Tips for Paraglider Pilots - You can help

version of 2008/9/29

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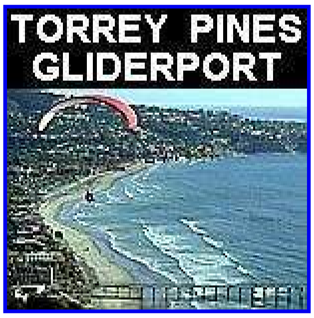

Introduction

Assumed skill level :
It is assumed that the pilot masters the basic techniques of launching, flying towards the landing zone, making an approach and landing.

Purpose / Legal note :
Gathered since 1989, this list of tips is intended for the paraglider pilot who wishes to improve his flying skill and better deal with bad situations. Some advice is trivial but can remain unknown to pilots that did not grasp it the first time around. The author does not encourage extreme maneuvers. The author is not responsible for injuries or damage resulting from the advice given in this document. This document can not be reproduced, in part or as a whole, without the authorization from Jérôme Daoust (E-mail).

Level of importance / Revision date / Color :
Each tip in this document is rated as :

L1 : The most important advice. Something you have to do, or else... This event is likely to occur.
L2 : Important. You should do this. This event may occur.
L3 : It will help if you do this. Try to make it a habit. This event does not occur often.
L4 : For your information. Try this if you want to.

After the level of importance, is the tip's last revision date. Tips that are new or revised since January 1st 2008 are of this color. For example "L2 - 1990/5/18" means that what follows is something you should do (level L2), and was revised (not discovered) on May 18 1990.

About the author :
Jérôme Daoust (E-mail, see My Photo Album) has been paragliding since 1989. He learned in Canada, and flew mainly at Mt Yamaska near Montréal. He moved to France in 1993 and flew in the Alps. Living in California since 1996, Jérôme enjoys flying at Marshall within the Crestline Soaring Society club (see External Links/Flying Site). For each of the 3 countries (see Paragliding Association), he easily passed (well...) a new exam to get a license. Although he won a few prizes in local competitions, he doesn't enjoy competing, as it stresses him out, and he has enough of his normal job to do that.

Conversions

1 kg = 2.205 lb (pound-mass)
1 m = 3.28 ft
1 m/s = 197 fpm (feet per minute) = 2.24 mph = 3.6 km/h = 1.94 kt (knot)
1 km/h = 0.621 mph (miles per hour) = 0.278 m/s = 54.7 fpm = 0.540 kt
1 mph = 1.609 km/h = 0.447 m/s = 0.869 kt
1 kt = 1.151 mph = 1.852 km/h = 0.515 m/s

Mental

L1 - 1999/5/26. ***Group Effect***. Seeing many pilots accomplish something may create a strong temptation to try to do the same thing. They may be more skilled than you, or they may simply be taking a higher risk. This is one time where you have to keep your ego under control, and judge for yourself of the skill and risk involved.

L2 - 2005/4/19. ***Living in the Moment***. When flying, you live for the moment. This is good as a mental release from the rest of your life. But this is bad for the same reason, as you ignore risk consequences. Putting a family picture in sight can help.

L3 - 1992/9/1. Maybe your strong ego got you into paragliding. This is also why many people quit. They realize at one point that they are taking too many risks (to show off) and then feel that they are not really under their own control. It is then a good decision for them to stop. If you think I am talking about you, I am probably not, but maybe this helped.

L3 - 2000/8/4. ***Fame***. What is the maximum reward that paragliding pilots can achieve ? Even if you get to be world champion or the one that went highest/furthest, most people don't even know what paragliding is. A few years after your death, the few people who remember you, will not do so because of your paragliding expertise, they will be your close friends and family. Maybe the greatest benefit of performance is self-esteem (if you don't have it already). Clint Eastwood (movie star) said : *You're a legend in your own mind* !

L3 - 2005/4/19. ***Risk-taking Creates Anxiety***. You are on launch and everything seems good (weather, physical) but you have a vague unpleasant emotion. Think back on your recent flights. Do you remember taking higher risk than usual? When taking higher risk than normal, your mind will pass it on as anxiety later, to remind you of your loss of self-control.

L3 - 2006/12/11. ***Fear Control***. An accident (or incident) you lived or have witnessed, has left you with fears, which overwhelm your flying pleasure. Knowing that:

- People's capacity to visualize a risk is an important part of the attention they give to it. So if you can think of an incident in which a risk has come to fruition, you will exaggerate its likelihood.
- What availability does to you: It plants an image that comes readily to mind, and that image is associated with an emotion: Fear.

To recover, you must believe you have significantly increased your safety level, by doing as many of the following as necessary:

- Following a maneuvers clinic to associate new positive images of control over departures from normal flight. Note that you will have to overcome a temporary spike of fears, before and during the clinic.
- Trading your wing for a more relaxing one.
- Choosing milder flying conditions. See also: Risk-taking Creates Anxiety.
- Clean-up your entourage to reject those inciting you to take risk.

L4 - 1999/2/20. Note to self : Paragliding never promised me good flying conditions on a regular basis. Just as any passion, paragliding will make me very upset at times. When a friend tells me that I missed a great day, I will hurt to the point of thinking : "I will quit this unpredictable hobby". The key is to look back at the year that went by, and ask myself if I am ready to lose what paragliding has brought me, and the joys waiting ahead, maybe next weekend.

L4 - 1999/3/20. Keep other hobbies. After the first years, unless paragliding is your business, flying every day may nullify most of the fun, or put you in search of peer recognition for your invested efforts.

L4 - 1999/4/6. Boldness Bell curve. A pilot's degree of boldness follows a Bell curve over the first five years. Pilots start conservatively, due to a low experience level and a high fear level. Midway, the experience level goes up, the fear level goes down, and bolder decisions are made. Boldness generally peaks when a pilot gets his advanced rating. This is the "Intermediate Syndrome". Towards the end, having experienced that bad situations happen to everyone, decisions become more conservative again.

Launch - Mountain

L1 - 2003/12/17. ***Getting into the harness***. Many accidents have happened because pilots are struggling to get into their harness after take off. The worst are those with their brakes in their hands and grabbing the bottom of their harness. The pilot will unintentionally enter a Stall (Full, Recovery), or if they use only one hand to adjust the seat, the glider will go into a Spin (Recovery). See Image: Repositioning harness with brakes in hand. Another bad idea is to let go of the brakes to then grab the harness, a Collapse (Asymmetric, Recovery) then takes too much take to control (you need to find your brakes again) and they come right back into the hill. A not-so-good idea is to hold both brakes with one hand while using the other to work on the harness, as you can't control a Collapse (Asymmetric, Recovery) as well as if you have a brake in each hand. It is not recommended to press on the accelerator bar to get better seated right after launch. If you are not automatically in your harness after launch, wait until you are safely away form the mountain, then use the following method. Lean back and lift your knees up towards your chest while pushing (but don't hold) with your hands (still holding the brakes) on all your risers at the height that you had your hands for braking, and squirm in the seat, to help "falling" into it. Practicing this maneuver in your garage by attaching your harness to a couple of straps will also help. Do you have harness lower back straps that are too tight ? A common problem is to have the leg straps too loose which places the harness higher as you run/launch, making it more difficult to get seated after.

L2 - 1990/7/1. Attitude. You don't have to take off. If you don't feel at ease with the flying conditions or with a new launch area, fly another day or at a better place. Beware of the Group Effect and those that fly to show off. I heard many times "Well I'm taking off !", and then you see him parked in the strong wind, sure looks like fun.

L2 - 1990/6/1. If the wind varies by more than 10 km/h (6 mph) in less than 3 seconds, you will encounter turbulent air. Don't launch.

L2 - 1991/7/1. The following applied to a rounded summit launch. As a general guideline, one can still launch if the average wind speed is 20 km/h (12 mph) with gusts up to 25 km/h (15 mph) not lasting more than 5 seconds, and still have a reasonable margin of safety with respect to the wing's air speed. One must measure the wind a far ahead as he can on the launch to avoid turbulence. Incline the wind meter to find the maximum wind speed direction. Remember that wind is reduced as it gets closer to the ground. Remember that there is more lift (better) and less horizontal wind speed if you can move forward from the launch.

L2 - 2000/9/7. Those gray clouds are darkening. Thermals and wide lift zones will become strong. Don't launch, and land if you are already flying. Looking around you may see rain showers (at a distance). See also : Flying in Rain, Landing near/in Rain.

L2 - 1990/5/1. Before pulling on your risers to inflate the wing, tell yourself : "This is a trial and will launch only if all goes well.". Don't think : "I have missed this launch twice, and people will not laugh of me any longer.". Fierce mosquitoes are also a bad reason to rush a launch.

L2 - 1990/8/1. After launch, your wing dives to gather speed (you haven't run fast enough) and starts to do a follow-up surge. If you increase the brakes while the surge starts, you will amplify the pendulum motion, which may then lead to a Stall (Full, Recovery) at the summit of the surge. This effect is compounded if entering a thermal (or lift) at the same time.

L2 - 1998/11/1. Top 10 bad reasons for launching : 10) I've waited long enough. 9) I can't get a ride down. 8) I'm hungry, cold. 7) It was a long walk up here. 6) It is getting dark. 5) Let's do it before the rain gets here. 4) The mosquitoes are eating me alive. 3) I will be late for diner. 2) I will look like a wimp if I don't (Group Effect). 1) This is my last vacation day !

L2 - 2006/4/26. ***Pulled up during rotation from a reverse inflation***. If there is a risk of being pulled off the ground as soon as the wing gets overhead from a reverse inflation, we may think it is a good idea to turn around quickly before that happens. See Image: Pulled up during rotation from a reverse inflation. But if your feet leave the ground during that fast rotation, then you can't cancel your rotational impulsion and you will twist the risers the other way, which is disorienting. It happened to me, and I kept pulling the wrong brake until my wing started facing the hill. To prevent this from happening in the first place, do not turn around quickly and/or request launch assistance (too proud ?). Most important, is to relax, and fly the wing away from the hill, untwist later. Grab risers as you rotate back, try to maintain their separation while facing the front (this may pass some rotation to the wing). Verify (before launching) that your Chest Strap Adjustment is not too narrow. For those with gymnastic talent, extend arms to side and extend your legs to the front (increases rotational inertia, reduces rotation speed) when your risers have maximum torquing force against the rotation, and twist your torso to prolong this ideal riser twist angle.

L2 - 2003/12/23. ***Wing Examination at Launch***. Before commiting to launch, examine your wing overhead for Twisted Risers (Harness Flipped), a Line-Over (Recovery), a Cravate (Recovery), or a Knot (Unstable, Recovery) which is hard to see from underneath your wing. These situations could be irreversible once in flight. If there is enough wind, stay stationary and examine your wing overhead for a few seconds. See Video: Pilot launches with a knot, 2003/12/18, Salève.

L3 - 1989/9/1. The wing is over your head put slanted to one side towards the ground. Just "hitting" the brake on the side which is highest will send that side back down if you don't supply a strong forward motion. The most important action to fix this, is to move your body to the side that is closest to the ground. The idea is to re-center your body under your wing.

L3 - 1990/5/1. Let at least another pilot launch before you to have a better idea of the flying conditions.

L3 - 1990/5/1. If taking off in no-wind conditions, identify the lowest obstacle path in front of your launch area.

L3 - 2003/6/6. ***Launch - Mountain - Thermal Timing***. Often, thermal currents form at regular intervals of time. By studying the wind speed 20 minutes, you will be able to predict the next cycle and launch just before the wind increases again. One should also note the duration of the peak wind speed within a cycle.

L3 - 1991/6/1. If you feel a light head wind at launch but look back and see trees being shaken by a stronger wind, look at the cloud movement above you to try to get a confirmation that you are not actually in a rotor from a strong back wind.

L3 - 1991/7/1. At launch you have a strong head wind (20+ km/h, 12+ mph) and people down at the landing zone are reporting light winds (less than 5 km/h, 3 mph). This indicates that the average lift component throughout your flight (ignoring thermals) will not be very good, because most of the wind speed is not coming from a lower altitude. Expect to face a head wind without much lift.

L3 - 1999/12/5. ***Cliff Launch***. You are about to do a cliff launch and there is a strong wind in front of launch that makes a rotor behind you. If you start from far back, beware the band of lift just ahead, that will resist your entry, lift you up and push you back into its rotor. Try to launch as far ahead as possible and then be ready to fly at maximum speed. If you intend to stop at the edge of the cliff, be aware that the non-horizontal wind direction will cause your wing to stabilize ahead of you, pulling you forward unless you add more braking. See Image: Cliff launch.

L3 - 2001/3/20. ***Cross-Wind Launch***. The wind comes at an angle (more than 30 degrees) from your left or right. If you must launch straight because of the terrain (corridor cut amongst the trees, like a ski slope in the woods), the side which is most exposed to the wind may Collapse (Asymmetric, Recovery) just after launch. Try to turn into the wind as soon as possible. See Video: Asymmetric collapse following a cross-wind launch, 2000, Aspen, CO.

L3 - 2004/1/29. You ***Forgot to Fasten your Leg Straps***. Several people have died this way, hanging helplessly by their armpits for a couple of agonizing minutes, then letting go. If it happens to you, remember the following sequence. Grasp the risers. With your weight on your arms, swing your legs through and up, to hook them around the risers and lines. Pull the seat back underneath your bum. Swing back to normal position and fasten your straps. You can reproduce a similar situation in your garage to practice the maneuver. See Image: Recovering from untied leg straps, Video: Pilot recovering from untied leg straps, 2003/11, Canada.

L3 - 1991/4/1. You forgot to tie your chest strap. A similar situation happened to me because of a bad automotive-type buckle that let go in flight. After the initial surprise, you can just force it back together. The tension to close it is about 25% of your weight, depending on the angle of your suspension cone at that place.

L3 - 2006/4/20. ***Dust Devil (Waiting to fly and connected to your wing)***. If you are buckled into your harness, tied to your wing, and you see a dust devil close by, dive on top of your wing to prevent it from becoming airborne. See Image: Holding wing down during a dust devil, Video: Dust devil picks up a wing and harness, 2003, Piedrahita, Spain, Video: Dust devil picks up 2 pilots, 1996, Poland. Do not spend unnecessary time connected to your wing, waiting to launch. See also : Dust Devil (On approach).

L3 - 1999/12/5. ***I'm Launching - Make people aware***. Make people in front of you aware that you are attempting to launch. They will enjoy watching you miss/succeed and you will avoid having someone inflate his wing in your flight path, or cause turbulence. See Image: Make people aware that you are trying to launch.

L3 - 2000/3/10. ***Pre-Launch Reserve Check***. The velcro which holds the handle in place may set and become more fixed due to car transport vibrations, making it harder to separate the Velcro when trying to throw your reserve. Prior to getting in the harness :

1. Peel the handle loose and re-seat it.

2. Check that the pins of your reserve are fully inserted.

See Image: Siggy Bockmaier's reserve deploys at launch.

L3 - 2000/8/1. ***Urinate before Launch***. An empty bladder is much less prone to rupture than a full bladder during a crash-landing.

L3 - 2004/5/5. ***Kiting Wing Unattached to Body***. You may have seen someone kiting his wing by the risers, unattached to his body through the harness, just held by hands. There is no need for this. Many people have died after being pulled up and dropped. Fatality examples : Portugal in May 2004, Tirol in 1999, Slovenia in 1991.

L4 - 1999/4/19. To help untangle your lines, stretch them out, hold up the "A" lines and tug on the brake lines, one side at the time, they often untangle all the others. If your harness is unhooked and your risers are in a knot, start from the canopy and work back down the outside "A" lines.

L4 - 1989/10/28. If a gust, bad ground handling or bad landing gets your wing in a confused and tangled mess try doing this : Grab the leading edge from the center and work your way out to the tip hand over hand. Never grab the tip and start pulling it out of the mess because that will make the mess worse.

L4 - 1991/5/1. If the wind increases as if a thermal passes by, but you don't see any tree branches moving in front and below the launch, the thermal can be forming behind the launch and pulling air through where you stand. You should feel slightly colder air. This is not a good time to launch.

L4 - 1990/5/1. When laying out your wing in strong wind, one can set small stones on the folded over trailing edge to prevent the wind from lifting it, or build up a 30 cm (1 ft) wall with the leading edge by keeping a light traction on the A risers. That wall will reduce the wind speed over the wing.

L4 - 1994/7/1. You will need to launch on a very slanted grassy slope. Bring a few clothes line pins to attach your leading edge to the grass so it doesn't slip.

L4 - 1991/6/1. You have a piloting seat (popular in the early 1990s) on your harness, and are launching with a heavy backpack. This will increase the wing's angle of attack. Apply more pressure with your legs to compensate the weight offset.

L4 - 1998/7/1. Your wing seems to always inflate from the wing tips before the center and you already tried the "horseshoe" or "V" shape layout. Instead of pulling on your "A" risers, pull on all lines (wear gloves) from the "A" riser except the ones going closest to the wing tip. This will put traction first on the center of your wing.

L4 - 2000/9/7. You are about to launch but rain is starting. Do you really need to do that flight ? Know that the bigger the raindrops are, the stronger the lift there is in/under the clouds. So if there is only a fine mist, the lift/sink might not be so bad. But if your hear heavy raindrops on your wing, beware. See also : Flying in Rain, Landing near/in Rain.

Launch - Tow for Cross Country

L3 - 2003/6/6. ***Tow Early and Often***. Get towed early in the morning, and often, until you get a good flight.

L3 - 2003/6/6. ***Release on Lift During Tow***. If you get decent lift on tow above 150m (500') AGL, then disengage. On the way up is your best chance of finding a thermal, too many people stay on to the end of the tow. It is difficult to find something you flew through early on the tow, and even if you do find it, the altitude gained on tow outside of it will be mostly lost and you now re-enter that thermal later in its cycle.

L3 - 2003/6/6. ***Tow Timing***. This is different from a Launch - Mountain - Thermal Timing. If you launch in a thermal (gust), you will be in sink by the time you have height to release. On tow, you want to get a thermal towards the end of the tow. But it is hard to guess when this will happen, so Tow Early and Often. On strong wind days, launch in a lull.

Landing

L2 - 1990/8/1. You have the bad habit of flying a minimum sink rate prior to flaring for your landing. You should know that there could be a wind gradient (proportional to the wind speed) close to the ground that may make you Stall (Full, Recovery) a few meters above the ground. Fly at a higher speed when you are on your final approach.

L2 - 1990/5/1. ***Crabbing***. You have decided to go land but the wind isn't aligned with your flight path. You will need to do like the way a crab walks, and fly "at an angle" from your intended flight path. Let's consider a wind component from the left. If you keep your wing pointed towards the LZ at all times, your trajectory will describe a curve towards the right as the wind has pushed you to that side, ending up to the right of the LZ, facing the wind almost head on to reach it. You will have to compensate sooner or later for that side wind component. Depending on the strength of the wind side component, you need to have your wing pointing at an angle from the LZ to compensate throughout the remainder of your flight. Note that while "crabbing" you are not constantly turning. The shortest path isn't always obtained by facing the destination.

L3 - 2000/9/7. ***Landing near/in Rain***. Rain is falling heavily on the horizon (10+ km, 6+ miles). Expect the winds to dramatically increase as you come in to land, coming from this shower of colder air that spread when hitting the ground. See also : Flying in Rain, Wing Degradation due to Humidity.

L3 - 2002/5/28. ***Landing in Wind Shadow***. The wind is strong and you must land in an area hidden from the wind, like a large hole in the forest. You will need to compromise between 2 evils : Dealing with Turbulence and a Stall (Full, Recovery) due to a reduced air speed as you enter the hole. The most likely event is a Collapse (Asymmetric, Recovery) due to turbulence, which may turn your wing around and result into a high speed impact. It is recommended to fly with 20% braking and practice Active Flying as you approach such a landing zone. You can expect a mild-to-moderate forward surge from the wing as it re-adjusts its airspeed.

L3 - 1990/7/1. You are going to land in a field where the wind is strong. Remember that a line of trees or a house can induce turbulence up to a distance of 10 times their height.

L3 - 1999/10/3. If you must land on a slanted slope and there isn't enough head wind to reduce your ground glide ratio enough to land facing the wind, increase your wing's angle of flight against the wind (don't head into the wind as much) until you start losing relative altitude against the slope under you. Flare (just before touching down) by turning into the wind.

L3 - 1999/7/25. You have landed. Nothing can happen right ? Someone has already died from being dragged after landing through a field, knocked unconscious by collisions along the way and swept into a neighboring river. See Dragged by your wing.

L3 - 1991/7/1. The stronger the wind, the less you need to flare.

L3 - 1999/7/25. ***Dust Devil (On approach)***. Stay as far as possible from dust devils. If one is on the landing zone, land elsewhere. See also : Dust Devil (Waiting to fly and connected to your wing).

L3 - 2004/9/20. ***Landing Backwards***. If caught going backward at the time of landing :

- For a walking/jogging speed, see : Wing Kill.
- For a higher rate of speed... Unclip the chest strap(s) and then one leg strap in preparation. The remaining leg strap will prevent you from falling out by accident. Be sure there will be no safety strap (vario, radio...) linking you to your harness. On final approach, unclip the last leg strap. Jump out of your harness upon touch down, and roll. You may want to hold one brake toggle to put your wing in a flag mode.

See also : Dragged by your wing.

L3 - 2004/9/20. ***Wing Kill***. To quickly disable your wing :

Method	Efficiency	Description + Comments
One A riser + Opposite brake	80%	Simultaneously pull down one A riser and the brake on the other side. The wing will twist and bend back. If you don't brake enough, the open side may turn and hit the ground on its leading edge (bad).
Both C risers	65 %	Let go of the brakes and pull down the C risers. The wing will hinge span-wise along the C line attachement points.
Both B risers	50 %	Let go of the brakes and pull down the B risers. The wing will hinge span-wise along the B line attachement points. The wing may stay off the ground at a 20° angle.
Both brakes	20 %	Pull both brakes as you run downwind towards your wing. The wing may pull you faster than you can run.
Both A risers	10 %	Keep the brakes in hand and pull down the A risers. The wing will collapse from the front, but then have a strong tendency to re-inflate as it goes back, which would destabilise your stance from the sudden spinnaker effect. Early and ample braking following the A riser pull, could maybe prevent this. This method is not recommended.

See also : Dragged by your wing.

L3 - 2007/4/20. ***Precision Landing***. Use 1/4 to 1/2 brake on approach. Release some braking to improve glide, increase braking to no more than 3/4 to degrade. To degrade glide even more, do S-turns with gradual movements about 1/4 brake.

L4 - 1991/9/1. If you have been flying for over an hour, make sure you legs are not numb. Beware of those tight variometer straps.

L4 - 2007/4/20. ***Landing on Speedbar and Brakes***. The following is a high-risk maneuver for landing in a small area (without final precision)... 1/4 to 1/2 brake, then simultaneously add braking and speed bar to degrade glide. Practice at high altitude to get the feeling. To flare, just release accelerator (this makes you loose the final precision). About the risk of using brakes while accelerated, see: Accelerator (Turbulence). For a safer and more precise technique: Precision Landing.

Top Landing

L2 - 1998/12/1. You have the habit of making Big Ears (Execution) to top land because it should be more stable through turbulence and it produces a higher sink rate. Do you think you have enough control to brake your wing if it wants to surge forward ? Are you ready to handle a Frontal Collapse (Recovery) ? Do you think using the Accelerator (Usage) at the same time makes you less or more susceptible to a Frontal Collapse (Recovery) ? See Video: Frontal Collapse while under Big Ears.

L3 - 1996/5/18. On your approach to a top landing, you realize you are too high. Don't over-brake and be close to Stall (Full, Recovery), as it may just happen. Just overshoot, get into the lift again, get altitude and retry. Beware of making your approach from the back as you may get into rotors. Try making your approach from the side instead and turn into the wind prior to flaring. Ask the locals about the best approach for the site.

L3 - 1999/1/15. To reduce your glide ratio and improve the landing. Approach from the side (let's say the wind comes from your right), weight shift as much as you can to the right and maintain your axis with the left brake. This degrades the glide (good). Just before touching down, let go of the left brake and the wing will face the wind.

L3 - 1999/3/21. What is harder than top landing ? Deciding not to do it. If there are strong thermals in the area, or turbulence, think about it twice. This is especially hard when you see others top land before you, beware of this Group Effect.

L3 - 1999/12/5. ***Top Landing - Make people aware***. Make people aware that you are attempting to do a top landing. They will enjoy watching you miss/succeed and you will avoid having someone inflate his wing in your flight path, or cause turbulence. See Image: Make people aware that you are trying to top land.

L4 - 2004/6/2. ***Top Landing - Increase Body Drag***. To reduce your glide ratio (good), adopt an upright (standing) position and spread arms and legs, which increases the drag from the pilot. See also Reduced Pilot Drag.

L4 - 2000/12/14. ***Flapping***. Some pilots flap their wing to degrade its Lift/Drag performance in order to facilitate top landing (common in Taiwan). The technique consists of pulling your brakes in small consecutive bursts (1+ per second). If we are attempting to duplicate a bird's wing flap during landing, lets remember that unlike them, we can not move our leading edge up and down, backward and forward, increasing its relative path through the air. What really matters is not to Stall (Theory). The question boils down to the following : If by flapping, the flow which was starting to reverse is re-established more quickly when we let off the brakes, than the time that it takes to reverse it while pulling the brake, then flapping could be better than a steady state equivalent braking. But this remains unanswered. Remember that flapping will not prevent your wing from a Stall (Theory). Alternative methods : Perform S-turns or Big Ears (Execution). See also : Butterfly.

L4 - 2000/12/14. ***Butterfly***. This technique consists of repeatedly deep braking for about 2 seconds and releasing. The wing ends up doing ample pitch motions. I don't recommend it. See also : Flapping.

Normal Flight

L2 - 1991/6/1. Look, lean, turn. Turn your head to see if the space is clear before making the turn. Furthermore, turning the head naturally tends to perform a proper weight shift in the harness.

L2 - 1989/12/1. Recall of basic flight rules. Avoid by the right. The pilot with the mountainside to his right has priority. The pilot just under you has priority. If you enter a thermal with other pilots already in, turn the same way they do.

L2 - 2001/2/24. ***Abrupt Steering***. Sharp changes in steering input will increase your sink rate, as will tight turns. Perform smooth maneuvers to get the best performance. Sharp changes will also make your banking angle oscillate. The following describes a common accident. Facing away from the ridge, the pilot thinks that if he starts his turn sharp enough, he has time to complete a full turn. Supplying a sharp steering input, he quickly obtains a high banking angle. But just as he is now starting to face the hill, the bank angle now oscillates back to almost zero, sending him straight for the ridge at that time. Thinking that he is not supplying enough turning input, he "stuffs" the inner brake inducing a Spin (Recovery) and falling into to hillside.

L2 - 2000/4/3. ***Brake Toggle on Wrist***. Flying with your brake toggles around your wrists (you threaded your hand) is dangerous because if you need to grab/throw your Reserve (When) or reach for something far from your last brake line pulley, you will be inducing an unexpected reaction in the wing from the excessive brake pull. The brake toggle may not slip out of your hand when you need it to, especially if you are wearing gloves. I also believe it provides less feedback than holding the brake with the fingers.

L3 - 2001/10/4. ***Harness Recline Angle***. Adjust your harness so you can recline. Reclining in our harness doesn't feel natural at first (as other things in aviation), but when you do it will enhance your flights. To demonstrate the difference between flying upright and flying reclined, try this exercise. Sit in your harness whether in flight or in a simulator and note the things that are within your line of sight. While sitting upright, with your eyes on the horizon, you can see :

- your feet
- the ground

When you recline (with your eyes on the horizon) you can see :

- your hands (i.e. the brake input you are effecting on the glider)
- your Riser to Harness Connection (i.e. the weight shift input that you are effecting on the glider)
- your Accelerator (Usage) (i.e. to what extent it is engaged on each side)
- your glider (out of your periphery)
- the ground (with reference to the way your glider is pointing and hence, your track across the ground)

Try making the biggest weight shift turn that you can while upright and the while reclined. You will find that you can perform much bigger weight shifts while reclined than while upright. There is a drawback to being too reclined : The pilot's inertia about the yaw axis is increased, leading to an increased chance of twisting the risers following a big Collapse (Asymmetric, Recovery). See also : Chest Strap Adjustment.

L3 - 1990/5/1. During turns, lean your weight into the turn to load the harness on the side you are turning, otherwise you will be counteracting some of your steering input.

L3 - 2001/10/4. Wind speed and direction at cloudbase, can be observed by looking at the movement of the Cloud Shadow on the ground.

L4 - 1997/6/1. When flying a ridge, low and close to the hill, always be weight-shifting away from the hill, that way if you have a hill-side Collapse (Asymmetric, Recovery) you will be less likely to turn into the hill as you are ready to correct before a problem develops. Note that too much weight-shifting away from the hill will require extra hill-side braking that is detrimental to the wing's performance. Determine your own safety/performance compromise.

L4 - 1991/7/1. The clouds indicate the wind gradient (speed and direction change with altitude). The head of the cloud gives an indication of the wind at its level while its base is more influenced by the winds closer to the ground.

L4 - 1991/8/1. To better understand another pilot while flying, turn your head such that you have one ear heading in the direction of the wind, thus reducing the whistling noise in you ears.

L4 - 1990/6/1. For those with a piloting seat (common in the early 1990s) on the harness, adjust your speed with the harness to reduce the braking effort and improve performance.

L4 - 2004/5/5. ***In-Flight Drinking***. Sipping is actually a metabolic drinking method, where if you take in small amounts of water at a time, your body is able to metabolize it without causing much of it to end up in your bladder as if you guzzle it down. See also : In-Flight Urination.

L4 - 2007/4/20. ***Airspeed Reporting***. Reporting an airspeed, like "my wing goes 40 km/h at trim" is meaningless without the corresponding altitude and your position in the wing's weight range. There are other factors (MSL air pressure and flight-level temperature) but you need to correct your measurement for at least these main factor:

- Correct for a weight at the middle of the recommended range. For the formula, see: Ballast.
- Correct to a sea-level altitude, using these relations (slower at lower altitude):

2.2 km/h	1000 m
1.0 km/h	450 m
0.43 mph	1000'
1.0 mph	2350'

Thermals

L1 - 2005/2/23. ***Entering a Strong Thermal***. You feel yourself swinging forward under your wing and being pulled up. You must reduce you braking and give your wing speed during this phase. Some competitors even use their Accelerator (Usage). But do not increase the braking as you would risk a Stall (Full, Recovery). See Video: Adding brake during thermal entry, 2005, Valle de Bravo, Mexico. If you initiate a hard turn at this time, you risk a Spin (Recovery). Once installed in the thermal, and the wing stabilized overhead, reduce your speed but not more than minimum sink rate speed. More important than using your wing's best sink rate, you must concentrate on Centering the Thermal (using a Vario). When exiting a thermal, perform Active Flying, giving the wing less braking (or more accelerator) as you swing back under the wing after the forward surge, minimizing the time spent accelerating and in sink.

L2 - 2002/2/3. ***Centering the Thermal (using a Vario)***. If one follows the indications of his variometer : If it indicates an increase in the climb rate, open up your turn (you may even go straight). If the rate of climb diminishes, tighten your turn as we would otherwise be moving away from the center of the thermal. There is no need to delay your response to your variometer, since it typically indicates the average over the last second of readings.
This technique is good for wide thermal lift **without** a sharp increase in climb rate near its center. It can also serve to find better thermal cores when multiple thermals merge with altitude. See also Tighten on the Surge, Feeling the Thermal.

L2 - 2002/12/2. ***Tighten on the Surge***. When you feel the thermal pushing up solidly, (or the vario indicates the strongest lift) you should tighten the turn and dig the wing into the thermal. Most pilots do not turn tightly enough. When the vario indicates weaker lift or sink, having kept a mental picture of the best lift location, you should widen the turn and anticipate repeating the procedure at the next surge. Do not exaggerate and induce a Spin (Recovery) when Entering a Strong Thermal.
This technique is good for narrow thermals or ones **with** a sharp increase in climb rate near its center. See also Centering the Thermal (using a Vario), Feeling the Thermal.

L2 - 2002/2/3. ***Brake Control on Weak Lift Side***. If a strong thermal lifts a side of your wing (your harness is lifted by one side), the other side will support less weight and may Collapse (Asymmetric, Recovery). You will feel the outside brake line going soft. At that point, pull on the soft brake line to increase that side's angle of attack and prevent the Collapse (Asymmetric, Recovery). Once normal brake line tension is restored, choose to fully re-enter or leave the strong thermal but don't remain in the vertical shear zone.

L2 - 2001/1/1. ***Don't Follow a Thermal Too Far Back***. Because of the Thermal Path, when following a thermal over a mountain edge, it's normal to see ourselves go back into the mountain (while rising). But keep in mind that you will need to get back in front (usually) of the mountain after loosing the thermal. You will then mainly be fighting against a head wind. For this purpose, don't exceed a 45 degree (ground glide ratio of 1.0) angle when going up and back.

L2 - 1998/6/1. You are far from any ridge, and you have passed through some lift, which is gone now. You are wondering if you should be making a U-turn to your left or right to get back in it again. Go to the side that lifted your wing the most when you were in the lift. This will make you pass closer to the thermal's center.

L2 - 2002/2/3. ***Map the Thermal Using Others***. You are turning the same thermal as someone else at the same altitude and your are both describing a large circle. You notice the other person suddenly sinking a lot. Reduce your turn radius or turn the other way to avoid the sinking area. By the time the other pilot returns to the thermal he will be below you. Similarly, if someone out-climbs you off to one side, move your circle towards them. There is no heroism in climbing slowly by yourself. See also Rake the Sky.

L2 - 2005/1/11. ***Finding a thermal from air disturbance***.

- **Go against the roll**:
  - **Roll and shift in opposite direction**. If you are rolled left, yawed left, and drifted right, you are below the thermal top in the in-flow region. The thermal is to your right. This is common in unstable conditions, for example when there are cumulus about.
    Blanket model. One can visualize himself on a side of a huge blanket laid flat, then pulled up from its center. You would feel a roll away from the pull-up and shifted towards it.
  - **Roll and shift in same direction**. If you are rolled left and drifted left you are in the out-flow region above the thermal top, and the thermal is to your right. You may have to wait for the

thermal to climb up to you. Expect increasing climb rates as the core get closer to you. This is common when you are ridge-soaring above a Thermal Launch Point in relatively stable conditions, when thermals form from low down and are often of short duration.

- **Ground speed increase when upwind**. If when flying upwind you observe an increase in ground speed (reduction in wind speed), you may be headed for a thermal blocking the wind.
- **Turbulence ripple running along the wing span**. The turbulence pattern near a thermal can be used. If you notice a turbulence ripple across the span of your wing, the side that gets hit first is usually towards the thermal.
- **Horizontal push at low altitude**. When trying to find convergence low down, in that case the air will accelerate towards the convergence and it is necessary to fight against your instinct. Follow the air's acceleration to where the convergence lift is.

See also : Microlift Lines,

L2 - 2008/8/12. ***Thermal Model***. Definition of a thermal: Rising air due to heating. This definition helps to include the top part of a thermal that rises beyond its buoyancy point thanks to its momentum, and encapsulates anabatic wind within the Thermal Collector.
In a Thermal Collector, the ground heated by the sun, generates a blob of heated air, in which micro-thermals serve to give the blob some thickness above the ground. Consider the envelope of the blob as a fuzzy one, not well defined. A Thermal Initial Impulse will start the upwards spillage of the heated air within the Thermal Collector towards the Thermal Launch Point, after which it follows a Thermal Path, gradually emptying the heated air blob from the Thermal Collector faster than it was created, creating a thermal life cycle. See also : Sink Origin, Low Save.

L2 - 2008/8/12. ***Thermal Collector***.

- Nature of the surface. Surfaces that absorb the most sunlight energy will heat up most the air that is in contact with it. Note that moisture content (wet is bad) is more important than color (dark is good).
- Orientation. Depending on the time of day (sun position), the best collector is the one with a surface facing the sun, as it ratio of EnergyReceived/Surface is highest. In the morning look for East facing mountain sides, West later in the afternoon. During mid-day flat ground gains in influence. Don't expect to get good thermals over a town before 2:30 pm. Look for the base of a hill, representing a dish facing the sun.
- Wind exposure. Wind will facilitate a Thermal Initial Impulse. So the more the surface that generates the thermals is protected from the wind (vertical structure before or after), the stronger the thermals and longer cycles. These areas will accumulate more heat before releasing a thermal. A surface exposed to the wind (like a rock shoulder) will not be able to gather as much heated air before releasing it. Instead it will render a more constant, but lighter lift. When looking for a thermal source on flatland, consider the downwind side of a village, hedge, forest, hill, small valley (I'm not saying to go low and place yourself in a rotor). A parking filled with cars is better than an empty one.

If the collector is inclined (like a mountain face), there can be a soarable Anabatic Wind within it below the Thermal Launch Point, where the flow detaches from terrain. Otherwise try to intercept a Thermal Path. See also : Thermal Initial Impulse.

L2 - 2008/8/12. ***Thermal Launch Point***. It is where the heated air from a Thermal Collector detaches from terrain.

- Adrian Thomas, 2008/7/21: Just as a surface-imperfection can generate heat differences and thereby initiate thermal flows, so linear features like tree-lines, or ridges can also direct the flows of thermal updrafts. There is a problem with any flow directly away from a surface, the pressure will be at a minimum immediately under the updraft. There are only limited flow patterns that can result. Shear layers, saddle points and focusses, for example. These are known as critical points, and the flow pattern is very sensitive indeed to the precise geometry of the underlying surface. That sensitivity can mean that small variations in surface topology can lock thermals to particular points. The flatter the terrain, the stiller the air, the smaller the feature needs to be.

Examples :

- It is most often at the highest point of the Thermal Collector. The preference to lifting from a terrain feature is that the underlying geometry is more favorable to creating/maintaining a vertical flow pattern. Flow perpendicular from a flat surface is subject to more resistance because the pressure under the updraft would be at a minimum. The flatter the terrain, the stiller the air, the smaller the terrain feature needs to be.
- You may find this at the limit of 2 different terrain type (a field and a forest for example). The terrain that heats up more will draw its replacement air from the other (in light wind conditions).
- The catabatic flow on snowy upper slopes will launch thermals at the snowline where it meets the anabatic flow.
- Instead of having a stationary thermal launch point (exposed hillside) it can be moving (flatland) and following wind at ground level, providing a moving vertical thermal column, even on a windy day (15+ km/h), which can be followed for 10-20 km.

The word "trigger" is intentionally avoided because it is confused with both Thermal Initial Impulse and Thermal Launch Point. See also : Thermal Path, Thermal Model, Thermal Spacing.

L2 - 2008/8/12. ***Thermal Path***. This is the path a thermal takes after its Thermal Launch Point. Factors influencing the path shape:

- Wind. On days with very light wind, thermals will rise vertically from their Thermal Launch Point. On a windy day, a thermal column does not have the same incline throughout its altitude. It is more vertical close to its stationary Thermal Launch Point, more inclined at higher altitude where it is more adapted to the wind speed. We can visualise it as the shape of a blade of grass in the wind. On strong wind days, the thermal column with a stationary Thermal Launch Point can incline past its stability point and separate into segments. Thermals can form in the lee-side of a mountain (sheltered from the wind): expect turbulence as it becomes rises and becomes exposed to the wind.
- Rate of climb. The trajectory is a function of the thermal's temperature difference (rate of climb), the width of the thermal (more inertia to respond to wind) and the wind strength, all of which can change with altitude. Upwind of a weak core, there can be a stronger core wich originates from the same Thermal Launch Point but has not drifted in the wind as much, because it rises quicker.
- Terrain. If a thermal rises next to a slope it can be fed more warm air heated from its face such that a path along a heated slope becomes favorable.
- Proximity. Thermals gather on their way up, think of it as thermal "roots".

See also : Thermal Path Indicator, Cloud Shape.

L2 - 2001/2/24. ***Coordinated Turn***. A common problem is maintaining a consistent circle while thermalling. An excessive roll motion may send you straight out of the thermal. See Abrupt Steering. Try to maintain a coordinated, banked turn. Start with a smooth controlled lean and a simultaneous and progressive inside-brake application. The wing will bank, your body will follow and the centrifugal force will keep your body outside the wing's circle to smoothly ride the thermal up. Applying Active Flying to will help you keep the wing over your head, which is a measure of a true coordinated turn.
Suggestion : Use twice the amount of inside-brake tension than for the outside brake, and adjust the turn with lean and outside brake.

L2 - 2008/8/12. ***Anabatic Wind***. It is wind coming upslope, as part of thermal convection. It can be considered to be found within a Thermal Collector. The best anabatic lift is found 20-30 m away from the slope, and not closer, due to terrain airflow drag. See also : Catabatic Wind.

L3 - 1991/7/1. Thermalling close to a ridge. Making figure-8 turns can be better than full turns if there is a risk of colliding with the ridge.

L3 - 2002/2/3. ***Feeling the Thermal***. From Robbie Whittall : When you feel a thermal lifting a side of your wing, brake that side, keep flying straight but if the sensation diminishes, turn more into the side that lifted to keep the same sensation. If this maneuver is executed correctly, you will end up describing a circle around the thermal. At that time you will know the thermal's diameter and center. Then tighten your circles. See also : Centering the Thermal (using a Vario), Tighten on the Surge.

L3 - 2005/3/3. ***Lost Thermal (Staying Local)***. If you have lost the thermal you were in. Make larger circles to find it again while looking at the other pilots flying below you, as you may still have time to use those thermals once you get in their axis. Active thermals for the pilots above you may be unusable at your altitude from now on. You can also try a "clover leaf" search pattern, allways re-centering on the best previous lift location. See also : Never Leave Lift, Finding a Lost Thermal with a GPS, Lost Thermal (During XC).

L3 - 2002/2/3. ***Weak Lift Optimization***. So the thermal you were in has provided you with an altitude gain but has now mellowed, providing insufficient lift to maintain your altitude. You also know that thermal normally form there. Many pilots do not optimize the rate at which they go down, thinking that anything that doesn't make the variometer beep is equally bad. Concentrate in staying in the area that make you come down as slow as possible. Thermal activity follows a cycle that lasts about 15 minutes (or anywhere from 5 to 30 minutes) in between the time at which they provide maximum lift. By optimizing your rate of descent, you are improving your chances of waiting out for the next time the lift gets sufficiently strong again to go up. This is when you will see many pilots get "flushed" down to the landing zone as you start going up again.

L3 - 2008/8/12. ***Thermal Path Indicator***. If you see tree branches moving somewhere down below, a thermal flow must be passing close by. Get over that area and find it (unless you are already if good lift). Another visual indicator of thermals is a group of rising bugs (butterflies...). In summer, you may see flower petals going up. If you suddenly smell something bad, it is usually coming from the ground, therefore in lift. See also : Thermal Model.

L3 - 2001/7/11. ***Calm Air and Now Sink***. You were flying in calm air for a while and are now entering some sink. There may be some lift a little further, so don't turn around too quickly. There is usually lift somewhere close to that sink, try to find it. See also : Using Sink to Find a Thermal.

L3 - 2001/7/11. ***A Thermal is a Wind Obstacle***. A strong thermal column constitutes an obstacle for the wind. If you are downwind from such a thermal, expect turbulence in addition to the sinking air. If you need to exit the thermal, choose an upwind direction. Note that the upwind exit rule does not apply when doing a Cross-Country flight. See also : Using Sink to Find a Thermal, Thermal Core Offset.

L3 - 2001/7/11. ***Thermal Core Offset***. Wind will cause a thermal's maximum lift location to be shifted upwind. Think of a thermal's cross-section as being shaped like a water drop "falling" horizontally upwind. If entering the thermal from "behind" (downwind), keep heading upwind to find its true core (smoother, larger), don't stay in the disorganized lift in the wake of the thermal column. See also : A Thermal is a Wind Obstacle, Using Sink to Find a Thermal.

L3 - 2001/7/11. ***Using Sink to Find a Thermal***. What follows applies to days where there is wind. If you encounter sink and turbulence, fly in an upwind direction to find the thermal. See why in : A Thermal is a Wind Obstacle. If you encounter smooth sink, the thermal should be downwind of you.

L3 - 2000/6/21. ***Lift Rate Estimation***. How to estimate the thermal lift you will encounter based on the wind speed variation at launch. Assuming :

> Thermal vertical flow speed = 0.9 x (Variation in wind speed at launch)
> Your average sink rate is 1.2 m/s (236 fpm)

And knowing that 1 km/h = 0.278 m/s (1 mph = 87.9 fpm), we can establish that : The first 4.8 km/h (3.0 mph) of wind speed variation is needed to give you sustained flight, and every 4.0 km/h (2.5 mph) beyond that will add another 1 m/s (197 fpm) of lift.

L3 - 2000/3/10. ***Staying in an Inclined Thermal***. If your wing had a null sink rate, you could maintain a constant bank angle to follow the inclined thermal column on your way up. But with our wings that have a sink rate, you would fall under the lee side of the inclined column, so while turning you need to extend the period of time you head upwind in comparison to your downwind phase.

L3 - 2000/10/24. ***Finding a Lost Thermal with a GPS***. If you are high and have lost your thermal you can find it again using the track log of your GPS. Zoom the map to about 200 m screen size, and you can see the wind-swept trace of your thermal circles. Fly over to about where you expect the next circle to be. See also : Lost Thermal (Staying Local).

L3 - 2000/8/9. ***Thermals under an inversion***. You can expect more turbulence as the thermal reaches an inversion. See Image: Why an inversion create more thermal turbulence.

L3 - 2001/2/24. ***Do Not Change Turn Direction***. This is especially true when low. There are 3 reasons :

1. Changing direction disturbes your Coordinated Turn and the time you spend flying straight usually takes you away from the lift.
2. You loose your "mental map" of where your best circle was.
3. The direction change causes your vario to beep in many interesting but non-helpful ways.

L3 - 2001/2/24. ***Safe Inside the Thermal***. The smoothest air is usually at the core of a strong thermal, and your wing will be more pressurized and stable when flying at a high bank angle. With a fast climb rate, you should expect turbulence at the edge of the thermal. Don't fly away from a very strong thermal as you are sure to hit turbulence. It is best to lock into the core and take it to cloudbase (or top of lift).

L3 - 2002/2/3. ***Best Approach to an Obvious Thermal***. Approach from either directly upwind or downwind, as you may stumble onto a stronger climb rate than the established gaggle of circling pilots.

L3 - 2003/8/5. ***Punching Through the Inversion***. Thermals who pass through an inversion layer have their diameter eroded away as they go through, with only the strongest core being able to traverse. You need to turn tighter during this period.

L3 - 2005/9/26. ***Low Save***. When low, follow the horizontal tugs from the air (see Finding a thermal from air disturbance) unless it is unsafe to follow it. Stay in the lift you have found, making use of the abundance of low thermals, as all the time you spend flying improves your chances of finding the thermal that will take you high.
Josh Cohn, on the abundance of low lift, 2005/9/16:

- Let's assume a normal distribution (bell curve) of thermal sizes and temperature differentials as they leave the ground.
    - The largest, hottest thermals will rise the fastest and go the highest. The smallest, coolest thermals will not go very high.
    - The lower you get, the more thermals you will run into. The higher you are, you will only run into the occasional big strong thermal.

  Of course this assumes a lapse rate that is not superadiabatic enough to compensate for mixing. But this is true of most conditions we fly in, especially at dryer and more stable sites.
- Another explanation is that small thermal bubbles mill about down low until enough of them join up to form a real thermal that then lifts off. Turkey vultures work this sort of very low bubbling lift. This is why you can often maintain low at a Thermal Launch Point until it releases.

See also : Thermal Model, Never Leave Lift.

L3 - 2008/8/12. ***Thermal Initial Impulse***. It is the mechanism that allows hot air gathered at a Thermal Collector to start moving in an organized manner. The sun heats the surface directly by radiation. The air is heated by conduction from the surface it is in contact with. So the air next to the surface is hotter than the air further from the surface. If the surface is completely flat, then there may be nothing to disturb the air into motion, and the layer of air next to the surface can get very much hotter than the air above it. It is the normal condition for the atmosphere in the morning. If the surface is completely flat, the heating can go on beyond the temperature normally initiating movement. However any tiny imperfection in the surface can cause a local increase in heating, and can initiate air movements. The impulse is something local that starts an updraft. Stirring, local heating, wind rising over a ridge. In the absence of such an impulse the cold air will sit over the warm air indefinitely. The strength of the impulse that is required depends on the instability in the atmosphere - lapse rate and heating. The word "trigger" is intentionally avoided because it is confused with both Thermal Initial Impulse and Thermal Launch Point. See also : Thermal Model, Thermal Restraint Breaker Myth

L3 - 2008/7/23. ***Sink Origin***. Some mechanisms:

- Thermals. In the zone around and near the bottom of a thermal (blob or column), there can be organized sink to back-fill the space under it. An inversion layer will act as an elastic "lid", so a thermal reaching it will more forcefully displace air above it, which can organize into sink. A strong thermal which kept rising past its stabilized "buoyancy" point (if it had gone up very slow), will start to sink since it is colder than the surrounding air. Combining these understandings and knowing that air displacements often gets organized (less energy required) we can visualize large-scale convection between ground and top-of-lift.
- Wind. The lee-side of a rounded summit or ridge can produce sinking air, unless the wind is so strong that the lee-side goes into a turbulent regime (instead of staying laminar).
- Upper terrain cooling. Catabatic (downhill) wind originates from air being cooled by contact with upper terrain. This typically happens at the end of the day as upper terrain cools by radiation faster than surrounding air.
- Rain. Rain can cool air which will then start sinking. An extreme case is if the rain evaporates before reaching the ground (virga) which further cools the air.

See also : Thermal Model, Thermal Sink Sleeve Myth, Organized Convection.

L3 - 2008/8/12. ***Catabatic Wind***. Is is wind going downslope due to cooled air. The sink effect dissapears after 100 m distance from the slope. See also : Anabatic Wind.

L4 - 1991/7/1. When at cloud base, avoid the downward currents when they are materialized as filaments going down.

L4 - 2002/2/3. ***Cheap Thermal Simulator***. Go to an empty parking lot and bring a buddy (let's call him Joe), a chalk, a blindfold, and a whistle. Go to the center of the parking and blindfold yourself. Joe will draw up the contour of a "thermal" with the chalk, about 40 ft (12 m) in diameter, and an X in the center. Ask Joe to bring you outside the "thermal" and point you somewhat towards it. Joe will blow the whistle when you are in the "thermal", with increasing volume as you are closer to the X (like a vario). Simulate brake positions with your hands. Start walking at a slow and constant pace. Try to circle around the X. Retry, but change your walking speed.

L4 - 2005/1/12. ***Thermal Rotation***. The convergence pattern at the Thermal Launch Point will often induce a rotation, which has a 70% chance of following the Coriolis effect on a low pressure system (Counter-clockwise in Northern hemisphere). One can think of a Dust Devil (On approach). The rotation energy typically reduces with altitude, but can be sustained by unstable air (accelerating vertical flow). As you fly though it, you can feel a jolt of yaw, marking the center of lift for you. If the whole thermal section were to rotate about its vertical axis, it would make sense to turn against the rotation to reduce our angular velocity, reducing our bank angle and increasing our efficiency. But there is insufficient evidence based upon pilot experience to confirm that we can take advantage of this.

L4 - 2001/2/24. ***Thermal Quality***. When catching a thermal close to the ground, it will be narrower and more violent. They tend to smooth out and expand as they rise. High-pressure days produce narrow and sharp-edged thermals. Days with a high lapse rate will produce thermals with a stronger ascent rate.

L4 - 2008/7/23. ***Thermal Sink Sleeve Myth***. The myth : A thermal is a column of rising warm air surrounded along its length by a sleeve of descending cold air. Most pilots learned this during their schooling. This error in representation does not allow you to understand thermal breezes, and penalizes you while learning to perform thermal flights. Why people may believe in the myth :

1. They confirm it as they experience a drop at the entry and exit of many thermals.
2. It is easier to imagine that at the border of a thermal, your increased sink rate is due to a descending air

mass, instead of a turbulent vertical shear.
3. They have felt weightless or got a Frontal Collapse (Recovery) when exiting a thermal, and think there had to be descending air to explain this.
4. They justify it by an equilibrium of air displacement, not realizing that it can be achieved on a larger scale.
5. They justify sinking air at the Thermal Launch Point as a means for replacement of the warm air going up. But replacement air can be provided horizontally from a base wind. There is a well know model for valley winds that are increased due to the thermal activity on the valley hillsides, with the replacement air coming from the opening of the valley.

Ways we can disprove the myth :

1. On windy days, the thermal column (stationary Thermal Launch Point) will be inclined as it is pushed by the wind as it rises. Why would descending air follow the thermal column on the way down, going against the wind ?
2. There is not always descending air before entering a thermal of after exiting it.

General :

1. This does not mean that you can not find descending air next to a thermal. See : Sink Origin.
2. Lift is a blend of pure thermal, ridge lift and convergence.
3. Reality is complex, it is better to keep open questions than a bad simple model.

See also : Thermal Core Offset.

L4 - 2008/7/23. ***Thermal Restraint Breaker Myth***. There is no surface tension (not applicable between 2 gases) for a volume of heated air, holding it down to the ground. So forget ideas of spherical bubbles clinging to the ground by a "tendon", waiting for a moving animal or vehicule (or any assorted object) to cut it loose. Human soarable thermals range from several thousands to several million tons. Selective memory of pilots, based on coincidences, are keeping this myth alive. See also : Thermal Initial Impulse, Thermal Model.

L4 - 2008/8/12. ***Organized Convection***.

- Adrian Thomas, 2008/7/21: The process is demonstrated in a pan of water heated from below (on a stove, for example) or cooled from above (coffee, for example). At moderate temperatures (below boiling) you can see the patterns of circulation that form in a pan. Imperfections very obviously iniitiate local convection. Similarly, in unstirred coffee, the surface cools, and this cooling can be really uniform - if it is then you get cellular patterns in the coffee when milk has been added. These are usually called "Benard cells". A large scale example is provided by cloud streets - hexagon theory in still air above smooth terrain (the sea, usually), self-organised cloud streets in a breeze. Only when the wind direction is uniform with height, and ideally when there is an inversion at altitude to limit convective activity to a thin(ish) layer.

See also : Thermal Path, Thermal Spacing.

Dynamic

L2 - 2004/12/5. ***Accelerator (Usage)***. You are using your accelerator (speed bar). Do you really need to ? Your wing is less stable under these conditions. Use of the accelerator near the ground, should be for emergencies only. Do not use the brakes at the same time for these reasons:

- It increases your risk of collapses. See Accelerator (Turbulence).
- Small amounts of brake pull will significantly reduce your speed and L/D.
- Resuming max speed after a temporary brake use, takes a long time.

A Collapse (Asymmetric, Recovery) with the accelerator fully extended will induce more violent reactions than at normal flight speed. Look at your wing's DHV test report (see Wing Certification) to find out more. Stomping on the accelerator will make your wing more likely to Collapse (Asymmetric, Recovery). I have seen this happen. Activate your accelerator in a gradual manner. If you want to have Big Ears (Execution) simultaneously with using the accelerator, perform Big Ears (Execution) before using your accelerator. Otherwise you risk a Frontal Collapse (Recovery) as you perform Big Ears (Execution). See also : Accelerator Adjustment.

L2 - 1990/5/1. Try to fly in front of the side of the mountain which face is most perpendicular to the wind direction, such that there will be the least amount of sideways deviation of the wind (useless wind direction component).

L2 - 1990/4/15. ***Venturi Effect***. A typical Venturi effect : On the mountainside that faces the wind, a dip in the profile will accelerate the wind over it. This typically happens in between to peaks. The horizontal component will increase, the lift will diminish. To cross this area, one should move forward (away) from it, and then get back closer to the mountain after having crossed. Think of it as an aspiration zone.

L2 - 2005/10/21. ***Blown Back***. The wind has risen and you are now going backwards towards a ridge line. Face the wind. If there is no turbulence, use your Accelerator (Usage). Hope that the wind will reduce again, but look for potential landing zones behind you (beware of areas hidden from the wind). If you have managed to get back in front of the mountain, don't give the wind a second chance, go land. If the problem remains, you have options:

- Find lower wind at lower altitude. If you are far in front of the ridge, do Big Ears (Execution) plus Accelerator (Usage) to get lower without going back too much.
- Gain enough airspeed to move forward. By the way, improving pilot aerodynamics has little influence on airspeed. Options for gaining a few km/h over max speedbar (watch your GPS ground speed):
  - Pull down the A risers a few cm. Grabbing the A risers with a thumb-down fist and start twisting by bringing your elbows down (7-8 cm contraction potential). You will become more vulnerable to a Frontal Collapse (Recovery). Don't shorten so much as to significantly loose tension in the A risers. Compared to a straight pull on the risers, this method is both less tiring and provides better shortening control.
  - Adrian Thomas, 2005/10/20: Reach up to the outer A lines, and pull gently down on them (a few cm). It only works on wings which are designed with wash-in (angle of attack higher at the tips) at speed, and because the purpose of such a design is to give you greater leading edge tension (and therefore tuck-resistance) your chance of a Frontal Collapse (Recovery) is higher.
  - Adrian Thomas, 2005/10/20: Grab the stabilo lines and pull these in. You can pull more than a few cm. This will reduce span, increasing loading, and increasing leading edge tension. Your glide will go down a tiny bit. It is hard to hold the stabilo lines for long. The effect per cm of line pull is smaller than the effect of the "outer A lines" option.
- Go around the shoulder of the ridge. If you are close to the shoulder of the mountain and you can avoid it altogether by letting yourself slip to the side to a safer area, do it.
- Accept that you will go over the top. Remember that "air is harmless, rocks hurt". The idea is to maximize height before the summit, then fly far downwind. Try to get into a more aerodynamic position (may not improve airspeed, but will improve L/D). Get as much height as you can by positioning yourself for max ridge lift from the ridge. As you are getting close to ridge line, perform Crabbing to aim for a "dent" in the ridge where the Venturi Effect will exit (windier but more laminar). When at the ridge line, turn and "run" with the wind. After the ridge, maximize ground height to try to remain on top of the rotor. In the case you can't avoid the rotor, see Dealing with Turbulence.

L2 - 1991/6/1. To reduce your altitude without sacrificing too much of your horizontal speed, use the Big Ears (Execution) technique or do some Wing-Over (Execution). Note that Big Ears (Execution) offers more stability.

L2 - 1991/6/1. If you fly very close to the mountainside (15 m / 50 ft or less) beware of turbulence induced by a lower irregular slope. Always have a light tension in the brake that would make you turn away from the mountain and keep some speed (above minimum sink) to be able to maneuver away.

L3 - 2001/1/26. ***How to Gauge Wind Speed from Visual Clues***. See also : Water Surface - Gusts.

On Land	Sea Conditions	km/h	mph
Still Air. Smoke rises vertically.	Mirror-like water surface.	0 - 1	0
Rising Smoke drifts. Weather vane still inactive.	Small ripples on surface.	2 - 6	1 - 3
Leaves Rustle. You can feel the wind on your face. Weather vane is still inactive.	Small glassy wavelets.	6 - 11	4 - 7
Leaves and Twigs move around. Light weight flags extend.	Large wavelets. Some white caps.	12 - 19	8 - 11
Thin branches move. Wind may raise dust and paper.	Small waves. Frequent white caps.	20 - 30	12 - 18
Small trees sway.	Moderate waves. Many white caps. Some spray possible.	31 - 39	19 - 24
Large tree branches move. Exposed wire may whistle.	Large waves. All white caps. Some spray.	40 - 50	25 - 31
Large trees sway. Resistance felt when walking.	Seas heap up the waves. Some foam streaks off waves.	51 - 61	32 - 38

L3 - 1990/8/1. The depth of the usable lift band increases with the wind speed. In a light wind, you must remain close to the mountain to get sufficient lift. When the wind is stronger, you can move away from the mountain and still get enough lift.

L3 - 1991/5/15. At the end (shoulder) of the mountainside that faces the wind, the wind will slip sideways instead of going over and producing lift. Avoid these low lift areas.

L3 - 1990/6/1. You have been flying in lift caused by dynamic conditions, but your ground speed is not the same when flying along the mountain in one direction, compared to the other. This indicates that the wind has a sideways component. To now get over the landing zone with as much altitude as possible : Leave the lift when you have completed the leg that offered the least ground speed. That last effort of going back against the sideways component of the wind will now allow you to leave the mountain and have less to fight against the sideways component.

L3 - 1991/6/1. You have been soaring for a while but you now realize that you are making less and less turns and facing the wind in a more constant fashion. This indicates that the wind speed has increased while you were flying. Don't look at the others to see if they are still flying, decide on your own to go land.

L4 - 1991/7/1. The wind has been blowing 20+ km/h (12+ mph) all day, and the sun was out all afternoon. The wind will typically reduce its speed about 2 hours before sunset, and it is possible that the accumulated heat in the ground keeps giving off sufficient lift well in front of the mountainside. Welcome to "magic" conditions.

By the Sea

L3 - 1991/7/15. Unless the winds are strong all day, the following conditions will be typical during the day. In the morning you will have an offshore flow (from the land into the sea/ocean), about 3 hours after sunrise the wind will shift to on-shore (because the warmed-up land calls for the cool sea air), and return to offshore before sunset.

L3 - 1998/6/1. When the forecasted wind for the area is contrary to the on-shore or offshore flow, beware of wind shear a low altitude (When you are going to land). This typically happen if you go land in a valley at sea level.

L3 - 1991/7/15. You are going to land on the beach in a valley next to the mountain you launched from. It is early morning or close to sunset. Beware of an offshore flow as you loose altitude to go land. You may end up in the water. See also : Water Landing, Salt Water (Damage).

L3 - 2001/1/26. ***Water Surface - Gusts***. While flying, look at the water surface to identify gusts of wind over its surface that may come in our direction. It will either look like a darker zone on the water or "white caps" if the wind gust is over 29 km/h (18 mph). You can see these zones coming in from quite a distance, allowing you fly more forward from the cliff and/or fly away from the path of the gust. But don't think that all gusts will be visible on the water, as some gusts can come from above. Visualize signs of increased wind on the water, as just the bottom of a three dimensional gust. See also : How to Gauge Wind Speed from Visual Clues.

L3 - 1998/6/1. At high tide, ocean water may cover most of the landing area on the beach. To avoid getting your glider wet or worst, getting dragged into the ocean, land facing the wind and as far away from the water as possible. While the glider drops, pull on one riser to let the glider stacks up on itself in a neat pile. You should have a hook knife to cut lines in case you get dragged into the ocean and tangled up. See also : Water Landing.

Cross Country

L2 - 1991/6/15. When flying over a large forest, identify emergency landing zones within your glide ratio.

L2 - 2002/2/3. ***Never Leave Lift***. When you leave thermal lift before it has expired, you will encounter more sinking air around it. Just staying in mild lift may still lead you in the desired direction. There are exceptions. Leave lift if it brings you somewhere you don't want to go, like too far back into the mountains or into a cloud. Leave lift if you are certain of accomplishing you goal and you are racing. The lower you are (and risking to land) the less you should search for better lift. See also : Lost Thermal (Staying Local), Flying Height Band.

L2 - 2001/1/1. ***Don't Fly into Clouds***. If the lift is very strong, take a bearing on your compass as an potention exit direction in case you loose visibility. When you loose visibility you may be flying back into a mountain, or another pilot. Without a compass it is impossible to know where you are heading as turning is hard to judge. Always maintain visual contact with the ground. If you are still in lift, take an evasive direction before you actually get to the base of the cloud, ending up ideally at the edge of the base with a safety margin. Before I knew better, I went into a white cloud for fun, but it then took me 20 minutes to find the exit and I had gained 2000 m (6500 ft) after many Collapse (Asymmetric, Recovery) to then find myself in between huge cloud columns. Another time, the sky "closed up" over me and I lifted in a dark cloud through rain, then snow, did a "B" Line Stall (Execution) and went back down to exit next to a mountain. Now, when I get close to cloudbase I watch out for an increasing climb rate, and consider a transition. See also : Escaping Cloud Suck.

L2 - 2004/5/11. ***Cloud Shape***.

- **Pointy top**. A cloud having a flat base and a pointed upper shape means that it is still in formation and that you will find lift under it. A decaying cloud will usually have sinking air under it.
- **Whispies**. If you see "whispies" start to appear within gliding distance, you have a good chance of finding usefull lift under them.
- **Height**. Clouds that are taller than wide, indicate strong thermals, and may lead to overdevelopment later in the day. If they are much taller than wide, go land or use a better portion of the sky. See also : Signs of Growing Overhead Cloud.
- **Width**. With large-based clouds, the best lift is found under the highest part of the base. Cloud base width is the dominant factor in Cloud Suck (Theory).

- **Bend**. Air circulation within clouds are influenced by wind shear, thus increasing winds with altitude will make you find best lift on the upwind side of the cloud, and reversely.
- **Merge**. There is lift under a closing cloud gap.

L3 - 2001/1/17. ***Cloud Snapshots while Climbing***. With every circle as you climb in a thermal, look downwind to take a mental picture of all Cloud Shape in your predicted flight path. This will help you to determine which ones will still be forming as you reach them.

L3 - 1992/6/1. Consider going back and over the mountain you launched from only if you have at least twice its elevation (from the base). Ensure that you can clear it by as much distance as it takes you to do it (double your needed ground glide ratio) on the backside and avoid potential turbulence areas. Typical values : 1800 m (5900 ft) ASL at Marshall (California) to glide to Crestline, 600m (2000 ft) above launch at St-Hilaire du Touvet (France) to glide to "Dent de Crolles", 1000 m (3280 ft) ASL at Mount Yamaska (near Montreal/Canada) to fully clear the mountain.

L3 - 1999/4/12. If our flight axis follows that of the wind direction, ground speed is added and greatly increases the distance traveled. In this case, exit thermals on the downwind side and fly fast across the sink.

L3 - 2008/9/29. ***Speed for Best Glide***. To get the best glide (most ground distance traveled) in no-wind condition, use your wing's best L/D (Lift/Drag) speed. If you must face the wind (or in sinking air), best glide ratio is achieved by flying faster than best L/D speed. If a tail wind pushes us into our flight direction (or in lifting air), slow down your wing, but not more than "best sink". With no wind, you need to be sinking at more than 3 m/s (600 fpm) before using your Accelerator (Usage) will give you a ground glide ratio advantage, but otherwise it just makes you feel good about doing something. See also : Flying Height Band, Speed to Fly.

L3 - 1994/5/1. If you are following a ridge that gives of sufficient lift all along your way, there is no point in following up a thermal, because there is no transition to accomplish.

L3 - 2001/1/1. ***Patience for Clouds***. With cumulus clouds spread out throughout the sky, avoid flying in an area without any clouds because there is most likely fewer thermals there. This will typically happen over a lake (which does not produce thermals). If there are no clouds along the next 15 km (9+ miles) of your intended flight plan, get under a cloud and wait for the sky to improve.

L3 - 2008/9/29. ***Transition***.

1. Commitment. When you make a decision to go to the next mountain, you don't want to start to go, then lose confidence and turn back half way (or go land). You need to commit to your belief that there should be lift at the other place. You will most likely encounter sink before you get to the other place, but this should be accounted for, when planning the transition.
2. Deviation. As you follow someone into a transition, you notice the other pilot ahead of you going into huge sink. Try to go around that area where the sink is occurring. I was amazed once to see another pilot loose rapidly about 500 m (1600 ft) while I maintained a normal glide by deviating my course to a parallel path 100 m (330 ft) next to his. He landed in that valley while I pursued my course.
3. Straight line. Make a straight line when searching for lift. In the absence of obvious Thermal Launch Point, just fly straight along your intended path, don't bother flying a fancy pattern to look for thermals. You're just as likely to run into another thermal by flying straight, but if you don't meet one, you'll be further downrange.
4. Optimizing a long transition. As soon as the terrain turbulence dissapears :
    - Best body position. The idea is to reduce the cross section exposed to the airflow. Lean your chest back, let go of the brakes, cross your arms in front of your chest. Fold your legs such that your feet are level with your butt, or align them in the relative airflow, but don't leave them dangling.
    - In non-smooth air, avoid using the brakes to dampen pitch, as it degrades the glide too much (better to pull outer rear riser lines), either:
        - Let the wing "float". Leave it free to follow the air mass. It will find the ideal path on its own. Control your bearing with hip movements.

- Accelerator to Dampen Pitch.

See also : Speed for Best Glide, Venturi Effect, Rake the Sky.

L3 - 2005/10/25. ***Accelerator to Dampen Pitch***. Adrian Thomas, 2005/10/25: I've done comparative glide tests where one glider flew hands off with trimmers (available on some wings) released, and the other maintained the same speed using bar. It is very easy for the guy on bar to gain compared to other by actively damping pitch with bar movements. The gain is large. The movement sequence is: As the wing surges forward come off the bar, as your body begins to swing through go on the bar dynamically to dampen the motion and finish vertically below the wing. There are 2 advantages: significant performance and stability (collapse resistance) gain. You can stay on a higher average level of bar, in rougher air, getting better glide and fewer collapses. In even moderate turbulence I find I am going from 0 to 3/4 bar. If my legs were longer I'd be going to full bar. See also: Transition, Accelerator (Turbulence).

L3 - 2003/9/30. ***Testing the Air***. Before starting you X-C journey, test a few thermals near launch for about an hour. This will avoid the frustration of a short flight if you sink out quickly. It will also help you determine the time between the cycles, the duration of the usable lift, max altitude, wind speed at higher altitude, Thermal Path, and the strength of the sink. See also : Flying Height Band.

L3 - 2002/2/3. ***Rake the Sky***. When flying in groups, to get a better sampling of the lift as you are searching for it, fly along parallel paths, separated sideways by about 330 ft (100 m). Keep in contact visually or by radio.

L3 - 2005/3/3. ***Lost Thermal (During XC)***. Once you've lost the thermal that you've been climbing in, make only one more circle to try to find it, then start the next transition. Any more effort spent looking for the thermal is only altitude lost without going further. See also : Lost Thermal (Staying Local).

L3 - 2002/2/3. ***High or Low***. Considering an altitude halfway between the ground and cloudbase (or the top of usable lift), anything above this altitude is "high", and under it is "low". If you are "low" you need to head for a Thermal Path. Stop for any solid lift when "low". See also : Flying Height Band.

L3 - 2005/9/26. ***Fly the Sky or the Ground***. An often heard saying : When you are high, fly the sky, when you are low, fly the ground. See also : High or Low. "Fly the sky" means flying from one cloud (or Cloud Street) to another, based on Cloud Shape. If you are "low" focus on Thermal Launch Point and Thermal Path. See also : Low Save.

L3 - 2001/1/1. ***Recovery***. Tell someone where you intend to go, in case you don't show up later. In many states (USA), a fishing licence will cover rescue costs. Because your radio signal goes further while still at altitude, report your potential landing zone before being too low. If both you and your recovey team have a GPS, you can report your position by coordinates.

L3 - 2008/7/23. ***Thermal Spacing***. Generally, the more distance between thermals (or clouds), the longer they will last, because they are fed by a larger volume of air. Also, the higher top-of-lift (or cloudbase) will be. Typically, over flat terrain, the horizontal distance between thermals is 2.5 to 4 times their height above ground. The highest hill/mountain in an area, acting as Thermal Collector and Thermal Launch Point, will set a convection pattern over a zone with a radius of 10 times its height, shutting down thermals in its surroundings, with the exception of its flanks. See also : Organized Convection.

L3 - 2001/10/4. ***Cloud Shadow***. The following applies to flat terrain. The advancing (outward-moving) edge of a cloud shadow often acts as a Thermal Launch Point. In dry climates, one can observe Dust Devil (On approach) at this advancing shadow edge. The theory is that it acts as a mini cold front lifting the warmer air. Be well ahead of the advancing shadow edge to maximize your chances of finding a Thermal Path. Avoid being over a recently shaded area, as it will require a full thermal cycle period to become a fully "charged" Thermal Collector.

L3 - 2008/9/29. ***Flying Height Band***. Is is defined as the altitude range that you should fly in, starting at a safe low level, up to cloudbase or top of lift. At the beginning of the day, we should be patient and leave the thermal at the top. In the middle of the day when lift is strongest, we make our decision to leave the thermal when the rate of climb drops to 80% of the maximum, for a turn or two. This percentage would be modified up if :

1. Cloud pattern ahead does not look good.
2. Overcast ahead.
3. Thunderstorm or Cu-Nim shadow ahead.
4. Rough or higher terrain ahead.
5. Wet terrain ahead.
6. Turnpoint ahead.
7. Time to start final glide.

From middle to late afternoon, look for softness in the thermals and less character to the Cloud Shape. When this condition is suspected, ease the height band up (top and bottom), and as conditions continue to fade, narrow the band all the way to the top. At the end of the day, we should make the decision to leave the thermal at the top, and then make that final glide. See also : Speed for Best Glide, Speed to Fly, Never Leave Lift, Testing the Air, High or Low.

L3 - 2003/9/30. ***Cloud Street Shadow***. In the morning, when the Cloud Street to the East shadows the ground under you, try to avoid going down. Same thing at noon (shadow from your Cloud Street) and mid-afternoon (shadow from the cloud street to the West). In between, race between clouds with a good Cloud Shape. See also : Flying height band.

L3 - 2003/9/30. ***Thermal Street***. Also known as "Cloud Street" if clouds form, or "Blue Street". Streets form when surface winds are over 13 km/h (8 mph) in greener areas. Deserts are not conductive to street formation due to high thermals and absence of a lift lid.

L4 - 2001/1/1. ***Fight Until the End***. It is still possible to return back up to high altitude from 100 m (300 ft) from the ground. Never give up, but accept your faith early enough so you can still make a safe landing. There is only one thing better than getting high, and that is being low first.

L4 - 1992/6/1. You are ending you flight in a field with power lines ahead of you. You are wondering if you will pass those lines to make a little more distance. Just land before the lines, it won't really change your accomplishment.

L4 - 2002/2/3. ***Follow a Better Pilot***. If you fly with someone who is typically slower than you, you will end up waiting for him. See also : Map the Thermal Using Others.

L4 - 2006/4/26. ***Microlift Lines***. There can also be thermic convergence lines over flatlands, but the position can not be predicted. You have to find them by feel. When setting off on glide towards a distant target, keep the Chest Strap Adjustment wide to maximize sensitivity through the harness, focussing on the lift difference between the risers. For added sensitivity, you can hold the stabilizer lines or outside C or D lines. Avoid using brake for feel as it can degrade the glide. The aim is to weight-shift to turn towards the strongest lift and away from the sink. The path can become erratic, with significant deviations from the desired track. Flying along a good line is like balancing on a knife-edge. See also : Finding a thermal from air disturbance.

L4 - 2008/9/29. ***Speed to Fly***. Depending on how easy it is to find the next thermal and its expected strength, one could fly faster than the Speed for Best Glide, to minimize the time to reach a goal.

- Adrian Thomas, 2008/8/29: The idea is to fly so that (initial climb)=(final climb). You go flying on a normal day. Your first climb starts out somewhat disorganised close to the ground, so you only get 2 m/s in the first couple of centred turns. Higher up the climb sorts itself out and you get 4 m/s, but applying the rule you continue to climb until your climb rate drops to 2 m/s as you approach the inversion capping climbs. You go on glide at the S2F (Speed to Fly) for 2 m/s. Your initial and final climb rates were the same, and your speed is low and glide is relatively shallow because of that low climb rate. That means you arrive higher in the next climb, in the organised 4 m/s bit. You climb while the rate is 4 m/s or higher, then leave as soon as it drops below 4 m/s. You use only the strongest bit of climb and then leave at S2F for 4 m/s - faster and steeper than before. This might get you to the next climb a bit lower, say where the climb is only 3 m/s, but now you climb until it is 3 m/s and your next glide gets you to the thermal where it is again 3 m/s. You are now using the optimal region of the thermal. Automatically, because you have been optimising your climbs so that the initial and final climb rates are the same.

See also : Flying Height Band.

Collapses and Bad Situations

L1 - 1998/11/1. Do you really need to let go of your brakes ? If you let go, and have a Collapse (Asymmetric, Recovery), the time it takes you to find them again is too long, and your wing may already have done half a turn, potentially leading into a Spiral Dive (Recovery). I know, it's happened to me. Never let go if there is a risk of turbulence and you are less than 200 m (650 ft) of the ground below you.

L1 - 2003/5/20. ***Collapse (Asymmetric, Recovery)***. Steer, then clear. Your wing has collapsed on the right side. See Image: Asymmetric Collapse - 60%, Image: Asymmetric Collapse - 75%, Video: Asymmetric collapse with counter, SIV clinic 1999, Salève, Video: Asymmetric collapse with no input, SIV clinic 1999, Salève, Video: Asymmetric collapse after launch followed by impact. Brake the left side enough to keep your direction if possible (unless you are flying into an obstacle) but not too much to Stall (Full, Recovery) the remaining open side, which would make things much worse, possibly putting you into a Spin (Recovery). Over-countersteering has been called the paraglider pilots's plague, keep the open side flying at the cost of letting the wing turn for a while. The fact that the inflated side is more highly loaded (and flying faster), contributes to a higher air pressure than normal inside the wing on that side that will the communicate internally to the closed side and help re-inflate it. Try to keep your weight in the harness on the wing's open side. If 50% or more of your wing is collapsed, weight-shifting (to keep the risers more level) will not increase the load on the open side, but will still promote re-inflation (by reducing the shear deformation at the center or your wing) as well as reduce the amount of braking required to maintain a straight flight path (because of a reduced amount of leading edge being tucked). On the collapsed right side, give very ample braking movements (small pumping is useless) until the wing fully re-inflates. Note that on high-performance wings, if more than half your wing is collapsed, you may not be able to maintain your direction, but still brake the open side without making it Stall (Full, Recovery), this will prevent you from entering a Spiral Dive (Recovery). On intermediate (or safer) wings, the collapse recovers quicker without opposite braking (let it turn), but you need to judge if maintaining trajectory is more important. See also : Collapse (Asymmetric, Execution).

L2 - 1994/7/1. So you had an accident or a close call. Ask yourself if you could have done something to anticipate or resolve the situation. If there is nothing you could have done, you better stop paragliding. Was your ego the main factor for pushing yourself into bad flying conditions ?

L2 - 1996/6/1. The more turbulent the conditions are, the further away from the hillside you should be flying, to increase you altitude above the ground, in case a Collapse (Asymmetric, Recovery) occurs.

L2 - 2005/10/25. ***Accelerator (Turbulence)***. See also : Dealing with Turbulence, Accelerator (Usage). You have entered a zone of turbulence (the flight is bumpy). Get off the Accelerator (Usage) (unless speed is critical). Don't use the brakes (but keep hold of them)...

- Robbie Whittall,1999/11 : With most wings, it is better not to apply brakes while using the Accelerator (Usage) through turbulence, as it shifts the center of pressure and increases the risks of Collapse (Asymmetric, Recovery) / Frontal Collapse (Recovery). It also reduces the efficiency of the wing due to profile deformation, just use less Accelerator (Usage) instead, but not both at the same time.

If you must provide some control, instead of using brakes (but keep hold of them)...

- To prevent an imminent collapse, release an amount of accelerator extension.
- Adrian Thomas, 2004/12/1: You can still put in pitch control movements by pulling on the rear riser,

which is effective but more subtle than brakes, and less damaging to performance. Better still, is to just use the outer lines on the rear riser, which provide effective inputs with very little performance degradation.

See also: Accelerator to Dampen Pitch.

L2 - 2003/3/18. ***Dealing with Turbulence***. See also : Accelerator (Turbulence). You have entered a zone of turbulence (the flight is bumpy). Brake use :

- Ideal airspeed. Avoid flying at maximum speed, dialing in some brake to reduce the air speed. You should be flying a little faster than minimum sink. Flying a little faster than minimum sink will give a sufficient margin from the Stall (Full, Recovery) speed. Flying slower will give the wing more time to adapt to each shift in the air mass. From this brake position, perform Active Flying.
- Wing pressurisation myth. Pressure inside the wing is only dependent on airspeed, so braking and slowing down the wing, will decrease the wing's internal pressure.
- Spanwise tension. When applying brakes it displaces the trailing edge of the wing somewhat evenly between the center of the wing and the tips. But the chord at the tips is much shorter, making the local lift coefficient much higher at the wing tips. By re-distributing the lift towards the drooped wingtips, spanwise tension is increased.
- Angle of attack. When applying brakes, the pressure difference across the leading edge increases as well as the angle of attack, increasing collapse resistence.

To improve stability, spread your legs apart, it increases your body's moment of inertia and give more leverage over the harness base. I don't recommend using the Big Ears (Execution) technique, but to perform Active Flying instead.

L2 - 2006/8/18. ***Active Flying***. Collapse prevention :

- Always keeping some tension in the brake lines in rough air will give you feedback from the wing. Don't keep your brakes/hands locked at a given position (like thumbs in the riser quick-links) as you want to maintain constant tension in the brake lines, not constant position. This will prevent many Collapse (Asymmetric, Recovery) from happening.
- For a rapid and temporary pull on the brakes, there is no change in the angle of attack at the leading edge, because the angle between the relative wind and the forward part of the chord line remains constant. But there is a change in the upwash at the leading edge. Brake deflection causes air to descend at a steeper angle behind the wing, and also ascend at a steeper angle in front of the wing. This ascending flow (upwash) is what prevents Collapse (Asymmetric, Recovery) and Frontal Collapse (Recovery). Note that if you pulled the brakes too late to prevent a Frontal Collapse (Recovery), you will worsen its recovery, having now sent the wing further back.

Pitch stability :

- Excessive pitch motions can result in a Frontal Collapse (Recovery) or a Stall (Full, Recovery). The stability can be increased by a good use of brake input : Add braking when the wing is starting to swing forward with respect to you, release as it starts swinging back. The worst thing you can do is add braking when the wing has stopped ahead of you, or reduce braking when the wing has stopped behind you.
- The amount of temporary brake pull needed, often largely exceeds the new pilot's expectations, as he has been often told to be "gentle on the brakes". But there are cases of extreme wing surge that require full amplitude braking for an instant to prevent the wing from going forward and under the pilot. Such extreme surges happen when the wing went far behind the pilot, got its shape again, and is now fully loaded as can happen from:
    - A Frontal Collapse (Recovery) where the pilot braked after the collapse, sending the wing far back. This can be aggravated if the pilot hits lift at the start of the surge.
    - You released brakes at the start of a Stall (Full, Execution).

See also: Dealing with Turbulence, Myth: Good Pilots Prevent 99% of Collapses, Accelerator to Dampen

Pitch.

L2 - 1991/6/1. You have either exited a high-speed turn abruptly or entered a strong thermal (or dynamic lift). You are swinging forward under your wing and its angle of attack has increased. The overall pilot/wing assembly will surge up and at this movement's crest, you will feel yourself go light in the harness. The wing is sensitive to a Collapse (Asymmetric, Recovery) at this time. Expect your wing to follow with a dive (ahead of you). This is where you can add the proper input : Add progressive braking as the wing starts to dive and stop braking as soon as the wing has stopped going more forward. Do not keep braking when the wing is swinging back up over you as you will amplify the movement. In other words : Brake while the wing is moving forward, give speed while it moves backward to dampen the pendulum motion.

L2 - 2007/4/18. ***Big Ears (Execution)***. If you need to come down faster than your normal sink rate without significantly reducing your forward speed, use this technique. Depending on your wing and the size of the ears you make, your new horizontal speed may be faster or slower than without the ears: Increased wing loading trying to overcome the drag from the ears. For related problems, see Big Ears (Problems). Don't do this in anticipation of a rotor, instead gain as much height as possible (see Blown Back) and then Dealing with Turbulence. Now for the method. Looking at your "A" risers, identify the line leading closest to the wing tip. Without letting go of the brakes, pull on both of these lines such that the wing tips will fold under. Don't pull too abruptly as this may induce a Frontal Collapse (Recovery). Hold these line otherwise the wing tips may re-inflate. See Image: Big Ears. You have the option to use your Accelerator (Usage) (applied after the ears are made) if you fear the effects of an increased angle of atttack, or to gain more speed, but flapping tips may start oscillations at higher speed. Control your direction by weight-shifting in your harness. One can also improve steering control by making the "Ear" bigger (pulling more on the "A" lines) on the side to turn into (keep brakes in hand). To resume normal flight, release the Accelerator (Usage) if it was applied, then let go of the lines and if the wing does not return to its normal shape within a few seconds, clear one ear at a time by weight-shifting away from the side to be cleared, or by treating it as a Collapse (Asymmetric, Recovery), but be gentle to avoid a Spin (Recovery). This technique will produce a sink rate of about 4 m/s (800 fpm) depending on your wing and how big the ears are. See also : Escaping Cloud Suck.

L2 - 2004/12/5. ***Spiral Dive (Execution)***. The fastest descent rate can be achieved by performing this technique. See Video: Spiral dive from the movie "Fly Hard" and Video: Sébastien Bourquin makes a spiral dive, a wing-over, and a spin. Just start turning more and more until you feel your body centrifuged (you feel your feet swelling from the blood pressure) and your wing starts facing downward. I don't recommend pushing this until your wing is fully facing downward, leave a 30 degree angle to it. Read up on your wing's DHV test report (see Wing Certification) for this maneuver. You should notice that your variometer is indicating -12 m/s (2200 fpm) when executed properly. This is a very fast descent. Keep your eyes on your glider, the inside wingtip, otherwise looking at the ground or looking at the upper wingtip will result in nausea. If you see your field of vision narrowing and fear blackout (less blood pressure in your head), clench your stomach muscles (or bring your thighs up to your chest) to force blood back up to your head. To resume normal flight, reduce the amount of inside braking gradually to avoid a monster surge. See also : Spiral Dive (Recovery), Spiral Dive with 2 Ears (Execution), Escaping Cloud Suck.

L2 - 1999/11/23. ***Reserve (When)***. This indicates when you should use your reserve. If you have broken lines and your wing is no longer controllable, throw it. As general advice, if you are higher than 150 m (500 ft) from the ground below you and there is no broken lines, try to remedy the situation. If you have not fixed the problem when you reach that altitude, throw it. Even if you are on approach at 30 m (100 ft) from the ground, and you have an uncontrolled Collapse (Asymmetric, Recovery), throw it. See also : Reserve (How)

L2 - 2000/11/16. ***Reserve (How)***. See also : Reserve (When), Video: Classic reserve thrown, SIV clinic 1999, Salève, Video: Rogallo reserve thrown, SIV clinic 1999, Salève, Video: Wing Tangles with Reserve, Villeneuve, 1990. How to throw your reserve :

1. Grab the reserve handle. Practice this so that you can find the handle with your eyes closed. You may be disorientated. Keep your arm close to your body as you reach for the handle if experiencing high G-forces.
2. Look to check that you are holding the reserve handle and not the harness webbing. A second to check

can save many seconds of useless pulling.
3. Pull the handle to release the reserve pins. Each harness has a different geometry, and it pays to practice. Sometimes it is possible to deploy the reserve in one continuous outward pull, letting the handle go when your arm reaches full extension. Pull hard as some Velcro closures may have become tightly bonded. The extraction motion is (in most cases) that of a punching motion : Alongside the body and forwards. But this depends on your particular equipment configuration.
4. Look where you intend to throw the reserve.
    - Behind you and downwards is usually clear, but your wing might be there.
    - If spinning, you will want to throw in the same direction that your throwing arm is spinning.
5. Throw with all your might and remember to let go of the handle.
6. Look at the ground to prepare for landing, then look back at the reserve to check that it is deployed. It may need a tug to assist deploying.
7. Once you have thrown your reserve the real issue becomes one of control.
    - As the reserve inflates, it will pull you backwards. Try to grab your brakes.
    - Down-planing can occur (wing facing the ground, opposing the reserve). See Image: Down-planing (Wing opposing the reserve). Also, your wing may become uncontrolable, or interfere with your reserve. For any of these conditions, you will need to disable your wing.
    - If disabling your wing, do it in a symmetric manner. You can do a "B" Line Stall (Execution) (prevents down-planing completely), a Shrimp Stall (Execution) is good for high aspect ratio wings, and if you have altitude you can wait for the wing to be lower than you and do a Frontal Collapse (Execution) and try to grab fabric. Trying to do a Stall (Full, Execution) using the brakes or back risers is nearly impossible. While pulling in the wing, be careful not to wrap lines around your hand or fingers, as the wing may re-inflate, and then tie you up. Try to grab and hold the center of the wing's trailing edge, as this is the one place that eliminates the risk of re-inflation.
8. Do a Parachute Landing Fall. If you need to rotate under the bridle prior to it, do a pedaling motion with one leg.
9. Dragging is inevitable in any wind. Get on your feet as soon as possible, and run towards your reserve, pulling the bridle in.

L2 - 1991/6/1. Fixed point method. Will you make over that crest , river, power line or to the landing zone ? Look at the scenery ahead of you as if it was a painting. As you are flying into it (look at it for at least 15 seconds) pick a point ahead of you like a house or a tree on the crest you hope to pass. If that point is moving down (in you imaginary painting) then you will fly over it. Repeat this process until you identify a point that is neither going up or down. That "fixed point" is where your glide you bring you. Try to average out any temporary sink of lift along the way.

L2 - 2001/4/17. ***Spin (Recovery)***. Do not confuse a Spin (Execution) with a Spiral Dive (Execution). See Video: Spin leading to twisted risers, SIV clinic 1999, Salève, Video: Spin - Forward Surge - Pilot Falls Beyond Wing, Villeneuve, 1991, Video: Spin - Forward Surge - Pilot Falls Short of Wing, Villeneuve, 1991, Video: Stall - Asymmetric Surge - Spiral, Villeneuve, 1992. To get out of a Spin (Execution) you must completely release both brakes. It is best to release the brakes when the wing is in front, to minimize the subsequent forward dive. When the glider recovers, it will dive forward and may need braking to stop it diving too much. Upon exit there is a risk of Deep/Parachutal Stall (Recovery). See also : Spin (Execution).

L2 - 1999/11/23. ***Parachute Landing Fall***. PLF="Parachute Landing Fall". Anticipating a crash landing, this is the name of the position you adopt before you even get close to the ground. Legs together and pointing down, knees slightly bent, legs turned 45 degrees off the direction of motion. Present your calf to the ground first, then your thigh, then the hip, then tuck your torso in and roll, straightening your legs as you roll over on your back. Practice it by jumping off a chair.

L2 - 2006/8/18. ***Frontal Collapse (Recovery)***. This can happen when flying straight into a strong sink from a strong lift. Some can be prevented thanks to Active Flying. See also : Frontal Collapse (Execution). The wing's leading edge folds under, creates more drag, and the pilot swings forward from his momentum. As the wing is behind the pilot it may have bunched up more or less, depending on the amplitude of the collapse. You must not brake during this first backwards mouvement of the wing, which could induce a Stall (Full, Execution). Be ready to control the forward surge of the wing, but most often little or no braking will be required. The situation will often return to normal by itself after dropping about 5 m (16 ft), putting a "step" into your flight path. Your wing may remain in a Shrimp Stall (Recovery) configuration, which you can fix. See Image: Frontal Collapse - Leading edge is folded, Image: Frontal Collapse - Center of wing flips under, Image: Frontal Collapse - All the wing flips under, Video: Small Frontal Collapse, SIV clinic 1999, Salève, Video: Frontal Collapse while under Big Ears, Video: Frontal Collapse with Shrimp, SIV clinic 1999, Salève.

L2 - 2004/5/11. ***Cloud Suck (Theory)***. When a cloud's width reaches a certain size, air rushing from the side will not satisfy its air draw, and cloud suck occurs. So a cloud's horizontal size is the dominant factor, not height. Conditions that promote this effect :

- Moist layer at cloud formation level, as the cloud will evaporate slower and less cooling of the surrounding air.
- Low pressure system, or a heat low.

Detecting the condition : As you get near cloudbase, widen turn and if lift is widespread, expect this effect. See also : Escaping Cloud Suck, Cloud Shape.

L2 - 2007/3/3. ***Escaping Cloud Suck***. You are at cloud base and still going up at 2+ m/s (400+ fpm). Before you loose visibility, do Big Ears (Execution). This table shows typical descent rates of various maneuvers :

	Descent rate	Accessibility
Small Ears (less than 15% each side)	2.1 m/s (380 fpm)	*****
Small Ears + Accelerator (Usage)	3 m/s (540 fpm)	*****
Big Ears (Execution) (at least 30% each side)	3.1 m/s (560 fpm)	****
Big Ears (Execution) + Accelerator (Usage)	4 m/s (720 fpm)	****
"B" Line Stall (Execution)	8.5 m/s (1530 fpm)	****
Spiral Dive with 1 Outside Ear (Execution)	9 m/s (1620 fpm)	***
Agressive Spiral Dive (Execution)	15^+ m/s (2700^+ fpm)	*
Spiral Dive with 2 Ears (Execution)	18 m/s (3240 fpm)	**

If the air is rising at more than 8 m/s it is better to keep a constant heading to exit the lift, possibly combined with Big Ears (Execution) and using the Accelerator (Usage). The idea is to exit the airflow, instead of fighting it. See also : Cloud Suck (Theory), Signs of Growing Overhead Cloud, Cloud Shape, Don't Fly into Clouds.

L2 - 2002/2/3. ***Locked Spiral Dive (Recovery)***. This is an extreme case of Spiral Dive (Recovery), not something that one normally wants. It is typically induced by an uncontrolled Collapse (Asymmetric, Recovery). It happened to me because I had let go of the brakes (mistake) while I was putting my Accelerator (Usage) bar back into its holder, and turbulence induced a half wing Collapse (Asymmetric, Recovery). By the time I found the brakes again, the still-open right side of the wing had induced a sharp left dive placing the wing horizontal with me, heading perfectly towards the ground, and fully re-opened. One may panic from the fact that this situation is self-maintaining and brake inputs seem ineffective. Because of the wing's high loading and speed, the amount of brake tension required, and response time, is much greater. Summary on how to recover :

1. If you are less than 300 m (1000 ft) from the ground, use your Reserve (How).
2. Otherwise, slow down the wing by applying both brakes, with more braking to the exterior (side your body is moving towards, or non-initiating side). Exterior weight-shifting can help.
3. Be patient as it may take several seconds for the wing to un-lock from this situation and back into a

regular Spiral Dive (Recovery).

L3 - 2005/4/19. ***Big Ears (Problems)***. This is in fact a much more serious maneuver than people in general tend to think. For the technique, see Big Ears (Execution).

1. A paraglider can have a hidden Deep/Parachutal Stall (Recovery) problem, either because of design, line distortion, cloth degradation, trim tabs set on slow setting. On exiting Big Ears (Execution), and especially if you "pump out", the glider may not regain normal flight and instead slows down even more and then goes into a Deep/Parachutal Stall (Recovery) with a descent rate of about 5 m/s (1000 ft/m), enough to cause injury. But the problem isn't the Deep/Parachutal Stall (Recovery) itself, but that you may not be aware of it, as your quick descent rate with Big Ears (Execution) will disguise the Deep/Parachutal Stall (Recovery).
2. Another problem is the reduced immediate efficiency of your brakes if you need to correct a Collapse (Asymmetric, Recovery) or Frontal Collapse (Recovery). See Video: Frontal Collapse while under Big Ears.
3. This technique puts additional tension in some lines and anchor points, and this is amplified when combining it with a Spiral Dive (Execution), due to the added centrifugal force.
4. The stall speed is raised, so be cautious if you are braking at the same time. If caught Flying in Rain, the stall speed is further increased, and pilots have been locked into a Deep/Parachutal Stall (Recovery) because of this. See Video: Flying in the rain, pumping ears out produces a deep stall, 2003.

Big Ears (Execution) is mainly used over landing zones or for top landings in strong winds, and pilots often release Big Ears (Execution) at heights from 10 to 30 m (30-100 ft) above the ground, just a nice height to get into trouble with, if the glider goes into a Deep/Parachutal Stall (Recovery). Never RELEASE Big Ears (Execution) below 100m (300 ft) above the ground, keep them until just before you touch down (at about 1m or less), then just let go of the ears and flare normally.

L3 - 2001/12/19. ***"B" Line Stall (Execution)***. A very fast descent rate can be achieved by pulling on the "B" risers. You may prefer this technique over a Spiral Dive (Execution) if you have to descend fast for a long period of time and spiraling makes you nauseous. I used it once to get out of a cloud that pulled me up about 200 m into drizzle and snow. You should first ask your Wing Manufacturer to know if your wing can be used in this manner. Also, behavior of the wing is specific to the brand and model, so consult your wing's manual. In any case you should know that it is detrimental to the wing as it highly stresses the anchor points of the B lines to the wing. Having said this, keeping your brakes in your hands, grab hold of both B risers under their link to the lines and pull symmetrically (with force) until they start coming down and tension is greatly reduced. You will feel dropping and stabilizing at about 8 m/s (1600 fpm). The wing can be steered by pulling more on one of the B risers, making a turn to that side. If you pull too much, it may produce a Shrimp Stall (Recovery). See Image: "B" line stall. To resume normal flight, most Wing Manufacturers recommend slow release of the B risers, but with a rapid release during the last 5-10 cm to ensure a rapid surge so that the wing gains flying speed on both sides and avoids a Deep/Parachutal Stall (Recovery) or Spin (Recovery). In general the surge from exiting a "B" Line Stall (Execution) is very minor and the greater problem is that some wings might hesitate or not exit into flight at all (see Deep/Parachutal Stall (Recovery) and Video: Bad "B" Line Stall exit, Hanglider Hill, Bakersfield, CA, 2000/2/18). Do not push on the A risers systematically after exit, as most pilots can tell if they are in a Deep/Parachutal Stall (Recovery) or not (worse would be to push the A risers during the wing's surge). Do not apply brakes until the wing has regained normal airspeed (normally after a few seconds) otherwise it is more prone to malfunctions. I used this technique maybe a dozen times (before I knew it wasn't good for the wing) and experienced a stable descent. Remember that this method also reduces forward air speed. See also : Escaping Cloud Suck.

L3 - 2001/2/9. ***Tree Landing***. So you could not make it to you normal landing zone and you are over a forest. Don't aim for that narrow road in the forest with tall trees because your wing tips will catch the branches, Collapse (Asymmetric, Recovery) your wing and make you fall to the road. Also beware of power lines next to mountain roads. Instead, pick the biggest, softest looking tree, face the wind, cross you legs (to avoid cutting a vein) and close your arms, then flare to land right in the center of it, reducing your forward speed to zero. Keep braking until you can hold on to something. If this goes well you will end up suspended in the tree by your wing resting on the forest canopy, but you will not have a big fall to the ground. It will take time to untangle and maybe some repairs (at least an inspection), but you will have saved your bones from a fall. You can use your reserve as a "rope" to help you down. Look into your Emergency Kit. To get you wing out of the tree, detaching the lines from the risers can make it easier. Consider leaving the wing in the tree to return with climbing equipment and free the wing using boths hands while being secured to the tree. If the wing is caught in 2 trees, have a friend simultaneously free it from the other tree, just cutting down one tree could rip the wing. If your weight was partially or totally supended from your wing while in the tree, have the wing and lines inspected.

L3 - 2002/2/3. ***Spiral Dive (Recovery)***. Also called "Tight 360's". Do not confuse a Spiral Dive (Execution) with a Spin (Execution). If you induced the maneuver, and the Spiral Dive (Execution) is maintained by yourself still pulling the inner brake, progressively release that brake. See also : Locked Spiral Dive (Recovery).

L3 - 1990/6/1. Another pilot just passed close to you in the direction from which the wind is coming. If he is at the exact same altitude or above, there is no problem. If he is a little lower, you will feel the wake of his wing. The amplitude to the turbulence (wake) in the back of an aircraft increases with the load and how slow he is flying. The worst scenario is a tandem flying with lots of brake. This is one turbulence you can anticipate for.

L3 - 1990/6/1. ***Knot (Stable, Recovery)***. You have a knot in some of your lines (usually just after launch) but your wing remains stable. Maintain your direction by adding some brake to one side if necessary. Pull on the lines (if you can reach them) that lead to the knot, one at a time. If you can't undo the knot, go land. See also : Knot (Unstable, Recovery).

L3 - 2005/4/1. ***Cravate (Recovery)***. Description : The wing tip has folded down, and is now caught in your lines. This is different from a Line-Over (Recovery). It can have been caused by an Unbalanced Roll Motion Collapse (Recovery) or a Shrimp Stall (Execution). You have a cravate and the wing makes you turn out of your control, maybe inducing a Spiral Dive (Recovery). See Image: Cravate. If you have a Reserve (When), use it now. The following is if you don't have a Reserve (When) or choose not to use it (lots of altitude) :

- Pull the stabilo line (2+ m) to untangle the cravate.
- Induce a 50% Collapse (Asymmetric, Execution) by pulling the "A" riser on the side of the problem. Hope that re-opening will clear it.
- Perform Big Ears (Execution) to establish a symmetrical drag of both wing sides.
- Induce a Stall (Full, Execution). Hope that re-opening will clear it. Note that this could also make the cravate worse, threading it through more lines.

L3 - 1999/5/26. ***Knot (Unstable, Recovery)***. You have knot in your lines, and the wing is unstable (repeated Collapse (Asymmetric, Recovery) or makes you turn out of your control). You have already tried pulling on the individual lines going to the knot and giving symmetrical brakes impulses. If you have a Reserve (When), use it now. The following is if you don't have a Reserve (When) or choose not to use it. If the knot is mainly tying up lines attached to the front risers and centered, induce a Frontal Collapse (Execution) by pushing the "A" risers apart (to the side). If the knot is mainly with rear lines, induce a Stall (Full, Execution). If the knot is not centered, induce a 50% Collapse (Asymmetric, Execution) by pulling the "A" riser on the side of the problem. Just make sure you have enough altitude to do such maneuvers. Hope that re-opening will clear it.

L3 - 1991/8/1. After a tight turn or Spiral Dive (Execution), if you raise abruptly the brake that was inducing the turn, there will be a big surge. While turning at a high bank angle you can exceed your wing's rated maximum speed due to the additional centrifugal force component that acts as an increased wing load. When returning abruptly to a straight flight path, your wing will try to slow you back down to the normal speed, sending you forward under it, and send the whole wing/pilot up because of the higher angle of attack and stored kinetic energy. Beware of a potential Stall (Full, Recovery) condition at the top of the surge.

L3 - 2002/7/12. ***Stall (Full, Recovery)***. You have achieved a stabilized stalled decent (brakes full on) by performing a Stall (Full, Execution). During the stabilized descent, the wing will repeatedly pitch forward as it attempts to fly again. Release the brakes when the wing has pitched to its most forward position, typically on the third time is surges. Rob McKenzie said (April 1999) : "Out of the dozen times I recovered from a full stall, every exit required different and immediate input, this is not something we can teach, especially over a radio". Enleau O'Connor (July 2002) : "Recoveries are cahotic". See also : Stall (Full, Appreciation), Active Flying.

L3 - 1999/10/3. ***Stall (Full, Appreciation)***. Many maneuvers clinics still promote a maneuver that involves for you to slow down the wing until you can recognize the onset of a Stall (Full, Execution) but not induce it, just recognize the warning signs. The problem with this, is that the Stall (Full, Execution) can happen abruptly, without warning signs, and then the pilot would release his braking to produce a forward surge, with the pilot possibly falling into his wing or passing next to it. See Video: Releasing brakes at stall onset. Exiting a Stall (Full, Recovery) at its initiation is more violent than after its stabilization.

L3 - 2000/7/7. ***Twisted Risers (Recovery)***. Your wing has spun around and left your risers twisted. See Video: Spin leading to twisted risers, SIV clinic 1999, Salève. This will also happen to pilots who reverse the wrong way during launch (only one twist turn). Your brakes are probably of no use at this time because they are caught up in the twist. If you need directional control, you can steer by reaching the brake lines (or D/C risers) above the twist. If the twist is not already coming undone by itself, grab the risers above the twist and un-twist yourself. See also : Spin (Recovery).

L3 - 2003/9/23. ***Wing-Over (Execution)***. Why do you need to do this ? Important things :

- Keep brake tension in the upper wing side, where a Collapse (Asymmetric, Recovery) is most likely. One of the reason for this, is that the angle of attack is small on that side (because velocity is high). The other reason is because turn input was given too early (see below).
- Keep the wing pointed in the airflow. A Cravate (Recovery) can result from badly timed turn inputs :
    - Too early (worst). The wing is turned more than it should, so as the pilot keeps pendulating upwards, the upper side will get unloaded and produce an Unbalanced Roll Motion Collapse (Recovery). But because the lower side will now support the pilot's weight, the pilot's return pendulation is accelerated and there is a sudden transition into an extreme Spiral Dive (Recovery) possibly aggravated by a Cravate (Recovery). The pilot's attempts to gain control with counter-brake or Stall (Full, Execution), usually prove ineffective. In addition, due to the opposing pilot/wing rotation, there can be Twisted Risers (Recovery) which will limit pilot brake input, in which case the pilot must use his Reserve (How).
    - Too late. As the pilot pendulates back without having turned enough the wing, the lower side will get unloaded and produce an Unbalanced Roll Motion Collapse (Recovery), potentially followed by a Cravate (Recovery).

When learning this maneuver, go progressively. At first, remember to keep the amplitudes low (don't swing more than 45 degrees). The danger of this maneuver is under-rated because of the extreme consequences of pilot error. Even very safe wings (DHV 1) are at risk. See Image: Wing-Over. See Video: Wing-Over goes bad, Video: Wing-Overs from the movie "Fly Hard", Video: Sébastien Bourquin makes a spiral dive, a wing-over, and a spin.

L3 - 2000/3/13. ***Deep/Parachutal Stall (Recovery)***. How to recognize the situation :

- High descent rate. You are typically falling at 6 m/s, and your vario alarm will typically sound. But to be sure you are not in strong descending air, look for the other symptoms.
- Lack of forward air speed. You are no longer feeling the wind in your face, but sense it coming from underneath. Your Lift/Drag ratio is close to 1.
- Lack of pressure in the wing. You can see the bottom surface being limp and bulging upwards between the lines. Sometimes the back of the wing will flick up between the brakes.
- Ineffective brakes. Your brake lines will have little tension and your wing will not turn easily.

What NOT to do :

- Inducing a turn. This has been taught in the past as a recovery technique, but because a wing in parachutage is very susceptible to doing a Spin (Recovery), it is no longer recommended.
- Do not "rock" (pitch swinging motion) the glider. You could easily enter a Stall (Full, Recovery).

Parachutage can be exited by :

1. If you are less than 20 m from the ground, concentrate on steering the wing by weight-shifting into a safe place and make a good Parachute Landing Fall.
2. Pushing forward on the A risers.
3. "Shortening" the A risers. It doesn't mean to pull down far, but rather, to tweak them by reaching high and grabbing them with thumbs down (brakes still in hand) and twisting the hands to shorten the A lines by 7 cm (3 in) or so. This encourages the wing back into forward flight, much the same as pulling the A's a bit will inflate a wing from its wall position to coming overhead while ground handling. If while pulling the A risers, the wing starts a Spin (Recovery), keep pulling A's as it acts agains the reverse flying of the wing. Your most vulnerable time is after letting go of the B risers (if exited a "B" Line Stall (Execution)) and before grabbing the A risers.
4. If we exited a "B" Line Stall (Execution), you can initiate another and release the risers more quickly.
5. Push the Accelerator (Usage) about 50% of max travel. This gives a controlled and progressive angle of attack reduction over the wing in a design-specified manner (unlike pushing the "A"s). An advantage, is that both hands are dedicated to Active Flying while pushing the Accelerator (Usage). Note : The author is unconvinced that the design criteria for accelerating from a normal flight and exiting a Deep/Parachutal Stall (Recovery) would lead to the same Accelerator (Usage) mechanism design. Also, preparing yourself to use the Accelerator (Usage) will reduce your ability to do Active Flying during this unstable situation. Can you see yourself going for the Accelerator (Usage) as a Spin (Recovery) is starting ?

L3 - 2004/9/20. ***Dragged by your wing***. If you get dragged on the ground by your wing in strong wind, grab only one riser (ideally a "B") and reel it in towards you until the wing becomes like a flag. To prevent being dragged in the first place, see Wing Kill.

L3 - 2000/11/27. ***Water Landing***. This is not an exact science, don't listen to those who pretend it is. If there is current, without quick release buckles, a Tree Landing is preferable. If you want to jump out of your harness :

- It is not recommended because it is very difficult to judge your altitude over the water (to help : Don't look down, look instead at the horizon). See Image: Water landing - Pilot jumps out of harness.
- 3 m (10 ft) is an ideal jump height.
- Resurface and look to see if your wing and lines are falling over you, in which case, dive and swim away.

If you remain in your harness :

- Unclip the chest strap(s) and then one leg strap in preparation. The remaining leg strap will prevent you from falling out by accident. Quick release buckles are not a luxury, as square buckles are difficult to undo under tension.
- In light winds, try to fly downwind and do not flare, so the wing overshoots and keeps lines stretched. The leading edge will hit water first and remain air filled, standing on the water like a wall and be a signal for those at shore. The wing will catch the wind and drift away from you.
- Back protector influence :
  - 12 cm foam : Only small pilots will have difficulty keeping their head above water.
  - 22 cm foam : Difficult to keep your head above water.
  - Airbag : Nearly impossible to keep your head above water. Unzipping airbag for over water activity is recommended.

  Adapt your equipment to your typical flight conditions.

Once tangled in lines it is nearly impossible to become un-tangled. If caught in the lines and under your wing, use your hook knife, look for an air pocket. Try to avoid kicking motions to reduce further entanglement. For rescuers : Don't jump in water before putting on a lifejacket.

L3 - 2006/8/18. ***Shrimp Stall (Recovery)***. Also called "horseshoe" or "rosette". See also : Shrimp Stall (Execution). A disadvantage of this method is that upon release of the center A lines (when voluntarily induced), the wing has a tendency to make a substantial surge which will require Active Flying. If this resulted from a Frontal Collapse (Recovery) (typically only happens from accelerated flight) and is stable, then symmetrical braking is used to restore the wing's shape. If the wing does not open symmetrically, the surge will be asymmetrical and put you in a bad situation.

L3 - 1999/12/5. ***Aerobatics at low altitude***. It is a bad idea. See Image: Low altitude aerobatics is a bad idea.

L3 - 2000/2/18. ***Aerobatics over Another Pilot***. It is a bad idea. See Video: Collision, 1999/1, Monte Carlo.

L3 - 2000/11/16. ***Unbalanced Roll Motion Collapse (Recovery)***. From Rob McKenzie. This dynamic situation in roll has one wing half lowering with one climbing. It can also be caused by exiting an updraft with one winghalf entering the downdraft at the edge or an unbalanced Wing-Over (Execution). The climbing wing (or the wing entering the downdraft) has as a result, a lower angle of attack. Often this can make the wing look as if it is hinged along it's chord. If it's very large in nature it can have the wing that is folding, make the wingtip move to a point almost in front of the pilot's face. As it gets to the low point it then blows rearward and if the lines are still arced outward the wing can blow back under the lines. A typical result is to get the C lines or D lines to become positioned up an over the top of the wing, going across the top toward the leading edge then down from the leading edge to the risers. A Cravate (Recovery) is the name of the result in most cases. See Video: Asymmetric Surge leading to an Asymmetric Collapse, Villeneuve, 1990.

L3 - 2000/8/3. ***Hypoxia***. Hypoxia originates from the lowering air pressure, which lowers the partial pressure of oxygen, causing less oxygen to pass through the membrane of the lungs and therefore in the blood. Major factors which determine the altitude inducing Hypoxia :

- Physical fitness is beneficial.
- Regular smokers and pilots having consumed alcohol or narcotics (experiencing a hangover) are disadvantaged.

The symptoms appear in this order :

- Faster breathing and feeling tired. For pilots in bad condition, for a flight lasting a few hours, this can occur between 2000-3000 m (6500'-10000').
- Feeling of extreme well being.
- Delirious feeling. You will not be aware of this. Try to keep track of cognition by counting down
- Loss of feeling in extremities. Cold temperatures will accelerate this beyond just the lack of oxygen.
- Loss of alertness, difficulty in making decisions. Side effects are nausea and headaches.
- Loss of consciousness.
- Death.

When these symptoms hit, you should get low fast. A flight over 12000' (3660 m) requires oxygen if more than 30 min, and 15000' (4570 m) requires constant oxygen flow if you want to keep your normal brain function. Using oxygen will :

- Warm you up quickly. The way our body produces heat is to oxidize our food/fuel we ingest.
- Improve your vision : Everything looks washed out and dull when hypoxic, and the contrast returns with oxygen.

Grunt breathing (forcing air in your lungs and pressuring it) can buy you some seconds of clear thought when you need it the most, but is not suitable for extended flights without oxygen.

L3 - 2005/4/19. ***Flying in Rain***. You are caught flying in the rain. The following is dependent of the intensity of the rain and your exposure time. The fabric may stick together during recovery from a Collapse (Asymmetric, Recovery) or Frontal Collapse (Recovery). When flying in the rain your sink rate may increase because of disturbances to the laminar air flow over the wing. The soaking of the fabric (throught microcuts in the coating) increases the weight of the wing which causes the trailing edge to "drop", adding unwanted braking and increasing the angle of attack. This may lead to an irreversible Deep/Parachutal Stall (Recovery). Note that a wet wing will Stall (Full, Recovery) at a higher speed. So, do not make maneuvers that require strong braking like Wing-Over (Execution) or Spiral Dive (Execution), only do a "B" Line Stall (Execution) if absolutly necessary, and be light on the brakes during your landing approach. Do not do Big Ears (Problems). See Video: Flying in the rain, pumping ears out produces a deep stall, 2003. Make sure you maintain visibility for the rest of your flight. You may get cold. See also : Landing near/in Rain, Line Length Change, Wing Degradation due to Humidity.

L3 - 2004/3/31. ***Signs of Growing Overhead Cloud***. Signs that the cloud you have glided under may be getting bigger :

- A blue hole forms next to your cloud.
- The base of your cloud is getting darker.
- Your climb rate and the lift area (volumetric upward flow) is growing beyond expectations.

See also : Escaping Cloud Suck, Cloud Shape.

L3 - 2004/9/3. ***Line-Over (Recovery)***. Description : Your wing has threaded through a line, but the tip is still inflated (usually), you can see a line travelling over the top of the wing. This is different from a Cravate (Recovery). It can have been caused by a Collapse (Asymmetric, Recovery), an Unbalanced Roll Motion Collapse (Recovery) or a bad Wing Examination at Launch. You have this and the wing is unstable (repeated Collapse (Asymmetric, Recovery)) or prevents you from maintaining your flight direction. If you have a Reserve (When), use it now. The following is if you don't have a Reserve (When) or choose not to use it (lots of altitude) :

- Perform Big Ears (Execution). This will reduce the internal pressure at the tip, which otherwise lock the line-over in place. This will facilitate clearing the problem by reeling in the tip line. Added benefit : Reduces the turning effect from an asymmetric wing.
- Induce a 50% Collapse (Asymmetric, Execution) by pulling the "A" riser on the side of the problem. Hope that re-opening will clear it, or start moving the problem closer to the tip.
- Reel in the tip line, pulling the tip down toward the pilot, and when pulled far enough, the line can fall off.
- If your wing and flight path is controllable, you can choose to go land with it.

L4 - 2006/12/18. ***Steering without the brakes***. This is useful if you have a Knot (Stable, Recovery) including a brake line or if a brake handle has come undone from the line. Options in preference order:

1. Many wings respond well to pulling on your rearmost riser's outer line alone. Less risk of a Stall (Full, Recovery) than by pulling on the rearmost riser.
2. Pulling on the back risers will result in a slow turn but you will keep control of your direction.
3. Weight-shifting will also help.

L4 - 1990/6/1. Instead of looking at the place we are afraid to crash into (this is called fixation), look where you want to go to. Some pilots end up in a field's lonely tree for this reason.

L4 - 1991/7/1. You have made an emergency landing and you think you are hurt. Leave your wing unfolded as much as possible so people can find you easier and understand you are hurt. If you are well, fold up your wing.

L4 - 1998/12/1. Snow in the wing. If you have scooped up snow into your wing (due to ground handling), it is likely to build up in the trailing edge during flight. This in turn, will weigh down the trailing edge, acting as additional braking input (your brakes will feel soft). With enough snow (over 5 kg in a side of the wing) this can induce a Stall (Full, Recovery).

L4 - 1999/12/5. ***Shrimp Stall (Execution)***. Also called "horseshoe" or "rosette". I haven't found a usefulness for this technique yet, that other techniques ("B" Line Stall (Execution), Spiral Dive (Execution)) do not fulfill. It consists of pulling and holding the center A line and have the wing tips go forward. See Image: Shrimp stall. There was a period (roughly until 1992) when many wings only had two risers, making a "B" Line Stall (Execution) impossible, so this technique was taught as a fast decent method. One small advantage over a "B" Line Stall (Execution), is that it requires less arm strength. The disadvantages are associated to the Shrimp Stall (Recovery) and the risk of inducing a Cravate (Recovery).

L4 - 1999/4/24. Loss of altitude causing pain in ears. This result from a higher pressure outside the ear in comparison to inner ear pressure (inside your head). Use the Valsalva maneuver to equalize pressure : Close your mouth, pinch your nose and blow gently. Avoid blowing too hard and over-inflating the middle ear space. Note that differential ear pressure automatically equalizes during altitude gain.

L4 - 1999/12/2. ***Looping (Execution)***. Why do you need to do this ? Only attempt over a body of water (See also : Water Landing), with a recovery crew. Make a tight Spiral Dive (Execution) and exit it by a strong weight shift to send you into a full loop (very disorienting, strong acceleration load). See Image: Looping. A common mistake is to exit the Spiral Dive (Execution) by using a brake, this will reduce your kinetic energy, and potentially make you fall back into your wing from an incomplete loop.

L4 - 1999/5/26. ***Collapse (Asymmetric, Execution)***. Some reasons to perform this : Attempt to clear a Cravate (Recovery), increase the sink rate, practice recovery from a Collapse (Asymmetric, Recovery). To induce : Keep your brakes in hand, and pull down one or a few "A" lines leading to the wing tip. For a 50% collapse, you can pull down one "A" riser. To recover see Collapse (Asymmetric, Recovery).

L4 - 2002/3/28. ***Frontal Collapse (Execution)***. Some reasons to perform this : Attempt to clear a Knot (Unstable, Recovery) in central "A" lines, practice recovery from a Frontal Collapse (Recovery). To induce a small collapse, keep your brakes in hand, pull slowly and symmetrically on A risers until the leading edge folds under. For a bigger collapse, increase speed and amplitude of pull. This can also happen if you try to make Big Ears (Execution) too quickly. To recover see Frontal Collapse (Recovery).

L4 - 2000/3/10. ***Stall (Theory)***. Stall happens when you have enough reverse flow from the trailing edge over the top surface. Stalling depends on how much brake is pulled and for how long. You can be pulling less brake and still achieve stall if you wait long enough than a brake pull that produces a quick onset of stall. See also : Stall (Full, Execution), Flapping.

L4 - 2001/8/2. ***Stall (Full, Execution)***. Some reasons to perform this : Your wing is uncontrollable because of a Knot (Unstable, Recovery) and you don't have a Reserve (When) but have enough altitude, practice recovery from a Stall (Full, Recovery). To induce : Brake too much for too long. Do NOT release the brakes as the wing drops and pulls you backward, you would get a huge surge, possibly sending the wing below you. See Image: Forward surge followed by pilot getting wrapped in wing, Video: Forward surge followed by pilot getting wrapped in wing. Establish a stabilized descent (brakes full on). See Stall (Theory), Image: Maintained Full Stall, Video: Planned full stall, but released brakes to early, Zsofi 1999/1, Monte Carlo, Video: Stall - Asymmetric Surge - Spiral, Villeneuve, 1992, Video: Stall - Pilot Falls Into Wing, Villeneuve, 1993. To recover see Stall (Full, Recovery). If you had a beginner wing and now changed to a performance wing, review your normal braking position. I had a friend with a Trekking Corniche (1990 ?), which required lots of braking to get its best sink rate, change to an Advance Omega 2 (1991 ?). He stalled twice in flight, and injured his spine each time. See also : Stall (Full, Appreciation). Rob Whittall said (1995) for ALOFT magazine in response to "Do you advise that pilots learn full stall ?" : It's a mixed feeling. You could go both ways on that. It's good to know as much about your glider as possible, but also full stalls are dangerous, there are no two ways about it. I would probably say no. It's not worth doing full stalls because they can definitely get you in more trouble than they can get you out of. They're not going to get you out of any trouble because they're pretty useless forms of descent. And they're pretty messy. I think it is basically something best left to the test pilots, really. (End of quote).

L4 - 2001/2/3. ***Spin (Execution)***. Spins are pilot induced. A glider will only spin if the pilot pulls one brake so hard that he stalls that half of the wing. To induce a spin : Fly a low speed, then suddenly raise one brake and lower the other. This may result in Twisted Risers (Recovery). See Video: Sébastien Bourquin makes a spiral dive, a wing-over, and a spin, Video: Releasing brakes at spin onset, André Gallant 1999/9/4. The spin will continue as long as the pilot holds down the brake, and will recover when he completely releases the brake. See Video: Toni Bender doing a spin over Achensee (Nova test area) 2000/9/28. To recover, see Spin (Recovery).

L4 - 1999/9/2. ***Airplane on Collision Course***. If an airplane is heading in your direction, do a high bank turn to show him you're there and head in the direction that gives the greatest chance of a miss. If you are close to a ridge, stay there.

L4 - 2000/1/17. ***Twisted Risers (Harness Flipped)***. Maybe because of a bad Wing Examination at Launch, you end up having both risers twisted in flight because your harness is rotated one full turn. This just happened to me (2000/1/15). Your wing is probably stable and stearable (although brake lines are rubbing on the risers). Go land (safest thing to do). The following is if you decide to untwist the risers in flight (only in stable air), and if you have either have a front or shoulder-mounted reserve deployment handle, since side-mounted handles have a 50% chance of getting caught by a riser while rotating (see Reserve Handle Position). Visualise which way to rotate (pitch axis) the harness to untwist the risers. Fly to a place where there you have sufficient ground clearance. Let the wing fly at trim speed for a few seconds, let go of the brakes, and hope for no Collapse (Asymmetric, Execution). If a backwards flip is required, push on the risers while sending your feet (leg extended) upward and over the top, and for a forward flip, first get your legs extended and close to vertical before starting your rotation. Stretch out your arms so they will encounter the risers and stop the rotation after one turn, then grab your brakes.

L4 - 2000/7/25. ***Airsickness***. Remedies, by order of effectiveness :

1. Eat Ginger :
   - About 1 hour before you plan to fly, take 2 ginger pills (available from any drug store or health food place).
   - Drink ginger ale all morning, all you can stand.
   - Eat ginger biscuits in the morning.
2. Acclimatization. Fly regularly and often.
3. Elasticated sea bands worn on the wrist.
4. Avoid watching the ground too much. Fly with a vario.
5. Don't tilt your head up and down as you turn. Move eyes rather than head.
6. Don't drink too much beer the night before.
7. Get a good night's sleep the night before.
8. Stay relaxed. Lower your shoulders.
9. Eat a good, solid meal before flying.
10. Urinate frequently prior to launch.
11. Learn to stay in the thermal to get a smoother flight. See Centering the Thermal (using a Vario).
12. Downgrade to a wing that dampens the turbulence.

Other informations :

- Chewing gum does not help.
- If you start to feel bad, land before you get too sick as your judgement becomes impaired with the progression of the nausea.

L4 - 2004/5/5. ***In-Flight Urination***. Options :

- Use an adult diaper.
- Men : Use a condom-catheter.
- Men : Hang in the leg straps, lean far forward. Hold the brakes in one hand (behind you), use the other hand to urinate.

See also : In-Flight Drinking.

L4 - 2000/12/14. ***The Reverse Spiral***. It is only an aerobatic figure, without any real utility. While in a Spiral Dive (Execution), a Spin (Execution) is induced and maintained. The centre of rotation is between the pilot and the wing, so the pilot ends up travelling backwards. Raoul and Félix Rodriguez of the SAT (Safety Acro Team) have created this maneuver. See Video: The Reverse Spiral performed by Raoul Rodriguez, France, St-Hilaire, 2000/9/23-24.

L4 - 2000/10/6. ***The Helicopter***. It is only an aerobatic figure, without any real utility. A Spin (Execution) is induced such that the wing turns about its center and descends vertically. See Video: The Helicopter, Switzerland, Villeneuve, 2000/8/25-27.

L4 - 2003/5/5. ***Cough CPR Myth***. The usefulness of the method knows as "Cough CPR" is an urban legend started in 1999. Its use is limited to clinical situations in which the patient has a cardiac monitor, the arrest is recognized before loss of consciousness, and the patient can cough forcefully.

L4 - 2006/8/18. ***Myth: Good Pilots Prevent 99% of Collapses***.

- Adrian Thomas (world-class pilot) writes:
  On any reasonable XC day I would expect to get a few minor Collapse (Asymmetric, Recovery). On a good day I'd expect several, and on an epic day (or in any epic thermal) I'd expect to lose 50% of the wing at least a couple of times, and might find I had induced an incipient Spin (Recovery) once or twice working too hard to stay in the core. The updraft in a 5m/s climb is going at 50% of trim speed - so of course XC conditions are turbulent.
- Should we tell all the top-level pilots who got injured that they were not good enough?

L4 - 2007/3/7. ***Spiral Dive with 1 Outside Ear (Execution)***. A small/moderate outside ear is folded and held, then a Spiral Dive (Execution) is progressivly initiated. Do not let go of the ear before exiting the spiral dive and flying straight. Being able to use the inner brake makes the initiation and exit easier than a Spiral Dive with 2 Ears (Execution). The theory is that the drag caused by the ear diffuses the energy and makes the pilot feel less centrifuged. Note that the pilot's load is supported by a smaller portion of the wing and less lines. Dangers:

- If you let go of the outer ear during the spiral dive, your wing will turn to face the ground, risking a Locked Spiral Dive (Recovery).
- Spiral dive is initiated too sharply: Risk of Spin (Recovery).
- The pilot may push the maneuver too far (G load not high enough to alert him to stop) and produce a Locked Spiral Dive (Recovery).
- Making the outer ear too big can generate too much drag, combined with inner side braking, can lead to other incidents.

See also : Escaping Cloud Suck.

L4 - 2007/3/7. ***Spiral Dive with 2 Ears (Execution)***. Do Big Ears (Execution), then widen the Chest Strap Adjustment and lean in your harness to start a Spiral Dive (Execution). Patience, it takes a few seconds before it starts, but accelerates afterwards. Descent rates close to 20 m/s (3600 fpm) can be achieved, so be aware of your altitude over ground. During the maneuver, look towards the inside of the turn. A big advantage of this maneuver is that there is almost no G loading on the pilot because of the limited bank angle of the wing and low centrifugal effect, making this maneuver more accessible than an agressive Spiral Dive (Execution) alone. The maneuver can be done in a very turbulent air mass. To exit, release the ears, then dissipate the rotation energy by straightening up in your harness and doing 2-3 more turns. But this maneuver is hard on the lines and you loose brake input control. No problem with new equipment, but don't do this often. And if your lines are getting old, don't do this. See also : Spiral Dive with 1 Outside Ear (Execution), Escaping Cloud Suck.

Your Gear

L2 - 2000/9/7. ***Wing Degradation due to Humidity***. If there is still moisture in your wing when you store it, mildew will set in and greatly accelerate the deterioration process of the material. This is one of the worst things you can do to your wing. Wings can get wet, but just make sure it is very dry when you store it away. Never do a flight to dry your wet wing (See also : Flying in Rain), leave it in the shade. Another bad thing is to store it in a compressed state (under a load, or rolled very tight).

L2 - 1991/6/1. Darn ! You have made a small tear in your wing. But you think that it is so small that it is not worth repairing. My Engineering background reminds me that even a small hole (as long as material is cut) will locally diminish the strength by a factor of 3. And at the tip of a tear it can be reduced by a factor of 10. You better use that special sticky tape (made for paragliders) they gave you with your wing to redistribute the efforts over that tear. If the tear is bigger than 5 cm (2 in) think of having it professionally repaired. Beware of using common sticky tape like electrician tape or duct tape which adhesive material will harm the material.

L2 - 2002/6/25. ***Wing Selection***. Decide on the DHV (see Wing Certification) rating you want (see Wing Rating for You) and make a list of each Wing Manufacturer's latest wing that corresponds, considering the wing's worst DHV rating (Accelerator (Usage) in use or not) for your weight. If you want to keep your harness, eliminate wings without a DHV rating for your harness type (GX, GH). Stick with major Wing Manufacturers. Reduce your list to models that came out within the last year and a half, to have state-of-the-art technology. Your list should now have 5-6 wings. Disregard price as they are usually similar. Eliminate wings that have not been reviewed in a reputable magazine (like "Vol Libre" or "Parapente Mag"). From reviews, pick one that seems to have the best performance (see Wing Test), handling and ease of inflation. Don't put too much emphasis on a demo flight because even a competition wing can be well behaved in gentle conditions, and having a Collapse (Asymmetric, Recovery) doesn't suddenly make the wing a bad one (trust the DHV rating instead). Consider also Wing Loading. Some colors have more UV Resistance than others. Buy/order it from a reputable reseller, be confident in your choice, have fun flying it, but don't email the world in an attempt to convince others you have bought the best paraglider.

L2 - 2000/2/23. ***Wing Rating for You***. See also : Wing Selection.

- From Patrick Bérod (former France champion) : If you fly less than **50** hours per year, you should not fly with a wing certified higher than AFNOR "Standard" (typically equivalent to DHV 1-2, 2 at the most). This still applies if you have been flying for 10 years.
- From Philippe Lami (School owner) : If you fly less than **200** hours per year, you should not fly with a DHV 3 wing (AFNOR "Competition"). This still applies if you have owned one in the past.

L2 - 2006/4/26. ***Chest Strap Adjustment***. DHV tests wing with a 38/40/42 cm adjustement (between the centers of the riser bottom ends) depending on wing size. A recommendation can also be given in your wing's user manual. When you make it **wider**, these are the effects ordered by importance:

- Bad: More rolling motion in harness (apparent instability), which is stressful in non-smooth air. This adjustement and that of Harness Recline Angle are the 2 factors which will make the difference between landing with a smile or having a green face following a turbulent flight.
- Bad: When you do get a Collapse (Asymmetric, Recovery) the harness has more authority to roll your body towards the collapsed side and that can disturb you during recovery.
- Good: Fewer Collapse (Asymmetric, Recovery) as wing halves are allowed more vertical relative movement to follow air disturbances.
- Good: Less risk of Twisted Risers (Recovery) after a Collapse (Asymmetric, Recovery) or Spin (Recovery).
- Good: More feedback (roll motion) from your wing to your harness, to determine the side to turn into lift.
- Funny: Flatters your macho swagger when claiming to have it wider than Texas.
- Good: Easier to weight-shift (if you believe in that). Note: Some wing designs control the amount of shear possible in the center cell, induced by a roll motion in the harness.
- Good: Possibility of decreasing spiral instability, which lowers the risk of a Locked Spiral Dive (Recovery).

L2 - 2000/4/3. ***Brake Line Length Adjustment***. The ideal brake line length is achieved when the brake lines are deflected by about 30cm (1 foot) at the center of their length, while your brakes are released and you have fully activated your Accelerator (Usage). Note that when accelerated, your trailing edge rises, so you should not adjust the brake line length while not in accelerated flight.

L2 - 2000/12/16. ***Leading Edge Hits the Ground***. This can occur during landing or bad ground handling. Did you hear someone yell "*whack*" ? When the leading edge of your wing hits flat on the ground, pressure inside your wing may exceed its design limit and cause rips in cell walls or diagonal ribs. Have your wing inspected.

L3 - 1996/6/1. There is a consensus amongst paragliding professional that a wing is good for 300 hours of direct sunlight exposure. So if you want to keep your wing for a long time, protect while not in use. You can use a small tarp if you don't want to fold it up. At least bunch it up, and hide the top surface close to the leading edge (most important part for a wing's performance), by exposing the bottom side instead.

L3 - 2000/10/31. ***Line Length Change***. Line lengths can increased differently for each pair of risers if you are caught Flying in Rain, changing the angle of attack of your wing. Getting your lines wet may cause a subsequent shrinkage (during drying) in their shielding (not the actual core) and that could set your wing out of trim exposing you to Deep/Parachutal Stall (Recovery) as the lines with a lower loading (C, D) may not extend back to their original length right away.

L3 - 2001/5/31. ***Wing Cleaning***.

- You have an ugly spot on your wing, and it doesn't come off with soft water alone. Keep the spot. Never try to clean your wing with chemicals that may affect your material's resistance in the long run. See also : Line Length Change.
- To get rid of trapped dirt, hang the trailing edge of your wing on a tight rope, using clothes pins, such that the leading edge is above ground. Starting from the center, clean the cells by shaking the trailing edge and remove the dirt gathered in the cup of the leading edge. At the tips, remove the dirt through the cross vents.

L3 - 2004/4/17. ***Keeping Lines in Place***. If your lines are moving around on your riser's quick links, get some O-rings (see below for size) from a hardware store. Two methods :

- **1 twist**. Size of O-rings : O.D.=3/4", wire thickness of 1/16". Open the quick link. Leaving lines in place on the quick link, remove riser carefully (don't twist it once removed). Insert O-ring on quick-link under lines on solid quick link side. Re-attach riser into quick-link as it was before. Give 1/2 turn to O-ring and re-attach on other side of lines. Close the quick link. See Image: Using O-rings to hold lines in place (1 twist).
- **2 twists**. Size of O-rings : O.D.=1", wire thickness of 1/16". Open the quick link. Take the line loops out of the quick link and keep them sorted by sliding them onto a pen. Insert the O-ring into the open quick link and give the O-ring a 1/2 turn. Insert all the line loops through the O-ring after the twist, and hook them onto the quick link. After the lines, give the O-ring an opposite twist, and hook it onto the quick-link. Close the quick link. See Image: Using O-rings to hold lines in place (2 twists).

Tighten the quick link with a light torque of a wrench, just enough so it can't be undone by finger strength.

L3 - 1999/3/23. Don't walk on your lines, especially on rocky ground. Fibers inside your lines may get broken while the line's protective layer hides the damage. In the same idea, don't pinch lines. Making a small tight knot reduces line strength.

L3 - 2001/10/4. Carry a spare Riser to Harness Connection, if/when you detach your harness at the end of the day, fasten the risers together with it. This stops the risers from going through themselves and tangling up.

L3 - 2002/3/28. ***Folding your Wing***. Do not always fold the wing symmetrically to the center cell as this can cause constant stress on the center cell (center cell always to the outside). Protect the rigidification in the leading edge by superposing it during span-wise folding and making it part of the same fold during chord-wise folding. Do not press down too hard on you wing to evacuate the trapped air :

- When you fly, the dynamic pressure (above that of surrounding air) in your wing is determined by $q={}^{1}/_{2}\rho V^2$. Assuming a speed (V) of 50 km/h (13.9 m/s) and a density (ρ) of 1.225 kg/m^3, this results in q=118 N/m^2 or 0.00117 atm.

  When you press down on your wing with both hands (effective area of about 0.024 m^2) and a force of

20 kg (44 lb), this results in a pressure of 8167 N/m^2 or 0.0806 atm. This is 69 times the typical dynamic pressure in your wing !

L3 - 2007/2/10. ***Riser to Harness Connection***. You have a choice amongst these :

1. **Quick-Link**. Also known in French as "Maillon Rapide". See Image: Quick-Link (stainless steel). It doesn't look as cool as a thick aluminum anodized carabiners, but it resists better to fatigue crack propagation. This is because both sides are loaded under symmetric tension, instead of the carabiner's one-sided bending loads which occurs before the gate is under tension due to its mechanism tolerances. Close the gate screw to the recommended torque with a wrench (external reference: Péguet): For 5 mm wire diameter, it is 0.80 N-m (0.59 ft-lb), so be very gentle.
2. **Carabiner**. See Image: Twist-Lock Carabiner, Image: Button-Lock Carabiner.
    - Mountain launch. Put the gate to the inside. A twist-lock mechanism can be opened by an speed bar line after a reverse launch, allowing the riser to slip out.
    - Tow launch. Put the gate to the outside (if tow bridle attached to carabiner). A number of people have had problems with carabiners coming undone when tow bridles are routed throught them. It is better to add a small triangular quick-link through the end of the riser to attach the tow bridle, then have the gate to the inside.
3. **Quick-Out**. See Image: Quick-Out. Special connector for those who require a rapid disconnection (in flight).
4. **Pin Lock**. See Image: Pin Lock. Special connector for easy disconnection of riser.
5. **Safe-In-Lock**. See Image: Safe-In-Lock. Special connector for easy disconnection of riser.

Which to choose ? If you don't often need to disconnect your wing from your harness, use Image: Quick-Link (stainless steel) instead of carabiners. Bad reasons to disconnect your wing from your harness: So it fits better in the carrying bag, it will protect the wing. A good reason : You fly with different wings and/or harnesses. When re-connecting you risers to your harness there is added risk of line entanglement and it takes more time to setup (specially on a windy launch).

L3 - 2004/2/3. ***Wing Loading***. For a higher wing loading :

- Speed. An increase of 20 kg (44 lb) typically increases the airspeed by 5 km/h (3 mph). Your sink rate will be proportionally increased (disadvantage). See also Ballast. Launch and landing speeds will increase (not good for beginners).
- Brake effort increases for a given amount of brake travel (amplitude). But piloting can be achieved with less brake travel, partially compensating for the increased effort. The main difference is increased effort at slow speeds.
- According to Note A... Following a Frontal Collapse (Execution) at maximum speed, the reaction is more dampened. It is less vulnerable to the initial collapse, seems to react more at first but has a smaller forward surge (dampens more quickly), and offers a more progressive re-opening, reducing the risk of a cascade of events.
- Pitch stability. According to Note A... Understanding : The wing has less mass compared to the pilot's, reducing pitch amplitudes. It is more difficult to produce a collapse while provoking pitch motions.
- Avoidance maneuver (ample and rapid pull of one brake). The wing is less sensitive to a Spin (Execution).
- According to Note A... During a Spiral Dive (Execution), the pilot is much more physically strained and there is more kinetic energy, but rotation is easier to maintain and exit from the Spiral Dive (Recovery) is calmer (less pitch and roll motions).
- In turbulence and thermals. According to Note A... This is where the influence is greatest. The wing is more mobile for low angles of departure from overhead position, but is more solid. Less bouncing around in turbulence. Less lines-go-slack events. Less need to use the brakes, more relaxing, you can let it float more. Better penetration into thermals, instead of the hitting-a-wall-of-wind feeling. More precision in the turns.
- Resistance to collapse for the same airspeed. If brake pull is increased to match the same airspeed as before (less loading), the angle of attack is higher, making the wing more resistant to collapses. The change in the angle of attack (and resistance to collapse) is roughly proportional to the change in wing

loading. So there is more benefit in resistance to collapse (at same airspeed as before) than the gain in airspeed (when keeping the same brake pull as before) which only varies with the square root of the change in loading. But remember that more brake pull, put you closer to a Stall (Full, Recovery).

Note A on Wing Loading : True for average and large sized wings. But small wings are often very dynamic when loaded in the upper range.

L3 - 2005/7/31. ***Accelerator Line Connection***. Do not use Brummel hooks which don't have a tight insertion fit or spring clips. When releasing from full acceleration, they can catch on one side of the harness and the asymmetrical acceleration can induce a Spiral Dive (Recovery) or a Collapse (Asymmetric, Recovery). The Woody Valley X-over harness seems most vulnerable. Solution : Wrap Brummel hooks with tape or use small quick links. Test that each connection can support your body weight (safety factor of 2+) without deformation. See also : Accelerator Adjustment, Compact Brummel Hook Knot.

L3 - 2005/7/31. ***Compact Brummel Hook Knot***. If you have limited motion of your accelerator line because the Brummel hooks contact an grommet or pulley on your harness, avoid having a knot on the line below the Brummel hook. See also : Image: Brummel hook J knot, Accelerator Line Connection.

L4 - 2002/6/25. ***Ballast***. If it is hard ballast (which could hurt someone below), keep it with you. Letting go of your extra ballast (water), will not give you a big sink rate advantage. See the laws below. For example, assuming your best sink rate is 1.1 m/s (217 ft/min), letting go of 10 lb (4.5 kg) when your total flying weight is 200 lb (91 kg) will only better your best sink rate to 1.072 m/s (211 ft/min). So concentrate on you technique instead. Letting go of your ballast will indicate your desperation to others. This is the basic law :

$$\text{Force} = \text{Drag\_coef} \,.\, \text{Area} \,.\, \text{Speed}^2$$

The following can be deducted :

$$\text{Speed\_final} = \text{Speed\_initial} \,.\, \text{Sqrt}(\text{ Weight\_final} / \text{Weight\_initial })$$

Note that you can also apply this rule to you horizontal speed when thinking of increasing your speed with ballast. Adding 10 lb (4.5 kg) to a total flying weight of 200 lb (91 kg), will only give you an additional 2.5 % or 1.1 km/h (0.7 mph) if you had a max speed of 45 km/h (27.9 mph) before.

A ballasted pilot looses out in turns from both the direct increase in sink rate, and the increase in sink rate that results from the steeper bank angle that is required for a given turn radius. The total effect is roughly proportional to the change in weight. Only if you expect to be racing, spending 2/3 or more of your time gliding (not thermalling), then it might be good to be heavily loaded on your wing. This would be particularly true if you expect the thermals to be turbulent (when the extra agility and stability would help you core the thermal). Ballast can also allow you to fly a bigger glider that glides a little better, and which can fly a little slower and turn a little tighter in thermals. See also : Wing Loading.

L4 - 1999/11/16. ***UV Resistance***.

UV resistance by material color. (Most resistant are at the top of the columns)		
Porcher (Advance, Airea, Firebird, Flying Planet, Gradient, ITV, MacPara, Pro Design, Windtech). Source : Cross-Country #51, page 39.	Carrington 1080 (Gin, Nova, XIX) and Carrington 1097 (FreeX, Swing, UP) Source : Cross-Country #49, page 51.	Gelvinor (Apco, Ozone)
Purple, Black, Blue, Light Orange (Gold), Lilac.	Red, Orange, Sun (Gold), Royal, Sea Blue, Purple.	Light Gray.
Yellow, Dark Blue, Orange (Mandarin), Red, Light Blue (Bluet).	White, Black.	White.
White.	Parma (Light Pink).	Green.

Light Blue (Azur), Turquoise, Green, Fluorescent Green, Fluorescent Yellow.	Pink XT (Magenta), BT Green, Fluorescent Orange.	Sky Blue.
Light Grey.	Rossignol.	Medium Blue.
Pink.	Fluorescent Pink.	Violet.
Fluorescent Orange, Fluorescent Pink.	Fluorescent Yellow.	Yellow.
		Purple Blue.
		Orange.
		Turquoise.
		Purple.
		Pink.

L4 - 1992/5/1. If you keep a very large plastic trash bag with you, well packed, it won't take up much space and it will help you keep your wing dry in case it rains.

L4 - 2006/8/14. ***Salt Water (Damage)***. If you have fallen into salted water, you must rinse all your gear in soft water. Many components would otherwise keep deterioration after the salt water is apparently gone because the salt crystals remain and they are harder than the Kevlar fiber in your lines that will wear out by abrasion. Rinsing your lines in soft water may be unsuccessful in removing all salt crystals, you may need to replace all your lines. Electronic equipment that has been submerged should be turned off as soon as possible, batteries removed, then rinsed in distillated water (Try not to wet parts that have not been flooded), let dry (convection without heat) completely before being reactivated. If you often fly over water bodies, put your electronic equipment in watertight bags.

L4 - 1991/6/1. You fly at a place with lots of mosquitoes and you cover yourself with repellant oil. Some of these products will eat away your wing's material. Be sure to wipe off your hands before handling your wing.

L4 - 1997/6/1. If you have a harness with a rigid Kevlar back protection, consider replacing it with a softer protection. Kevlar back plates were popular between 1992 and 1997, but medical tests revealed that they concentrate more load to the lower back upon a crash.

L4 - 2001/1/1. ***Emergency Kit***. Item to put in your emergency kit :

- A 300 yard dental floss roll. It is small and compact. You can use it to pick up rescue items from the people on the ground if you are in a tree.
- A charged-up radio, set to a common frequency.
- A whistle to call for help.
- A small tool to undo your riser links to the lines. It can help to get your wing out of a tree.
- A flexible "rope" saw, if you fly over hard wood trees (requires 2 hand to operate). For cutting into trees with resin (like pine), which would clog a "rope" saw, a saw with a folding rigid blade is better (can be used with one hand).
- Industrial strength pain killers. If you crash far from a road, this can be your last chance to prevent shock and keep you clear-headed.

See also : Tree Landing.

L4 - 2001/8/31. ***Air Travel***.

1. If you change country, register your valuables (paraglider, harness, variometer, and radio) at the airport's customs office prior to checking it in at the airline. You will then have a card itemizing your gear with serial numbers, which may avoid you from paying tax again.
2. Don't leave your helmet in your PG bag as it can get crushed.
3. Put electronic equipment (radio, vario) in your hand luggage to avoid being called down to the tarmac for suspicious items.
4. Put fragile stuff (not electronics) in the middle of the wing.

5. Put wing, harness inside a large garbage bag. I once had my wing stained by another's broken red wine bottle.
6. To avoid having a PG bag strap ripped off by a conveyor belt, put it all in another bag.
7. Don't put a note on the reserve handle that says "do not pull".
8. Don't bring a pyrotechnic reserve deployment unit on the plane.
9. Your *Leatherman* multi-purpose tool will be confiscated if you carry it on you or in your carry-on luggage.
10. If you have a 2-meter radio in your carry-on bag, be ready to show your amateur-radio license.

L4 - 1998/12/1. When the snap that holds your brake toggles to your risers won't unsnap easily you can put a little lip balm (chap stick) on the male end of the snap. Avoid Vaseline or any other petroleum-based product.

L4 - 1999/5/26. Costume. Make sure you can use the full travel of the brakes. If the costume has too much volume it can cause excessive drag and bring you close to Deep/Parachutal Stall (Recovery). If the wing must support the costume, use the "B" risers but keep the load light. Don't reduce visibility too much. Use a wing which is easy to inflate.

L4 - 1999/6/10. Skin protection from the Sun. UVA sunlight is absorbed by urocanic acid (natural molecule made by the outermost skin cells) chemically altering it, and causing it to create within the cells a type of oxygen free radical. This oxygen radical degrades collagen and elastin (major molecules that make up the skin), decreasing the elasticity (aging) of the skin. Also, malignant melanoma (deadliest form of skin cancer) is 90% caused by UVA, 10% from UVB. Melanoma risk depends a great deal on genetic factors such as hair, skin and eye color, and the number of moles you have. People with fair features were six times more likely to get melanoma. Most sunscreens protect against UVB while doing little to against UVA, giving a false sense of security. UVA can be blocked by a few sunscreens, including zinc oxide (white goo that lifeguards often smear on their noses). Check the label to make sure lotions contain ingredients (like Parsol) that also protect against UVA. Use a wide-brimmed hat, long pants and a long-sleeved shirt.

L4 - 2000/6/21. ***Reserve and Handle Position***.

	Advantage	Disadvantage
Top reserve with handle mounted on a shoulder strap.	Easy to find, can be grabbed by any hand.	Handle may be unusable if you have Twisted Risers (Recovery) behind your head (it happened to me). Note : Do not relocate a side-mounted handle to a shoulder position for which your reserve/harness has not been designed for (do not extend the handle to reserve strap).
Lower back reserve with handle mounted on side of harness.	Faster deployment than when handle mounted on a shoulder strap.	Risk of interference if doing a rotation with the harness for Twisted Risers (Harness Flipped). Difficult to grab handle with opposite hand.
Front reserve with handle mounted on reserve.	Reserve can be easily transferred to another harness. Easy to find, can be grabbed by any hand.	Reserve can easily be left in the car.

L4 - 2000/10/24. ***Harness Seat Board***. Your harness has been designed for a given seat board width. If you reduce its width in order to fit tigher in your harness, the reserve parachute may be locked by the deformed harness shape when it is loaded. To achieve a tighter fit, use a foam padding inside the harness.

L4 - 2000/11/3. ***Sunglasses***. Avoid polarized sunglasses. They are good to reduce dominant horizontal polarization from a broad, smooth horizontal surface directly ahead and slightly below the viewer's eye level (good for driving or fishing), but when flying, the terrain below is usually too irregular to produce orientation-specific polarization. Also, they may interfere with viewing liquid-crystal displays (LCD) such as your variometer's. Horizontal power lines will be more difficult to distinguish because their reflection is absorbed.

About sunglasses in general... If your eyes are good you can see better in all conditions without sunglasses. For people with eye problems which require a tint, yellow/orange lenses can help to spot the edges of clouds, inversions, but can cause problems with distance perception. Get the lightest tint you can stand. Prescription non-tinted glasses already filter out most UV rays.

L4 - 2005/12/12. ***Unsheathed Lines***. Typically found on competition wings. Compared to "normal" sheathed lines:

- Good: The rule-of-thumb if they add an extra 0.25 L/D at trim speed, more when accelerated.
- Good: They do not shrink as much in length over time. The sheathing being the major cause of shrinkage.
- Neutral: Some say the reactions from the wing in turbulence are a little "drier". But I could not tell the difference when switching from a normal Nova/Tattoo, to the C version in 2005.
- Neutral: Some say the handling is improved and turns are more dynamic. But I could not tell the difference when switching from a normal Nova/Tattoo, to the C version in 2005.
- Neutral: If they do not have a special UV treatment, they will degrade quicker from sun exposure. As of 2005, most have a UV treatment.
- Bad: The lines tangle more easily because they are more flexible, and pick up more debri on launch.
- Bad: They absorbe moisture more quickly (snowy launch).
- Bad: They are more vulnerable to mechanical damage: If stepping on lines over hard ground, or rubbing lines against rocks. In my first 22 hours with a "mostly unsheathed" line set (2005 Nova/Tattoo C), I have broken one brake top line and damaged an intermediate one, but I launch over hard ground with embedded rocks.

See also Reduced Pilot Drag.

L4 - 2001/10/11. ***Knot - Brake Line***. For tying your brake line to its toggle, see : Image: Non-slip loop knot.

L4 - 2003/1/2. ***Line Tab - Junction Method***. Some wings have external tabs under the wing for connecting the lines, made of a folded strap sewn back into the wing. There is a good and a bad way for the end loop of the lines to connect to this tab : Image: Line tab - Junction method.

L4 - 2003/1/8. ***Brake Pulley Noise***. Tired of hearing your brake pulleys squeak ? Do not use petroleum-based lubricants, they could find their way to your wing and damage it. Use a Silicone-based lubricant and wipe away any excess.

L4 - 2005/3/18. ***Reduced Pilot Drag***. Reducing aerodynamic drag at the pilot level, by use of a profiled harness or other means, will improve you L/D at any airspeed, but more at higher airspeeds. For the same "no brake (trim)" situation, the L/D is mainly improved from a better sink rate (slightly raised angle of attack from reduced drag below the center of drag) while airspeed remains about the same (contrary to what many still think). See also Top Landing - Increase Body Drag, Unsheathed Lines.

L4 - 2004/6/24. ***Accelerator Adjustment***.

- Line length.
  - The proper length of lines attached to the foot bar, is when you achieve riser pulley contact (max travel) with your legs in full extension.
- Reducing activation force.
  - If you have a single step foot bar...
    Get a 2 step foot bar. The first step will give you more leverage from pushing with knees less bent.
  - If you are already using a 2 step foot bar...
    The following will not change the wing's certification. Buy 1 extra pair of pulleys, and 1 pair of longer accelerator lines than the ones you have attached to your foot bar. Attach the new pulley to the end of the riser's accelerator line using an Accelerator Line Connection. Attach one end of the new harness accelerator line to a convenient place on the harness, and run it through the new pulley, then back down through the normal route of the line through the harness and to the foot

bar. You now have a 2:1 reduction in activation force, but twice the travel. If there is too much travel for your leg length, put a knot in the new line between the new pulley and the attachment to your harness so that when it hits the new pulley, the added leverage is eliminated.

See also : Accelerator (Usage).

L4 - 2005/3/14. ***Broken Line Sheathing***. Order a replacement line, then consider these options:

- **Fly it as-is**. If these conditions are met:
  - The core is not obviously damaged.
  - Broken area will not interfere with piloting (like a brake line going through the pulley).

  Then just leave the line as-is and replace it as soon as possible.
- **Welding**. If these conditions are met:
  - The core is not obviously damaged.
  - The core is heat-resistant (will not melt like Dyneema does).

  Then we can apply this procedure (See Image: Welding a broken line sheathing):
  - Fray the ends of the broken sheathing.
  - Butt together the sheathing ends, covering the core.
  - Briefly heat the frayed sheating ends so they melt together.

  The sheathing should remain free to slip from the core, otherwise you have over-heated and the sheating is melted into/with the core. This method is a temporary fix, most likely the core has been damaged to some extent, so still replace the line.

L4 - 2006/2/11. ***Elastic Cord***. Also known as: Bungee cord, shock cord. Many harnesses are starting to use 3mm (1/8") elastic lines so your speedbar auto-retracts. If you buy material commonly found in hardware stores, you will typically get a double-layer sheathing of Nylon, which is ideal for abrasion resistance, but elongation will be limited to about 100% (30 cm length becomes 60 cm). A better compromise is a Polypropylene single-layer sheathing, which provides 140% elongation (same as cord from Sup'Air). In the USA, one source is Superior Bungee, part # 125P1216SU25.

L4 - 2008/3/23. ***Extra Line Loop at the Riser Quick-Link - Length Effect***. Where a lower line (1.5 mm diameter) meets the riser quick-link (3.5 mm wire diameter), if you add an extra loop for the quick-link wire to thread into, the line will effectively shorten by 9.5 mm.

Quotes

L4 - 1998/1/1. There are no good pilots, only old pilots.

L4 - 1998/1/1. The only thing better than getting high, is being low first.

L4 - 1999/8/1. I am a talented, skillful and experienced pilot with excellent judgement. I use my experience and judgement to avoid getting into situations where I have to rely on my talent and skill.

L4 - 1999/12/22. A popular analogy for describing the learning process is to split it into four stages :
1) Unconscious ignorance (Beginner)
2) Conscious ignorance (Intermediate)
3) Conscious knowledge (Advanced)
4) Unconscious knowledge (Guru)

L4 - 2001/1/22. Leonardo Da Vinci : Why fly ? For once you have tested flight, you will walk the earth with your eyes turned skyward, for there you have been, and there you long to return.

L4 - 2001/1/22. Fr. Nietzsche : The higher we rise, the smaller we appear to those who do not know how to fly.

L4 - 2002/2/4. It's always better to be down here wishing you were up there, than to be up there wishing you were down here.

L4 - 2002/2/4. Everyone who lives, dies. Yet not everyone who dies, has lived. We take these risks not to escape life, but to prevent life from escaping us.

L4 - 2007/5/15. Every new pilot is issued two bags: One is full of luck. The other is empty. The goal is to fill the empty bag with experience before you run out of luck.

External Links

Why is the background of this color here ?
The color of this background is used to identify hyperlinks to other web pages, requiring you to be connected to the Internet. Therefore, you can save this document to your hard disk, disconnect from the Internet, and still be able to use all the hyperlinks outside this background color.

My E-mail addresses

Wing certification (See also : Wing Selection)

Wing test (See also : Wing Selection)

Wing manufacturer (See also : Wing Selection)

Paragliding association

Flying Site

Image
If you have an image to illustrate a tip, send it to me by E-mail.
See also : ***My photo album*** , ***Believe it or not !***

Launch - Mountain		
Tip	Title	Comment
Getting into the harness	Repositioning harness with brakes in hand	
Forgot to Fasten your Leg Straps	Recovering from untied leg straps	
Dust Devil - Waiting to fly and connected to your wing	Holding wing down during a dust devil	
I'm Launching - Make people aware	Make people aware that you are trying to launch	
Pulled up during rotation from a reverse inflation	Pulled up during rotation from a reverse inflation	
Cliff Launch	Cliff launch	
Pre-Launch Reserve Check	Siggy Bockmaier's reserve deploys at launch	
Top Landing		
Tip	Title	Comment
Top Landing - Make people aware	Make people aware that you are trying to top land	
Collapses and Bad Situations		
Tip	Title	Comment

Collapse (Asymmetric, Recovery)	Asymmetric Collapse - 60% + Asymmetric Collapse - 75%	
Stall (Full, Execution)	Maintained Full Stall	
Stall (Full, Execution)	Forward surge followed by pilot getting wrapped in wing	Video of the same event.
Frontal Collapse (Recovery)	Frontal Collapse - Leading edge is folded	
Frontal Collapse (Recovery)	Frontal Collapse - Center of wing flips under	
Frontal Collapse (Recovery)	Frontal Collapse - All the wing flips under + Laura Nelson in Porterville, South Africa	
Cravate (Recovery)	Cravate	
Big Ears (Execution)	Big Ears	
Reserve (How)	Down-planing (Wing opposing the reserve)	
Shrimp Stall (Execution)	Shrimp stall	
"B" Line Stall (Execution)	"B" line stall	
Thermals under an inversion	Why an inversion create more thermal turbulence	
Wing-Over (Execution)	Wing-Over seen from underside + Wing-Over sequence	
Looping (Execution)	Looping	
Aerobatics at low altitude	Low altitude aerobatics is a bad idea	This pilot recovered just before impact.
Water Landing	Water landing - Pilot jumps out of harness	
Your Gear		
Tip	Title	Comment
Keeping Lines in Place	Using O-rings to hold lines in place (1 twist)	Factory setup for an Nova/Aeron.
Keeping Lines in Place	Using O-rings to hold lines in place (2 twists)	Factory setup for an Ozone/Proton.
Riser to Harness Connection	Quick-Link (stainless steel)	My preferred connector.
Riser to Harness Connection	Twist-Lock Carabiner	
Riser to Harness Connection	Button-Lock Carabiner	
Riser to Harness Connection	Quick-Out	
Riser to Harness Connection	Pin Lock	
Riser to Harness Connection	Safe-In-Lock	
Knot - Brake Line	Non-slip loop knot	
Compact Brummel Hook Knot	Brummel hook J knot	
Line Tab - Junction Method	Line tab - Junction method	
Broken Line Sheathing	Welding a broken line sheathing	

Video

If you have a video to illustrate a tip, send its URL to me by E-mail.
See also : ***Video (free)***

Launch - Mountain

Tip	Title	Size	Format	Comment
Cross-Wind Launch	Asymmetric collapse following a cross-wind launch, 2000, Aspen, CO	159 kB	MPEG-4 H.264 (*.mp4)	
Wing Examination at Launch	Pilot launches with a knot, 2003/12/18, Salève	395 kB	MPEG-4 H.264 (*.mp4)	
Forgot to Fasten your Leg Straps	Pilot recovering from untied leg straps, 2003/11, Oliver, B.C., Canada.	606 kB	MPEG-4 H.264 (*.mp4)	The pilot's name is Doc. He survived because he read about this a few months earlier.
Dust Devil - Waiting to fly and connected to your wing	Dust devil picks up a wing and harness, 2003, Piedrahita, Spain.	354 kB	MPEG-4 H.264 (*.mp4)	Video from Karol Kociecka.
Dust Devil - Waiting to fly and connected to your wing	Dust devil picks up 2 pilots, 1996, Poland.	609 kB	MPEG-4 H.264 (*.mp4)	During a competition.
Thermals				
Tip	Title	Size	Format	Comment
Entering a Strong Thermal	Adding brake during thermal entry, 2005, Valle de Bravo, Mexico	5.72 MB	MPEG-4 H.264 (*.mp4)	Viewpoint from a helmet video camera. Increased braking during a thermal entry produced in a Stall (Full, Recovery) (notice rear risers go slack).
Collapses and Bad Situations - Collapse				
Tip	Title	Size	Format	Comment
Collapse (Asymmetric, Recovery)	Asymmetric collapse with counter, SIV clinic 1999, Salève	251 kB	MPEG-4 H.264 (*.mp4)	
Collapse (Asymmetric, Recovery)	Asymmetric collapse with no input, SIV clinic 1999, Salève	182 kB	MPEG-4 H.264 (*.mp4)	
Collapse (Asymmetric, Recovery)	Asymmetric collapse after launch followed by impact	196 kB	MPEG-4 H.264 (*.mp4)	
Frontal Collapse (Recovery) + Big Ears (Problems)	Frontal Collapse while under Big Ears	211 kB	MPEG-4 H.264 (*.mp4)	
Frontal Collapse (Recovery)	Small Frontal Collapse, SIV clinic 1999, Salève	65 kB	MPEG-4 H.264 (*.mp4)	
Frontal Collapse (Recovery)	Frontal Collapse with Shrimp, SIV clinic 1999, Salève	76 kB	MPEG-4 H.264 (*.mp4)	
Unbalanced Roll Motion Collapse (Recovery)	Asymmetric Surge leading to an Asymmetric Collapse, Villeneuve, 1990	274 kB	MPEG-4 H.264 (*.mp4)	Beni Stocker during formation for factory pilots organized by Air Turquoise and the FSVL.
Collapses and Bad Situations - Reserve				

Tip	Title	Size	Format	Comment
Reserve (How)	Classic reserve thrown, SIV clinic 1999, Salève	369 kB	MPEG-4 H.264 (*.mp4)	
Reserve (How)	Rogallo reserve thrown, SIV clinic 1999, Salève	464 kB	MPEG-4 H.264 (*.mp4)	
Reserve (How)	Wing Tangles with Reserve, Villeneuve, 1990	557 kB	MPEG-4 H.264 (*.mp4)	Helmer Marquard during formation for factory pilots organized by Air Turquoise and the FSVL.
Collapses and Bad Situations - Stall				
Tip	Title	Size	Format	Comment
Stall (Full, Appreciation)	Releasing brakes at stall onset, Christian Quest 1999/9	117 kB	MPEG-4 H.264 (*.mp4)	A few lines broke upon wing re-loading.
Stall (Full, Execution)	Planned full stall, but released brakes to early, Zsofi 1999/1, Monte Carlo	1011 kB	MPEG-4 H.264 (*.mp4)	Other formats available from KFKI - Isys.
Stall (Full, Execution) + Spin (Recovery)	Stall - Asymmetric Surge - Spiral, Villeneuve, 1992	1.06 MB	MPEG-4 H.264 (*.mp4)	Laurent David during a tandem certification flight for Air Turquoise and FSVL.
Stall (Full, Execution)	Stall - Pilot Falls Into Wing, Villeneuve, 1993	815 kB	MPEG-4 H.264 (*.mp4)	Laurent David during a certification flight for Air Turquoise and FSVL.
Stall (Full, Execution)	Forward surge followed by pilot getting wrapped in wing.	1.77 MB	MPEG-4 H.264 (*.mp4)	Picture. The wing reinflated 30 m (100') AGL. Tony fully recovered from his broken arm and hand.
Collapses and Bad Situations - Spin				
Tip	Title	Size	Format	Comment
Spin (Execution)	Toni Bender doing a spin over Achensee (Nova test area) 2000/9/28	341 kB	MPEG-4 H.264 (*.mp4)	Wing is a Nova/Carbon.
Spin (Execution)	Releasing brakes at spin onset, André Gallant 1999/9/4	286 kB	MPEG-4 H.264 (*.mp4)	André compressed 2 vertebras by 28%, shortening by 2 cm but recovered fully.
Spin (Recovery) + Twisted Risers (Recovery)	Spin leading to twisted risers, SIV clinic 1999, Salève	221 kB	MPEG-4 H.264 (*.mp4)	
Spin (Recovery)	Spin - Forward Surge - Pilot Falls Beyond Wing, Villeneuve, 1991	369 kB	MPEG-4 H.264 (*.mp4)	Nicolas Jaques during a certification flight for Air Turquoise and FSVL.
Spin (Recovery)	Spin - Forward Surge - Pilot Falls Short of Wing, Villeneuve, 1991	142 kB	MPEG-4 H.264 (*.mp4)	Alain Zoller during a certification flight for Air Turquoise and FSVL.
Collapses and Bad Situations - Descent technique				
Tip	Title	Size	Format	Comment

Spiral Dive (Execution)	Spiral dive from the movie "Fly Hard"	197 kB	MPEG-4 H.264 (*.mp4)	
"B" Line Stall (Execution)	Bad "B" Line Stall exit, Hanglider Hill, Bakersfield, CA, 2000/2/18.	1.35 MB	MPEG-4 H.264 (*.mp4)	You can read his report. Gunter only gets a few broken ribs and swolen internal organs, but suffers no permanent damage.
Big Ears (Problems) + Flying in Rain	Flying in the rain, pumping ears out produces a deep stall, 2003.	674 kB	MPEG-4 H.264 (*.mp4)	
Collapses and Bad Situations - Aerobatics				
Tip	Title	Size	Format	Comment
Wing-Over (Execution)	Wing-Overs from the movie "Fly Hard"	189 kB	MPEG-4 H.264 (*.mp4)	
Wing-Over (Execution)	Wing-Over goes bad	742 kB	MPEG-4 H.264 (*.mp4)	Source : Thomas Beyhl, Chiemsee Flight School.
Spiral Dive (Execution) + Wing-Over (Execution) + Spin (Execution)	Sébastien Bourquin makes a spiral dive, a wing-over, and a spin	493 kB	MPEG-4 H.264 (*.mp4)	
Aerobatics over Another Pilot	Collision, 1999/1, Monte Carlo	1.06 MB	MPEG-4 H.264 (*.mp4)	German pilot in Hungarian team spiral dives into Hungarian pilot with pink wing. Reputedly, after the accident, the German pilot just laughed about it. Collision happened at low altitude, as the Hungarian pilot was preparing to land. Notice that the Hungarian pilot flips backwards, sending his legs into his lines. Other formats available from KFKI - Isys.
The Reverse Spiral	The Reverse Spiral performed by Raoul Rodriguez, France, St-Hilaire, 2000/9/23-24.	435 kB	MPEG-4 H.264 (*.mp4)	The wing is an Edel/Millennium. According to witnesses, there's a very fine line between this maneuver working at all and it going completely to worms.
The Helicopter	The Helicopter, Switzerland, Villeneuve, 2000/8/25-27.	437 kB	MPEG-4 H.264 (*.mp4)	