

Carve

User manual

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GIN

WARNING: Read this user manual before first flight!

Like any extreme sport, powered paragliding involves unpredictable risks which may lead to injury or death. By choosing to fly, you assume the sole responsibility for those risks.

Because it is impossible to anticipate every situation or condition that can occur while powered paragliding, this manual makes no representation about the safe use of the wing under all conditions. Neither Gin Gliders nor the seller of GIN equipment can guarantee, or be held responsible for, the safety of yourself or anyone else.

Many countries have specific regulations or laws regarding powered paragliding activity. It's your responsibility to know and observe the regulations of the region where you fly.

Gin Gliders reserves the right to alter or add to the contents of this manual at any time. You should therefore regularly visit our website:

www.gingliders.com

where you will find additional information relating to your paraglider and any changes to the manual. The date and version number of this manual are given on the front page.

Thank you...

... for choosing Gin Gliders. This user manual contains important information for the use and maintenance of your paraglider. Detailed knowledge of your glider and equipment will help you to fly safely and make the most of your flights.

Your GIN paraglider has been designed to meet all safety and regulatory requirements. These requirements also include the need to familiarise yourself with this user manual and the information and instructions regarding safety, equipment and service prior to the initial commissioning. These operating instructions must be fully read and understood before the first flight.

If you have any further questions about these operating instructions, please contact your GIN dealer in the first instance, or Gin Gliders directly.

We wish you exciting flights and always a safe landing.
Your GIN team

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Gin Gliders

Dream

In forming Gin Gliders, designer and competition pilot Gin Seok Song had one simple dream: to make the best possible paragliding equipment that pilots all over the world would love to fly—whatever their ambitions.

At Gin Gliders, we bring together consultant aerodynamicists, world cup pilots, engineers and paragliding school instructors, all with one goal: creating better paragliders.

Touch

We're a "hands-on" company that puts continuous innovation and development at the centre of everything we do.

At our purpose-built R&D workshop at head office in Korea, we are able to design, manufacture, test-fly and modify prototypes all in a matter of hours. Our international R&D team is on hand both in Korea and at locations worldwide. This guarantees that your equipment has been thoroughly tested to cope with the toughest flying conditions.

Our own production facilities in East Asia ensure the quality of the finished product and also the well-being of our production staff. Our facilities are independently certified to AS9100C (Aerospace standard) and also to ISO 9001:2008.

Believe

We believe that the product should speak for itself. Only by flying can the pilot understand the wing and develop trust and confidence in it. From this feeling comes safety, comfort, performance and fun. The grin when you land should say it all!

Manual

We recommend that you familiarise yourself with your new paraglider by reading this manual before your first flight. This will allow you to acquaint yourself its new functions, to learn the best way to fly the paraglider in various situations, and explain how to get the best out of your paraglider.

Information in this manual on design of the paraglider, technical data and illustrations are subject to change. We reserve the right to make changes without prior notification.

The manual complies with the EN 926-2 and DGAC airworthiness and forms part of the certification. It is comprised of:

1. Manual (this document):
Instructions on getting started and using the paraglider
2. Inspection Information:
General instructions and guidance on carrying out the regular inspection of paragliders
3. Glider details:
Pilot details , proof of ownership and inspections and repairs overview

This manual was current at the time of publication, and may also be downloaded from the GIN website.

Gin Gliders website

Gin Gliders has a comprehensive website, which provides additional information about the Carve, any updates to the manual and many other issues related to paragliding.

www.gingliders.com

On the Gin Gliders website, you will find an extensive range of accessories for your paraglider and other useful products.

You will also find links there to other services and websites:

- Gin Gliders Shops
- Facebook, Twitter & youtube

These websites and their content are provided for your use. The content of Gin Gliders websites has been made available for your use on an “as is” and “as available” basis. Gin Gliders reserves the right to alter the websites at any time or to block access to them.

Gin Gliders and the environment

Protection of the environment, safety and quality are the three basic values of Gin Gliders and these have implications on everything we do. We also believe that our customers share our environmental awareness.

Respect for nature and the environment

You can easily play a part in protection of the environment by practising our sport in such a way that there is no damage to nature and the areas in which we fly. Keep to marked trails, take your rubbish away with you, refrain from making unnecessary noise and respect the sensitive biological equilibrium of nature. Consideration for nature is required even at the launch site!

Paragliding is, of course, an outdoor sport – protect and preserve our planet's resources.

Environmentally-friendly recycling

Gin Gliders gives consideration to the entire lifecycle of its paragliders, the last stage of which is recycling in an environmentally-friendly manner. The synthetic materials used in a paraglider must be disposed of properly. If you are not able to arrange appropriate disposal, Gin Gliders will be happy to recycle the paraglider for you. Send the glider with a short note to this effect to the address given in the appendix.

Safety

WARNING: the safety advice and instructions contained in this manual must be followed in all circumstances. Failure to do so may invalidate the certification and/or result in loss of insurance cover, and could lead to serious injuries or even death.

Safety advice

Paragliding demand a high level of individual responsibility. Prudence and risk-awareness are basic requirements for the safe practice of the sport, for the very reason that it is so easy to learn and practically anyone can do so. Carelessness and overestimating one's own abilities can quickly lead to critical situations. A reliable assessment of conditions for flying is particularly important. Paragliders are not designed to be flown in turbulent weather. Most serious accidents with paragliders are caused by pilots misjudging the weather for flying.

In Germany, paragliders are subject to the guidelines for air sports equipment and must not under any circumstances be flown without a valid certification. Independent experimentation is strictly prohibited. This Manual does not replace the need to attend training at a paragliding school.

The manual must be passed on to any new owner if the paraglider is sold. It is part of the certification and belongs with the paraglider.

Observe the other specific safety advice in the various sections of this manual.

Safety notices

Safety notices are issued when defects arise during use of a paraglider which could possibly also affect other gliders of the same model. The notices contain instructions on how the affected gliders can be inspected for possible faults and the steps required to rectify them.

Gin Gliders publishes on its website any technical safety notices and airworthiness instructions which are issued in respect of GIN products. The paraglider owner is responsible for carrying out the action required by the safety notice.

Safety notices are issued by the certification agencies and also published on the relevant websites. You should therefore visit on a regular basis the safety pages of the certification agencies and keep up-to-date with new safety notices which cover any products relating to paragliding.

Liability, warranty exclusion and operating limitations

Use of the paraglider is at the pilot's own risk!

The manufacturer cannot be held liable for any personal injury or material damage which arises in connection with Gin Gliders paragliders. The certification and warranty shall be rendered invalid if there are changes of any kind (incl. paraglider design or changes to the brake lines beyond the permissible tolerance levels) or incorrect repairs to the glider, or if any inspections are missed (annual and 2-yearly check).

Pilots are responsible for their own safety and must ensure that the airworthiness of the glider is checked prior to every flight. The pilot should launch only if the paraglider is airworthy. In addition, when flying outside of Germany, pilots must observe the relevant regulations in each country.

The glider may only be used if the pilot has a licence which is valid for the area or is flying under the supervision of an approved flying instructor. There shall be no liability on the part of third parties, in particular the manufacturer and the dealer.

Liability and warranty exclusion

In terms of the warranty and guarantee conditions, the paraglider may not be flown if any of the following situations exists:

- the inspection period has expired, or the inspection has been carried out by the pilot him/herself or by an unauthorised inspector
- the pilot has incorrect or inadequate equipment (reserve, protection, helmet etc)
- the glider is used for winch-launching with a winch which has not been inspected or by non-licensed pilots and/or winch operators
- the pilot has insufficient experience or training

Operating limitations

The paraglider must be operated only within the operating limits. These are exceeded, if one or more of the following points are complied:

- the take-off weight is not within the permissible weight range
- the glider is flown in rain or drizzle, cloud, fog and / or snow
- the canopy is wet
- there are turbulent weather conditions or wind speeds on launch higher than 2/3 of the maximum flyable airspeed of the glider (varies according to the total take-off weight)
- air temperature below -10°C and above 50°C
- the glider is used for aerobatics/extreme flying or flight manoeuvres at an angle greater than 90°
- there have been modifications to the canopy, lines or risers which have not been approved

Before the first flight

WARNING: Your instructor, dealer or a specialist must test-fly and inspect the paraglider before your first flight. The test-flight must be recorded on the paraglider information label.

For motorized flight, the engine, harness, rescue equipment and supporting structure have to be checked individually for their compatibility. The compatibility of the engine with the other components must be checked and confirmed if necessary. If you have any further questions, please contact the supplier of your engine.

Harness

It's important for your comfort and safety to fly with a suitable harness that is properly adjusted. When choosing a harness, remember that the height of the attachment points (i.e. distance from the carabiners to the seat plate) affects the sensitivity of the glider and the relative brake travel. The lower (shorter) the attachment points, the more sensitive the glider is to weightshift.

The adjustment of the harness chest strap controls the distance between carabiners and affects the handling and stability of the glider. Excessive tightening of the chest strap increases stability but also the risk of riser twists following glider collapses. It also increases the likelihood of getting collapses due to poor feedback from the glider. The risk of twisting is also strongly influenced by the seating position of the pilot. Flying in a laid back (reclined) position makes it much more difficult to react in time to prevent riser twisting. With the chest strap in a more closed position the glider also has more tendency to maintain a stable spiral. With the chest strap in a more open position, feedback from the glider is increased but stability is decreased.

GIN gliders are developed with GIN harnesses, which have an attachment point of approximately 40-48 cm (depending on size and model). EN/LTF certification test flights are carried out with the horizontal distance between the harness attachment points (measured between connector centrelines) set depending on the total weight in flight as follows:

Total weight in flight	< 80 kg	80 to 100 kg	> 100 kg
Width	40 ± 2 cm	44 ± 2 cm	48 ± 2 cm

We recommend adjusting the distance of the chest strap according to the table and, if necessary, to adapt easily. In general, the carabiner distance should not be set too narrow!

For flight comfort and safety it is very important that you fly with a suitable, properly adjusted harness. In practice, it turns out that few pilots have a harness that suits their flying style and paraglider. If you have any questions or doubts regarding the use of your harness with the Carve, please contact a GIN dealer or Gin Gliders directly.

NOTE: Don't adjust your leg and shoulder straps too tightly. If the harness is setup incorrectly, you may have difficulty sitting back into your harness after take-off, especially during thermal flying and turbulence.

Reserve

It is a mandatory requirement to carry an approved reserve for use in emergency situations where the paraglider fails and recovery is not possible, for example after colliding with another aerial sports craft.

In choosing a reserve, you should be careful that you remain within the specified take-off weight. The reserve is fitted according to the manufacturer's instructions.

Weight range

Be sure to fly your glider within the certified weight range given in the Technical Specification section. The weight refers to take-off weight: pilot, incl. clothing, engine, glider, harness and equipment.

The reactions are quite different at the upper- or lower weight range. If you fly at a high wing- loading, the glider shows dynamic flight behaviour with fast reactions. This may be an advantage in strong wind conditions, but considerable pilot skill is required.

The dynamics are reduced somewhat in the middle and lower part of the weight range.

Overload

The EN 926-2:2013 describes the weight measurement with: "All weights are subject to an acceptable tolerance of $\pm 2\text{kg}$ ". Therefore a slight overload of the wing would be within EN tolerances. However, flying over the maximum weight further increases the dynamic flight behaviour. In small bubbles, the wing has more horizontal momentum and less tendency towards lifting. A test flight is always recommended if in doubt.

Note: Check your total flying weight by standing on weighing scales with all your flying equipment including your motor unit. Remember that ballast can also be used to adjust wing loading to the conditions.

First flight

Carry out your first flights only during stable weather, and in a familiar area or on a training slope. You should steer gently and carefully to begin with so that you can become accustomed to the reactions of the glider without stress.

Flying the Carve

Gin Gliders cannot ensure that the flight behavior described in this chapter is accurate to all engines used with the Carve. The compatibility of a new combination must therefore be confirmed by a test flight by an accredited K-pilot. Compatibility flights can be requested by the manufacturer of the engine or in the form of a single sample test by the pilot himself at a testing house.

Preparation for launch

Follow a consistent routine every time you fly. This is very important for safety. We recommend the following procedure:

Material check

Check the following condition of your paraglider and other flying equipment before every flight:

- Is the glider fabric free from tears or other damage?
- Are the lines free from knots, tangles or other damage?
- Brake lines freely and firmly connected to the handle?
- Correct adjustment of the brake lines length?
- Are the maillons connecting the lines and risers closed and secured?
- Is the glider dry?
- Are the risers and seams in good condition?
- Is your harness in good condition?
- Is your rescue handle secure and rescue pin in?

Pre-flight check

A careful pre-flight check is required for any type of aircraft. Make sure that you exercise the same level of care each time carry out the check.

- Once you have arrived at the take-off, you should first take a look at the conditions: observe wind speed and wind direction, airspace, turbulence and thermal cycles.
- Check your engine, paraglider, harness, rescue handle and pin, helmet and other equipment.
- Carry out the preflight control check of the engine.
- Choose a wide starting place, as uniform as possible and free from obstacles.
- Put on your harness and be sure to close the leg straps! Then put on your helmet.
- Place the paraglider in a curved shape and sort the lines.
- Connect the riser to the harness carabiners. Make sure that the carabiners are closed and that nothing is twisted.
- Connect the speed system of the riser and harness with the Brummel hooks.
- Check one last time that there are no knots in the lines, nothing is twisted and that the lines are not caught in vegetation or rocks. You must be particularly attentive in lighter winds.

WARNING: If there are obvious creases in the glider as a result of tight packing or long term storage, carry out some practice inflations before your first launch and smooth out the trailing edge a little. This ensures that the flow profile is correct during launch. This is particularly important in low temperatures.

Start check

The start check is carried out immediately before launch to check the most important safety points once again. It should always be carried out in the same sequence so that nothing is overlooked. The points are:

1. Is your personal equipment in order (engine, harness, carabiners, reserve, helmet) and are all straps done up?
2. Is the canopy arranged in a half-moon shape and are all the air intakes open?
3. Are all the lines untangled and are any lines under the canopy?
4. Are the trimmer positions correct and symmetrical?
5. Does the weather, in particular wind direction and strength, allow a safe flight?
6. Is the propeller free?
7. Does the engine deliver full power?
8. Are the airspace and launch area clear?

General warnings and advice

Before flying, check the following:

- Are you in good physical and mental condition?
- Are you familiar and compliant with all applicable laws and regulations in your area?
- Are you within the certified weight range?
- Do you have the necessary insurance cover?
- Are you briefed thoroughly about the site, airspace and expected weather conditions of the day?
- Is your equipment and choice of site suitable for your level of experience?
- Do you have a suitable helmet, gloves, boots, eyewear and adequate clothing?
- Are you carrying some form of identification, in case of an accident? Take along a radio and mobile phone if possible.
- Do you fully understand how to safely fly your new wing? If not, have your instructor or dealer explain anything you are not sure about.

Launching

The Carve has smooth and progressive inflation characteristics with no tendency to hang back or shoot forwards.

Forward launch

We recommend a forward launch in nil to light winds. Pull up the glider with the lines stretched. It is not necessary to use any momentum to launch the Carve and/or to start running with slack lines.

Avoid lateral rotations with the upper body during the inflation, as otherwise the lines may fall into the propeller. If the glider does not rise in the middle, you should use the risers instead of the brakes to compensate. This prevents the wing falling down on one side. During the take-off run, it is important to stay under the glider and follow the take-off direction. If both risers have a steady tension and the glider is above the pilot, the control view is carried out. Check that the canopy is completely inflated and that no lines are twisted or tangled. Do not stop and do not turn the upper body. If the wing breaks out sideways or falls back to the rear, stop the engine and abort the take-off.

After the control view, the full motor thrust is used. A slight back position supports the take-off as the full engine power is used. Release the risers and accelerate until the Carve is lifted.

When you launch forwards, keep the following points in mind:

- If the cage of the engine is not stable enough, the risers can deform the cage and push the propeller while it is being pulled. Pay attention to it before you fly with maximum power
- Apply the brake evenly and moderately during the take-off
- Do not start before the wing is over your head. Opening the throttle too soon can cause dangerous pendulum movements
- Just sit in your harness when you are a few meters in the air
- Low suspension for back motors usually allows easier start-up

Reverse launch

The Carve is suitable for reverse launching from light to strong wind speeds. You can hook in the glider as for a forward launch, and then turn around when the motor is switched off. Run the lines over the cage and then make sure that all the lines are free.

As with the forward start, the correct combination of braking and engine power is important to achieve the best speed and the best climb. The right technique of hooking the riser in, pulling up the glider and turning is very important for reverse launching. This must be controlled by the pilot before executing it with the engine running.

Note: During reverse launch and ground handling, care should be taken that the brake lines do not rub over the riser. This may cause damage to the riser or brake lines.

Knots or loops in the lines

If you have taken off with a knot in the lines, you should wait until you have enough height and distance from other pilots before you attempt to loosen the knot. Control with weight shift and gently brake the opposite side before attempting to open the knotted side by pulling on the brake line. Make sure you don't fly too slowly and stall or spin the paraglider. If the knot does not open, land safely as soon as possible.

The initial climb-out

After a successful launch, continue into wind using the brakes to regulate the rate of climb. Do not try to climb too steeply. A powered paraglider behaves more like an airplane than a

paraglider. If there are no obstacles, it is much safer (and more impressive for the spectators as well) to fly level for a while after take-off and pick up speed before converting speed to height with a brief application of the brakes.

An additional reason not to climb too fast is related to the risk of low-level engine failure. Although the Carve does not hang back during a steep climb as much as some other wings, a stall is still more likely at low speed and high pitch angles. In addition, you should always be in a good position to land in case of engine trouble. Don't take unnecessary risks and fly with a wide margin of error.

Depending on the characteristics of your engine, once in the air you may be faced with a torque effect. This may cause the wing to turn, so be prepared to counteract this effect with suitable braking or anti-torque strap. If such a situation occurs during the climb-out with "slow" trims and maximum power, be pay attention to the risk of stalling. Safe operations and management of your engine depend on your knowledge and equipment.

Engine-induced oscillations

Certain configurations of weight, propeller diameter and engine power may cause serious oscillations. The pilot is lifted to one side by the torque effect, swings down due to his weight and is then lifted again and so on. To counter this effect:

- change the throttle setting
- counteract the pendulum movement with a slight brake input
- adjust the trimmers to dampen the oscillation

These oscillations typically occur at full power. The greater the engine power and propeller diameter, the greater will be the oscillations. In addition, late or inappropriate pilot reactions may worsen the problem instead of solving it. Most inexperienced pilots tend to overreact, leading to "pilot-induced" oscillations. In the majority of cases the best way to handle this is to release the throttle and release the brakes.

In-flight characteristics

Cruising flight

Once you have reached a satisfactory altitude after take-off, you can turn in your chosen direction, open the trimmers if they were previously in the "slow" configuration and go "hands-up" on the brakes. If conditions are strong, you will need to fly actively.

For each paramotor, you must make an adjustment of the length of your brakes to prevent them interfering with the propellers when you do release in flight.

If you have a vario or altimeter, keep an eye on it. In level flight, it is very easy to climb unintentionally. The instruments exist to help you maximize your speed and fuel economy. Naturally, the safety and success of each flight will depend on your piloting set-up, and thanks to its ability to fly safely without constant piloting adjustments, the Carve will leave you all the comfort to adjust everything properly.

Normal flight

“Trim speed” (brakes fully released) is the best glide speed in still air. The brake lines are used to adjust the speed according to the flight situation in order to ensure optimum performance and safety.

Minimum sink speed on the Carve is achieved by light braking. In a normal flying position (knees parallel to the ground and your body slightly reclined), your hands should be holding the brakes at a level between your eyes and your shoulders. Use this speed for thermalling and ridge soaring.

Stall speed is approached by bringing your hands towards your hips. Notice the decreased wind noise and a significant increase in brake pressure.

WARNING: Flying too slowly close to stall speed increases the risk of an unintentional asymmetric or full stall. This speed range should therefore be avoided and used only on landing during the final stage of the flare.

Accelerated flight

Once you have become accustomed to flying the Carve, you can practice using the trimmer and speed system. To understand correct trimmer usage, study the diagrams showing trim and speed bar movement as well as speed bar hook-ups. The diagrams also illustrate how different trimmer settings affect the airfoil shape, and how changes in the Centre of Pressure (CP) influence pitch stability.

The Carve’s Reflex wing section is unique - it has a remarkably wide and relatively safe speed range. On the slower settings, sink rate improves dramatically and brake pressures are light. This enables you to make the best use of thermal cores. You will also have improved climb rate and shorter, slower take-offs and landings. See diagram below describing differences in turning.

On faster trim or speed bar settings, brake pressures generally increase and weight-shift or wing tip steering becomes safer and more effective. With the trimmers fully off, the wing’s speed and stability increases and its ability to cut through turbulence and cover distance improves.

Trimmer and speed bar settings are additional points to include in your pre-flight checklist! If the setting is not symmetrical, the paraglider will turn in flight. And if you inadvertently release the trimmers, the Reflex profile of the Carve will keep your wing level, so after hitting the throttle you will descend with increased speed instead of climbing as intended.

WARNING: When flying accelerated the glider reacts much faster to a collapse. Also the glider reacts more radically when a collapse occurs during accelerated flight compared to flying at trim speed. Flying at maximum and minimum speed should only be done with sufficient altitude and experience. Avoid flying accelerated near the ground, and be careful using the accelerator in turbulence. If you do encounter a collapse while using the accelerator, immediately step off the bar completely before taking any other corrective actions.

Symmetrical braking with the main brake with open trimmers (reflex mode) creates an extremely unstable profile and there is a danger of a front stall or other extreme flight maneuvers. In addition, never apply brakes when using the speed bar.

PA (Power Attack) system

The PA system combines a speed system with trimmers. Pushing the speed bar results in the automatic, smooth release of the trimmers. The chapter “Riser and speed system” describes how to activate this system and explains the significant risks.

After activating the PA system, the pilot can use the entire range of the airfoil geometry and angle of attack (to the extent that the trimmer tape has been released).

Active flying

Practice active flying to eliminate collapses in all but the most turbulent conditions.

Keep tension on the brakes approximately equal to the weight of your arms. This allows you to stay relaxed and sensitively feel the internal pressure in the wing through the brakes. If you feel a loss of pressure in one or both sides of the wing, quickly apply the appropriate brake(s) to regain pressure. Release the brake promptly as soon as normal pressure is resumed.

If you miss the above timing and get a collapse, be sure to first raise your hands and release the brakes before considering any other corrective actions.

The Carve has excellent pitch stability. Nonetheless, in turbulence or during manoeuvres, the glider may pitch. If the glider pitches in front of you, apply brake to slow it down. If the glider drops behind you, ease off the brakes to allow it to speed up. The objective is to reduce the pendulum effect by adjusting the speed of your glider so that glider and pilot are travelling at the same speed.

The same general principles also apply when gliding on bar.

Summary: "Active flying"

- The pilot sits upright in his harness, his view goes in the direction of the flight.
- He constantly responds to increasing and decreasing brake pressures with the aim of maintaining a constant pressure on the brake lines.
- The further in front of you the glider pitches, the larger the brake input required, but for a shorter duration.
- When brake pressures decrease, brake firmly; when brake pressures increase, ease off the brakes.

WARNING: Never release the brakes when the glider is behind you but accelerating forwards.

Turning and steering

General

The Carve performs best in turns when it is flown with sufficient speed and weight-shifting. Enter a turn with good airspeed, weightshift and then apply the brake. Once established in the turn, regulate your speed and turn radius with weightshift and the outer brake. Too much braking increases the sink rate.

Make your first turns gradual and progressive. Also remember that your harness and its set-up has an influence of the turning behaviour of the wing. The Carve has extremely low negative tendency, so it can also be turned in a tight area by carefully pulling the inside brake line.

If the brakes are applied more, the bank attitude increases and the glider will fly a fast turn increasing in steepness, which will eventually become a spiral dive (further information on this is in the section “Spiral Dive”).

As your skill improves at all speed settings, the differential application of both brakes while banking will allow you to make very effective turns by increasing the lift to assist the turn when the lift axis is angled towards the bank. Likewise engine thrust and speed bar can be applied at certain times to increase turn rate etc. These techniques come with pilot experience and allow you to get the most from your wing and achieve fully coordinated, smooth turns, much like those possible on a three axis aircraft.

NOTE: In general, when flown with the higher hangpoint motor units, the wing has more of a tendency to dive when entering turns. This may also result in higher ‘G’ loadings in tight turns and a bigger swing effect when exiting manoeuvres. Weight shift is usually less effective with high hang-points. However, extra pendulum and lateral stability is usually gained.

2D steering

The 2D steering is considerably different from the classic steering system. The possibilities it offers are of particular value to competition pilots. On one hand, the 2D system offers much more precise control of the canopy, but on the other side it requires learning new (different) reflexes and reactions. A pilot must spend some time exploring the system and perfecting his own technique before flying 2D in a demanding competition environment.

The following figures show the basic modes of steering with the 2D system. The demonstrated examples are far from comprehensive – there are a lot of transitional configurations, especially as you can fly them with different accelerated configurations of the glider as well as engine thrust. The most appropriate configuration for any given situation must be chosen by the pilot.

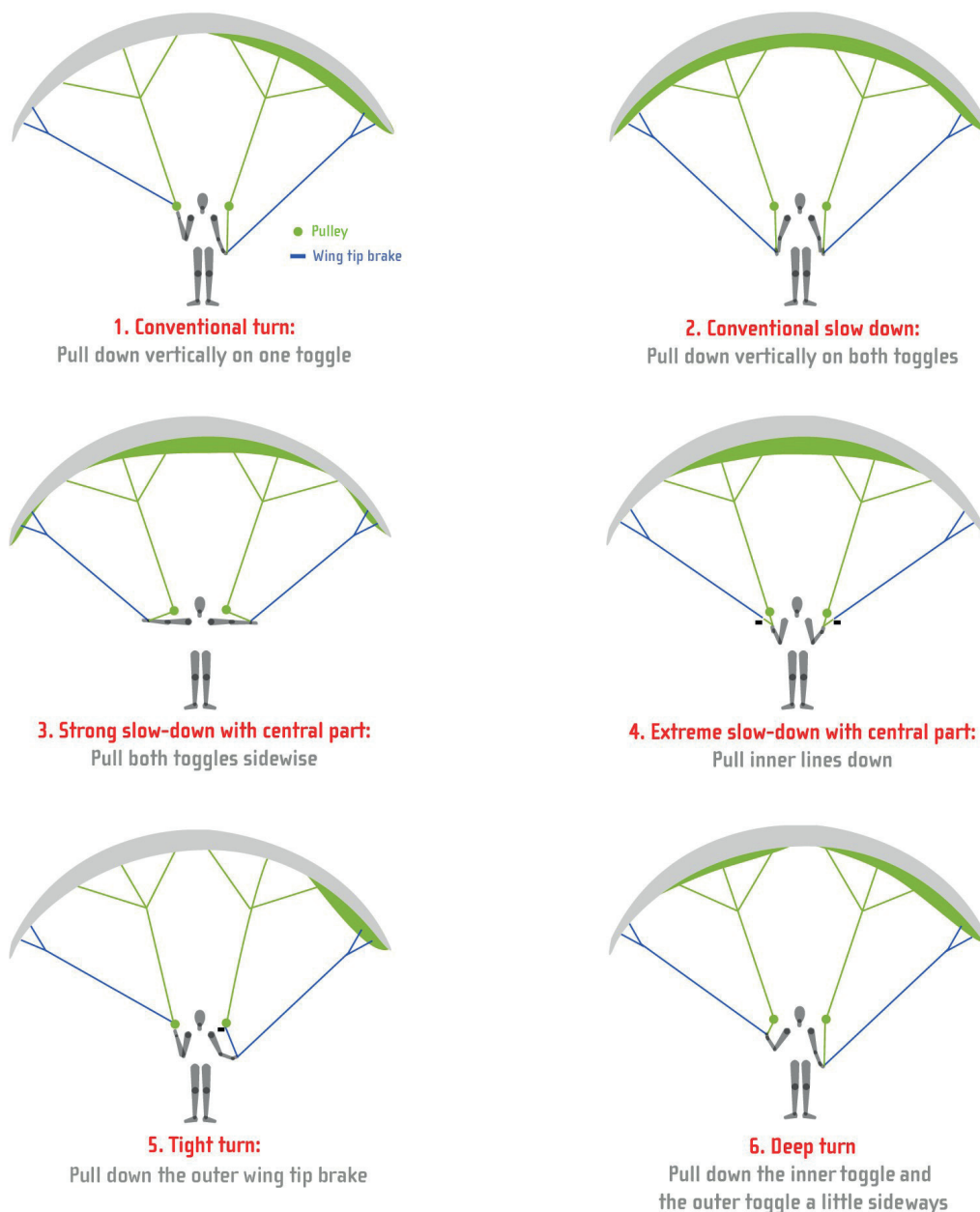


Figure: Basic modes of steering with 2D system

Steering with different speed configurations and settings

The following speed configurations and steerings can be defined, according to trimmer settings and speed-system operation:

Slow (trimmers closed)

Steering is done with the main brake handles. You can pull them straight down along your body or sideways, away from your body, thus differentiating the progression and bank angle.

1. Straight down along your body - bigger progression, sharper turns.
2. Away from your body - lesser progression, turns with less banking.
3. Combined technique - "inner" hand along the body, "outer" hand moves away to keep the central part of the canopy solid and to stay ready for necessary corrections.

Accelerated (trimmers open)

Steering is as described above, but significantly more force is needed. Consider grabbing the outer brake line above the handle. In this way, you will be steering mainly via the outer part of 2D brake system.

On long transitions, using only the outer brake line or Tip Control Line is recommended.

Full speed (trimmers open and speed system activated)

Steering the Carve with the main brake handles in full speed configuration is not recommended! Attempts to use the main brakes will have no effect other than evoking collapses. As such, this is not dangerous. It will hardly even alter the flight path, given that the pilot won't be keeping the brakes down for long. However, this phenomenon is undesirable, unpleasant and - most of all - not effective as a means of directional correction.

It follows that steering at full speed should be done only with the wingtip steering system. That system does not distort the reflex profile, and thus guarantees safe and efficient operation.

Examples of various steering methods**Steering with main brake handles only (slow or accelerated)**

The main brake handle has different effects when pulled down vs. away.

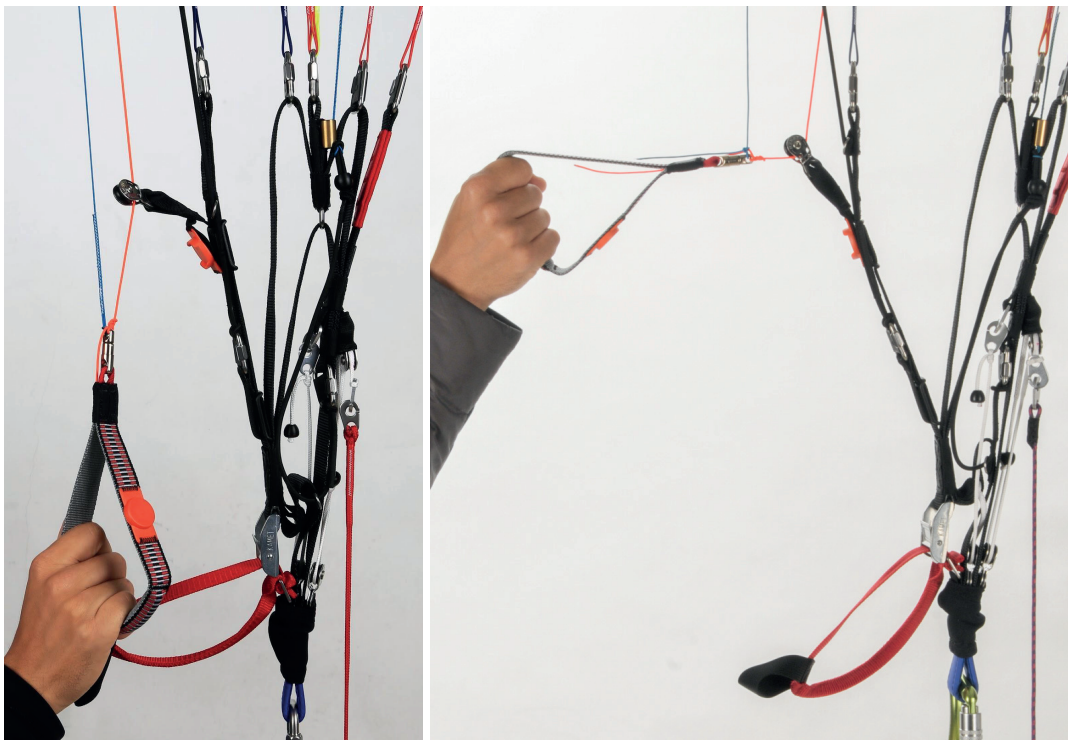


Figure: Steering with main brake handles only

Main brake handles and outer line (accelerated)

Variable steering progression depending on degree of operation.

Steering with outer 2D steering line only (accelerated)

Main brake handles can be fixed on the magnets or let free. The following 4 pictures shows different ways to activate the outer 2D steering line with open trimmer and pushed speed system.

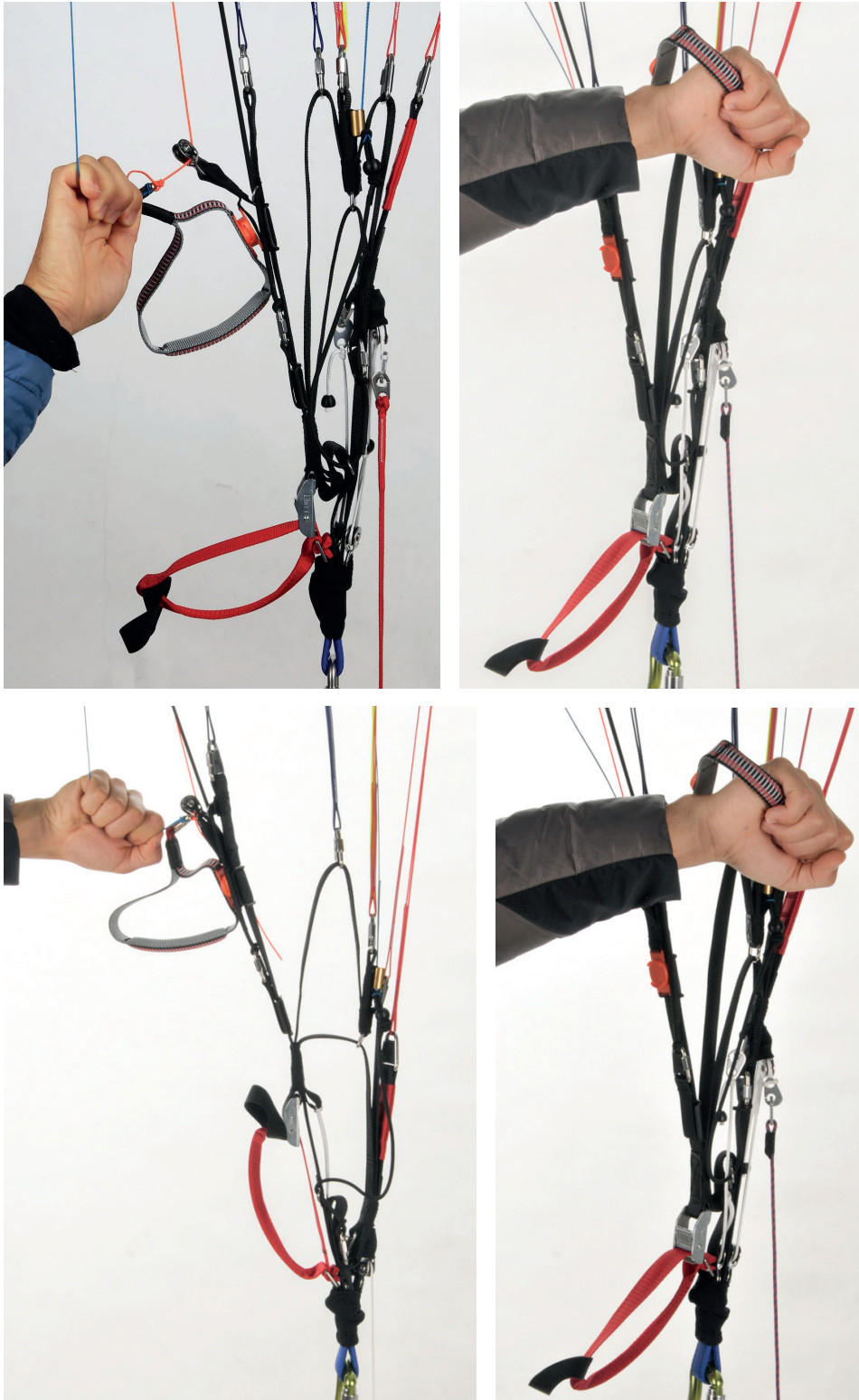


Figure: Steering with outer 2D steering line only (trimm speed and accelerated)

Steering with wing tip brake (required for full speed)

When fully accelerated (trimmer and accelerator activated), you should be steering the glider **ONLY** with the wing tip brake. Such steering does not deform the reflex airfoil, guaranteeing safety and effectiveness.

Beside this, the wing tip steering is also recommended for any kind of accelerated flights.

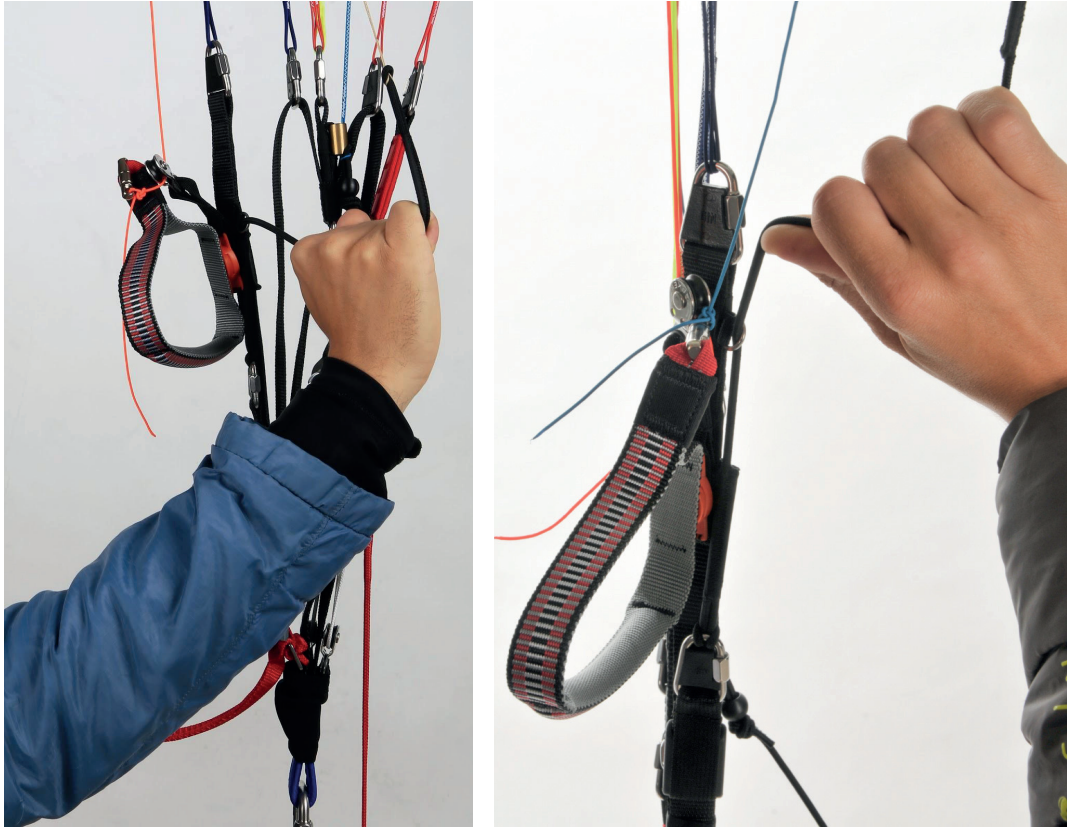


Figure: Steering with wing tip brake

Rapid descent techniques

Many flying situations call for a very rapid descent to avoid a dangerous situation, e.g. the up current from a cumulus cloud, an approaching cold front or a storm front.

Rapid descent methods should all be practised in calm conditions and at sufficient altitude so that a pilot is then able to employ them effectively if extreme conditions arise. Rapid descent techniques are divided into three different manoeuvres which increase the sink rate in a safe and controllable manner.

All of these options will also strain your motor paraglider and should be avoided if you want to preserve your motor paraglider. We recommend that you practice the rapid descent techniques under professional guidance during a safety training course.

Spiral dives

The spiral dive is the most effective method for making a rapid descent, and can allow sink rates of up to 20 m/s to be reached. It is suitable where there is a high ascent rate and little wind.

The Carve fulfils the EN spiral dive requirements and has no tendency to remain in a stable spiral dive under normal conditions. The certification test flights are carried out with a defined carabiner distance (see chapter "Harness"). Deviations from this setting, unapproved harnesses or spirals with excessive sink can change the maneuver considerably; pilot action may be required. In such cases, exit the spiral by weightshifting to the outside and progressively applying the outside brake.

Before entering a spiral, make sure you have adequate height for recovery. To enter the spiral dive, weight shift and progressively apply the inside brake until the glider enters the spiral. As the glider accelerates into the spiral, centre your weight and control your rate of descent with weightshift and outer brake.

To exit the spiral, check your weight is centred (or slightly towards the outside) and progressively release the inside brake. As the glider starts to exit the spiral, you may also choose to reduce the pendulum moment by briefly re-applying the inside brake.

WARNING: In the spiral dive, very high turn speeds can be reached with an increase in acceleration due to gravity (up to over 6g), so exercise care when attempting this manoeuvre. Take note of the following:

- **The high g-forces experienced in steep or prolonged spirals may result in disorientation or even loss of consciousness.**
- **Always maintain ground clearance of 150 – 200m. The manoeuvre must be exited at this height above ground.**
- **Do not attempt to enter a spiral dive while in big ears. This places excessive forces on the paraglider and may result in structural failure.**
- **Frequent steep spirals may cause premature aging of your wing.**
- **Spirals with descent rates above 10 m/s are not recommended.**

WARNING: You must immediately deploy your reserve if you lose control of the glider and the sink rate and find yourself in a stable spiral. The high g-forces in the spiral may rapidly lead to a loss of consciousness which prevent later deployment of your reserve.

B-Stall

In the B-stall, a stall is provoked and the paraglider sinks vertically with a sink rate of approx. 8 m/s. The B-stall is suitable when there is an average ascent rate and little wind.

To enter a B-stall, grasp both of the B-risers on the mallions at the coloured mark. Pull both B-risers evenly down until the airflow is broken and the wing goes completely into vertical descent flight mode. The B-risers should then be held in this position to ensure a gentle descent.

Pull down the B-risers only until there is no airflow. If they are pulled down any further, the glider could go into a horseshoe. Check before and during the B-stall that the airspace beneath you is clear.

For recovery return the B-risers quickly and evenly into their normal position. The glider may go into a deep stall if they are released too slowly or into a negative spin if not released

symmetrically. If you enter a deep stall, increase the speed by using the speed system or by pulling the A-risers forward.

WARNING: The canopy speeds up after the B-risers have been released until the airflow returns. Under no circumstances should the brakes be applied at this time. This manoeuvre should be avoided at low temperatures. Pilots should be aware that this considerably increases the tendency to deep stall.

Big ears

Big ears are the simplest method for rapid descent and have a sink rate of 3-5m/s. The advantage of big ears is that the glider continues to fly straight, meaning that a danger area can be avoided. It is even possible to land using big ears, for example on a top-landing to compensate for the updraft.

The wing-loading increases by the reduction in the wing's surface area, the wing becomes more stable against collapses in turbulence. Nevertheless, the air resistance of the wing also increases, and it flies more slowly and closer to the stall limit. To counter this and to increase the effectiveness of the sink, the speed bar is generally also used in combination with big ears.

Start the "big ears" manoeuvre by pulling both outer A-lines downwards. This should fold down a sufficiently large part of the wing tips that the pilot does not then have to counteract the tendency to reopen. If the surface area which tucks under is too small ("ears" flapping, high holding forces), re-open the ears and then pull down and hold the A-lines a little more firmly.

The brake lines are held steady and the pilot uses weightshift to steer the paraglider. You can now descend safely on the stable middle part of the wing. The brakes must not be shortened during the manoeuvre, e.g. by wrapping the brake line. Do not use the brakes unless you intend to exit big ears.

Once in big ears, you can increase your sink rate and forward speed by applying the speed bar. Always apply the speed bar after entering big ears, never before.

To exit big ears, release both A lines at the same time. Apply brake progressively one side at a time to help re-inflation. Be careful not brake too deeply on both sides at the same time as this could cause a stall.

WARNING: Never use big ears with strong motor thrust. The resistance of the paraglider canopy increases the angle of inclination and the glider can enter into the stall.

The technique of big ears causes a higher load for the line groups which are still weight-bearing. Therefore, do not fly any extreme manoeuvres with big ears.

This manoeuvre should be avoided in low temperatures. Pilots should be aware that this increases the tendency to deep stall.

Landing

In Paramotor flight there are two ways to land: with standing propeller or trailing throttle. For landings, regardless of whether they are carried out with or without engine power, observe the following points:

Fly a proper landing circuit and plan your final approach well in advance. Actively choose a spot on the ground in the landing field to aim for. Adopt an upright position in your harness by sliding your legs forward, ready to make contact with the ground.

Make your final approach as straight as possible. Fly at around trim speed (keep just enough tension on the brakes to keep contact with the wing, a little more tension in turbulent air). Once you come within a metre of the ground, brake progressively to maintain a level flight path.

In nil or light winds, flare positively to reduce your ground speed to a minimum. Again: higher wing loading results in a higher ground speed. Make sure you always land into the wind. In nil wind situations, be prepared to run fast.

In stronger winds, use only the minimum amount of flare necessary to sufficiently minimize your vertical and horizontal speed. If you flare too hard in strong winds, the glider will climb rapidly upwards and backwards, and you may get injured. Turn to face your wing as soon as your feet touch the ground. Immediately stall the glider as rapidly as possible with the brakes or rear risers. Be prepared to run towards your wing.

Pay also attention to the following points:

- Take a closer look at the landing/airfield before you take-off
- Before landing, check the wind direction and speed
- Train landing flights as often as possible to become familiar with the Carve
- Landing without engine power requires less space
- Steep turns and rapid changes of direction must be avoided before landing due to the oscillating movements associated with them.

WARNING: Although the Carve is remarkably maneuverable even in the lower half of the brake range, do not be tempted to make an excessively slow landing approach. Strong gusts and/or a steep wind gradient may cause any glider to suddenly lose altitude, or even stall.

Never let the leading edge crash to the ground, you risk damaging the seams and/or internal structure. Ground handling (especially on rough surfaces) will accelerate the ageing process of your wing.

Landing with standing propeller

Landing with standing propeller reduces the chances of damaging the propeller on landing, but on the other hand there is only one possible attempt - so the landing must be done correctly! With or without the engine, the Carve reacts better with turbulence with open trimmers. Therefore, if the conditions are strong, it is better to make an approach with greater speed, and use plenty of space to bleed off the speed before touching the ground (like in hang gliding). The Carve has good energy retention, a long final approach should be used to store energy for the flare.

If you are attempting precision landings or landing in nil wind, it is recommended to use the trimmers to half or completely closed (maximum lift). Your performance in sink rate will be better. This choice is even more crucial at a high wing loading.

Landing with trailing throttle

Make a flat approach with the engine idling, then stabilize and lose speed before the final approach. Immediately after touchdown, switch off the engine. The main advantage of this procedure is the possibility to abort the landing and repeat the approach in case of bad judgment. However, if you forget to turn off the engine before the wing deflates, there is a considerable risk of damaging your propeller, catching lines, or even injuring yourself by falling with your gear on.

Additional information for motorized flying

The following points should be noted when flying with the Carve:

- Never place the engine downwind of your sail, to avoid trouble due to possible gusts
- Check the gaskets of all fuel pipes for leakage
- Check whether you are carrying enough fuel for the planned flight
- Inspect equipment and harness for loose parts that might fall into the propeller
- If you find any problem, take care of it immediately!
- Before each flight, carefully follow the individual points of the pre-flight check
- Immediately after landing, turn off the engine to avoid damage to the leash and propeller.
- Avoid flights over water and power lines, do not fly between trees and generally avoid areas where a motor failure does not offer a landing option
- Do not underestimate the turbulence created by other wings or even your own, especially when you fly low.
- Do not release the brakes below 100 meters, as a possible malfunction of your paramotor may require an immediate pilot reaction.
- Generally never trust your engine, it can stop at any time. Always act as if it was just going to let you go.
- If you recognize a change of the engine noise or increased vibration, you should land immediately to fix the problem.
- Keep in mind that engines interfere with noise. Therefore avoid low altitudes over towns.

Range of use

The Carve was developed and tested for use solely as a paramotor wing. Any use other than as intended is prohibited.

Free Flying

The Carve was not developed or tested for free flying.

Towing

The Carve is not intended for towing.

Tandem paragliding

The Carve is not intended for tandem use.

Aerobatics

Your Carve Was not developed or tested to be used for aerobatics (acro). By engaging in such an activity, you voluntarily assume an increased risk of injury or death.

Any type of acrobatic manoeuvre at all on the Carve is contrary to law and illegal. The pilot would be putting his/her life at risk. Acrobatics involves a risk of unpredictable flight attitudes, which could lead to damage to material and structural failure.

Dangerous situations and extreme flying

WARNING: Extreme flight maneuvers with a full throttle engine are life-threatening and cannot be tested! The following chapter describes how to avoid and correct extreme situations. The descriptions of the test maneuvers refer to the starting weight without engine.

The glider design is such that the following flight manoeuvres cannot be performed in terms of the certification test report:

- asymmetric collapse with open trimmers
- asymmetric collapse with open trimmers and speed bar
- front stall with open trimmers
- front stall with open trimmers and speed bar

Dangerous situations

Pilot error, extreme wind conditions or turbulence which goes unnoticed by the pilot for too long may leave the wing in an unusual flying position, requiring special reaction and skills on the part of the pilot.

Ground-training is a safe and effective method of familiarising yourself with your glider's reactions. Launch can be practised, as can small flying manoeuvres, such as stall, asymmetric collapse, front stall etc.

Any pilot who flies in turbulent conditions or who makes an error in handling the glider is at risk of getting into an extreme situation. All of the extreme flight figures and flight attitudes described here are dangerous if they are carried out with inadequate knowledge, without the right safety altitude or without training.

Always keep within the recommended limits. Avoid aerobatics and extreme loading such as spirals and big ears. This will prevent accidents and avoid overloading the glider.

In turbulent conditions, always keep enough distance from rock faces and other obstacles. Time and sufficient altitude are needed to recover from extreme situations.

WARNING: Deploy your reserve if the corrective manoeuvres described in the following sections do not return the glider to a controllable flying position or if there is not enough altitude for correction.

SIV / Safety training

The Carve is not suitable for SIV.

Material stress

During a safety training course, avoid subjecting the materials of your paraglider to excessive stress. Uncontrolled flight positions may occur which are outside the manufacturer limits of the paraglider. This may cause premature ageing, or even structural failure.

Stretching of the lines and/or canopy material after safety training can lead to a general deterioration in flight characteristics.

Damage as a result of safety training is not covered by the warranty.

WARNING: Be sure to perform any simulated collapses correctly. Asymmetric collapses performed incorrectly may result in unpredictable collapse behaviour and impulsive re-opening. This behaviour may require considerable pilot skill to manage safely.

Canopy Collapses

Asymmetric collapses

Asymmetric collapses are caused by the stagnation point moving to the trailing edge of the glider. A negative angle of attack makes part of the canopy collapse and tuck under, and the glider may plunge down, turn away or spin.

Use active flying techniques to virtually eliminate collapses in normal flying conditions. Nevertheless, if you do get a collapse, stabilize your weight in your harness and do not allow yourself to fall to the collapsed side. Control your course with weightshift and a little outside brake. The deflation should re-inflate spontaneously.

If the deflation does not re-inflate spontaneously, apply brake on the closed side in a smooth, progressive pumping action. Be sure not to apply too much brake too slowly as this may risk a stall. Remember that a partly collapsed wing has a reduced surface area and thus a higher stall speed.

If you get a collapse while in accelerated flight, release the speed bar immediately. Then apply the normal procedure for unaccelerated asymmetric collapses.

WARNING: After a large collapse, an instinctive reaction to the body falling is to attempt to hold something. This can result in the pilot unintentionally applying brake, which prevents proper recovery. Always make sure you have fully released the brakes (including any wraps taken) after any incident. Let the glider fly.

Cravat / glider wrapped around lines

A cravatte occurs when a wing tip becomes stuck between the glider lines, for example, following a bad take-off preparation. On the Carve, a cravatte is unlikely to occur. If you do get a cravatte, first control your direction. Do this by using weightshift and enough counter-brake to stop the turn, but not too much to risk a stall of the opposite side.

A cravat can generally be opened by a short, fast pull on the brake line of the cravatted side. If not, on the Carve, there is a separate stabilizer/winglet main line that goes down to the A2 riser. This line usually becomes slack in the event of a cravat. Pull this line down completely until it becomes tight and the cravat normally comes out.

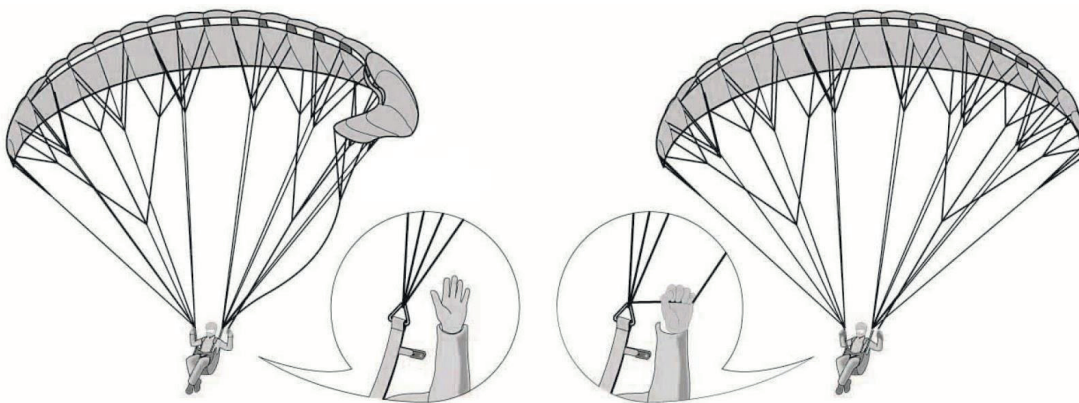


Figure: Grabbing the stabilizer/winglet main line

WARNING: Counter-steering too strongly on the inflated side of the glider can result in a stall and to further uncontrolled flight manoeuvres (cascade of events).

Always remain aware of other aircraft and terrain when dealing with a problem on your wing. Do not hesitate to throw your reserve parachute if the rotation in a cravatte is increasing uncontrollably, especially if you are at low altitude.

Symmetric collapses (Front stall)

A negative angle of attack can also cause part or all of the leading edge of the glider to collapse.

Symmetric (frontal) collapses will normally re-open without pilot input. The paraglider will pitch forward and then regain speed. Assist this process if necessary with a symmetric application of the brakes. Take care not to apply too much brake for too long as this may stall the wing.

In the case of extreme front stalls across the entire wing chord, the wing tips may move forward making the glider form a U-shape. Again, recovery is by light symmetrical braking on both sides. Take care that both wing tips return to normal flight evenly.

WARNING: If you get a collapse while in accelerated flight, release the speed bar immediately. Then apply the normal procedure for unaccelerated asymmetric collapses.

Types of stall

When a paraglider flies through the air, a laminar and turbulent boundary layer is created. Extremely dangerous flight configurations can result if the laminar boundary layer is interrupted, with practically the entire airflow along the top surface breaking away. This happens in particular when the angle of attack is too great.

WARNING: Full stall and spin are manoeuvres which can be fatal if recovery is not correct. These manoeuvres should therefore be avoided. However, it is important to learn how to recognise the indications that a glider is about to stall so that you can take immediate action to prevent it.

There are three different types of stall in paragliding.

Deep stall (parachuting, stable stall)

Paragliders can go into a deep stall for a variety of reasons: brake lines too short (no slack), old or damaged glider material which therefore has increased level of permeability, altered trim/line length and changes to profile characteristics caused by moisture (e.g. flying in rain). Paragliders have a particular tendency to stall if the wing-loading is too low. An out-of-trim glider, caused by changes in line lengths due to prolonged use, may also have a higher deep stall tendency.

In a deep stall, the airflow from the front reduces and the glider goes into a stable flight attitude without forward momentum. The paraglider sinks almost vertically at 4-5m/s and there is noticeably less flight noise.

The Carve has no tendency to get into in a deep stall. Should this nevertheless occur, make sure your brakes are fully released, the glider will then normally recover on its own immediately. If the glider still doesn't recover either put your hands on the A risers and push forward or use the speed bar to accelerate the wing.

If you have a speed system, you can also use it to accelerate, so that the glider goes into a normal flying position from the deep stall. After you have landed, the glider and the length of the lines must be checked.

You can recognise a deep stall by the glider getting "mushy" and the airflow around your ears decreasing. The glider may also compress spanwise. Flying in strong turbulence or exiting a deflation with too much brake applied can cause this situation. A wet glider also has a higher deep stall tendency, and you should do everything you can to avoid flying in the rain. If you do pass through some rain never make big ears! Apply speed bar until you are confident that the wing has dried out.

WARNING: Never apply the brakes, including any wraps taken, in a deep stall.

Full stall (dynamic stall)

The full stall happens when the wing partially deflates and loses its arched shape. It is triggered when the maximum possible angle of attack is exceeded. The most common cause is going below the minimum speed or flying near the minimum speed combined with the effects of turbulence.

In full stall, the paraglider loses its forwards travel, surges backwards and deflates. If the brakes are held down, the canopy comes up over the pilot again. The result is an almost vertical descent with a sink rate of approx. 8m/s.

Do not take wraps on the brakes during a full stall. Keep your hands close to the body and under the harness seat plate during the stall. If the canopy is in a stable full stall, it will move forward and backward. To exit the full stall, slowly release the brakes, making sure that this is done symmetrically. After that, the brakes are completely released when the glider canopy is filled and in front of the pilot. This prevents the canopy from pitching too far forward.

As this is done, the canopy accelerates forwards dynamically and picks up speed. Do not brake too soon (otherwise it could go into a full stall again), and be careful to avoid a front stall by making sure that it does not shoot too far forwards.

WARNING: If the canopy has gone back during the full stall, the brakes must be held down, otherwise the canopy may surge forward and, in an extreme case, end up underneath the pilot. Hold the brakes down until the canopy is above you again.

Spin

The spin is a stable flight maneuver, in which one side of the canopy stalls, while the other side continues to fly forward. The glider turns around the stalled side of the wing.

In normal thermal flight, you are not very far from the limits of a spin. If a spin occurs, just let up the brakes and wait for the glider to surge forward, checking it with the brakes if it surges too far. Never release the spin if the glider is far back behind you, always try to release it when the glider is above or in front of you!

Depending on the type of release and the dynamics of the rotary movement, the canopy may dive forward on one side and collapse asymmetrically. In the case of a longer spin, the pilot may release the brakes only at the moment when the glider is in its rotary motion above or in front of the pilot.

If the spin does not stop, check whether you have released the brakes fully, including any wraps!

Other tips for dangerous situations

Cascade

Many reserve deployments are a result of a cascade of over-corrections by the pilot. Please note that over-corrections are often worse than no input at all.

Emergency steering (rear riser steering)

If for some reason the brake lines are not working, e.g. if the knot on the brake handle has come undone or a brake line is defective, the Carve can also be steered and landed using the rear risers.

In this case, stall happens more quickly and the pilot must compensate for the changed flight behaviour by pulling carefully on the risers.

Flying in the rain

We strongly advise you not to fly in the rain on any paraglider including the Carve. If you do fly in the rain, be aware that you will have a greater risk of entering a deep stall. It is wise to apply speedbar after passing through rain until you are confident that the glider is flying normally, and has preferably dried out so that there is no longer any risk of deep stall.

Flying in extremely humid weather or in rain is outside of the operating limits of the glider. If you are unable to avoid flying in rain, please observe the following:

- it is advisable to fly with slight acceleration during and after the rain (min. 30% or more)
- use no brake input or as little as possible
- control travel reduces
- avoid tight turns, especially in the final approach. If conditions allow, you should also fly slightly accelerated in this phase
- avoid large angles of attack and the possible early stall near the ground (release the speed bar only slowly)

Advertising and adhesives

Always make sure before attaching advertising to the glider that the adhesive planned will not alter the glider's flight behaviour. If you are in doubt, we recommend that you do not attach the adhesive. Attaching adhesives to the glider which are large, heavy, or made of unsuitable material may result in revocation of the certification.

Overloading

The glider structure is put under high levels of strain in particular on extreme flight manoeuvres, rapid descent methods (spiral dives) or prohibited aerobatic manoeuvres. They considerably accelerate the aging process of the structure and should therefore be avoided. The glider must be inspected earlier than is usually the case if it has been put under more than the usual degree of strain.

Sand and salt air

In many cases, sand and salt air cause the lines and fabric to age much more rapidly. If you often fly near the sea, the glider should be inspected more frequently than normally required.

Temperature range

Temperatures under -10 °C and over +50°C can make the paraglider unfit to fly. The manufacturer's warranty will lapse if the glider is used outside of this temperature range.

Storing, care, maintenance and repairs

Storing the paraglider

Packing the paraglider

The Carve can be packed with all the usual methods. To ensure a long life of the profile reinforcements it is very important that you pack the paraglider carefully. It is therefore recommended that you pack the Carve as shown in the following illustrations.

The leading edge reinforcements (Mylar and Rigifoil system) on the front edge are placed on top of each other to avoid bending or misshaping them. This method of packing ensures that the leading edge is treated carefully, which will increase the glider's life, performance and launch behaviour.

If the reinforcements have been bent or misshapen, they distort more easily during flight, creating an altered air inflow which can lead to a loss in performance and changes in flight behaviour.

The leading edge reinforcements also perform an important function on launch. Therefore, the less they have been bent, the more easily the glider will inflate and launch.

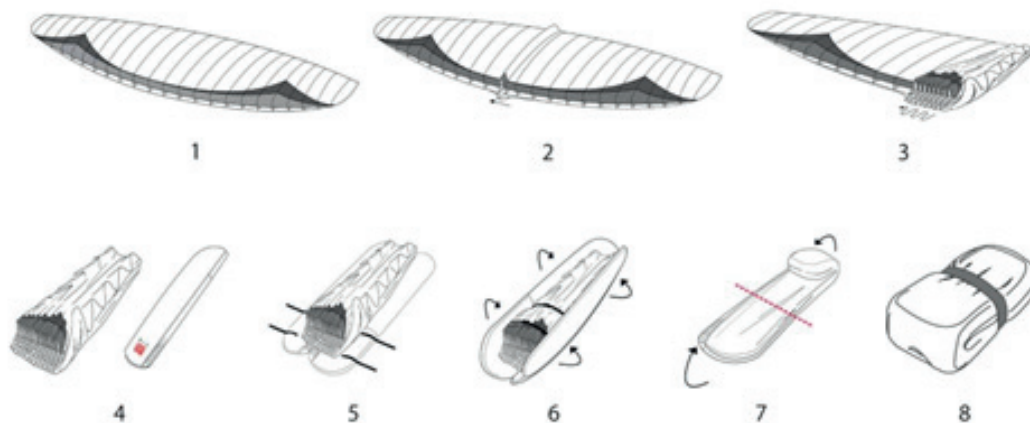


Figure: Packing the Carve

1. Spread out the paraglider completely on a smooth surface. Do not drag the paraglider across any rough surfaces such as gravel or asphalt. This may damage the seams and surface coating.
2. Start from the center to stack the profiles of each side of the wing on top of each other.
3. Proceed like this until the wing tip. All the ribs on one side are placed one on top of one another, so that the leading edges are not bent.
4. Then continue as in the second step, placing the leading edges of the other side on top of the next until you reach the tip of the glider. Place the concertina bag underneath the glider which has been folded together, so that the ribs are all lying along the length of the concertina bag.

5. The glider is now folded up along its length, and the leading edges are on top of each other without having being bent. Fasten the straps near the leading edges, so that they do not slip, and the straps in the middle and at the end of the glider.
6. Do up the zip, making sure that none of the lines or fabric is caught in the zip.
7. Fold up the glider along its length, with the first fold below the leading edge reinforcements. Pay particular care not to bend any of the rigid reinforcements!
8. Fold the glider again. Then place the compression strap around the glider and fasten it by pulling gently. Make sure that the glider is only loosely folded and is not bent or compressed excessively.

Rucksack

All GIN gliders are delivered with a suitable and durable rucksack, which is easy to pack and offers good ergonomics and comfort.

The backpack type/size included in delivery depends on the paraglider model/size. Therefore, there are different ways to pack the glider, depending on the personal preferences, the harness and the equipment. To maximize carrying comfort, the following method is recommended: First, place the glider inside the harness and then put the top of harness in the bottom of the rucksack with the glider side next to the back of the rucksack.

The tighter the rucksack is packed, the more comfortable it will be to carry. Gin Gliders offers a wide variety of rucksack sizes and models. They are available as an optional extra for pilots that require it.

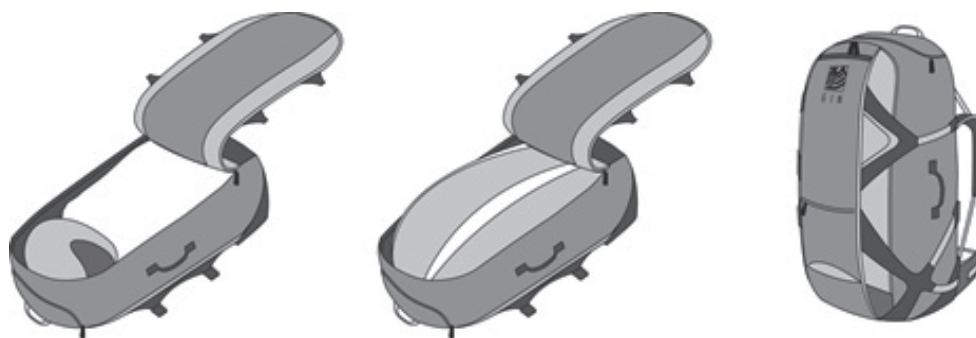


Figure: Packing the rucksack

Storing and transporting the glider

Even if your paraglider was completely dry when it was packed up after the final flight of the season, for long-term storage you should if possible take it out of the backpack and spread out the canopy a little in a clean, dry place away from direct light. If you do not have the space to do this, then open the backpack, internal bag and belt as much as possible and avoid compressing it. It must be stored at a temperature between 10° and 25° C and in relative humidity between 50 and 75%. Make sure too that the paraglider is not stored in a place where animals such as mice or cats could use it as a place to sleep.

Do not store the paraglider near any chemicals. Petrol, for example, causes the material to disintegrate and can cause considerable damage to your paraglider. When your equipment is in the car boot, keep it as far away as possible from any spare petrol cans or oil containers.

The Carve should not be exposed to extreme heat (e.g. in the boot of the car during summer). The heat may cause any moisture present to be pressed through the fabric, thereby damaging the coating. High temperatures accelerate the process of hydrolysis, particularly when combined with moisture, which damages fibres and coating. Do not store your paraglider near radiators or other heat sources. Always transport your glider in the special concertina bag and use the backpack provided for the rest of the equipment.

Care

The materials used in the Carve have been carefully selected for maximum durability and performance. Nevertheless, following the guidelines below will keep your paraglider airworthy and will ensure a long period of continuous safe operation. Excessive wear is caused by careless ground handling and packing, unnecessary exposure to UV light, chemicals, heat and moisture.

Ground handling

The following should be avoided:

- Don't ground handle or take-off on abrasive surfaces.
- To move the paraglider to another spot, don't drag it across the ground. Pick it up and carry it.
- Violent shocks to the upper surface (e.g. when the canopy crashes to the ground leading edge first whilst ground handling). This stresses the seams and can even cause the cell to explode.
- Don't repeatedly inflate the glider and allow it to crash back down. Step towards the wing as it comes down to take the force out of this action.
- Dragging the glider along the ground.
- Stepping on the lines or canopy. The Kevlar line inside the sheath can take lots of pulling force without stretching, but is sensitive to bending with small radius.
- Opening your wing in strong winds without first untangling the lines.
- Don't sit on your rucksack when your glider is packed inside.

Fabric

Care is essential to ensure that the fabric and glider remain durable and retain their qualities. The glider should therefore be protected from unnecessary UV light. Do not unpack your glider until immediately before flight and pack it up straight after landing. Modern paraglider fabrics have better protection against the sun, but UV rays in particular are still one of the decisive factors in how the fabric ages. The colours will fade first and then the coating and fibres will begin to age.

When choosing a place to launch, try to find somewhere which is smooth and free of stones and sharp objects. Do not stand on the glider. This weakens the fabric, especially if it is on a hard or stony surface. Pay attention to the behaviour of spectators at the launch site, especially children: do not hesitate to draw their attention to the sensitive nature of the fabric.

When you are packing up your glider, make sure that there are no insects trapped inside. Many insects produce acids when they decompose, which can cause holes in the fabric.

Grasshoppers make holes by biting through the fabric and also excrete a dark liquid which stains. Keep animals away when you are packing up. Insects are not attracted by any particular colours, contrary to what is commonly believed.

If the glider gets wet or damp, it should be dried as soon as possible in a well-ventilated room (but out of the sun). It may take several days before the canopy has dried completely because the fibres absorb water. Mould may form if the paraglider is stored wet and the fibres may rot, particularly when it is warm. This can make the paraglider unsuitable for flying within a short time.

A brand-new glider will often be compressed when delivered. This is solely for the initial delivery and the glider should not be compressed in such a way again. Do not pack your glider too tightly after use and, even though it is very comfortable, never sit on the backpack with the glider inside.

If salt water gets on the glider, it should be rinsed immediately in fresh water (refer to the section “Cleaning”).

Lines

The Carve has various different high-quality and accurately manufactured lines which have been selected according to the load and area of use. You should also protect the lines from unnecessary UV light because, as with the fabric, UV light in particular will weaken the lines.

Dyneema lines, which are used in the area of the top brake lines, for example, are very temperature-sensitive and can be permanently damaged at temperatures above 75° C. Therefore your glider should never be stored in a hot car especially during summer.

Be careful that there is no abrasion caused to the coating on the lines by rubbing, particularly when ground-training with crossed risers.

Do not walk on the lines after the glider has been spread out and watch out for spectators or skiers who may inadvertently go over the lines.

When you are packing up the glider, be careful to avoid putting any unnecessary kinks in the lines and use only the overhand knot or bowline knots described for the brake lines.

Rigid construction

Various forms of plastic rods are used in the Carve (rigid construction), which help maintain the shape of the leading edge and the stability of the canopy. To ensure that the plastic rods keep their shape, it is important that you pack the glider as described in the section “Packing the paraglider”.

The plastic rods on the Carve can all be replaced through small pockets. If you notice that a plastic rod has been damaged or misshapen because of incorrect use, this can be replaced by Gin Gliders or a Gin Gliders authorised workshop.

Cleaning

If you do have to clean the glider, use only lukewarm fresh water and a soft sponge. Use a weak soap solution for stubborn stains, and then rinse it out carefully and thoroughly. Leave the glider to dry in a place which is well-ventilated and in the shade.

Do not under any circumstances use chemicals, brushes, rough cloths, high-pressure cleaners or steamers to clean the glider, as these can damage the fabric coating and weaken it. The glider becomes porous and loses breaking strength.

Do not under any circumstances put the glider in the washing machine. Even if washing powder is not used, the glider would be badly damaged by the mechanical action of the machine. Do not put the canopy into a swimming pool - chlorine will damage the fabric. If you have no choice but to rinse the glider, e.g. following a landing in the sea, gently wash it down inside and out with fresh water. Frequent rinsing accelerates the aging process.

Maintenance

Type designation

GIN gliders have an exact identification on the underside of the wingtip or on the centre rib, which is obligatory for all paragliders. The information required is set out in the airworthiness requirements.

It is helpful to provide the type designation of the paraglider if you are contacting your Gin Gliders dealer with any queries or ordering replacement parts or accessories, to ensure accurate identification.

Regular inspections

The following parts and materials must be inspected regularly for damage, abrasion and correct operation, e.g. after landing:

- Risers and quick-links
- Lines
- Fabric

Lines

Measuring the length of the lines is part of the regular paraglider inspection. The lines must be measured with a load of 5kg, in order to ensure reproducible results for a comparison with the lengths in the check sheets.

The lines have a considerable influence on flight behaviour. Correct line length and symmetry are also important for performance and handling. Gin Gliders therefore recommends an inspection every 50 to 100 hours or once a year.

Environmental conditions such as high temperatures or moisture can affect line length. Check the line length regularly, particularly if you notice any change in launch or flight behaviour. The line length should be checked if you have landed in water or if the lines have got wet through. Lines age and lose strength even if the paraglider is used infrequently or not at all. This can affect the safety and function of your paraglider.

Signs of wear are slight bumps or changes in flying characteristics. The lines must then be replaced immediately. Use only inspected and approved lines, which can be obtained through Gin Gliders.

WARNING: A damaged line can result in loss of control of the glider. Always replace lines which are damaged. If you need to replace damaged or worn-out parts, use only original parts or approved parts from the manufacturer.

WARNING: Do not under any circumstances use knots to shorten the lines. Any knot will weaken the line considerably and may cause the line to break in case of high load. The overhand knot and bowline knots described are permitted only for connecting the main brake lines/brake handle.

Inspection periods

Failure to observe the inspection periods shall render invalid the certification and warranty. A properly completed logbook with details of all flying and training will help you to comply with these periods.

A qualified professional should perform a formal maintenance inspection no later than 36 months after the first flight or after 200 hours (including ground handling), whichever is sooner. Subsequent inspections should be carried out every 24 months or 150 hours (including ground handling), whichever is sooner.

Ground handling time must be at least doubled when calculating the total hours of use because of the increased wear and tear on the glider. If you ground handle frequently or fly in harsh conditions, we recommend an annual check. It is your responsibility as a pilot to ensure that your wing is airworthy at all times.

For gliders used in training, an inspection must be carried out every 12 months from the date of purchase.

A full inspection will give you peace of mind and extend your glider's lifetime. Additional inspections should be performed by a qualified person following a crash or violent landing on the leading edge, or if you note a deterioration of performance or behaviour.

Service and repair shops authorized by Gin gliders are in possession of the Gin Gliders service instruction, which contains all the necessary procedures, equipment and additional technical information about the Carve, such as single line lengths, sewing and further material and processing guidelines.

Validity of inspection

It is very important that your glider is serviced at the required intervals throughout its entire life. In order to benefit from Gin Gliders warranty:

- You must have your paraglider inspected by Gin Gliders or an inspection agent authorised by Gin Gliders.
- The documentation and the result of the inspection must be clearly identifiable (date and place / name of the inspector) and be entered near the glider information/certification sticker.

Inspection by the pilot

Under § 14 para. 5 of the German Aeronautical Products Investigation Order (LuftGerPV), pilots in Germany are able to carry out the inspections themselves or appoint a third party to do so

(e.g. manufacturer/importer), provided that the requirements are all fulfilled. However, if this is done, the liability and warranty of Gin Gliders will lapse.

The DHV recommends that inspection is carried out by the manufacturer/importer or by an authorised inspection agent .

Repairs

Gin Gliders workshops

All repairs and servicing should be carried out by a Gin Gliders authorised workshop or directly by Gin Gliders. Gin Gliders workshops have trained staff, original Gin Gliders parts and the necessary know-how, all of which will ensure top quality.

Major repairs at the Carve, such as replacing panels, should only be carried out by the distributor or manufacturer.

Small repairs to the glider

Very small holes in the sail can be repaired with the sticky back tape provided with your glider. Damaged lines should be replaced by your GIN dealer. Before fitting a replacement line, check it for length against its counterpart on the other side of the wing. When a line has been replaced, always inflate the glider on flat ground to check that everything is in order before flying.

WARNING: Do not attempt to perform repairs unless you have the knowledge, experience, materials and tools needed to do the job properly.

GIN quality and service

We take pride in the quality of our products and are committed to putting right any problems affecting the safety or function of your equipment and which are attributable to manufacturing faults. Your GIN dealer is your first point of contact if you have any problems with your equipment. If you are unable to contact your dealer or GIN importer, contact Gin Gliders directly via our website.

Glider characteristics, illustrations and technical data

Glider categories and guidelines

The complexity of the paraglider system means that it is not possible to give any more than a partial description of the glider's flight behaviour and reactions to disturbances. Even a small alteration in individual parameters can result in flight behaviour which is markedly modified and different from the description given.

WARNING: The descriptions of flight characteristics contained in this Manual are all based on experiences from the test flights, which were carried out under standardised conditions. The classification is merely a description of the reactions to these standard tests.

Glider category

DGAC certification

The Carve received ULM Class 1 registration (DGAC)

Description of flight characteristics

Paramotor with demanding flying characteristics and potentially violent reactions to turbulence and pilot errors. Recovery to normal flight requires precise pilot input.

Suitability for training

The Carve is generally not suitable for use as a training paramotor glider.

Description of pilot skills required

Target group and recommended flying experience

Designed for pilots well versed in techniques to recover from abnormal flying conditions, who fly regularly, "actively", and who understand the possible implications of flying a paraglider with reduced passive safety.

Reflex profiles require a correct assessment of operating limits in order to avoid canopy disturbances safely.

Gin Gliders recommend that paramotor wing pilots meet the following minimum requirements before flying the Carve:

- extensive flying experience of at least 75 hours airtime per year
- extensive knowledge of the special features of paragliders with reflex profiles

The Carve is not suitable as a wing for beginner paramotor pilots. On the contrary, pilots should already have experience with paramotor wings and be familiar with the performance and safety of gliders with reflex profiles.

The Carve covers many aspects of powered paragliding and offers various adjustment options according to the pilot's wishes. The adjustments require appropriate experience on the part of the pilot, in order to use the Carves full range of performance and handling.

Normal flight requirements

Gliders of this class are designed to have maximum performance. Therefore the flight and control behaviour requires the pilot to have comprehensive, long-term flight practice and advanced technical knowledge.

Requirements for incidents and quick descents

The requirements for incidents request a maximum of practice and responsiveness of the pilot. The safe control of extreme flight behaviour after disturbances and demanding flight manoeuvres, such as fast descent, must be at the highest level through constant training. Even low pilot errors have to be eliminated in response to canopy disturbances and extreme flight conditions.

Delivery

Make sure your dealer has checked and test-flown the glider. Your glider will be delivered to you with the original trim settings which correspond to the tested configuration. Do not make any modifications, such as changing the risers or altering the line lengths. This would invalidate the certification and is potentially dangerous.

NOTE: Your glider may have been delivered with some lines looped on the maillons, this is to allow the glider to be re-trimmed during a professional check at the recommended service interval.

Manufacturing

All GIN gliders are produced in the company's own facilities using the most modern techniques. Highly skilled staff take extreme care during the entire manufacturing process. Stringent quality control is made after each step, and all materials that go into each wing can be traced. These measures guarantee that pilots fly with the assurance that their wing meets the most exacting safety standards.

Overall illustration

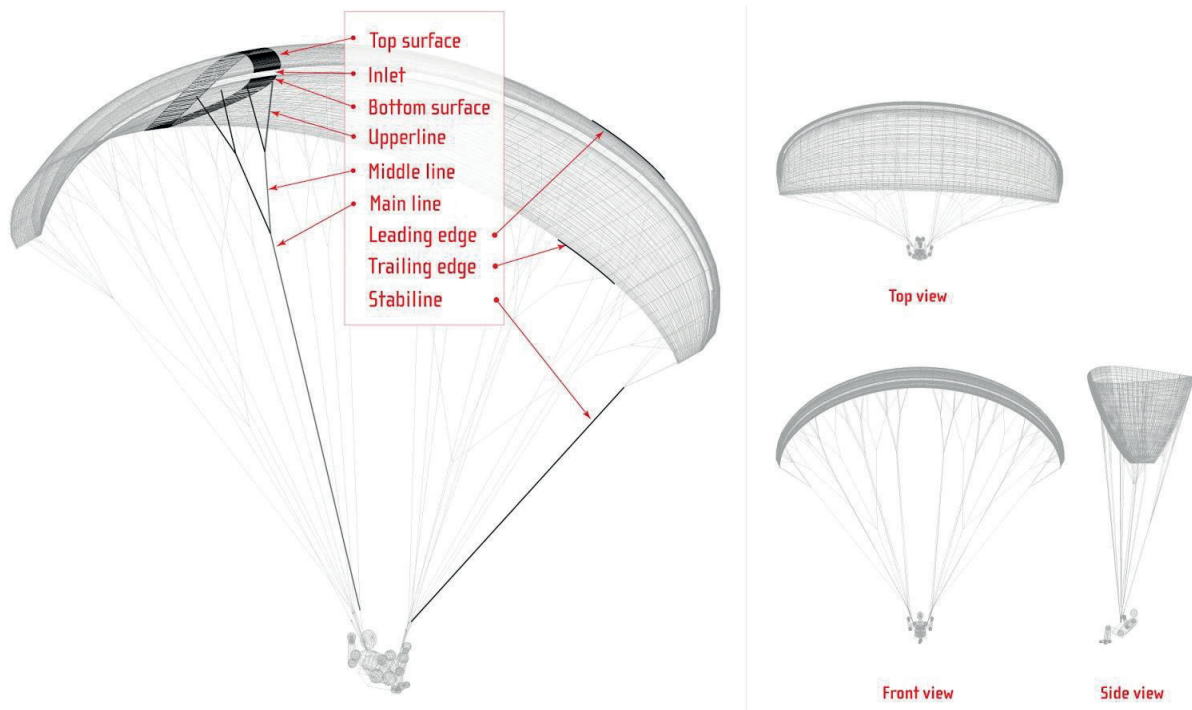


Figure: Overall Illustration

Technical data

Size	16	18	20	22	24
Area (flat) [m ²]	16.00	18.00	20.00	22.00	24.00
Area (projected) [m ²]	13.68	15.39	17.10	18.81	20.51
Span (flat) [m]	9.63	10.22	10.77	11.30	11.80
Span (projected) [m]	7.74	8.21	8.66	9.08	9.49
Aspect ratio (flat)	5.80	5.80	5.80	5.80	5.80
Aspect ratio (projected)	4.39	4.39	4.39	4.39	4.39
Cells	58	58	58	58	58
Glider weight [kg]	4.8	5.0	5.2	5.4	5.7
Weight in flight [kg]	60-100	65-110	75-120	85-130	95-140
DGAC identification ULM	DGAC	DGAC	DGAC	DGAC	DGAC

Riser and speed system

Riser

The specially developed riser for the Carve have a number of different settings and uses that the pilot should familiarize himself with before the first flight.

The Carve is equipped with a speed system and trimmers. With both systems, the pilot can adjust the speed behaviour of the Carve in the respective operating mode. In addition, the trimmer can be used to counter the torque effect.

The Carve's risers, at 480 mm, are shorter than those of conventional gliders. This allows better adjustment of different attachment point positions of the motor unit/harness. The brake pulley can be moved to ensure that the pilot can always choose the best position and accessibility of the brake handle, depending on the engine hangpoint position and design. The brake handles are attached to the riser by strong Neodym magnets. The advantage of the magnets is that the brake handles can simply be attached to the risers during flight.

The chapter "Flying the Carve" has further information on using the acceleration systems.

Riser diagram

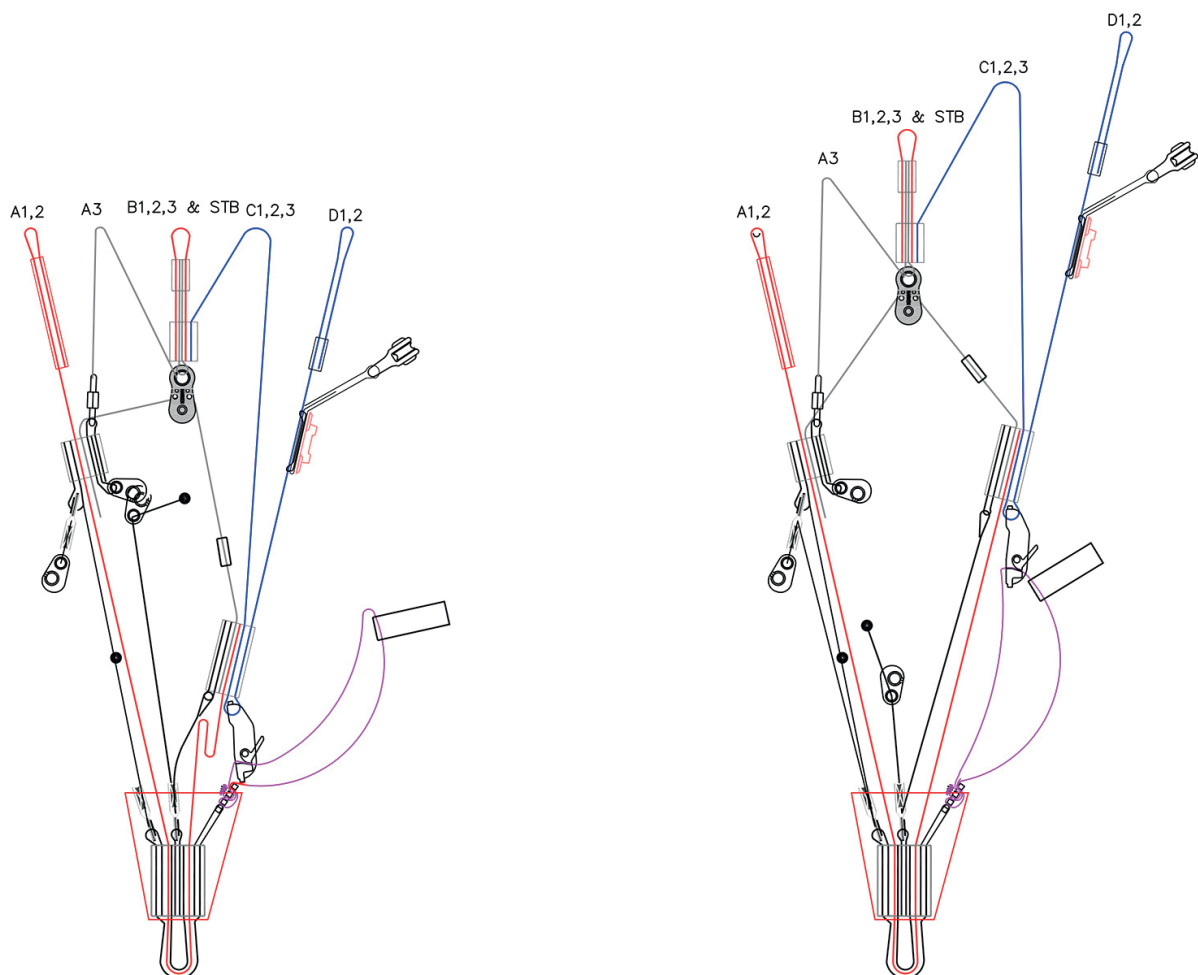


Figure: Carve riser

Riser lengths

Riser [mm]	A	A3	B	C	D
Trim speed	480	480	480	480	480
Accelerated and trimmer open	350	410	470	530	600
Trimmer open	480	500	540	570	600

Trimmer

The trimmer allows the pilot to increase cruising speed and to counter the torque effect. Due to the high trim speed of the Carve, we recommend that you always have the trimmers closed when launching or landing.

We generally recommend that you do not use the trimmer to increase speed in turbulent areas or near the ground because of the increased risk of collapse.

Do not brake the glider symmetrically in accelerated flight. Pulling both brakes down firmly can deform the profile and, in an extreme case, cause a frontal collapse.

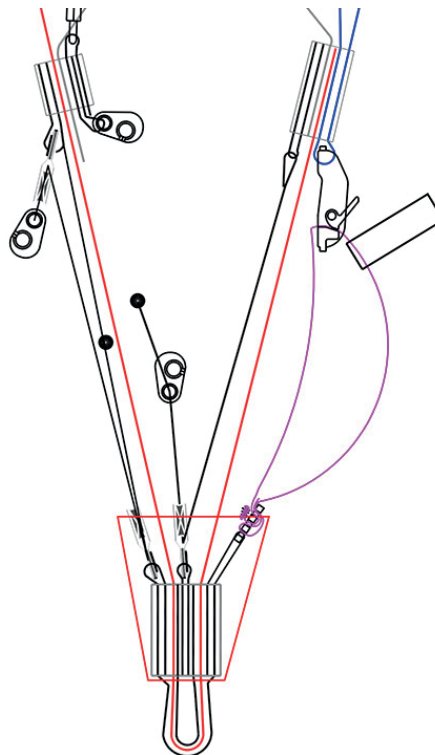


Figure: Overview drawing of the Carve riser with trimmer

Speed System

The speed system accelerates the wing by progressively shortening the risers towards the front. This decreases the canopy's original angle of attack and the speed of the glider increases.

The speed system must be correctly fitted and adjusted to ensure it operates smoothly during flight. Before first launch, the length should be adjusted to suit the pilot and the line duct should be checked.

The speed bar and the riser are connected by special Brummel hooks. Adjust the length to the speed system so that your legs are fully stretched when at maximum accelerated flight ("pulley-to-pulley" on the riser), otherwise you may experience symptoms of fatigue in long flights. You should still be in a comfortable flight position even when the speed system is used to its full extent.

You will not be able to use the paraglider to its full potential if the speed system is too long. Fasten the speed bar to the harness before launch to avoid tripping over it when preparing to launch or taking off.

After the speed bar has been adjusted according to the length of the pilot's legs or the

harness, the two-stage speed system is then adjusted. This system has two ball-bearing pulleys which reduce the acceleration pressure, thereby allowing comfortable acceleration even when the pilot's legs are bent. A stop ball then blocks the lower pulley, reducing the acceleration distance, effectively converting every centimetre into speed.

The two-stage speed system can be adjusted using a stop ball, which is attached to the speed system cord by a simple knot. The speed bar distance is increased if the stop ball is pushed upwards. If it is pushed down, then the lower pulley is locked earlier, which reduces the speed bar distance and increases the pressure. This allows pilots to alter the speed bar according to their own preferences, and to adjust the speed bar extension range and pressure ergonomically according to leg length, the harness and the speed bar used.

Before launch, fasten the speed bar to the harness to avoid tripping over it when preparing to launch or when taking off.

WARNING: Do not make the speed system too short. The glider must under no circumstances be pre-accelerated as a result of the adjustment being too short.

Problems (such as collapses or tucks) have a more drastic effect with increased speed than in unaccelerated flight. It is generally strongly recommended that you do not use the speed systems (accelerator and trimmer) in turbulent areas and when flying close to the ground, because of the increased risk of collapse.

Power Attack System

The Power Attack System merges the speed system with trimmer operation. It is intended only for competitors who fully understand the risks and benefits involved. Regular pilots will need up to three months before fully mastering its use.

The general concept is simple: pressing the speedbar simultaneously releases the trimmers (and vice versa, releasing the speedbar closes the trimmers).

Your wing is delivered with a Power Attack System. For safety reasons the factory preset of the PA system is non-functional. Before setting up the PA system and making it functional, it is important to understand its purpose and the associated risks!

Use

The PA system is designed for competition only. It allows to change the action of your wing very quickly using only your speed bar. You can move from slow speed flight to the fastest speed with a single push.

Adjustment

To adjust your PA system, simply position your trim in the OFF (neutral) position. Adjust the knot where the PA system brummel hook is located so that your line is tight after the hook is connected.

With the PA system correctly adjusted, opening the trimmer has no effect. The riser lengths don't change and stay in neutral position.

Activating the speed bar now has a double effect: besides the normal mode of acceleration, the PA system releases in addition the length of the open trimmer.

Risk

The use of the PA system increases the risk of front stalls. The front section of the profile generates a high uplift on the A-riser for a quick return to the neutral position after releasing the accelerator. If you touch the brakes before releasing your speed bar, the uplift of the center moves towards the trailing edge and the wing returns slower to the neutral position.

There is a risk that asymmetric collapses stay closed as there is not enough uplift and inner pressure to return the glider back into neutral position. Take additional care when you're close to the ground.

If you use the PA system intensively, the wear and tear on the lower pulley is significant. Therefore a thorough check of the PA system must be carried out during each pre-flight check.

WARNING: The PA system is developed for competitions in order to fly very short turns around the pylon. Pilots must fully understand the function and high safety risks when they use this system!

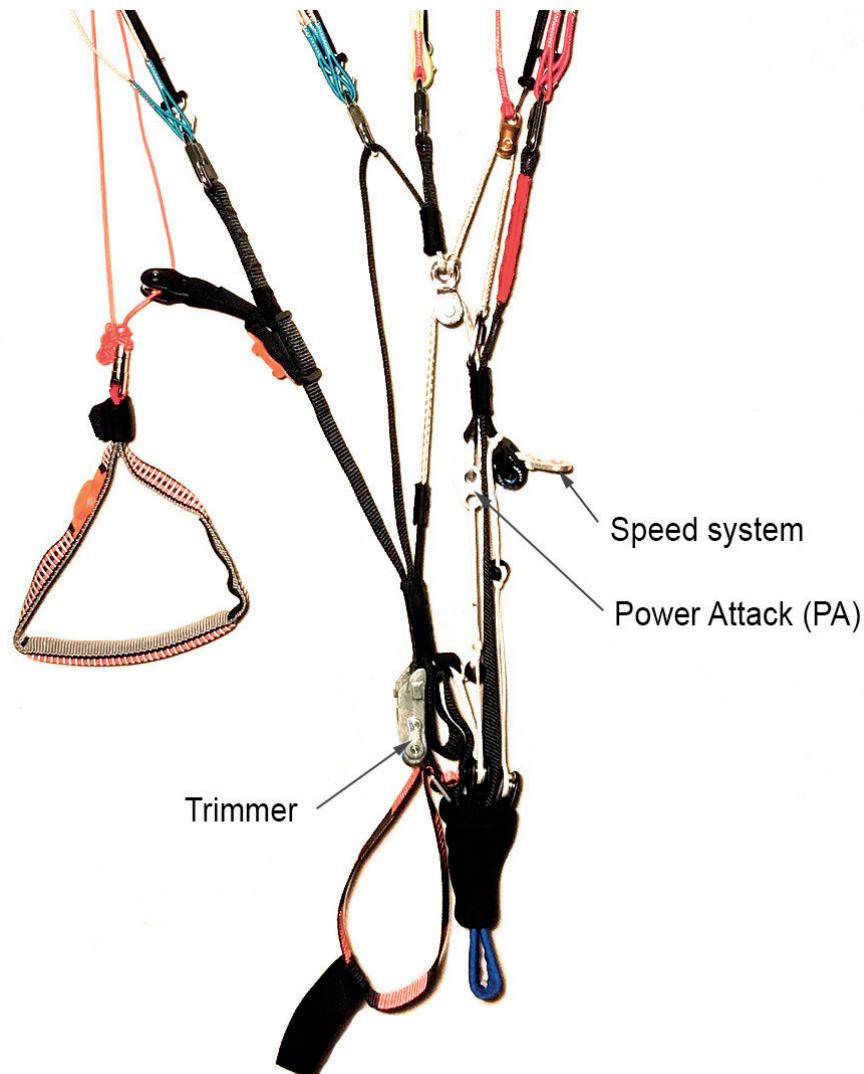


Figure: Carve riser with trimmer in neutral position, connected PA and speed system

Line system, brakes and line plan

Line system

The Carve has A, B, C and D line levels, which fork two or three times from the bottom (riser) to the top (canopy) and which are divided into "Main", "Lower-Middle", "Higher-Middle" and "Top" lines. The individual line levels are connected with one another using the "handshake knot" (special loop technology).

With the brake lines, the individual levels are bundled at the end with the main brake line. This runs through the brake ring (or pulley) attached to the riser and is knotted at the brake loop of the control handle. There is a mark on the main brake line which allows the control handle to be correctly positioned.

The main lines are all attached to Maillon quick links. They are fed through special elastic rings (or plastic clips) and attached to prevent the lines from slipping and to ensure that they sit in the correct position.

Brake line adjustment

Factory setting

The brake lines of the Carve are set to the length that was used for the certification test flights. These line lengths have been finely tuned by the GIN test pilots, and it should not be necessary to adjust them.

The brake line length is tuned so that there is slack in the brake lines when the glider is in fully accelerated flight. Therefore, the brakes are quite slack at trim speed, and to take up that slack in soaring flight, it is common to fly with half a wrap on the brakes and hold the handles on the knot. However, care should be taken to release the wraps in any extreme situation.

If you do need to make adjustments to suit your harness, body and flying style, we strongly recommend that you test fly the glider after every 2 cm of adjustment. There should be a minimum of 10 cm of free brake travel when the glider is flown hands-off. This prevents the brakes being applied unintentionally when the speed system is fully engaged. We recommend a double sheepshank or a bowline knot for the brake handle attachment as shown in the diagram.

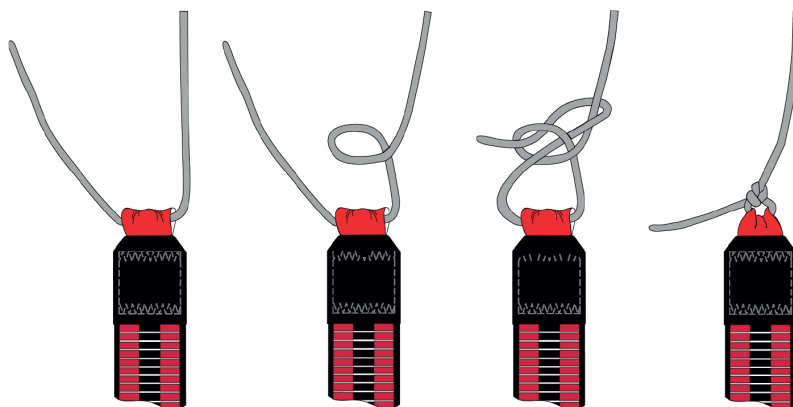


Figure: Bowline knot

WARNING: Loose, unsuitable or incorrectly tied brake line knots can cause the main brake line to loosen and then lead to loss of control of the glider.

Incorrect adjustment

If the brake lines are too long, the paraglider reacts slowly and is difficult to land. The brake lines can be adjusted during flight by wrapping them around your hands which will improve the flight characteristics. Adjust the brake lines to the correct length after you have landed. Changes to the braking distance should always be made in small increments of no more than 2 to 3 cm and must be tested on a training slope. The left and right brakes must be adjusted symmetrically.

If the brakes are shortened, care must be taken that the paraglider is not slowed down in trim and accelerated flight. Safety issues may arise and performance and launch behaviour may deteriorate if the brake lines are shortened too much.

If the brake lines are too short, the following risks could arise:

- there could be an early stall
- the paraglider does not launch well and there is a risk of deep stall
- the paraglider exhibits dangerous behaviour in extreme flying
- the trailing edge of the paraglider is braked in accelerated flight which, in an extreme case, could cause a frontal collapse

WARNING: Environmental conditions can also lead to the brake lines shortening. You should therefore check brake line length regularly, particularly if there is any change in launch or flight behaviour.

Variable brake pulley

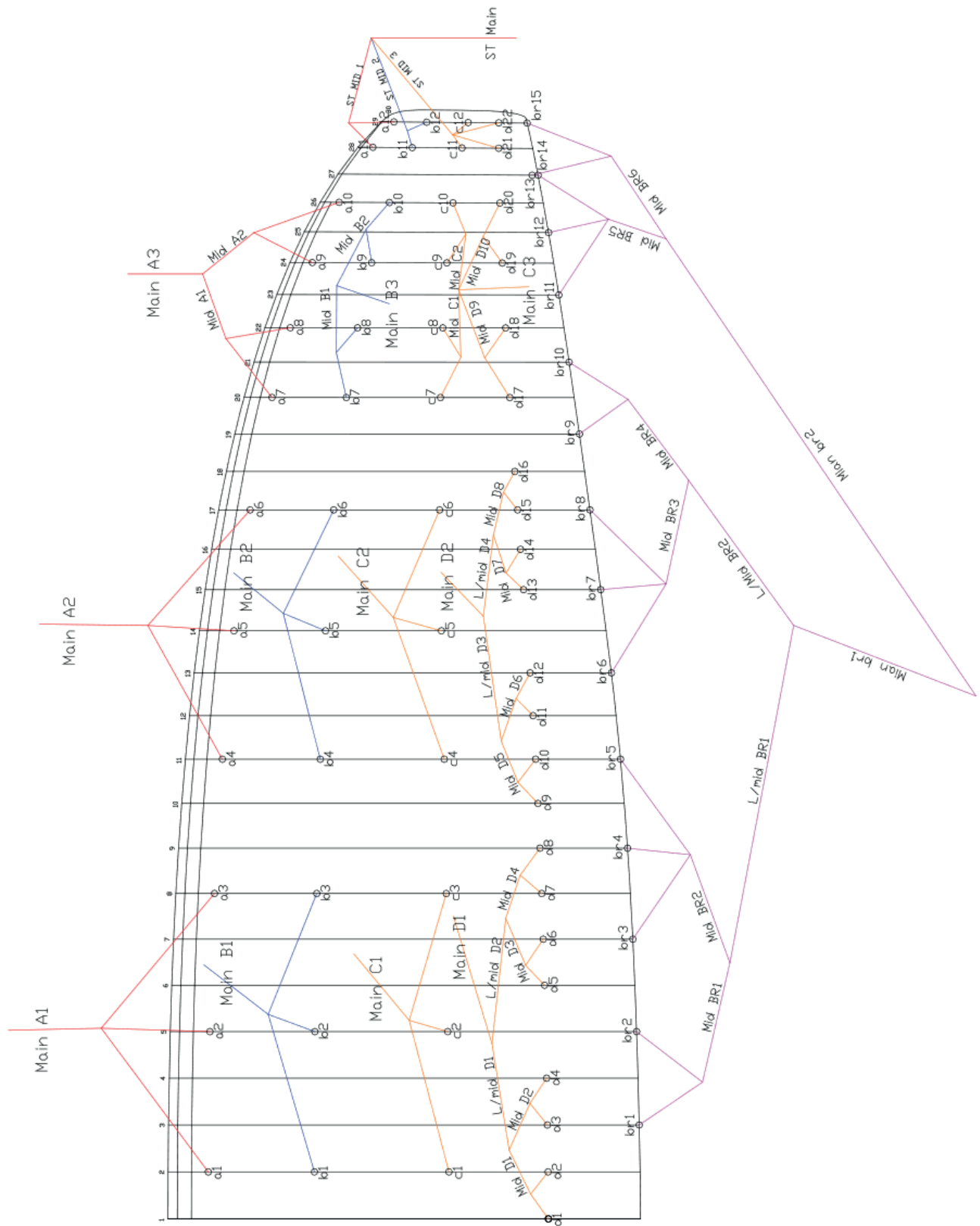
The position of the brake pulley can be adjusted to suit the needs of the pilot by sliding the pulley webbing freely on the riser. If the brake handle is still difficult to reach despite the correctly selected hook-in loop on the riser (e.g. with the trimmer Open), the brake pulley can be pushed downwards on the riser.

WARNING: If the brake pulley is pushed downwards on the riser, the main brake line must be enlarged to the distance the brake pulley has been moved downwards! Otherwise the glider will be braked even when the brake is fully released.



Figure: Variable brake pulley

Line layout



Materials

Canopy fabric

Upper surface leading edge	Dominico 30DMF (WR) 41 g/m ² water repellent
Upper surface trailing edge	Dominico 30DMF (WR) 41 g/m ² water repellent
Lower surface leading edge	Dominico 30DMF (WR) 41 g/m ² water repellent
Lower surface trailing edge	Dominico 30DMF (WR) 41 g/m ² water repellent
Ribs	Myungjin Textile 38HF, 38 g/m ² water repellent

Lines

Upper	Edelrid 8000/U-050 070 090 190
Middle	Edelrid 8000/U-090 130
Main / brake	Edelrid 8000/U-130 190 230 360

Riser

Güth & Wolf 20mm Polyester

Line shackle

Stainless steel 3.85mm

Canopy thread

Amann & Söhne - Mill Faden 150D/3
Polyester bonded

Appendix

Glider details

Size:	Colour:	Serial number:
Check flight (date): <hr/>		
Name and signature: <hr/>		

Pilot details / Proof of ownership

1. Owner	
Name:	
Address:	
Phone:	
Email:	
2. Owner	
Name:	
Address:	
Phone:	
Email:	
3. Owner	
Name:	
Address:	
Phone:	
Email:	

Inspections and repairs overview

Date	Work carried out	General condition on delivery	Completed by (Name)	Stamp and signature

Notes

Addresses

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