
Aircraft attitude:	Incidence board 600:24 horizontally on upper side of fuselage in front of vertical stabilizer

The center of gravity range for flight must be strictly adhered to.

The permissible c.g. range will not be exceeded if the loading corresponds to the Weight and Balance Record in section 6.2, page 6.4 of this POH.

Too little mass in the pilot's seat must be compensated by trim ballast (see POH section 6.2, page 6.3).

For determination of the empty mass c.g. position, see Maintenance Manual, Section 7.

2.8 Approved Manoeuvres

This powered glider has been certificated for normal gliding flight and powered flight in the UTILITY airworthiness category. Aerobatic manoeuvres are not permitted.

2.9 Manoeuvring Load Factors

The following manoeuvring load factors must not be exceeded:

- with retracted airbrakes:

* at V_A (175 km/h/94 kts): max. positive load factor $n = + 5.30$
max. negative load factor $n = - 2.65$

With increasing speed the above values decrease as follows:

* at V_{NE} (248 km/h/134 kts): max. positive load factor $n = + 4.0$
max. negative load factor $n = - 1.5$

- with extended airbrakes

* at V_{NE} (248 km/h/134 kts): max. positive load factor $n = + 3.5$

2.10 Flight Crew

The motorglider may be flown solo only from the front seat.

Min. load in the front seat	70 kg	(154 lbs)
Max. load in the front seat	110 kg	(242 lbs)
Max. load in the rear seat	110 kg	(242 lbs)

A pilot's weight in the front seat of less than 70 kg (154 lbs) must be compensated by ballast. A pilot's weight between 55 and 69 kg (121 and 152 lbs) can be compensated by installing lead trim weights to the support (standard equipment) on the forward control stick frame.

2.11 Kinds of Operation

With the minimum equipment specified in section 2.12 of the POH the aircraft is certified for:

- flights in accordance with Visual Flight Rules (VFR day)

Flights under IFR and /or icing conditions and flying in clouds are not permitted. The motorglider may not be flown with the engine removed. The self-launching capability has been demonstrated and is approved.

Caution: Self-launching must be performed according to the instructions in section 4 of the POH.

2.12 Minimum Equipment

- 2 airspeed indicators up to 300 km/h (162 kts) with color codings according to section 2.3 of the POH
- 2 altimeters
- 2 symmetrical safety belts (each consisting of 4 parts)
- back cushions with a min. thickness of 7 cm (2.77 in.) under load or a manually or automatically operated parachute for each occupant
- 1 multifunction instrument TAZ-G103-A or TAZ-G103-AS
- 1 magnetic compass (compensated in the aircraft)
- 1 rearview mirror

Note: During flights outside the traffic pattern and within controlled air space, an operating radio communication system must be available in the motorglider.

Instruments and other parts of the minimum equipment must correspond to an approved design.

2.13 Aerotow, Winch- and Autotow-Launching

Aerotow (only permissible using the nose towing hook)

Max. permissible speed: 140 km/h (76 kts)

Towing cable weak link
(nominal load): 850 daN (1874 lbf)

Min. length of cable: 40 m (131 ft)

Winch- and Autotow-Launching (only permissible using the c.g.
towing hook)

Max. permissible speed: 140 km/h (76 kts)

Towing cable weak link
(nominal load): 850 daN (1874 lbf)

Warning: The towing cable weak link (including tolerance) must
not exceed 935 daN (2061 lbf).

2.14 Other Limitations

Baggage Compartment Loading

Only load smooth, light objects (max. 10 kg / 22 lbs) which cannot
obstruct or injure the pilot during negative accelerations or in
the event of a crash landing.

Coloring

All components which are exposed to sunlight (with the exception
of the areas for registration marks and colored hazard indicating
paint) must have a white surface. Neither the color nor the
structure of paint may be changed without the prior permission of
the aircraft manufacturer.

Caution: Anti-static paint is used in the area of the wing tank.

Canopy Glazing

The following colors of acrylic glass are approved for the canopy
glazing:

- RÖHM 245 colorless
- MECAPLEX 2421 and 7704 blue
- MECAPLEX 2422 green

2.15 Limitations Placards

1

Maximum flying weight		710 kg (1566 lbs)		
Maximum airspeeds (IAS)		km/h	kts	mph
in calm air:	V _{NE}	248	134	154
in rough air:	V _{RA}	175	94	109
Manoeuvring speed:	V _A	175	94	109
Aerotow:	V _T	140	76	87
Winch/Automobile tow:	V _W	140	76	87
Powerplant operation max.:	V _{POmax}	110	59	68
Powerplant operation min.:	V _{POmin}	90	49	56

RH side wall of front and rear cockpit

2

Towing cable weak link	
aero-, winch- and automobile tow:	850 daN 1874 lbs
Tire pressure	
main wheel:	36-39.8 PSI 2.5-2.8 bar
nose and tail wheel:	36 PSI 2.5 bar

RH side wall of front cockpit

3

Payload	
(Pilot and Parachute)	
Minimum load in front cockpit: 70 kg 154 lbs (Less load must be compensated with trim weights)	
Maximum load in front cockpit: 110 kg 242 lbs (The maximum weight must not be exceeded)	

RH side wall of front and rear cockpit

Emergency Procedures (Check List)

(1) Canopy Jettison

- Switch off engine (ignition OFF) if possible
- Pull red-white handle on LH side of canopy frame backwards
- Lift canopy
- Pull red handle on RH side wall backwards
- Push canopy up

(2) Bailing Out

- Release safety harness
- Stand up and exit aircraft over left or right side depending on the attitude
- If possible, dive away under the wing
Caution: Wings, propeller and tail surfaces
- When using a manual parachute, grip release and pull firmly to full extent after 1-3 seconds

(3) Spin (Normal Attitude)

- (If engine is extended, move throttle to IDLE position)
- Apply opposite rudder (against spin direction)
- Apply some down elevator (push on control stick)
- Set aileron control to neutral or apply opposite aileron (against spin direction)
- After recovery from spin set rudder control to neutral and pull out smoothly

(4) Fire

- Fuel cock : OFF
- Throttle : FULL until engine stops
- Ignition : OFF
- Master switch : OFF
- Do not retract engine
- Slip the aircraft to deflect flames from the tail surfaces (check visually)
- land as soon as possible
- extinguish fire

(5) Aborted take-off prior to getting airborne

- The decision to abort the take-off should be made not later than 200 meters from the end of the useable runway!
- Throttle : IDLE
- Operate wheel brake
- Ignition : OFF
- Fuel cock : OFF

(6) Off-field landing

- Always try to retract the engine

- (7) Engine running rough
- Fuel quantity (fuselage tank) : check
 - Choke : check
 - Magnetos : check
 - Fuel cock : check
 - Propeller setting *) : check
 - If no improvement : switch off engine
- (8) Severe engine vibration
- Engine : switch off
 - Engine : retract if possible
- (9) Engine failure
- If engine fails with sufficient safety height
- Priority switch : ?
 - Choke : OPEN ?
 - Fuel cock : ON ?
 - Ignition : ON ?
 - Master switch : ON ?
 - Fuel quantity (fuselage tank) : check
 - Engine : retract
- Change to gliding mode
- If engine fails at low altitude
- Perform the above check list
 - Minimum flying speed : observe!
 - Throttle : IDLE
 - Ignition : OFF
 - Fuel cock : OFF
 - Engine : Retract if possible
 - Master switch : OFF
 - Prepare for off-field landing
- (10) Start engine after gliding using windmilling
- Speed : 90 - 100 km/h (48 - 54 kts)
 - Master switch : ON ?
 - Avionic switch : OFF
 - Engine electrics : ON
 - T-grip "Powerplant extension" : PULL
 - Propeller CRUISING setting *) : ON
 - Fuel cock : ON
 - Throttle for variable pitch prop: FULL
 - for fixed pitch prop. : IDLE
 - Choke : as required
 - Engine fully extended : check
 - "Powerplant extended" light : ON
 - Ignition (both magnetos) : ON
 - Speed : 160 - 175 km/h (86 - 94 kts)
 - Avionic switch : ON when engine is running
- *) only for variable pitch propeller

3.2 Canopy Jettison

If the engine is running, try to switch it off (ignition OFF) before jettisoning the canopies.

First jettison the front canopy, then the rear canopy.

1. Pull canopy latch on the LH side of the canopy frame backwards to the stop.
2. Lift canopy. The airflow will fully open the canopies.
3. Pull the canopy emergency jettison lever (red lever on the RH side wall) and push the canopy up. The lower attaching balls of the gas springs tear out and the airflow separates the canopies from the aircraft.

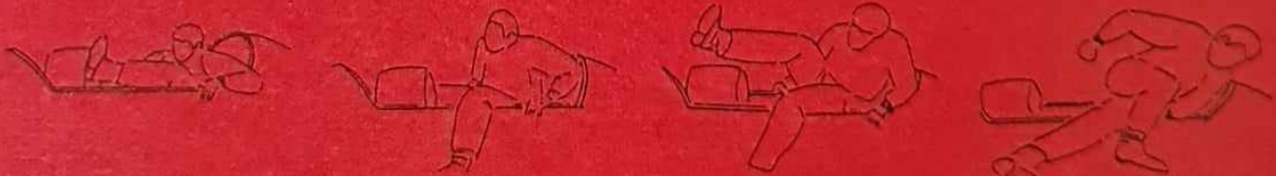
Warning: Do not use safety pins with the gas springs. If the canopies or parts of them remain on the aircraft during the emergency the bail-out will be endangered.

3.3 Bailing Out

If a bail-out is unavoidable, first release the safety harness and leave the aircraft as quickly as possible according to the bail-out procedure depicted below.

The roomy cockpit and its excellent furnishing panels ensure 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.

Be careful of the wing leading edge, the tail surfaces and the engine (if extended).



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3.4 Stall Recovery in Normal and Circling Flight

- Apply some down elevator (push on the control stick) until the aircraft recovers from the stall.
- Then use opposite aileron and/or rudder control as necessary.

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

Caution: Increased vibration and sluggish controls are indications of a stall condition.

3.5 Spin Recovery

Intentional spinning is prohibited.

The recovery from an unintentional spin is achieved by the following method:

- Apply full opposite rudder (i.e. against the spin direction)
- Apply some down elevator (push on the control stick)
- Set aileron control to neutral or apply opposite aileron.
- After recovery from the spin, set rudder and aileron controls to neutral and pull-out smoothly from the dive.

The loss of altitude from the spin recovery point to the lowest point of the pull-out is approx. 280 m (920 ft) (at sea level). The pull-out speed is approx. 190 km/h (103 kts) and the pull-out load factor approx. + 3.5 g.

Warning: If - as is instinctively done by beginners - the stick is pulled instead of pushed, the TWIN III SL could enter a steady spin even though the rudder and ailerons are held neutral. For recovery push the stick decisively for a prompt stop of the spin. During powered flight the engine must be throttled to idle. This prevents overspeeding the engine during spin recovery.

Notes: At forward center of gravity positions it is not possible to achieve a steady state spin with the aircraft. After approx. 1/2 rotation the aircraft goes into a spiral dive.

Caution: Spinning can be completely avoided by following the procedure for "Stall Recovery".

In the gliding configuration, the TWIN III SL has an extreme aft center of gravity position compared to the non-motorized TWIN series. This means that when circling in thermals (at high angles of attack), the margin for error leading to an unintended spin is much lower. Sufficiently experienced glider pilots will always recognize the stalled or almost stalled condition. If the circling flight stall is not recognized at an early stage and the aircraft starts to spin, a height loss of 150 m (492 ft) at MSL can be expected even if the correct action is taken. Correct action means a positive push of the stick.

3.6 Spiral Dive Recovery

Depending on aileron and/or rudder position during a spin at forward center of gravity positions (i.e. within the range of non-steady state spinning of the G 103 C TWIN III SL), the aircraft will go into a spiral dive or take on a yawing condition similar to a spiral dive after approx. 1/2 rotation. Both conditions are indicated by a rapid increase in speed and acceleration.

Recovery from both flight conditions is as follows:

- Apply opposite rudder (against direction of rotation)
- Apply opposite aileron (against direction of rotation)
- Apply up elevator, ensuring that max. pull-out load factor is not exceeded

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

Warning: During powered flight the engine must be throttled to idle. This prevents overspeeding the engine during spin recovery.

3.7 Engine Failure

(1) Engine Failure with Sufficient Safety Height

Go through checklist no. (9).

If no faults are apparent when the above items are checked, a defect has occurred which cannot be corrected in flight. After retracting the engine the G 103 C TWIN III SL must now be flown like a glider. Retract the engine normally according to the checklist. If necessary, perform a normal off-field landing.

(2) Engine Failure at Low Altitude

Go through checklist no. (9).

(3) Engine Running Rough

Go through checklist no. (7).

(4) Severe Engine Vibration

Go through checklist no. (8).

If no defect is found, switch off and retract the engine normally. It must be assumed that the propeller is damaged and has become unbalanced. Do not restart the engine.

3.8 Fire

(1) Fire with Extended Engine

Go through checklist no. (4) and land as soon as possible. Do not retract the engine as the burning engine will weaken the structure.

Extinguish the fire with a fire extinguisher or smother it with a suitable piece of material (items of clothing).

(2) Fire with Retracted Engine

If you suspect that the source of the fire is the engine, extend the engine if possible.

- Fuel cock : OFF
- Extend engine
- Master switch : OFF
- Land as soon as possible
- Extinguish the fire

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3.9 Other Emergencies

3.9.1 One Aileron not Connected

- Flight speed up to max. 120 km/h (65 kts)
- Turn with low bank angle
- 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. The one-sided moment 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 abruptly during take-off. A rudder control deflection of approx. 60 % will prevent a one-sided yaw.

- Launch or tow 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 angle is possible in either direction.

3.9.3 Retracting/Extending the Engine with a Discharged Main Battery

An optional auxiliary battery can be installed. If the main battery is discharged the auxiliary battery switch on the RH canopy frame must be switched over. This disconnects the main battery from the engine bus and switches the auxiliary battery on to the bus. The engine can now be extended. The auxiliary battery can now be switched off. After the ignition has been switched on the engine can be started using the windmilling effect in accordance with checklist no. (10).

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3.9.4 Ground Loop Landing

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

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

Ground looping requires the nose wheel to be unloaded. This is only possible with the wheel brake released and sufficient elevator effect (more than 40 km/h / 22 kts).

3.9.5 Off-Field Landing

Always try to retract the engine.
Choose a suitable landing site while you still have sufficient height. Observe the wind direction. Approach accurately and touch down smoothly.

3.9.6 Emergency Landing on Water

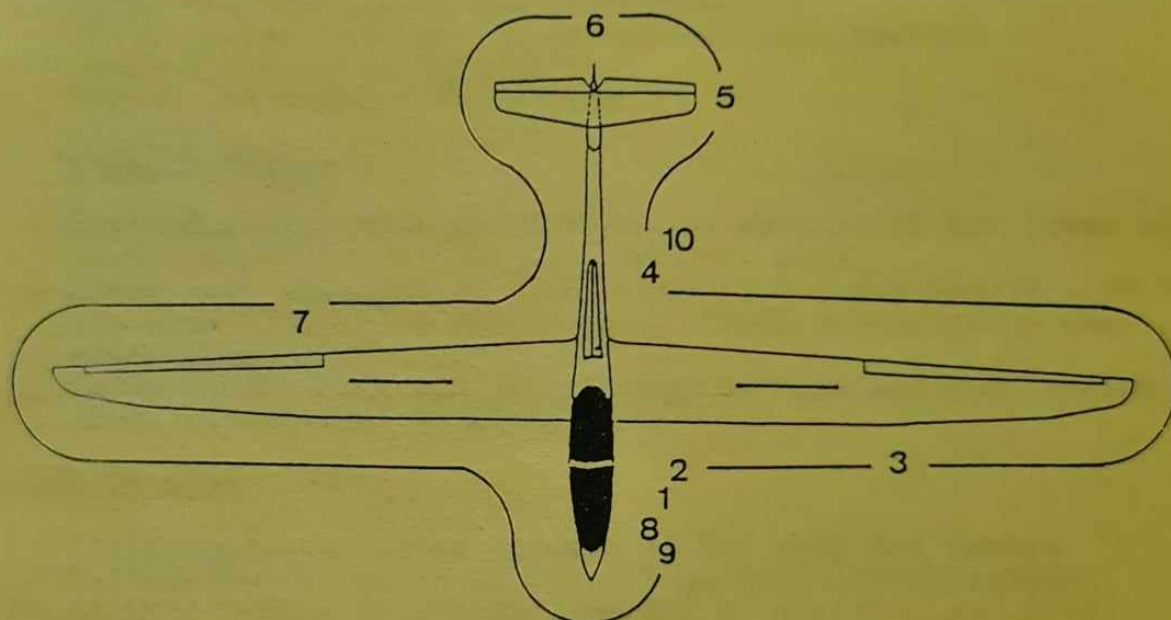
Experience from the ditching of a composite powered sailplane has shown that these type of aircraft with fixed or extended landing gear do not tend to "dive under" if they touch down at minimum speed (airbrakes retracted) with almost a zero rate of descent. Furthermore composite aircraft are capable of floating for a lengthy period of time.

Warning: An emergency landing on water, however, must always be considered the last resort.

4.3 Daily Inspection

It is essential that a full inspection is carried out after each rigging and on a flying day prior to the first flight.

Aircraft walk-around check



While walking around the aircraft, check the surface for paint cracks, buckling or unevenness. Also look for damage on the lower surface of the fuselage. In case of doubt call an expert for a professional opinion.

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(1) Cockpit Area

- Open canopies
- Check the 4 sliding sleeves inside the fuselage are locked
- Check electrical fuses (both fuse panels)
- Visual inspection of all flight control installations and connections
- Check flight and engine controls for function, full and free movement
- Check condition and functioning of the towing hooks
- Check functioning of the wheel brake
- Check canopy locking and canopy jettison devices
- Check for foreign objects
- Extend and retract the engine

(2) Front Fuselage

- Check fuselage hull for damage, in particular the lower surface of the fuselage and the landing gear area
- Check tire pressure of main wheel (2.5 - 2.8 bar/36 - 39.8 psi) and nose wheel (2.5 bar/36 psi). Check condition of wheels and check slip marks.
- Check cleanliness and functioning of nose and c.g. towing hooks
- Check cleanliness of pitot tube

(3) LH Wing

- Check upper and lower surface of the wing for damage
- Visual inspection of all flight control installations
- Aileron (check condition, freedom of movement and play)
- Airbrake (check condition, fit and locking mechanism)

(4) Rear Fuselage

- Check fuselage tube and vertical stabilizer for damage, in particular the lower surface and the tail wheel area
- Check static ports and TEK probe for cleanliness and secure attachment
- Check tire pressure of tail wheel (2.5 bar/36 psi)

(5) Horizontal Stabilizer

- Check horizontal stabilizer for damage, correct assembly and verify it is safetied properly
- Elevator (check condition, freedom of movement and play)

(6) Rudder

- Check condition, freedom of movement and play

(7) R/H Wing

- See item (3)

(8) Flight Controls Check

The flight controls check is undertaken by two people as follows:

One person operates the controls from the front seat while the second holds the corresponding control surface to prevent it from moving. This must be done carefully and without the use of force. Only check the controls for undue play in the control linkage. After releasing the control surfaces, check for freedom of movement up to full deflection.

(9) Instrument Functional Check

The instrument functional check is undertaken by two people as follows:

One person carefully blows into the associated ports of the probes while the second checks the instruments.

- Pitot tube (near nose hook): Air speed indicators must indicate positive values
- TEK-probe: Vertical speed indicators must indicate a climb

(10) Checks on the half-extended engine

- In addition to any inspection listed in this section, also consult engine manual ROTAX 505A and ROTAX Service Bulletin 505-010 (latest issue) for additional information.
- Check all screw connections and their safety devices. In particular the connections between engine, engine support frame, extension spindle and fuselage. Screws which are secured with LOCTITE or spring washers are marked with red locking lacquer. In case the locking lacquer is damaged, the screw joint may have slackened and must be secured again. Check any safety wire.
- By pushing onto the propeller shaft from the front, check the rubber engine mounts for cracks in the rubber material.
- Check arrestor cables and attachments to engine support frame.
- Check muffler attachment. The spring connections can be checked by shaking the muffler.
- Check muffler and engine support frame (with all their associated parts) for secure attachment and cracks.
- Check routing of Bowden cables, cables and fuel lines (no kinks); check pipes (particularly fuel lines) and other components for chafing.
- Check condition of the toothed belt.
- Check ignition cables, spark plug connectors and engine cover plates for secure attachment.
- Check for foreign objects in the engine compartment.

Propeller Check

- Operate the propeller to the TAKE-OFF and CRUISE settings (only for variable pitch propellers)
- Check play at propeller tips: max. 3 mm for variable pitch propellers
max. 1 mm for fixed pitch propellers

Fuel Tank System

- Fuselage tank:
The tank drain valve is located on the L/H lower side of the fuselage below the wing leading edge. Press the drain valve to drain any condensation water.
The tank vent is located on the L/H side of the vertical stabilizer, above the tail wheel. Check tank vent for obstructions.
- Wing tank (standard only for variable pitch propellers):
The drain valve is located on the lower surface of the L/H wing. Press the drain valve with drain glass to drain any condensation water.
The tank vent is located on the lower surface of the wing, approximately 1.5m (5 ft) from the wing root. Check tank vent for obstructions.
- Refuelling:
Refuelling is preferably done from canisters, containing a pre-mixed fuel-oil mixture.
The common grounding connection for fuselage tank and wing tank (see above) is located on the LH pylon of the engine support frame.

4.4 Preflight Inspection

- Wing and horizontal stabilizer connections secured?
- Weight and balance checked?
- Parachutes correctly fitted?
- Safety harnesses on and fastened correctly?
- Pedals adjusted and/or locked?
- Airbrakes locked after functional check?
- Full and free movement of controls checked?
- Flight controls checked with the help of a second person?
- Trim adjusted to the green mark?
- Radio equipment set to local frequency?
- Altimeter set?
- Canopies closed and locked?

For a Tow Launch:

- Correct weak link in the towing cable?
- Cable attached to correct hook?
- Caution: - Cross wind!
- Cable break!

For a Self Launch:

- Check engine in accordance with manual ROTAX 505A, also consult ROTAX Service Bulletin 505-010 (latest issue) for additional information.
- Check fuel quantity
- Check magnetos; magnetos „BOTH“!
- Ground run up: for variable pitch prop: 6200 bis 6400 RPM
for fixed pitch prop: 6000 bis 6300 RPM
- Propeller set to „TAKE-OFF“ (only variable pitch prop)

Aerotow

- Adjust trim lever to the green mark
- Max. towing speed: 140 km/h (76 kts)
- Max. demonstrated crosswind component: 25 km/h (13 kts)
- Engage the cable in the nose hook
- Towing cable weak link: nominal. 850 daN (1874 lbf)
- Recommended cable length: 40 - 60 m (131 - 197 ft)
- Engine retracted

If necessary, apply slight pressure to the wheel brake during take-off so as not to overrun the towing cable. During the entire acceleration phase, the motorglider can be controlled with rudder and aileron, if necessary up to full deflection. At an airspeed indication of approx. 70 - 80 km/h (38 - 43 kts) the aircraft can be lifted off. After lift-off, climb to approx. 1 to 4 m (3 - 13 ft) to avoid ground effect and wake turbulence from the tow plane. To release the cable, pull the cable release button hard to the backstop several times.

Warning: Aerotows using the c.g. position hook and tows with extended engine are prohibited.
Furthermore, low level tows are to be avoided because of the danger of a cable break.

Note: The motorglider has no tendency to swing off during take-off. However, if one wing makes ground contact during take-off or the aircraft swings more than 15°, release the cable immediately.
If the crosswind exceeds 10 km/h (5 kts), lift off the nose wheel only at an airspeed of 60 km/h (32 kts) to increase the effect of the nose wheel steering and to improve aileron control efficiency.

Caution: Additional equipment (e.g. rubber protectors) must not be attached to the towing cable within 3 m (10 ft) of the aircraft.

Self Launch

Self launches are described in detail in section 4.5.2.