K8 Cabrio
CHJE

4 Launching and getting away

There is a certain serene beauty about smooth flying, and it promotes efficiency and adds flow to a flight. Flying smoothly can increase the speed and therefore distance of a cross country by simply rounding off hard edges. I have seen and flown with pilots who think that efficiency means being heavy handed with the controls and justify this sort of flying by believing that they are being decisive and perhaps ‘hard-nosed’. Unfortunately, it usually means that they are simply adding drag by asking the wing to change direction abruptly. Inevitably, this also means they end up flying further (laterally and vertically).

The more people I fly with the more I realise that great basic flying skills are absolutely key to extracting reasonable performance from the glider. I sometimes fly next to people in their own single seaters with whom I have flown in two seaters. It is as certain as night follows day that if they can't fly accurately and smoothly, they are very easy to catch up with! Pilots may not think that flying smoothly, at the correct speed and in balance, is important. But without it, you get a very inefficient basic performance, even before you start selecting clouds and making decisions. In some situations, accurate flying really can make the difference between staying up and having to land.

So, it's smooth, accurate flying that we are aiming for. How can we work to achieve this particular goal? Practice is, of course, the key, but directed practice, coupled with a critique of one's own flying in a specific way, leads to that silky-smooth, efficient flight.

On the occasion when you might need to fly to satisfy some currency rule or other, it’s seen as a bit of a pointless exercise to simply do - say - 3 winch launches and circuits. I say pointless, because unless you’re addressing a specific element of your flying that you think might need working on, the exercise is of far less use than it could be.

The way to improve your flying, and specifically handling skills, is by always setting yourself a goal to attain on any

Left: The simple pleasures of an open cockpit - and some local soaring if you can only get away off the winch

particular flight. Say you just need to get in the air for a couple of winch launches during the winter. I would always make sure to set some simple aim, like landing and stopping the glider in a particular spot, flying a precise approach speed, or doing some turn reversals accurately etc. Even when I'm instructing, if I end up doing any hands-on flying, I'll critique my own flying every time. Was my launch beautifully smooth? Was the speed appropriate? Was my landing perfectly rounded out? Did the tail-wheel kiss the ground just before the main? If you practice goal setting and honest appraisal, you can steadily improve your technique. Believe it or not, this will hugely improve your ability to stay in the air and soar cross country. It is especially telling when the lift is weak – perhaps when flying down a shallow ridge line or in very weak wave. It is in these circumstances, if your flying is shoddy, that you will be unable to keep the glider in the air at all, when someone with better skills can. This sort of lack of competence is often blamed on something else like glider performance, or particular local conditions, or luck; but we know better!

Thermalling Technique

A very common error is thermalling at an inappropriate speed and angle of bank. Obviously, the wing loading (pilot weight and water ballast) will affect the appropriate speed to thermal a glider, but, in my experience, at a 40 - 45 degree bank angle (which has been proven as an appropriate angle of bank in the vast majority of cases, by the way) the following speeds seem to be approximately right:

* K8: 40 knots
* K13: 47 knots
* Junior: 45 knots
* K21: 50 knots
* Astir: 48 knots
* Libelle: 46 knots
* ASW19: 48 knots
* Janus: 48 knots
* Duo Discus: 52 knots

You get the idea! How can we fly at a reasonably accurate speed? Well, the key is in your elementary flying training – always fly by attitude. I glance at the ASI in my LS4 once in a blue moon. If you simply maintain your attitude on a gusty day the speed will vary, sometimes quite a lot, but it will always vary around a baseline figure, and not the 70 knots that was very common in the Duo with our soaring course students. Of course, the reason that they flew so fast was because they were used to a very different view forward – the Duo is very nose high at 50 knots, so it looks wrong. Pilots fly a picture, and they were trying to make it look right. If you're used to flying a K8, you will probably thermal an ASW19 far too fast to start with. Pilots attribute this to the '19 being 'slippery'. This is mostly rubbish – it's just that the nose appears to be much lower in the K8, so when you get in the '19, you try to make the picture look the same – which results in the high speed. Same is true when going from a K13 to a K21.

Below: Assessing your angle of bank

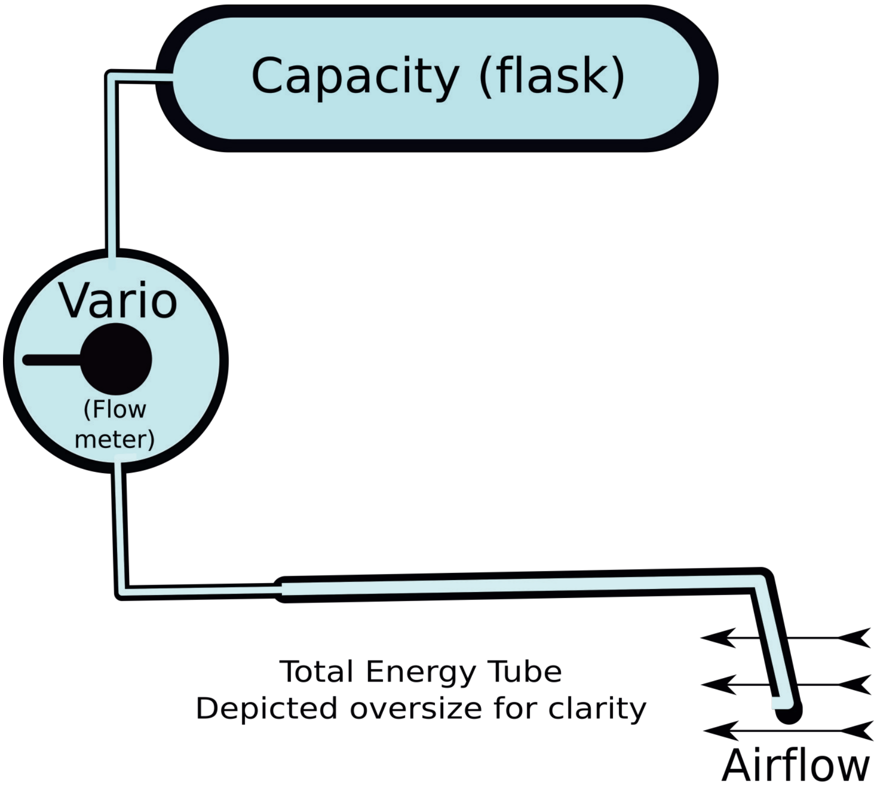
The judgement of your angle of bank is more challenging. There is a method which looks a bit silly at first glance. On every instrument panel, there are at least some round-faced instruments in square mounts with four, corner screws to fix them in the panel. If you take the diagonal sets of screws, they will normally be at 45 degrees to the straight and level horizon. This means they will line up with the horizon when you are turning with a 45-degree bank angle. I'm not suggesting that you fly around in thermals, constantly squinting at the panel to line up those diagonal screws with the horizon, but you can use them to check your angle of bank judgement from time to time!

Thermal centring

There's an awful lot of misinformation out there regarding how to centre in a thermal. Most of it revolves around looking at the variometer and straightening and tightening up at various readings or trends of the needle. Fundamentally there is one way of centring on the strongest lift in a thermal, and that's by figuring out where the strongest patch of lift is and making that patch of sky the centre of your turn. Simple. Of course – simple it is not; but the first key is working out the location of the strongest patch of lift, and there are some principles to help us do that.

The first principle to keep in mind is that it's essential to maintain spatial and situational awareness while turning the glider steeply. In other words, you need to be able to identify, within a few degrees, which way you are pointing at any one time. The reason for this is that as you go round the turn, you need to be able to identify where the lift is strongest and remember for the next turn. You are then able to manoeuvre the glider before you're in the lift to put that best part of the sky in the centre of your turn. You can practice by simply identifying the position of a small landmark at any point in a steep turn. If you can point directly at your land mark at any stage during the turn, you are developing a valuable skill. If you can visually identify it, at any time, on demand, during a tight turn, you are developing skills needed for centring thermals. There are also some electronic aids (software on flight computers) that we can use to confirm our centring techniques. However, don't be under any illusion - you have to find a half decent thermal to start with before you can use these aids to centre.

Below: The Total Energy variometer plumbing in my glider (and many others). A vario measures the rate and direction of flow as air moves in and out of the flask. Flow occurs with any change in air pressure at the end of the tube, as the pressure in the flask equalises.



These electronic tools are a great help, but you must still use similar cues to develop your situational awareness to respond correctly to them.

Another principle that is often misinterpreted is related to variometer lag and 'feeling the surges' that thermals produce.

Variometer lag

There is practically no such thing. I promise! If you come to one of my evening chats, I will often have a complete variometer system set up to illustrate this point. Sounds complicated? No – not really. Have a look at the diagram on the previous page which shows the total energy (TE) system plumbing in my LS4.

I set this up in the room where we're chatting, then get someone to blow gently over the TE tube. Everyone in the room hears the blow and sees that the variometer reading changes at exactly the same time as the sound of the blow. So what causes 'vario lag' then? Well, you can't accelerate a mass – a 400 kg LS4, for instance – in an instant. Changing from going down at, say, 6 knots to going up at a similar rate – an overall vertical speed change of 12 knots, around 15 mph – takes time, no matter what the energy input. This is the cause of what's called 'variometer lag', and its why different gliders feel different to thermal as well. If you're used to flying a K8, this has very little 'variometer lag' as it's very light, with a good wing area. Try getting in a DG500 or something else heavy. This has roughly double the empty and gross weight and so has an awful lot more inertia, so takes longer to change direction, thus has a greater 'variometer lag'.

But we can feel the lift through the seat of our pants, can't we?

Feeling surges

So – you 'feel for the surge' as you are trying to locate the centre of this thermal. But what are you feeling? The strength of the steady lift? No – you are feeling acceleration. This vertical acceleration is the same thing you feel when you ride in a lift. Imagine walking into the lift. Close your eyes once you have pressed the button. You feel nothing as the doors close, but once the lift starts moving, you will feel the acceleration – you feel a bit heavier (if you're going up) and you can sense the movement. But let's say the lift has a long journey in a very tall building. Once the lift stops accelerating, you feel nothing again – you're travelling at a constant speed and so even though you are shooting heavenwards, it feels the same as when the doors were open and the lift wasn't moving at all. This is the gotcha when we are trying to centre. While we feel the surge, we are still accelerating, which means that it's actually once the surge goes away that we are climbing at the best rate! The other thing about feeling surges is that we will feel the same surge if we go from six knots of sink to zero (no lift, no sink), as if we go from zero to plus six knots. The vertical acceleration is the same.

In practical terms, we need to remember to use our bums and the vario together, to tell us the whole story. Perhaps we are flying along in some really strong sink and encounter a short surge. We are tempted to turn, but we monitor the vario as the surge disappears and we find that it's only just above zero, so the surge was the sink disappearing! Fortunately, we feel another strong surge. We monitor the vario as the surge peters out and note that it's starting to rise well. Quick – turn!

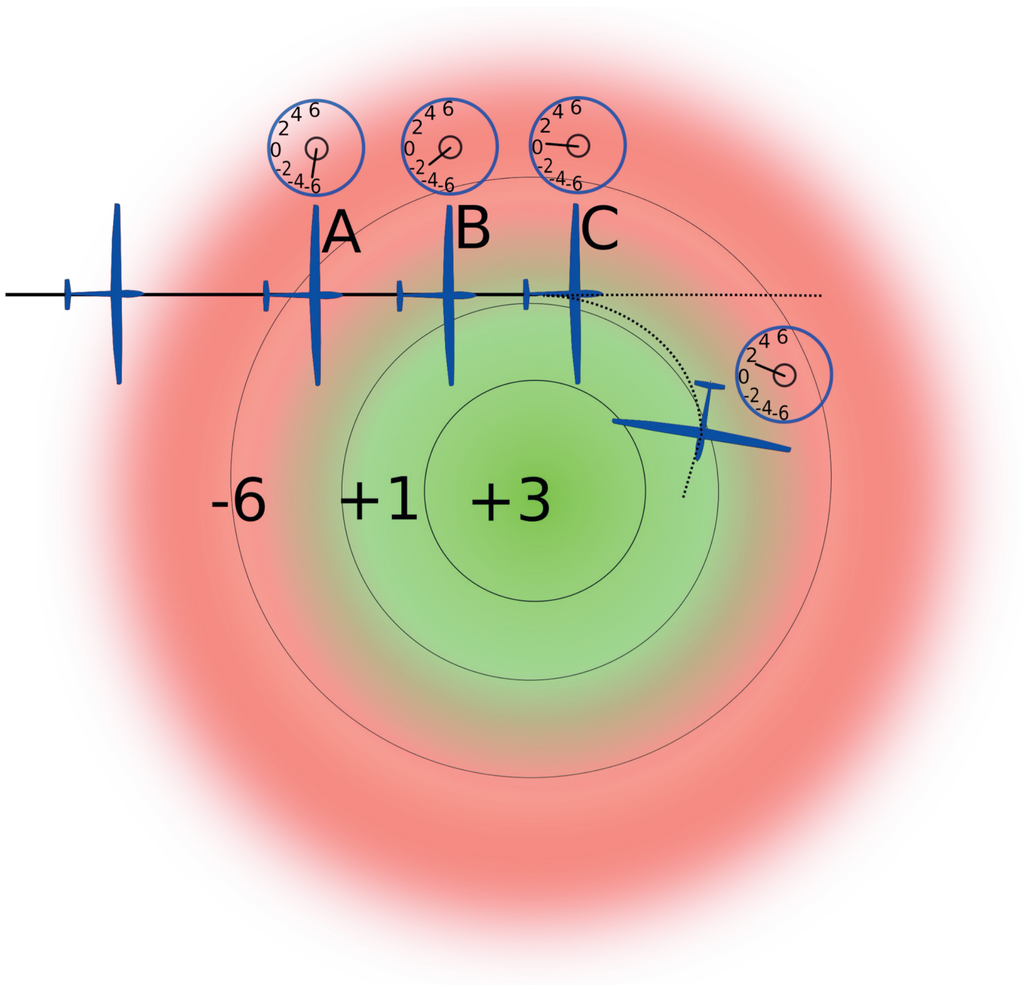
Have a look at the diagram of a glider approaching some lift. At 'A', we will start to feel a strong surge of 'lift'. That surge feeling will actually reduce a bit as we get to 'B', as this thermal isn't very strong, but there is fairly strong sink around it. If we want any lift at all, we will have to wait for the surge to disappear at 'C' before we turn right (hopefully) against the lifting wing. You will also need to confirm that the vario is rising past zero as you start the turn. Obviously, if this was a stronger thermal, the vario will be higher as you start to turn.

Turning and finding no lift – it was a gust!

OK – so another of those tales we hear in the bar is that Sam kept turning in 'gusts' and falling out of the thermal. What is meant by a gust here, and how can we avoid being fooled by one?

A gust, when referred to in connection with soaring, is generally defined as outflow

vario and out to standard static side vents. (Maybe it's just had the panel re-done and this has happened by mistake.) It's a cold, still, winter's day and you take an aerotow for the experience of flight. You fly around at 50 knots and notice the vario shows a sink rate of about 1.5 kt. After you've enjoyed the view for a while, you decide to speed up to 70kt, but the instrument shows a great deal of sink during your initial acceleration (you put the nose down quite



Left: Acceleration and steady lift - when the accelleration stops, the variometer tells the story!

from a thermal, which might fool you into turning, usually before the real lift at the centre. To understand how such gusts can mislead the unwary, you need to understand how the total energy system works. Don't worry – it's not complicated – even I understand most of it! Have a look at the diagram of the total energy system again.

Imagine the vario is connected, not as in the diagram but from the flask, through the

steeply at first, descending rapidly into air at progressively higher pressure), until you settle at 70 when it comes back up to a steady 3kt or so. Of course, this isn't really what you want. You want to know if you're going up or down in rising or sinking air, and you don't want to have to keep your speed constant all the while. You want to remove apparent lift and sink due to speed variations. This is normally done by connecting the variometer to a total energy tube (it can also be done electronically, but

Above: 'Bags of steam' some call these sorts of cumulus. Low cloudbases and weak climbs can often look like this, especially in the mornings. The advantages are climbs that are close together with good lines of energy between them.

Below: an early morning cumulus. It's probably past it's best; it looks like it's falling over without a very well defined bottom. I would probably try the smaller, newer cumulus further on if I had just had a winch launch.

Above: Spreadout (and in this case rain) is pretty common in the UK. The key here is to attempt to stay high by taking ever weakening climbs to stay in touch with the lift. If there is any sunshine on the ground (right of the pic), this should be your first port of call for a low save.

Below: Stratus encroaches ahead of a warm front, but it's still working below it. It can be suprising how well the darker bits of cloud can work on days like this.

Above: Well developed cloud streets can sometimes be tricky things to find lift under - especially low down. Always try under what looks like the best bit of cloud first, but then migrate to where the cloud shadow meets the sun on the ground on the sunny side.
Below: Blue conditions - if there are tiny cus, they usually work if you can get to them before they disappear. If you can't see any cumulus, try looking up - sun. You may be able to see 'haze caps' - the tops of rising air that brings different and often dirtier air up from ground level.

Above: Showers can be spectacular, and can bring spectacular lift. However, you need to figure out which way they are moving, and where they are sucking. If you are unlucky enough to get it wrong and have to land nearby, don't forget the wind can veer and back significantly around showers. Also - if you are tempted to fly through the rain, the ground behind the storm will be wet, and that will stop thermals there for hours after the storm has passed.
Below: When it's completely blue it's tempting and, indeed, practical to follow others if you can. You will soon gain confidence in your abilities to use ground features to predict where the thermals will be and forge out on your own!

the effect and anomalies we discuss are the same). A total energy tube has a hole in its trailing edge. Increasing pressure outside, during descent, pushes air into the flask, (and decreasing pressure associated with ascent draws air out), as with connection to the static ports. But also, as the airflow whistles past this hole it sucks (applies negative pressure), at a rate proportional to the glider's flying speed. This cancels out the apparent lift and sink due to slowing down and speeding up.

Once again, imagine the flight profile of the glider as before, but with the vario connected to a TE tube. This time when we go from flying at 50 to 70, the ambient pressure increases due to the glider descending, but the pressure behind the tube simultaneously reduces due to the increased airspeed. By the way, it's called a 'total energy' tube because it compensates for the needle movement due to the plane's potential energy being converted into kinetic energy and vice versa.

However, as a result of this total energy compensation, when the glider flies into a horizontal gust that 'blows air' at the glider and quickly increases its airspeed, it has two simultaneous effects. One is that it instantaneously reduces the pressure behind the total energy tube and therefore shows lift on the variometer. The other effect is that the wing produces more lift – and quite a lot of it, because lift is produced in relation to the square of the airspeed. So picture the scene. You fly along towards a likely-looking cloud. As the sink starts to abate you feel a surge, a feeling of acceleration, and at exactly the same time the variometer shows lift. THIS IS A GUST – DON'T TURN! You can tell it's a gust because the vario response doesn't have any lag. You need to wait for the smooth feeling of acceleration, followed a second or two later by a confirmation from the variometer. Once the lift is at its peak, the sensation of acceleration will go away, and you should turn then – and as quickly as possible.

Selecting the right cloud to fly under

I think that the first thing to say about the selection of appropriate clouds is that everyone gets it wrong to some extent. Even the most experienced cross-country competition pilot cannot say that THAT cloud over there will give x knots. However, the more you practice and add to your mental database, the better you will get at making this prediction. I reckon, with perhaps 2000 hours proper soaring, I can judge what lift the next cloud will give me, within a couple of knots, maybe 65% of the time. However, I think that most people probably know what a classic good cloud looks like. One with a big cauliflower top and a nice, well-defined dark base is usually a winner. Often, on days when the sky is nearly blue, any little scrap of cloud is worth heading for, but there can be some gotchas which will be covered in the chapter on making progress.

Thermal and cumulus lifespan

Sometimes you hear pilots calling their mates into thermals when they are many miles apart. In the vast majority of cases, that thermal will have died long before their partner gets to that spot. However, that area may be a good area for triggering and otherwise producing thermals, and so another may have formed in the interim to bolster this false idea of the lifespan of thermals and their cumulus.

There are a few things that control the lifespan of a thermal. The amount of cloud can have an effect. A large cloud will continue to be associated with thermal lift, just below its base, for a lot longer than a very small cloud. This is due to the effect that evaporation has on releasing latent heat. A large cloud continues to 'suck' due to this release of energy. In contrast, a small puff of cumulus on an almost blue day could have a life that's measured in

Above: searching for lift under large clouds. The dotted lines represent the edges of the cloud shadow.

seconds rather than minutes. If you get to the cloud as it's disappearing, you may be lucky to climb, but it may already be too late! Research indicates that an average sized cloud and it's thermal last for about 12 minutes. Of course, there may be another thermal produced from the same trigger or source that feeds into the side of the same cloud and continues to provide lift, – now a little upwind of the original thermal which has drifted downwind.

Where to fly under the cloud

You may hear talk in the bar about offsetting your search under the cloud to account for the wind. Unless there are unusual circumstances – like a convergence, or wave-induced thermals, the best lift is normally found right under the best-looking part of the cloud, as long as you are not too low (see below). This bit is usually the darkest, or where you can see movement in the cloud. Perhaps it's where you spot a 'step' in the level of the cloud, or even under the part of the cloud where you have memorised the tallest bit of the billowing white goodness above. A lot of people don't believe me, but think about it: if thermals lean, then you wouldn't join others directly underneath or over the top and find a thermal, would you? Perhaps the theories about offsetting your search have come from diagrams in books like Reichmann's, which show the path of the glider in relation to the ground when the wind is blowing. The diagrams are perfectly correct. They show the glider drifting downwind while climbing, but they can lead to the wrong conclusion.

Where to find lift under large clouds and/or high cloud bases.

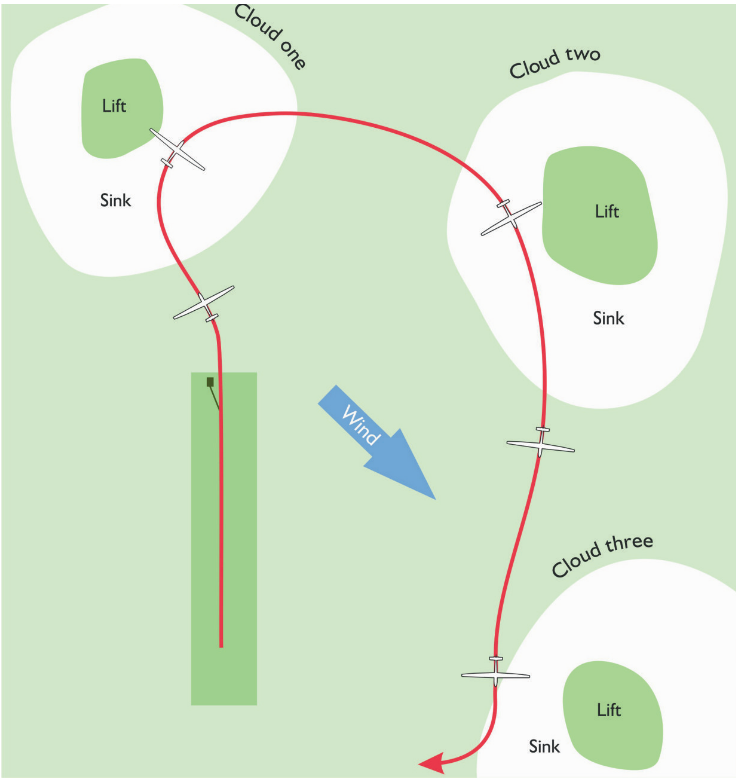
A common misconception is that a thermal will go all the way from the ground to the cloud above. Unfortunately, this seems to be rare, or short-lived in normal circumstances. Usually, flatland thermals rise in a series of elongated bubbles (see chapter 3 - thermal structure). These bubbles can be very deep, or quite shallow. What we need to know, if we are low down, is that we should look for the newer bubbles that are forming from good, sunny sources on the ground that haven't been in cloud shadow lately. Have a look at the annotated picture of the cloud street again. Remember that this is a snapshot in time, and I'm trying to explain what goes on over the course of perhaps 15 minutes. The dotted lines show how the sun and cloud cast their shadow - this is important information for us.

Thermals are forming from the ground on the 'up–sun' (right, in the pic, near the arrow labelled 1) side of the cloud shadow. Large clouds nearly always form on that sunny side because the ground on the opposite side has been in the shade of the cloud shadow (we will see why below). Remember though, that that thermal bubble will eventually break away from the ground, perhaps just after it forms new cloud at the top of the bubble. In this snapshot in time, if I were searching for a thermal and was low, I would search near the number 1 arrow. One might think that the obvious place to search might be right under the nice-looking cloud at 2. This could just work if you're not too low, but it's quite likely that this thermal bubble has already broken away from the ground, so you might not find lift. Practically, of course, you can try both locations, but keep the above theory in mind. It's very unlikely you will find lift on the left, the decaying side of the cloud.

Imagine, if you will, the scene 15 minutes after that photo was taken. Thermal 1 will be more mature, sucking like hell, and forming a large cloud overhead. Thermal 2 will be decaying and the cloud will start to evaporate (all the cloud on the left will have evaporated). There will be a new thermal, even further to the right of the picture, and the cycle will continue. New thermals forming up–sun and old ones decaying down-sun.

This illustration shows a cloud street (thermals and cumulus aligned with the wind). However, the same advice applies to individual clouds.

Below: Sink everywhere! Diagram: Steve Longland



Getting away from the launch (especially winch)

How many times have you been at the launch point when a pilot takes a winch launch, flies a circuit and proclaims that there's sink everywhere? I bet almost every one of us has heard that happen a few times at least, if not every soarable weekend. If that pilot has another couple of launches and fails to get away, it can be very demoralising; especially if several mates are soaring, or even off flying cross country. The fact is that if strong sink is around, then there's probably also lift somewhere. There are of course some situations where the airfield and its surrounds are in major sink from some phenomenon. Perhaps it's the 'down' of a wave system, or maybe there are showery conditions around or even thunderstorms. (If there are thunderstorms around – I wouldn't be winching!). However, if none of the above is happening, especially if others are getting away, there must be an alternative to finding all this sink!

Sometimes, there can be good triggers for thermals in consistent places, which