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4.1 Introduction

This section provides checklists for the daily inspection and the preflight check. In particular, the connections in the flight control system (assembly and inspection) have been described in detail. Furthermore, this section includes a description of the normal operating procedures and the recommended speeds.

Normal procedures relating to additional equipment can be found in Section 9.

4.2 Rigging and De-Rigging

4.2.1 Rigging

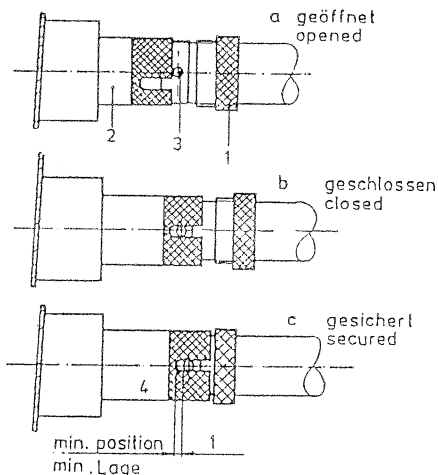
For rigging, hold the fuselage securely in a horizontal position. We recommend using a fuselage support or the assembly trolley of a trailer.

The aircraft can be assembled by 3 or 4 persons as follows:

- Clean all connecting fittings and apply non-corrosive grease

Wings

- Open the 4 sliding sleeves inside the fuselage
- Release the airbrakes in the wings
- Insert the RH wing into the fuselage
- Turn the sliding sleeves (RH side) so that the guide pins engage in the guide slots of the sleeves. By slightly moving the wing, the sliding sleeves will snap into place with a distinctly audible sound.
- Insert the LH wing into the fuselage
- Connect fuel line and ground connection (as standard only for variable pitch propeller)
- By moving the wing tips up and down, position the two spar stub bolts so that they enter the corresponding bearings of the root ribs. Move the wing tips with a circular motion to insert the wing bolts into the wing connecting tube. It is advisable to unload the root rib forward and rear.
- Turn the sliding sleeves (LH side) and move the wing fore and aft so that the sleeves snap into place.
- Turn the knurled nuts (1) of the wing connecting tube into the sliding sleeves (2) so that the sleeves are drawn against the red rings. The red rings are held by the guide pins (3) and form a safety device.
By moving the wing tips fore and aft during the safetying procedure, the knurled nuts can be secured hand tight (4). The guide pins, however, must not contact the end of the milled slot.



Inspection: The red rings on the fuselage tubes must be concealed by the sliding sleeves; the knurled nuts must be tightened hand tight.

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

- Connection of ailerons and airbrakes

The short connecting rods inside the fuselage are equipped with quick-locks which have to be coupled with the swivel ends of the wing push rods.

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

Horizontal Stabilizer

- Before mounting the horizontal stabilizer, hinge down the leading edge cap and pull out the butterfly screw as far as the stop. Make sure that the large opening of the cone-shaped bearings of the horizontal stabilizer spar shows to the rear.
- Mount the horizontal stabilizer so that the automatic elevator connection engages
- Push the horizontal stabilizer rearwards on to the 3 bolts
- Screw the butterfly screw tight

The assembly is correct when the butterfly nut is so tight that the horizontal tail is free from play in any direction. The horizontal stabilizer is safetied by installing the leading edge cap with the butterfly screw in a horizontal position. If necessary, tighten or slacken the nut by 1/4 turn.

Note: Only tighten the butterfly screw by hand. Do not use a tool.

Inspection after Rigging

- Check the 4 sliding sleeves inside the fuselage are locked
- Check correct seating of the aileron and airbrake quick-locks as described above
- Check operating force and functioning of the towing hooks
- Check functioning of the wheel brake and check tire pressure
- Check secure attachment of horizontal tail
- Check flight controls with the help of a second person

After the glider has been inspected, apply adhesive tape to the wing/fuselage and the fuselage/horizontal stabilizer joints.

Note: Adhesive tape should always be applied to the fuselage/horizontal stabilizer joint. This will prevent airflow separations at the fitting holes of the horizontal tail which may result in slight control stick vibrations.

4.2.2 De-Rigging

De-rigging is achieved in reverse order. Either wing can be removed first.

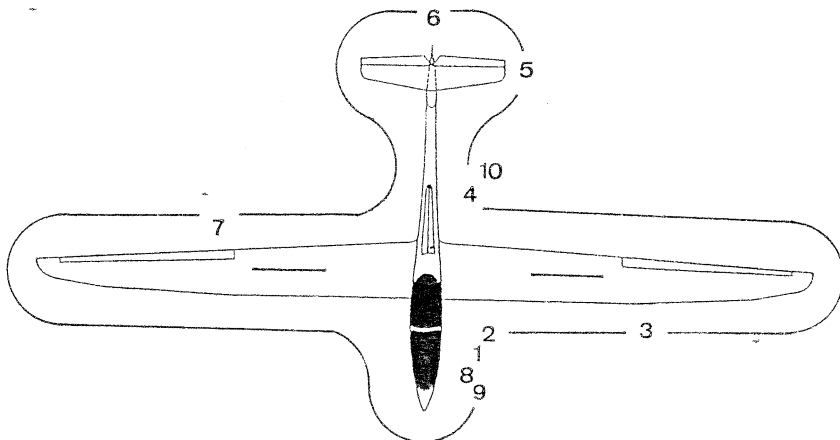
Caution: Before removing the LH wing, disconnect the fuel line and the ground connection (as standard only for variable pitch propeller).

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

4.3 Daily Inspection

It is essential that a full inspection is carried out after each rigging 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) RH Wing - See Item (3)

(8) Flying Controls Check

The flying 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 Functioning Check

Instrument functioning 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 probe: airspeed indicators must indicate positive values (near nose hook)
- TEK probe: vertical speed indicators must indicate a climb

(10) Check on a Half Extended Engine

- Check all screw connections and their safety devices. In particular the connections between engine, engine support frame, extension spindle and fuselage. Screws which are safetied with LOCTITE or spring washers are marked with red locking lacquer. If this locking lacquer is damaged the screw joint may have slackened and must be re-safetied. Check all safety wire.
- By pushing on 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 the muffler attachment. The spring connections can be checked by shaking the muffler.
- Check the muffler and engine support frame (with all their associated parts) for secure attachment and cracks.
- Check routing of the Bowden cables, cables and fuel lines (no kinking); 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 CRUISING settings (only for variable pitch propeller)
- Check play at propeller tips: max. 9 mm for variable pitch prop.
max. 8 mm for fixed pitch prop.

Fuel Tank System

- Fuselage Tank:

The tank drain valve is located on the LH lower side of the fuselage below the wing leading edge. Press the drain valve to drain off any condensed water.

The tank vent is located on LH side of the vertical stabilizer above the tail wheel. Check tank vent for obstructions.

- Wing Tank (as standard only for variable pitch propeller):

The drain valve is located on the lower surface of the LH wing. Press the drain valve with a plunger glass to drain off any condensed water.

The tank vent is located on the lower surface of the wing appr. 1.5 m (5 ft) from wing root. Check tank vent for obstructions.

- Refueling:

Refueling is preferably done from canisters containing a pre-mixed fuel-oil mixture.

The common ground connection for fuselage tank and wing tank (see above) is located on the LH pylon of engine support frame.

4.4 Preflight Inspection

- Wing and horizontal stabilizer connections safetied ?
- 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 ?
- Be aware: - crosswind !
 - cable break !

For a Self Launch

- Check engine in accordance with the manual !
- Check fuel quantity !
- Check magnetos; magnetos BOTH !
- Ground run up: for variable pitch prop. : 6200 to 6400 rpm ?
 for fixed pitch propeller: 6000 to 6300 rpm ?
- Propeller set to TAKE-OFF (only for variable pitch propeller) ?

4.5 Normal Procedures and Recommended Speeds

4.5.1 Launching Techniques

Winch Launch

- Adjust trim lever to the green mark
- Max. launching speed: 140 km/h (76 kts)
- Max. demonstrated crosswind component: 20 km/h (11 kts)
- Engage the cable in the winch launching hook (c.g. position)
- Towing cable weak link: nominal 850 daN (1874 lbf)
- Engine retracted

During roll and take-off, the glider has no tendency to swing off or to pitch up. If the winch is very powerful and initial acceleration is very fast, push the control stick slightly until safe altitude is reached. Then pull to achieve steep climb attitude.

Normal launching speed is approx. 115 km/h (62 kts).

Generally, the cable is automatically released after having reached the max. launching altitude. After the cable tension has decreased, pull the cable release button hard to the backstop several times.

Caution: Before take-off check seat position and whether the controls can be reached. If you use a seat cushion, take special care that you cannot slide backwards during the tow or steep climb.

Warning:

- Do not attempt a launch with tail wind conditions while using a weak winch.
- Release cable **immediately** if the wing makes surface contact during take-off.
- Release cable **immediately** at swing-off angles of more than 15°.

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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.

4.5.2 Take-Off and Climb

Starting the Engine on the Ground

Warning: Starting the engine is not allowed with removed wings and without a proper fixing of the motorglider (danger of accident) ! A competent person must seat strapped in the cockpit always during test run.

Firstly check that the priority switch (determines the priority for the ignition circuit) is selected for the pilot in command. Priority is generally in the front seat.

- Master switch : ON
- Avionic switch : OFF
- Engine electrics : ON
- T-grip "Powerplant extension" : PULL
- Propeller TAKE-OFF setting *) : ON
- Throttle : 1/3
- Choke : as required
- Wheel brake (airbrake lever) : applied
- Engine fully extended : check
- "Powerplant extended" light : ON
- Ignition (after approx. 3 sec.) : ON
- Engine START : ON
- Avionic switch : ON

Prior to Take-Off

- Altimeter : set
 - Radio equipment and frequency : set
 - Elevator trim : 1/3 nose up
 - Canopies : closed and locked
 - Safety harnesses : tight and secured
 - Pedal adjustment : adjusted
 - Flight controls check : accomplished
 - Propeller TAKE-OFF setting *) : ON (check)
 - Choke : ON
 - Throttle : FULL
 - Fuel cock : ON
 - Engine speed : check
 - with variable pitch propeller: 6200 to 6400 rpm
 - with fixed pitch propeller: 6000 to 6300 rpm
 - Magnetos (max. 100 rpm drop) : check
 - Magnetos : BOTH
 - Crosswind : ≤ 20 km/h (11 kts)
- *) only for variable pitch propeller

Caution for aircraft with fixed pitch propeller:

Engine speeds of 4950 to 5700 rpm must be avoided !

Also long horizontal flights at reduced engine power must be avoided. These could lead to engine damage (piston seizure) due to inadequate lubrication. For the same reason, descents with the engine idling are absolutely prohibited. Cruising should be accomplished using the sawtooth technique (see section 4.5.3).

4.5.3 Cruise and Cross-Country Flight

At any speed, loading condition, configuration and center of gravity position, the motorglider has very pleasant flying characteristics. With the airbrakes retracted, the max. time to roll from a 45° bank angle to an opposite 45° bank angle is 4.5 sec.

Slow Flight and Stalling Characteristics
(gliding and powered flight)

The stalling speed and minimum control speed is dependent on the loading, the center of gravity position and the position of the airbrakes (see section 5.2.2).

Stalling from Straight and Level Flight (aft c.g. position)

At aft center of gravity positions, there is a stall warning 3-6 km/h (2-3 kts) before reaching stall speed. The warning begins with a tail vibration which increases with continuing pull on the control stick.

Aileron control becomes distinctly more sluggish and the motorglider tends to roll in an oscillatory manner. If the pilot reacts incorrectly the motorglider tends to drop a wing if the flight is not coordinated (yawing) and the motorglider stalls.

The altitude loss for recovery from a stalled, yaw-free condition is 50 m (164 ft) at sea level.

Stalling during Circling Flight (aft c.g. position)

When the motorglider stalls it rolls off in the direction of rudder deflection. With the rudder control in neutral position, the motorglider tends to roll slightly into the direction of the turn. By applying down elevator and opposite aileron and rudder control, the motorglider will recover to normal flight attitude. An uncontrollable tendency to spin does not occur.

The altitude loss for recovery to a normal flight attitude from a stalled, yaw-free condition is 50 m (164 ft) at sea level.

Stalling during Straight and Circling Flight
(forward c.g. position)

The motorglider is in a stalled condition with the control stick pulled fully back. It does not drop a wing. Recovery to normal flight attitude is achieved by applying down elevator and, if necessary, opposite rudder and aileron.

The loss of altitude is 20 m (66 ft) at sea level.

Note: If a wing drops from straight and level flight or when turning:
Push the control stick and, if necessary, apply rudder and aileron against the direction of the turn.

Cruising with Engine Assistance

The version of the G 103 TWIN III SL equipped with a variable pitch propeller is a powered sailplane fully capable of being used for cruising. A level flight speed of 140 km/h (76 kts) can be achieved with the propeller set to the cruise position. The version with a fixed pitch propeller, however, was not designed for continous cruising. Due to the high drag of the extended engine and because the propeller is designed for optimum take-off performance, high-speed cruising is uneconomical. Cruise flight, therefore, on versions with a fixed propeller, should be accomplished using the sawtooth technique. This means climbing to the desired altitude (e.g. 2000 m (6562 ft) MSL) at a speed of 90 km/h (49 kts). When the desired altitude is reached, the engine is retracted and the flight continued until, if possible, at least 500 m (1640 ft) height is lost.

If a flight using the sawtooth technique is not possible for any reason (e.g. low cloud ceiling or airspace restrictions), brief level flight at reduced engine power can be carried out (observe engine rpm limit: max. 6800 rpm).

Retracting the Engine in Flight

- Speed : 90 km/h (48 kts)
- Avionic switch : OFF
- Ignition : OFF
- Propeller stopped : check
- Powerplant retraction : ON (press)
- Avionic switch : ON
- Speed : 90 - 120 km/h (48 - 64 kts)

When the engine is fully retracted switch off the engine electrics.

Extending the Engine in Flight

- Speed : 90 - 110 km/h (48 - 59 kts)
 - Master switch : ON (check)
 - Avionic switch : OFF
 - Engine electrics : ON
 - T-grip "Powerplant extension" : PULL
 - Prop. TAKE-OFF/CRUISING setting *) : ON
 - Fuel cock : ON
 - Throttle : 50% - 100% power
 - Choke : as required
 - Speed : 90 km/h (48 kts)
 - Engine fully extended : check
 - "Powerplant extended" light : ON
 - Engine START (after approx. 3 sec.) : ON
 - Magnetos : BOTH
 - Throttle : FULL
 - Avionic switch : ON
- *) only for variable pitch propeller

Caution:

1. If the ignition switch is moved out of the "ignition OFF" position during engine extension, the extension process will stop immediately! If the extension process is stopped by mistake, the process can be restarted by pulling the T-grip "Powerplant extension".
2. If, during engine retraction, the propeller moves out of its vertical position after the 6° switch has operated, the retraction process will stop immediately! Retraction will only continue after the propeller has moved to the vertical position and after the built-in time delay.
If the retraction process is stopped by mistake due to moving the ignition switch out of the "ignition OFF" position, the process can be restarted directly by resetting the ignition switch to the "ignition OFF" position.

High-Speed Flight

You must pay special attention not to exceed the never exceed speed $V_{NE} = 248$ km/h (134 kts). With the engine extended the never exceed speed is 175 km/h (94 kts).

Full control deflections are only permitted up to a speed of max. 175 km/h (94 kts). At a speed of 248 km/h (134 kts), only 1/3 of control deflection is permitted.

In heavy turbulence, e.g. in lee wave rotors, cumulo-nimbus clouds, visible tornados or when flying over mountain crests, do not exceed the rough air speed $V_{RA} = 175$ km/h (94 kts).

The airbrakes may be extended up to V_{NE} . However, the airbrakes should only be extended at such high speeds in case of emergency or if there is a danger of exceeding V_{NE} .

For example there is danger of exceeding V_{NE} when a speed of 200 km/h (107 kts) is reached in a dive.

Extending the airbrakes during high speed flight will result in decelerations and negative load factors. It is therefore important to ensure that the safety harnesses are well fastened and that you do not simultaneously operate the control stick while extending the airbrakes.

Diving with extended airbrakes and max. flight weight is limited to a dive angle of 32° at 248 km/h IAS (134 kts).

Warning: Avoid flights in regions with high possibility of lightning strike!

4.5.4 Approach

With Engine Switched off and Extended

This type of approach is performed using the same criteria as described below under Approach in Glider Configuration. To compensate for the additional braking effect of the extended engine, the airbrakes must be used to a lesser extent to achieve the same glide angle.

Note: Below a flight altitude of approx. 300 m (1000 ft), do not try to start the engine. Concentrate on performing the approach and landing (if necessary a off-field landing).

With Engine Running

• For variable pitch propeller

This type of approach is used if you want to prepare for a touch and go. Approaches to commercial airports must sometimes be long and stretched. For this the propeller is set to the CRUISING setting and the engine operated at full power. Required glide angle changes are achieved using the airbrakes. The recommended speed is 100 to 150 km/h (54 to 81 kts). The engine can be throttled shortly before touchdown to reduce the landing run. If a touch and go is planned after touchdown, do not throttle the engine.

• For fixed pitch propeller

This method of approach can be used but is not recommended. This is due to the considerably more difficult handling compared to variable pitch propellers.

Approach in Glider Configuration

With the airbrakes fully extended and the engine retracted, the recommended normal approach speed is 107 km/h (57 kts). The glide ratio in this configuration is 1 : 6.6 in calm air. Airbrake efficiency is also sufficient for steep approaches. The airbrakes induce a slight nose-down moment so that the aircraft almost maintains the selected speed after extending the airbrakes. With the airbrakes extended, the max. time to roll from a 45° bank angle to an opposite 45° bank angle is 5 sec.

Note: - The above recommendation is only valid for stabilized pitch attitudes.

- If the approach is made at low speed and with only partly extended airbrakes, then under normal conditions avoid a further extension of the airbrakes shortly before touchdown. This prevents the motorglider from dropping.

The side-slip is quite controllable and can, where necessary, be used for steep approaches. The most effective sideslip angle is 15°; the recommended airspeed range is between 107 km/h (57 kts) and 175 km/h (94 kts). Control reversal can occur at lower speeds but can be corrected with moderate effort. The side slip should be completed at a safe height. The airspeed indication is well usable in this range and does not show any unusual deviation.

4.5.5 Landing

To avoid causing unnecessary wear and tear of the landing gear (linked airbrakes/wheel brake), touching down with fully extended airbrakes should be kept strictly for "emergency use only". Perform a "two-point" landing if possible.

After touch-down of the nose wheel, directional control can be accomplished down to a speed of approx. 20 km/h (11 kts) using the nose wheel and rudder.

During taxiing after landing, the following operation procedure for the wheel brake is recommended to prevent overheating of the wheel brake:

- operate the brake intermittently ("cadence braking")
- if reduced brake efficiency is noticed:
release brake, pause, operate brake intermittently,
release brake, and so on

After a landing with the engine running, perform the following steps:

- Avionic switch : OFF
- Ignition : OFF
- Master switch : OFF

If the engine is to be retracted, wait until the engine has cooled (danger of fire due to hot carbon) and then turn the propeller to the vertical position by hand. The engine can then be retracted.

In case of overstressing (exceeding the maximum speed or permissible values), the motorglider must be thoroughly inspected and an authorized inspector (e.g. the German Prüfer Klasse III) called in before the next flight:

Look for:

- White spots in the laminate of the wing, fuselage and tail connections
- Cracks, creases or buckling on the surface
- Unusual difficulty during assembly
- Unusual bending oscillation number.

After hard landings or excessive flying stresses, the whole motorglider must be thoroughly checked with wings and horizontal stabilizer removed. Should any damage be recognized, inform an authorized inspector (e.g. the German Prüfer Klasse III). Under no circumstances may the motorglider fly before the necessary repairs having been done.

4.5.7 High Altitude Flight

Test flights for proof of flutter were made up to an altitude of approx. 3000 m (10000 ft). Computations were done up to an altitude of 5000 m (16400 ft). With increasing altitude the airspeed indicator indicates a lower speed than true air speed. Because of this and because the true airspeed determines the flutter limits for typical sailplanes, the following limits are valid for flights at high altitude:

Standard Flight Altitude (above sea level)		V _{max}	IAS
m	ft	km/h	kts
0- 2000	0- 6562	248	134
- 3000	- 9843	237	128
- 5000	-16404	214	116
- 7000	-22966	192	104
- 9000	-29528	171	92
-11000	-36089	151	82

Flights at Temperatures below Freezing Point

At temperatures below 0°C, e.g. when flying in mountain waves or in winter, it is possible that the freedom of movement of the flight controls may be reduced.

To prevent the danger of icing, make sure that the controls are free from moisture.

This is also valid for control surface and airbrake gaps. We recommend applying Vaseline onto these endangered locations to prevent them from freezing.

Ensure that moisture cannot penetrate cracks in the Gel Coat surface. This might lead to breaking open the varnish at low temperatures.

4.5.8 Flight in Rain

With wet wings there is no noticeable deterioration of the flight characteristics.

Heavy coverage on the wings will increase the stalling speed by approx. 10 km/h (5 kts). This does not affect take-off and touchdown characteristics:

Note: Increase approach speed by approx. 10 km/h (5 kts).