Pilot Manual

6- Technique II

Association of Paragliding Pilots and Instructors

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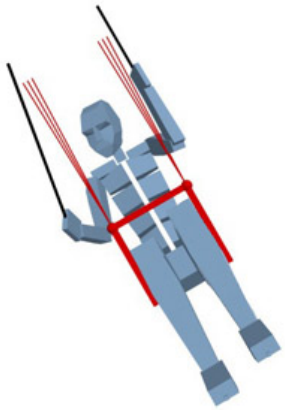
6.1 - Flight maneuvers

Important: All the maneuvers described in this chapter can and should be carried out with the brake controls in your hands.

Never let your glider take you down. Look where you want to go and to the horizon.

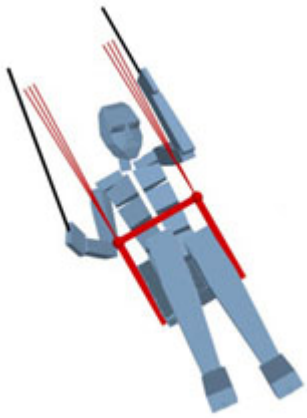
6.1.1 Turns

Look, Lean, Turn.
If you want to turn right. Look; check the airspace is clear, fix a point on the horizon. Lean putting your weight on the right hand side of the harness. Partly release the left brake but keep contact to stop it diving. Gently and progressivly pull the right brake line, the speed of the right half of the wing decreases whilst the other half accelerates forward. The weight shift and outside brake controls the speed and radius of the turn and how much of a bank angle is created.



The paraglider reacts differently at different speeds.

- Turns started in full speed are characterized by a large radius of the turn, a strong bank and a clear sink rate increase.
- Dynamic turn. Slow the wing to the carabiners, look, lean and turn by fully releasing the outside brake. Stop the turn once it is facing the point you choose. It is possible to enter a spiral dive from this turn so start with a 90 degree turn, then move onto 180 degree, then 360 degree.
- Turns made in very slow flight configuration can cause the canopy to stall on one side resulting in a spin. To prevent this from happening whilst flying at slow speed never pull one brake lower instead look, lean then release one side to initiate the turn.



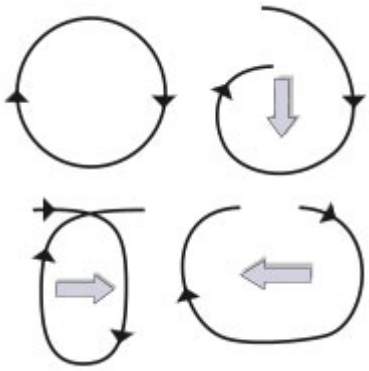
• Losing height with figure of 8 turns on the base leg. Fly near minimum sink. Initiate the turn look, fix a point, lean and start to release the opposite brake whilst pulling the brake gently on the side you want to turn to. As the glider starts to turn put your weight on the opposite side to keep the glider flat and stop it from diving. Look back to your landing point as you go away from it if you are sinking you can release the brake to come quickly back to final if you are still climbing you can carry on going away. Make all your turns flat and try to prevent the wing from penduluming.

- Hill soaring. Weight shifting away from the slope whilst hill soaring is safer. If the glider collapses it will turn away from the slope, it is also more efficient creating more lift and keeps the speed lower as the wing is facing into the wind. Use the brakes to maneuver the glider closer to the slope. To turn away just release the brake your weight shift is already over so the wing will turn quickly.
- Wind Gradient - Feel the need the need for speed! As you drop through the wind gradient the wind decreases and can become more turbulent near the ground. This can result in the stall point being higher making it easier to stall or spin the wing whilst the brakes are still high. To prevent this try to do your manouvering whilst high and on your straight final glide give full speed to the glider whilst keeping contact with the wing. Look far ahead to judge your height above the ground. Stand up with legs down, your body will create extra drag and your undercarriage is ready.

Avoid doing tight low level turns as these can result in the pilot penduluming to meet the ground. If you need to turn low make flat turns and use weight shift alone.

Watch your ground track as you turn this will show you the wind drift. Look down and do a 360 degree turn this enables you to choose your landing approach when there is no wind sock in the landing area.

Figure 4-22: The tracing of the turns on the ground: *According to the wind direction, the projection on the ground of a 360 ° turn varies* ⇒ ***very important in the preparation of the flip.***



6.1.2 The spiral dive

Spiral dives can be disorientating due to the excessive speeds and G-forces.

Learn how to exit a spiral before trying to do a fully locked in spiral dive. Turn until you feel the speed start to build, one or two tight 360’s then exit. Exit by fixing a point and looking on the horizon, putting your weight even on the harness and pulling the brakes evenly. Some gliders can remain in a stable spiral dive. Normally the fault lies in the pilot looking down and weight shifting to one side, or the wrong setting on the chest harness.

Never let your glider take you down, you decide by looking where you want to go. Always look on the horizon.

To initiate a spiral progressivly increase the bank angle the centrifugal force will build up. The leading edge will rotate and face the ground.

In a tight 360 the sink rate may reach values up to 15 m / s. Because of centrifugal force, the load due to the pilot and equipment greatly increases so that the load factor can be up to 3g.

One should get out of tight spirals with a sufficient height above the ground and slowly release the action on brake controls if one wants to avoid large pendulum swings.

6.1.3 The wingover

The wingover concept applies to turn reversals that manage to give the glider a bank over 90° for a brief moment. During this phase the pilot is at the same height, and in extreme cases higher, than the paraglider. It's a very good exercise for strengthening your confidence in the own wing and to improve the feeling. The wingover should be done with sufficient height and never recklessly.

Practise first with weight shift alone. It is all about timing when you are at the top of the wing over put your weight on the other side. Once the pressure is at the maximum add some brake. You may need to use both brakes to prevent the glider deflating at the top. It takes a lot of time and practice to do good wing overs. Bad timing can result in large assymetrics so gradually build up the height and only practise with sufficient height above the ground. A good way to get the timing right is to do small wing overs first with big ears and weight shift only.

6.1.4 B-Line stall

Pulling down simultaneously both B risers causes the most damped form of stall. It is hard at first to pull down, it must be done evenly and and insure only the B risers are pulled. The paraglider gradually loses speed until the canopy makes a small seesaw motion backwards which precedes the stall. (Do not let go at this point as the glider will do a huge dive) Maintain the stall for a t least 4 seconds to allow you to fall back under the glider.

In a B-Line stall, the horizontal velocity is zero. Sometimes one flies slightly backwards and slowly turning on its axis. (If it is turning evenly release the risers a little you are pulling too much. The sink rate may reach 8 m / sec. The pilot's attention during this phase should be paid to the airspace below.

In a B-Line stall the profile depth is greatly reduced; the rows of C and A suspension lines approach one of the other.

To recover from stall, the risers are quickly moved upwards with the hands, causing a slight wing swing and resuming normal flight. Caution: If one has a hesitant movement during this technique, the danger of deep stall is increased. If you release unevenly you may enter a spin. If one hand starts to go up then release both.

6.1.5 Stall

The glider goes into stall when going below the minimum speed. At the stalling moment the canopy characteristically swings back and the pilot has a pendulum movement forward. **Warning:** During this phase it is of prime importance to keep down the brake controls until hanging again under the wing. Lock your arms. Keep your body rigid and tuck your legs under the harness. If brake controls are suddenly released, the canopy performs a violent swing and may, with a fast wing in particular, dive dangerously forward.

Figure 4-16: Stall. *If the brakes are simultaneously pulled beyond 100%, the canopy will deflate significantly and the paraglider has no more horizontal speed.*

During a stall, the sink rate increases around 6 - 8 m / s and the horizontal speed is zero.

To exit, it is recommended to slowly move the brake controls upward until the glider enters the wing tips will look like backwards big ears and the wing will fly backwards. Once the glider has stabilised in back fly then release the brakes fully and keep your hands up, allow the wing to surge and take its airspeed. If it surges too much you can pull brakes to stop the dive whilst it is ahead of you but always release them fully again.

6.1.6 Backfly

Back fly is a very good maneuver to learn under S.I.V instruction as you can use it to get out of a cravats. It is also the point that acro pilots return to between maneuvers.

Unlike B-stall, and back fly the full stall is a sharp and shaking maneuver with little practical use.

6.1.7 The front stall

The front stall is triggered by pulling the two innermost A lines. The flight speed decreases and the wing tips head forward, horseshoe shaped. The sink rate increases to 6 - 8 m / s and simultaneously the horizontal speed becomes zero. By pulling both brake controls, the front stall gives way to a normal flight configuration without too much of a swing.

Photo 4-17ff: The front stall. With this operation a sink rate similar to brake stall is reached.

6.1.8 Big ears

By folding down the wingtips, a sink rate of 3 - 5 m / s is achieved by reducing the horizontal speed. Due to the decrease in surface area, the wing load and the glider stability increase. This flight maneuver is convenient, for instance, to descend quickly if you see the weather is going to change or to avoid going into clouds.

To pull the big ears one should pull the outer A lines, a lot of gliders have split A risers to allow you to pull them easily. Reach up and pull them down one at a time. Make sure it is folding and you have the front outer A riser. One must be careful not to pull all the front riser otherwise front tuck may occur. It’s possible to pull very big big ears by pulling two outer A lines on each side. by using weight shift it is possible to turn with the big ears folded down. Do not enter a spiral as this can overload the lines resulting in line failure.

To fully open the wing again you release the big ears one at a time. You can pump them one at a time. Do not pump them together as this can result in a deep stall. They should be released 200 foot up.

Photo 4-18: Big ears. *This maneuver is especially suitable well for crossing a turbulent zone.*

6.1.9 Big ears with speed system

Pull big ears, establish them, then press the speed bar having previously placed the speed bar on your foot ready for use. Push the speed bar smoothly let it stabilise. When you want to release it then release the speed bar first let the speed stabilise then release the big ears one at a time. You may want to use this as when you put the big ears on the glider is slower with an increased angle of attack. Pushing the speed bar decreases the angle of attack and gives you speed to descend if you need to forward as well as go down. Do not use this low to the ground as it can result in a assymetric collapse.

6.2 - Dangerous situations

6.2.1 Tuck

An asymmetric tuck is the most common dangerous flight configuration. If there are few cells closing, the pilot, in some cases, does not notice anything. Always look in the direction you want to go in and weightshift first to maintain a safe course. Most of the time the glider reopens itself, if not then after weightshifing onto the flying side a smooth pumping action on the deflated side should reopen the cells. But during a more than 50% tuck if nothing is done, the flow of air drops out on one side and the glider begins to turn and goes into a spiral out of control the stalling side.

The most urgent objective for the pilot is to stabilize the glider to prevent starting on autorotation. For that one must LOOK where you want to go, weightshift on the inflated side then pull the brake control on the flying side with an intensity that depends on how large is the tuck so that the glider can maintain the direction planned;

Caution: The countering action on the brake control must be restrained. Too strong action on the brake can lead to stall on the open side of the wing causing spin with the shut glider!
When the wing does not open by countering with the brake control, the shut side should be pumped slowly and smoothly in a large brake range.
Front tucks (collapse of the entire leading edge) are generally rarer and less problematic than asymmetrical tucks. One comes out by either leaving it alone or by a fast vigorous action on both brake controls.

Photo 4-19: Tucks. *They become especially dangerous if one is pumping the shut side instead of trying to stabilize the glider by countering with the opposite weightshift and brake control.* ***Caution:*** *on slope soaring. In general, if the side to the slope is shut immediately get away from the slope.*

Figure 4-20: Front tucks. They are less frequent and less dangerous than asymmetrical tucks.

6.2.2 Spin

Spins are quick rotations around the vertical axis with a unilateral stall in which the inner wing part of the turn rotates back, negative, that is to say that the air flow comes from backwards.
The result is a high torque which prevents the pilot, due to its inertial motion, of following this rotation = Twist (twist among the risers). In a twist the brake controls are generally blocked until one gets out of it.

The main cause of a negative spin is, most of the time, a too slow speed during a turn (e.g., thermal flight in turbulent conditions = one must therefore fly fast and skillfully). Similarly by going suddenly into a turn or tight spiral, a spin can occur. A negative spin is particularly dangerous if it’s not recognized right away and stopped immediately by a release on brake controls so that the glider can gain speed. The spin is recognized by a sudden decrease in tension on the inner brake control of the turn.

The surest way out of a stabilized spin is a complete stall, although sometimes a countering action with brake control is enough. A strong dive of the canopy is often inevitable.

6.2.3 Deep stall

This form of stall is apparently difficult to recognize. The lower surface is less tight and bulged up among the line attachments, but anyway the wing remains completely open. Yet during stall, the flow around the wing is not correct. The paraglider, despite brake controls completely relaxed, has a very low horizontal speed, but a high sink rate, around **4 - 5 m / s**. Deep stall can be detected by the absence of wind on the face and the softness on brake controls manifested by a lack of maneuverability.

All gliders can go on deep stall due to a poor base adjustment, or because rear trimmers are too drawn. Various factors can increase the tendency to deep stall, signs of wear such as the increase of air porosity on the fabric (mainly on the leading edge area of the upper surface) or the lengthening and shortening phenomenon of the suspension lines.
In normal flight configuration, deep stall occurs, rarely, by slowly releasing the brake controls. It may also occur in very slow flight configuration or during a too hesitant B-Line stall exit.
If there is enough height available, one can come out of deep stall by speeding (for instance, draw the front risers or release the rear trimmers). The paraglider picks up speed generating a moderate dive. This may, close to the ground, cause injuries. Therefore there is no attempt to escape from deep stall near the ground (approx. **10 - 20 m** high) and, if necessary, a roll may be performed when landing (see 4.9.5).

6.2.4 The tangled lines

In certain circumstances, a glider with knots in the lines is still able to fly. In case, a strong pull on the lines involved is not sufficient to release them, one should fly in the fewest possible maneuver to the landing site or an emergency place. Depending on the knot location a paraglider reacts differently:

- A knot on the right front ⇒ increases tuck danger on the right side.
- A knot on the left rear ⇒ the paraglider flies using brakes on the left side thus turning left. By a countering action on the

right brake control, one can try to fly straight. Care must be taken in this case for the glider not to drop out.

Caution: Avoid as much as possible turns on the right ⇒ spin possible.

6.2.5 The brake controls blocked

Instead of brake controls, it's possible to steer the glider with the rear risers or with only the D lines. Weightshift first then just pull the rear risers back a couple of cm's to help steer. They can also be used to land but flare a little lower. This technique requires greater vigilance as the control clearance until stall is substantially shorter.

Caution: shortening the rear risers of **10 - 20 cm** is already causing stall sometimes. Landing can also be achieved without problem with the rear risers.

Caution: approach with no brakes applied and about **1 m** above the ground just pull the two risers in a regulated way to flare out (cf.4.9).

6.3 - Special flight situations

6.3.1 Flying in turbulence - the active flight

Turbulence can be unpleasant, but they are inevitable and part of the flight domain. The most cautious pilot is not immune to it. Fly in thermals, for instance, means almost inevitably flying in a turbulent air mass. Only someone who masters such conditions can be pleased to fly in a strong thermal. The key to it is called the active flight.

According to the theoretical bases on aerodynamics (see Chapter 2. Aerodynamics), current paragliders fly the most stable way when gliding with no brakes applied because this is the way its surface can register the highest dynamic pressure. We also know that a wing profile with a stronger camber supports a larger negative angle of attack and therefore also more downwind. By acting on the brakes, it can give the glider more camber and accordingly the wing is less prone to collapse when using the brakes. These two conflicting requirements can only be taken into account simultaneously on an active flight style.

The **active flight** is: see to the maximum dynamic pressure thus flying as much as possible without action on brake controls but at the same time, if the wing threatens to collapse, to adequately use the brakes. Fly actively does not mean immediately stopping all aerofoil movements by using the brakes. When crossing a turbulent area, for example, the glider often begins to oscillate on the cross or horizontal axis. In these cases, one should fly without tension, with a slight action on the brakes and without intending to counter all the swings.
To feel absolutely all the wing reactions, it is necessary to pull slightly on brake controls all the time. So, a constant work on brake controls is essential in order to minimize tuck risk. Experience has shown that at least 80\% of incidents are, a priori, avoidable through active flight. Similarly, it is important to behave wisely when flying. In turbulent conditions, the horizontal and vertical distances from obstacles should be increased and the speed adapted.

6.3.2 The quick descent

Gliders of the present intermediate class have a minimum sink rate a little over **1 m / s** and in proportion a small horizontal speed. This is barely enough to move away from imminent danger (e.g., cloud suck). That's why a rapid and controlled loss of altitude is something very important in paragliding. The spiral dive is the most effective way to lose height as quick as possible. It allows reaching sink rates of more than **10 m / s**. In addition, it is easy to trigger and stop at any moment and it is feasible for a long time as long as there is no problem with vertigo or nausea. We can possibly reduce these two phenomena by looking at an object that is also turning (variometer, canopy). There is another alternative: a spiral to lose altitude with a collapsed wingtip. In this way a high sink rate is reached with a smaller centrifugal force.

The different stall techniques (mainly B-stall) are, indeed, also popular as a means of descent but their sink rate of **6 - 8 m / s** relegate them behind those of spiral dives. If one thinks that in a good thermal the variometer can sometimes indicate a rise rate of **5 m / s** and beyond, we will easily understand the need to perform spiral dives.

Summary	Benefits	Disadvantages
Big ears	⇒ Despite a high rate of fall, there remains a horizontal speed	⇒ Possibility only an average fall ⇒ At the exit, there is a danger of parachuting
The spiral dive, headwind of 14 km/h	⇒ Very high sink rate keeping all the flight characteristics ⇒ The canopy is not distorted	⇒ Delicate in turbulent air ⇒ Strong centrifuging effect on the body
B-Line stall	⇒ High sink rate without body burden ⇒ No problem during the exit	⇒ A formal symmetrical action can be depending on the model difficult to perform

6.3.3 Mountain Flight

The mountain flying is demanding. A great alpine and aeronautical experience and good knowledge on weather conditions are required. The chances of success here depend even more on a careful observation of the local weather and analysis of the general weather situation. The stable high pressure situations are particularly suitable. They are characterized by little wind and a moderate cloud development. Despite this, the general direction of the wind should not be ignored for the choice of flight area (exposure of the launching place).

Takeoff is without any doubt the most delicate phase in the paragliding domain and is made even more difficult by several factors:

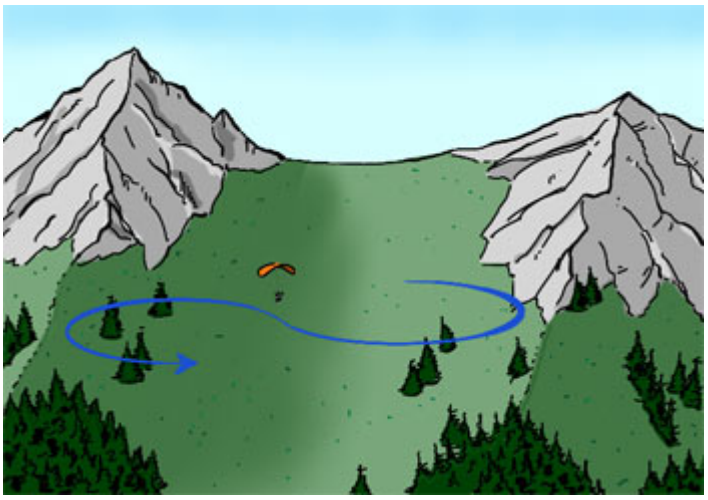
- Terrain:
  The more we go up in altitude and more the suitable takeoff places become scarce. One must be content most of times with a stony soil. In addition, it increases the risk of injury on aborted or missed takeoff. Consequently, a perfect take-off technique and good wind conditions become more important.
- Wind:
  - In general, thermal and true winds increase with the altitude. From **25 km / h** takeoff becomes already difficult without external assistance.
  - Assessing the general wind direction can be made more difficult by the presence of large rotors. Winds are stronger in exposed areas (ridge, summit, pass) and for this reason, these kind of sites are often inappropriate. However, it is easier to assess the situation in these places where the winds are less disturbed than in a sheltered area.
- Air density:
  - In altitude, the lowest density of air must be compensated by a higher takeoff speed. So the take-off distance will be longer.
  - The decrease in the density of air with altitude also has effects on human body which adapts well to changing conditions to an altitude of about **4000 m**, as long as the pilot is in good health. It is not always the case (e.g., during cooling etc.). Decision-making and response capacities can then be greatly changed.
  - With the altitude, the oxygen content of air decreases. Symptoms of a lack of oxygen may be a state of euphoria and decreased judgment ability (altitude sickness). The decrease of physical capacity due to deficient oxygen supply of the body can be substantially reduced by regular training of physical fitness and altitude acclimatization.
- Cold:
  Temperatures below the limit of well-being increase the oxygen demands and reduce the performance capacities. One must also think that in general, when flying, wind exerts an additional cooling effect on the body. Thus a wind around **30 km / h** (which corresponds roughly to an average speed of flight) with a temperature of 0°C cools down the body with the

same intensity as quiet air at -10°C.

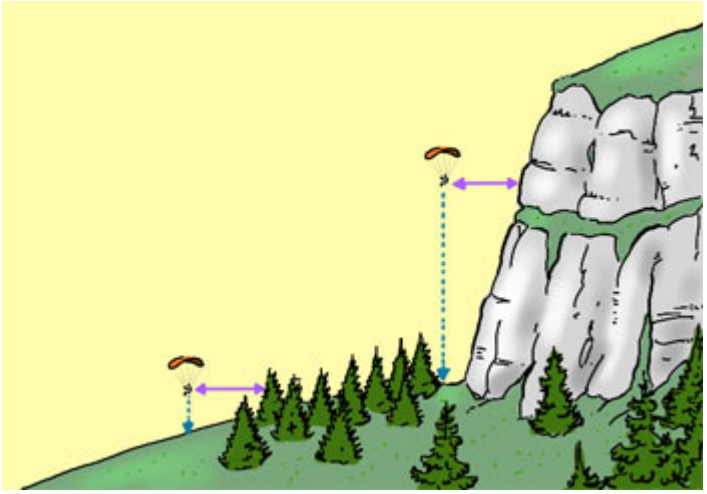
6.4 - Slope soaring and thermal flight

6.4.1 Dynamic soaring flight

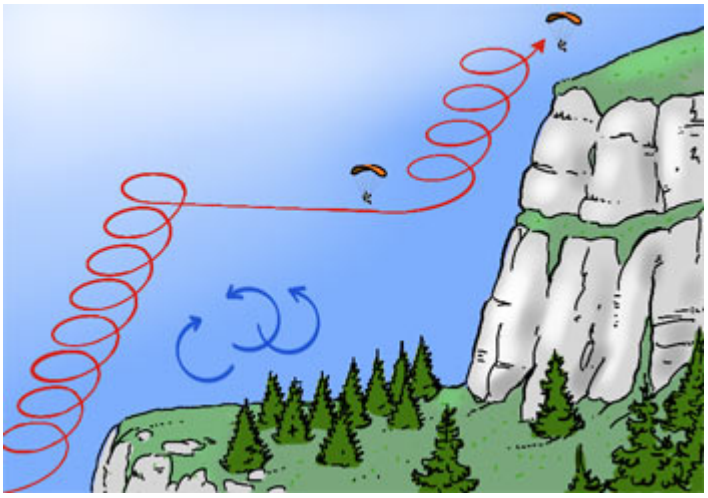
• **Technique:** Turn away from the hill. Fly in figure of eights and with a slight action on the brakes. Look, lean and then turn with the brakes gently letting one up and pulling one down but keeping contact on both sides to prevent setting up to steep a roll. Once you have initiated your turn you can transfer your weight so that it is facing away from the slope so that your bum is towards the hill this creates a crabbing motion in the glider. You can use the inside brake to move closer to the terrain yet if you release it the glider can turnaway from the slope quickly. It also helps protect you if you get an asyymetric collapse as your weight is already away from the slope.
Always turn away from the slope and where the lift is stronger. This way it is possible to compensate the highest sink rate of the turn. Sites with a thermal or a nozzle effect have the strongest lifts.
Caution: Don't turn the glider to face the slope, the wind will be behind you and you may hit the hill with the speed you are flying plus the speed of the wind.



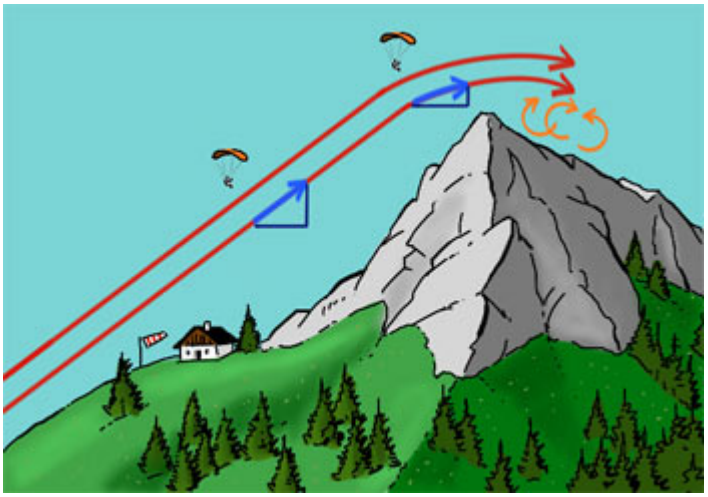
• **Distance to the slope:** Soaring flight (flying in dynamic wind) often requires flying near the ground. Despite this a safe distance must be kept which may vary according to the pilot experience and the consitions on the day. It must be borne in mind that maintaining the same distance to the slope, the safety margin is slightly less above flat ground than on a steep slope ⇒ You have to watch for the clearance of your wingtip lines flying near steep terrain.



• **Turbulence:** The lift on dynamic slope is often relatively laminar. Despite this, turbulent zones are caused by the shape of the land. Thus turbulent areas are near uneven terrain and great caution is required, increase distance from the ground! Mechanical turbulence is predictable and the risk may be reduced by choosing your route carefully to avoid these areas. Imagine a river flowing over the ground instead of the wind and avoid areas that would be white water and areas which would be venturied the side of hills and gullies where the area is narrowed the flow speeds up.
Caution: in case of a collapse, first look and weightshift away and steer away from the slope and only afterwards pump the collapsed side.



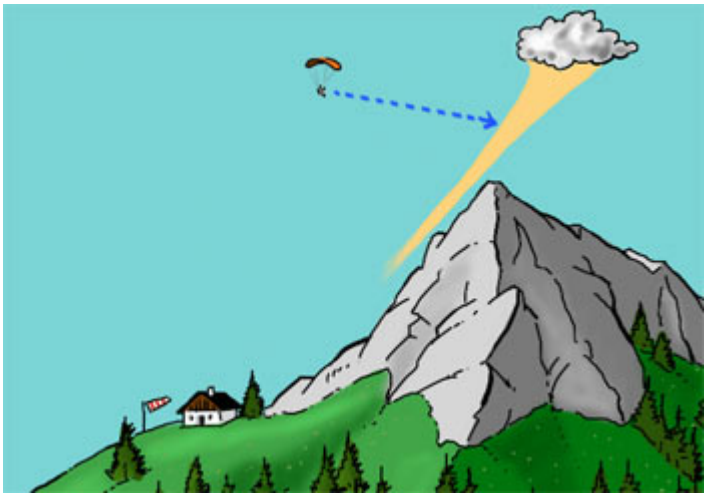
• **Flying over ridges:** due to the venturi effect, there is on mountain ridges a higher wind speed whose horizontal component increases while crossing ridges, summits or cols.
Caution: When flying over ridges one should not be dragged lee side of the ridge. In high winds, do not takeoff on ridges or summits.



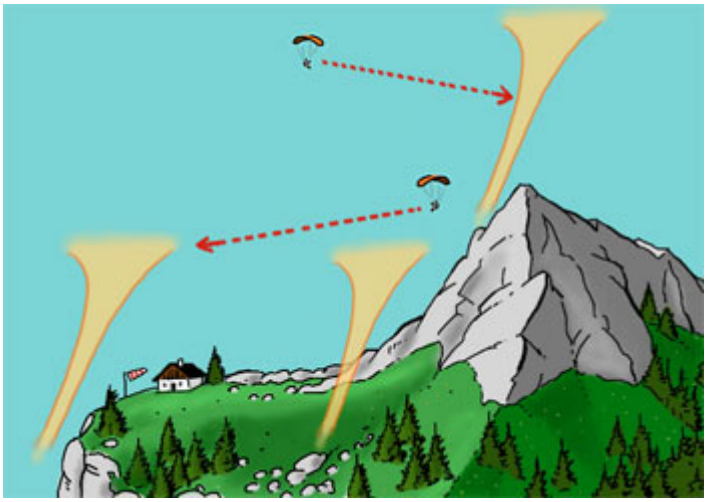
• **Flying lee side:** If you feel wind is increasing and you are being blown back lee side. If you still have height and are on the windward side you can use your speedbar. If you are leeside or too low or in turbulent air don't use the speedbar as there is a much higher risk of collapse. If you are getting blown leeside despite this then fly off the side of the hill or choose to get blown back where the rotor will be less. If you are definately going leeside you are better to turn and run and try to get to where the air is clear. If you hit a leeside thermal you can turn in it. Try to fly over the turbulent area as high as possible.

6.4.2 Thermal flight (see concepts of meteorology Chap. 3, Weather)

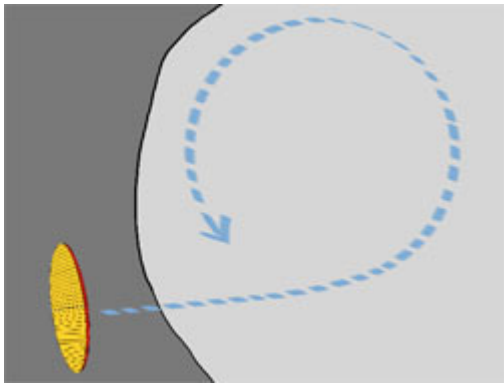
• **Searching the thermal:** The source of the clouds is an indicator. Therefore the thermal is found along an imaginary line between the triggering point (location where thermals rise from the ground and enter the free atmosphere) and the cloud. A powerful thermal is always around an area of turbulent air. That's why during a calm flight, turbulence normally indicates the presence of a thermal

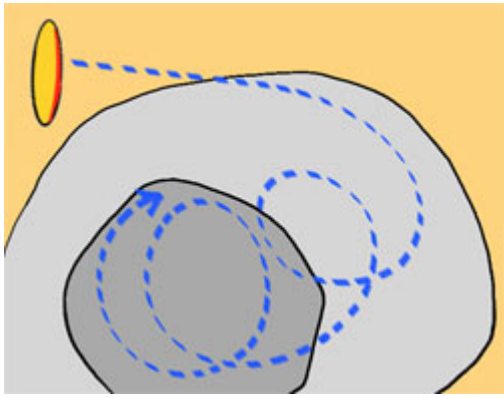


• **With blue thermal:** (without the formation of cumulus clouds) and a low flying height, one should head towards the possible triggering places and thermal sources, taking into account the influence of wind. Planning a promising route before takeoff is strongly recommended. This said, birds spiraling are the most reliable thermal indicators.



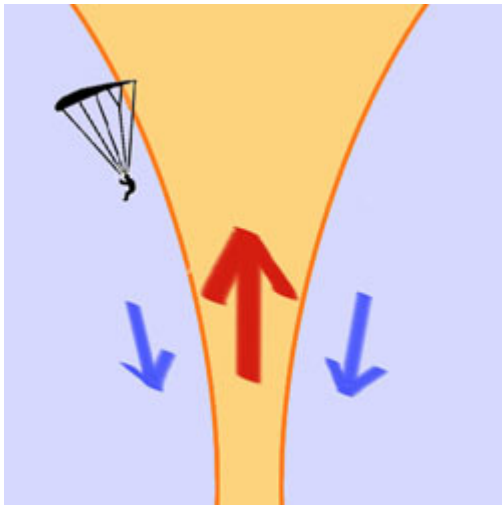
• **Entering the thermal:** If entering full force in a lift area, the leading edge is raised and the glider loses speed, so releasing the action on the brakes prevents the angle of attack of becoming too large and going down below the minimum flight speed. Then, during 3 to 4 seconds, fly in a straight line to ensure the turn will be performed inside the thermal column. Only after these maneuvers one must resolutely turn the preferred side or in the direction dictated by the ground. If other gliders are already turning in the same thermal column, adopt the same direction.
If touching the thermal with only half wing, the glider is raised on this half (and in some cases the opposite side collapses). The pilot responds by veering on the side of the raised wing. If these steering techniques are not performed, the glider itself will leave the lifting area (usually followed by a significant sink rate).





- **Flying in the thermal:** In a powerful thermal, steering maneuvers and tight turns are often used to ``center''. In weaker and wider thermals turns made with the minimum sink rate speed and gentle maneuvers are required instead.
  Caution: Do not fly too slowly ⇒ spin! At low altitude there are often only weak and small thermals, while higher the best lifting areas are only hardly accessible. In such situations, there is often nothing else to do than flying patiently in circles at the same altitude and wait for the next triggering.

• **Going out the thermal:** When leaving from a powerful lift, there is a downward turbulent marginal zone. The glider must then be accelerated. Through an enhanced action on the brakes, the risk of front tuck is reduced. Beginning pilots often live thermal flying in a more brutal way than the experienced pilots. Many times they are not properly centered in the lift and they always fall in the turbulent peripheral zone of the thermal bubble.

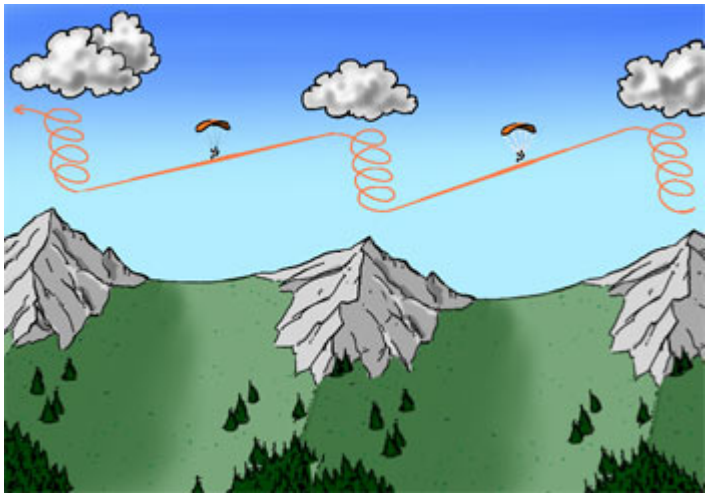


- **Flying in a "swarm":** By a measure of respect when flying together in a thermal, the most basic principles are the rules of flight and concentration. Considerable attention should be paid to the vertical safety distance. This reduces the danger of collision in case of collapse.

6.4.3 Long distance flight - cross country flight

In addition to favorable weather conditions, physical abilities and suitable techniques, it is essential, for long-distance flights, to have great experience and a good tactical flight. Following are some recommendations:

• Whenever possible, always fly above the ridges as slope thermals and thermal columns often range in short time intervals.
• When there is a crossing (transition), try to gain a sufficiently safe height in order to attach the thermal as high as possible in the next mountain.
• Succeeding a valley crossing requires a very high flight altitude at departure. Wind plays a crucial role here: a tailwind of **20 km / h** improves drag ratio over 10, a headwind of same intensity reduces it by half or even less. In general, ascents are exploited to their maximum height. If in altitude a contrary draft prevails, it can still exist a proper flight altitude lower down.



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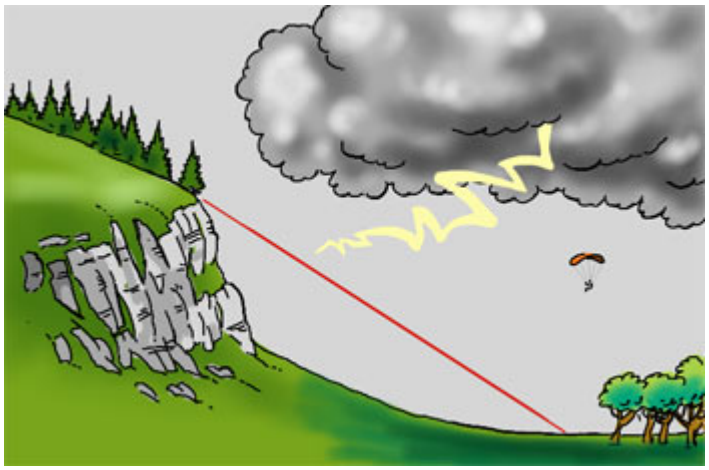


Warning: watch the weather development.

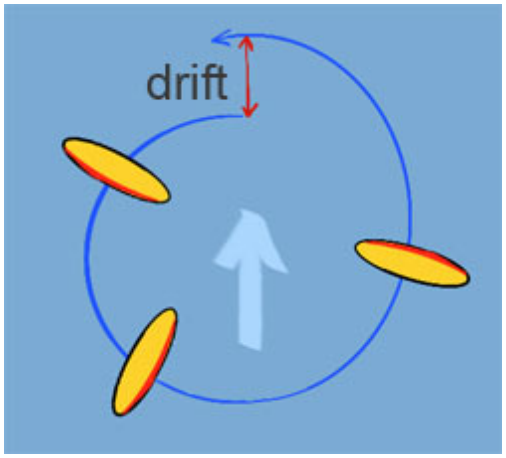
Warning: while slope soaring in unknown territory: be careful with wood cables below the tree line and above this limit with hay cables.

6.5 - The landing

On landing, the wind has the same importance as on takeoff.
For this reason landings are always made whenever possible, into the wind. But nevertheless, landing with a slight tailwind can be performed without problems.

Landing with...	Headwind	Tailwind
Approach angle	Steeper	Flatter
Speed landing	Lower	Higher

Figure 4-34: Determining wind direction: *If there is no windsock or flag or smoke to indicate wind direction, it can be determined by the drift, from where the wind blows, by performing a 360°.*



6.5.1 Preparing the S-turn

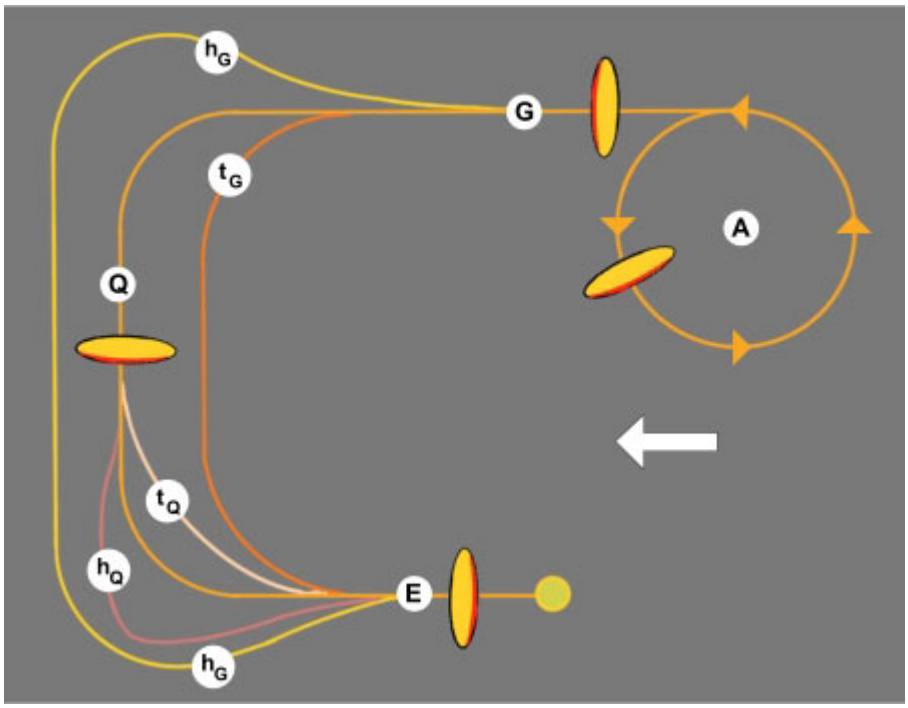
If there is enough height available, it is recommended to perform a prior survey of the landing place to observe the windsock. If there is not, an indication of wind direction may be given by smoke or flags and eventually also by drift when performing a 360°. The starting point of the **turn** is determined according to the wind. It is called altitude loss area (destruction area) and is always “into wind” and next to the targeted landing point. In the area of loss in altitude, the exceeding height is eliminated by performing controlled 360° in the same sense of rotation of the final **turn**.

6.5.2 The landing turn

Landing **turn** is a procedure used in all aeronautics matters; it provides an organized landing process and offers good conditions for its accuracy. If there are no specific rules, the turn will be made to the left. According to the wind and the size of the landing site (the stronger the wind or the larger the landing place the higher will be the height) the **turn** begins between **50 - 100 m** in height.

Warning: Trimmers or acceleration system should be set in neutral position before the start of the **turn**. An accelerated paraglider undergoes, in turbulence, faster collapses, while a trimmed wing increases the risk of stall or deep stall.

Figure 4-35: The landing turn
A: *Loss of altitude area*
G: *Tailwind*
Possibility of adjustments:
h_G *If we are too high*
t_G *If we are too low*
Q: *The base*
Possibility of adjustments:
h_Q *If we are too high*
t_Q *If we are too low*
E: *Final*
Possibility of adjustments:
More or less braking action



Flying with a little action on the brakes during the **turn** is an advantage. Slow speed allows more time for distributing and estimating the height. Turns and any corrective maneuvers are quietly done so that pendulum movements do not cause loss of approach vision and altitude control. There are the following correction opportunities:

We note that in...	Tailwind	Base	Final
...if we are too high	Extend elements of the landing turn	Extend the base or possibly repeat it	Brake the glider to reduce its glide angle
...if we are too low	Shorten the elements of the landing turn	shorten the base or squarely remove	Brakes off and slowly flare out

When the conditions of the landing place allow, in nil wind, a big **turn** with a long final is done. If the wind is stronger, it is done shorter lee side behind the targeted point (by no means behind the landing site). Simultaneously the **turn** starts relatively high because one can easily lose height at the final by acting on the brakes (see chap. 4.4.1). No correction maneuver should be undertaken in the last 3 seconds before landing.

6.5.3 Landing Technique

Shortly before touching the ground the glider speed is reduced by an action on the brake controls. The softest landings are therefore possible if brakes are pulled completely after a flight brakes released or even accelerated wing ⇒ flare. This technique, whatever it may be, must be executed and measured in the right time otherwise crash is expected when landing. Flare is also dependent on the wind and wing performance. The more efficient is the paraglider and / or the (head) wind is

stronger, and lower and later one will flare out.

During flare, there is a pendulum movement of the pilot somewhat forward. He must therefore be careful not to fall behind. To land properly, one must leave the sitting position in the harness and set upright at the appropriate time.

After landing, pick up glider and immediately leave the landing place, thus coming out the way of the following pilots.

Photo 4-21: *Usually, during* ***landing****,we approach with speed and brake contact and then, at about* ***1 m****, brakes are fully pulled in a measured way.*

6.5.4 Landing in the target

Precision landings depend on the knowledge of the own paraglider (ex. the perfect knowledge of the 100% position of brake controls, the response speed of controls etc.) and a good sense of anticipation. Landing at the target is prepared if possible with a long final with enough brake to maintain contact on the wing. To estimate the angle of descent, one tries to determine if and how the target point moves by fixing it and looking ahead:

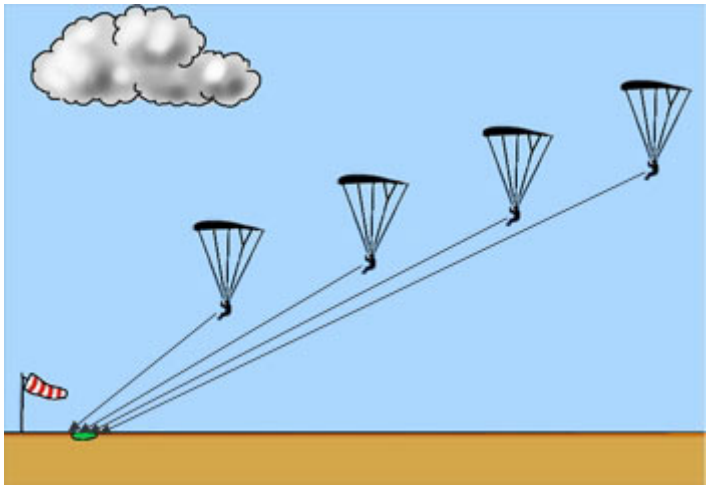


Figure 4-36: the target point moves downward
⇒ *The look aims lower.*
⇒ *The flight path is too flat.*
⇒ *The flight is too long*
Correction: *brake more.*
Caution: risk of stall.

Figure 4-37: the target point moves upwards
⇒ He look aims higher.
⇒ The flight path is too steep.
⇒ The flight is too short
Correction: *brake a little to get best glide*

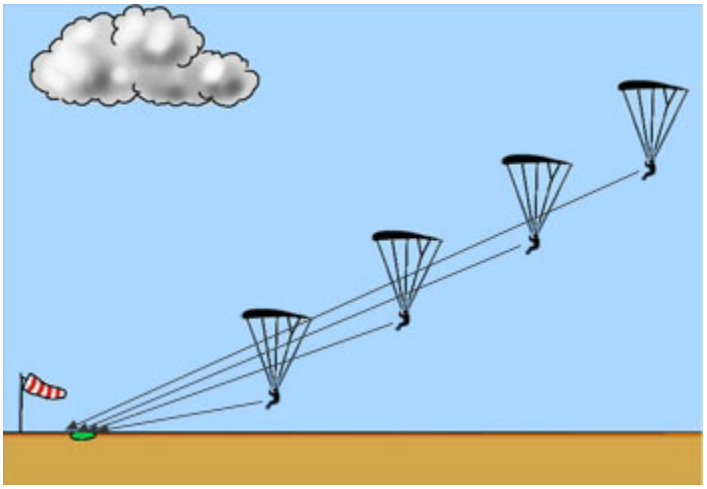
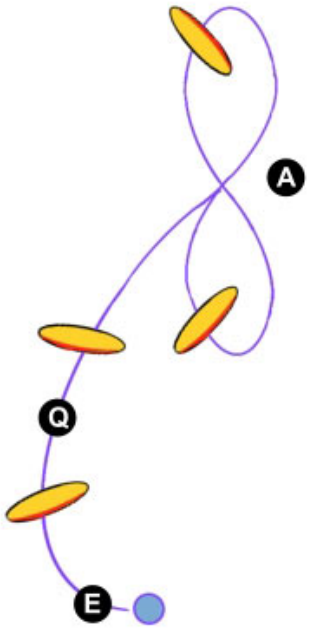


Figure 4-22: *In final it is possible to obtain a steeper trajectory by braking strongly:* ***Beware*** *of stall danger! Also wind gradient (the increase of wind speed with height) can cause the glider to stall at a different brake setting. Flying near the stall point should only be exercised at high altitude or when you are at a height you dont mind falling*

6.5.5 Landing in special situations

• **Landing in strong wind:** With a wind of **30 km / h** and more, the smallest distraction can have as a result being dragged behind the landing ground with the consequence of not being able to reach it anymore. Once one realizes a strong wind prevails upon landing, the location of the altitude loss area is chosen clearly on the windward side of the landing site and in no case should the turn around it be done the leeward side. During the turn one should count on a strong drift in the turns and a small advance in the final. That's why one turns much earlier (about the height of the landing point) at the base than in nil wind. The final is shortened.

Figure 4-38: *Loss of altitude and turn in strong wind: to lose altitude, eights, and not the 360°, are done upwind. The tailwind phase disappears. At the base veer the glider into the wind and the leading edge towards the aimed point.*



Caution: In spring and summer, on sunny days, strong valley wind should be expected which gradually increases with the loss of altitude and may reach **30 - 40 km / h** near the ground!
Caution: Maintain a sufficient distance from obstacles ⇒ turbulences are present throughout the height of obstacles and till the ground!
During landing slightly use the brakes just above the ground. Immediately after landing, deflate the wing by an appropriate operation (pull down the lines B or C)!

- **Landing with a tailwind:** Certain situations may arise when one must land with a tailwind.
  The causes may be:
  - The wind suddenly turns 180° during the final.
  - One has misinterpreted the windsock.
  - Just before, a pilot misinterpreted the direction of the wind on the ground and landed with a slight tailwind, etc.
    In these cases it is necessary to better adapt to the situation and if necessary accept landing with a tailwind. The highest landing speed can be reduced to its maximum by an abrupt action on brake controls at full speed **2 m** from the ground. On ground free of obstacles, landing with a light tailwind is no great danger.
    It is strongly recommended not to carry out violent maneuvers near the ground. One may lose height in an uncontrolled manner and hit the ground in a pendulum movement ⇒ great danger of injury!
- **Landing with a high sink rate** (e.g., deep stall etc.):
  From a sink rate of about **5 m / s** it is practically no longer possible to make an upright landing on feet. In this case the following procedure is recommended:

Rolling technique:

- Tighten the legs and feet, let your knees relaxed.
- Look far away, not to the ground.
- Tighten the arms along the body.
- At the impact, roll on the hip and shoulder. Caution: Do not hold on the ground with the hands ⇒ big danger of injury!

- **Landing on a slope:**
  - On a highly steep field one lands across (parallel to) the slope. During flare pull the brake control downhill more strongly because the glider has a tendency, at the very end, to spontaneously face the slope.
  - On a slightly steep slope one can just as well land facing the slope or back to the slope.
    Landing up the slope makes landing precision easier but makes a smooth landing more difficult. Landing down the slope makes landing precision more difficult and smooth landing easier.

6.5.6 Landing in unfamiliar territory - emergency landing

Landing outside is more difficult than landing on a place acknowledged beforehand. Yet sometimes it is unavoidable to have to choose and decide about a landing site in flight. The sooner it is done and more time there is to assess the wind and obstacles and determine an appropriate approach. With wind, the barriers upwind causing turbulence should be at least **100 m** away and the ground should be as flat as possible.

- **Landing in a tree:** If landing in a tree is unavoidable, use the brakes just before hitting the tree as in a normal landing. Then protect the head with the arms and cross the legs. If you have a choice, choose conifers because of their downward and more elastic branches than the broad-leaved trees.
  Caution: the greatest danger does not lie in landing itself but in the risk of falling from the tree during the ensuing descent! Therefore, in case of doubt, it is better to wait for assistance from another person without releasing from the harness.
  If wishing to free a paraglider from a tree with the least possible damage, release all the quick links and knots of the brake lines and then pull the canopy from the side, downward.
- **Landing on water:** The most important thing when landing in water is being able to separate from glider and harness as soon as possible. For this reason, throw, if possible even during the flight, the backpack and shoes and open the chest and leg straps. Upon arrival in water only use the brake controls slightly so that the leading edge falls into the water first, before the pilot. In this way the air does not go out the canopy and the glider does not sink immediately. Then get away from the glider by swimming against the current.

Caution: Water landings with current are the most dangerous. The current sweeps away the wing and pilot instantly.

6.5.7 Folding

According to the paragliding folding method spread out the wing as for the takeoff and then fold each side several times until the middle. Then fold up from the trailing edge.

Photos 4-23: *Folding*

6.6 - Behavior in case of accident

6.6.1 General Measures

- **Take a step back, consider what steps to take.**
- **Bringing rescue.**
  - Master the consequences of the accident, do not endanger others. Assess fall hazards. Never touch a power line before the power is cut.
  - Do not aggravate the condition of the injured person during transportation and protect the injured parts. If suspecting a back injury, do not carry the person yourself unless it is an extreme emergency. Avoid as much as possible to move the injured person or prevent her from that; put her in position or undertake the evacuation. The symptoms of spine injuries are back pain, loss of sensitivity on the limbs and inability to move them.
  - Arrange transport, if necessary, by third persons.
- **First Aid.**
- **Assistance.**
- Protect the injured from weather factors (cold, humidity, direct sunlight).
- Never leave the injured alone.
- If the injured may need an operation, do not give him any food or drink.
- Organize and control the transport.
- Inform family members and eventually retrieve the glider.

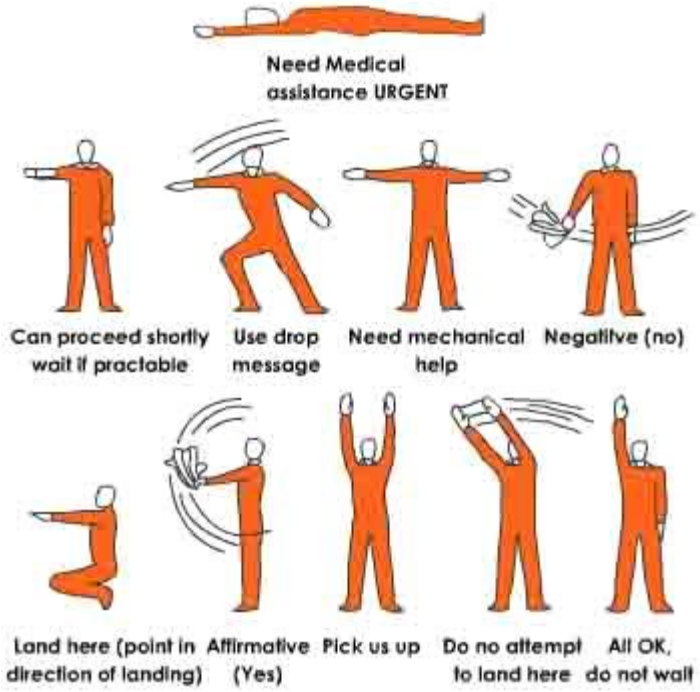
6.6.2 Rescue with the helicopter

One can often save precious minutes when alarming immediately, via telephone, the central local Air Rescue.

- **Conditions:**
  - Enough visibility (no fog).
  - Flat landing platform and at least **4x4 m**.
  - Area with a diameter of **24 m** without obstacle.

- **Guidance:** stand on the edge of the landing area, both arms raised and back upwind.

• **Distress signals:**



- **Fold the glider:** The helicopter rotors generate strong gusts near the ground and can carry in the air the glider left on the ground or clothing and blankets. This can bring significant risk to the injured person and the team of rescuers.

• **Suspension of flights in the accident area:** A white or yellow cross on red background placed on the ground indicates a ban on landing. It can be considered when recruiting a helicopter that all the flights within a radius of **1 km** around the intervention site must be suspended.

- **Approach a helicopter** always by front in the pilot's visual field and bending down.

6.6.3 Personal Accident

- Assess the safety degree; separate from harness and glider if there is no risk of falling.
- If no assistance is necessary, bend the paraglider as quick as you can to avoid a third concerned person from triggering the alarm.
- If a self-rescue is not possible, activate a visual or acoustic signal 6 times per minute. The answer is given by 3 signals per minute.
- Protect yourself from the cold.
- Await rescue.

6.6.4 The paragliding pharmacy

A small pharmacy takes only little space and can pay a tremendous service in case of accident. The basic equipment should include:
- Quick dressings,
- gauze bandages,
- elastic bandage,
- triangular sheet,
- adhesive tape,
- a pair of scissors,
- survival blanket,
- rescue cord,
- whistle,

- pain relief.

Issues	Signs and symptoms	Condition	Emergency action
Does he/her respond?	- Do not respond - Seems asleep (hug, never shake to not aggravate existing injuries) - Does not react	Unconscious **Danger of asphyxiation**	1. If sufficient breathing, lateral recovery position 2. Thermal protection (also below), moisture and heat protection 3. Continuously monitoring, special care in lesions in the spine and skull
Does he/her breathes??	- Rapid breathing, shallow, irregular, with rail, suffocating - Face (especially lips) and the tip bluish fingers - No visible and noticeable respiratory movement - Inspiration and expiration not audible or visible (check approaching your ear near the mouth or nose of the injury)	Respiratory arrest or respiratory failure **Acute danger of suffocation**	Immediately reanimate (mouth to nose, mouth to mouth) 1. Pull the head back gently, press the lower jaw against the upper jaw and lower lip against the upper lip 2. Carefully inject air into the nose, observe the expiration (look, listen) then 12 to 15 breaths per minute 3. In case of high resistance and / or lack of expiration, improve the position of the head, remove clogging substances
Does he/her bleeds?	- Venous hemorrhage: flow drop by drop or high flow - Arterial hemorrhage: spurted corresponding to heartbeat or in streams - Mixed hemorrhage (arterial and venous) are common - Consider internal hemorrhages - Pay attention to blood absorbed by clothing	The blood supply of vital organs is threatened **Bloodstream fails, risk of shock**	1. Lay patient 2. Maintain elevated body part that bleeds 3. In case of insufficient hemostasis, perform finger pressure in the direction of the heart 4. Compressive bandage with a soft padding (fabric, the highest and narrowest possible) and attach it, in case of emergency double it 5. If the compressive bandage is not enough, press the wound with your fingers or fist 6. The injured part should be elevated and left alone
His/her pulse is normal?	- Rapid pulse and low noticeable - Pale skin, cold and clammy - Apathy or amazing agitation, excitation - Shallow or accelerated breathing	State of shock **Bloodstream fails**	1a. In principle, when unknown causes, put the wounded in a horizontal position 1b. If the cause of shock is certainly heavy bleeding or severe fluid loss (eg when burning): elevate the legs about 30cm 1c. Do not raise the upper body injured shocked and conscious with respiratory failure, chest injury (without bleeding in the respiratory tract), skull injuries, or myocardial 2. Protect from cold, moisture and heat, reassure and monitor