Learning to soar slopes

Don Puttock, who is the Chief Flying Instructor at the Black Mountains GC in Wales, offers advice to pupils and instructors on learning to exploit the hill

SOARING all year around in the UK is possible, but how are we to make slogging up and down a ridge more appealing? This article is designed for instructors and students alike; they highlight training issues and illustrate how good hill-soaring skills will help a pilot improve his competence handling his sailplane, and thermalling.

Relatively few pilots have had the opportunity to develop their hill soaring skills. Little training material is available and even less guidance for instructors.

Sailplane design and piloting skills have developed in parallel with great cross-country achievements. As soon as the early gliders managed to break their bonds to the local hills, pilots looked to thermals and wave as the major area for training and development. Some pilots are even critical of the apparent low skill level required to soar a hill. This in turn tends to discourage pilots from exploring this fascinating area.

The recent growth of interest in mountain flying has been fuelled by cheap transport and the opening up of Europe. Pilgrimages to the Alps, for instance, are commonplace. Perhaps we should now be paying more attention to training, and ensure pilots maximise their enjoyment safely.

What is hill soaring?

Before we attempt to develop our skills we should first understand the beast. We often hear about pundits roaring along a ridge low level at some breakneck speed – it may be good fun, but is certainly not ridge soaring. "Soaring" is to use the air efficiently and safely in order to support the sailplane; the purpose may be to buy time or to assist the sailplane across country.

Lift over hills comes in several forms: with traditional hill lift, anabatic flows and streaming thermals being the more common sources of energy. Wind-generated ridge lift is the most commonly encountered form of lift. The size and shape of the terrain and the orientation and strength of the wind all have a direct effect on the strength and position of the best lift and the value of the ground as a good lift generator.

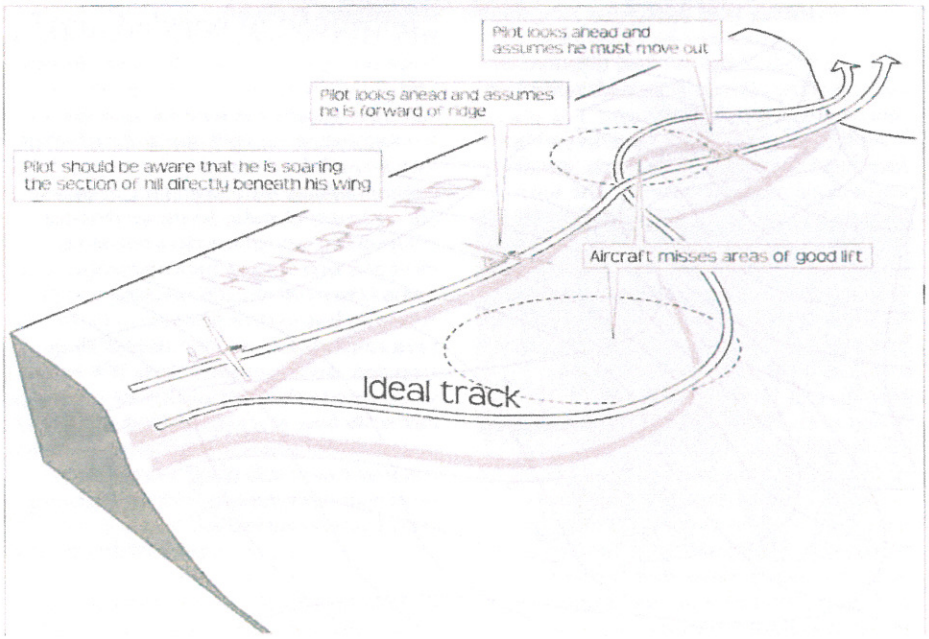
Below the crest

Subtle skills are required to soar ridges below the crest of the hill, and techniques described in this section should not be attempted without proper tuition from an experienced hill soaring instructor.

As well as the significant influence of the ridge's length, height and shape and the wind direction and strength on its value as a good lift generator, airflow below hilltops can be difficult to predict.

Habits, formed in earlier flying training, can cause significant problems and generally some unlearning is required:

1. Most cross-country pilots have an almost uncontrollable urge to reduce speed as the lift improves. This is a particularly dangerous practice when hill soaring below the tops.
2. Airspeed must never be allowed to get too low; a gust can cause the glider to stall at the most awkward of times. The natural horizon is not visible and the pilot must learn to use noise levels and control responsiveness as his guide; he must most definitely not chase the airspeed indicator.
3. Lookout procedures must change. Pilots can easily become fixated on the wingtip (often fairly close to the hill), and fail to look ahead to avoid the next rocky outcrop or oncoming glider.
4. Differences between heading and track can be quite disconcerting when close to a



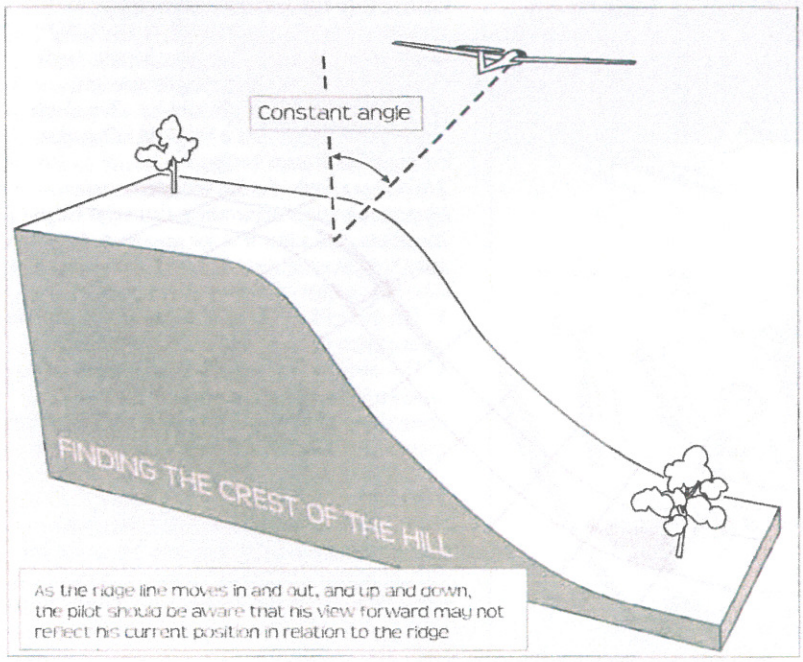
Opposite, top: the Black Mountains in the snow, seen from the gliding site at Talgarth, mid Wales (Robbie Robertson) and, opposite below: Figure 1 – where to find ridge lift; Above left: Paul Cooper took this high over Sutton Bank's wooded ridge – at the bottom of the shot – on a Staffordshire GC expedition when he got Gold height in wave; Above right: Brian Bateson took this photograph of Trueleigh Hill on the South Downs from Duo Discus 2UP – Brighton and the English Channel are visible in the distance; Below: Figure 2: be aware that your view forward may not reflect your current position in relation to the ridge line (all diagrams: Steve Longland)

hill. With the glider pointing away from the hill to correct for drift, the yaw string should be central.
5. Optical illusions can lead an inexperienced pilot into difficulty. A variometer indicating lift and the ground outside appearing to move upwards can cause the pilot to subconsciously pull back on the stick to correct the visual anomaly.
6. High closing speeds with the hill are common with the relatively high ground-speeds. Gliders typically approach a hill with a tailwind. The effect is not obvious until the glider is very close to the hill. Great care must be taken to avoid an inadvertent collision with an immovable object.
7. Selecting an appropriate airspeed is critical for both safety and soaring efficiency. Too slow is unacceptably dangerous, and too fast may mean you are due for a field landing. If you are in any doubt, it is always sensible to seek the advice of an expert. A carefully judged balance is required between optimising speed for soaring, and leaving a safe margin for gust-related stalls or lack of concentration on the part of the pilot.
8. Sufficient manoeuvring room must be allowed for the glider to move away instantly should he need to. The glider must always have a safe escape route.

Joining a hill below the top

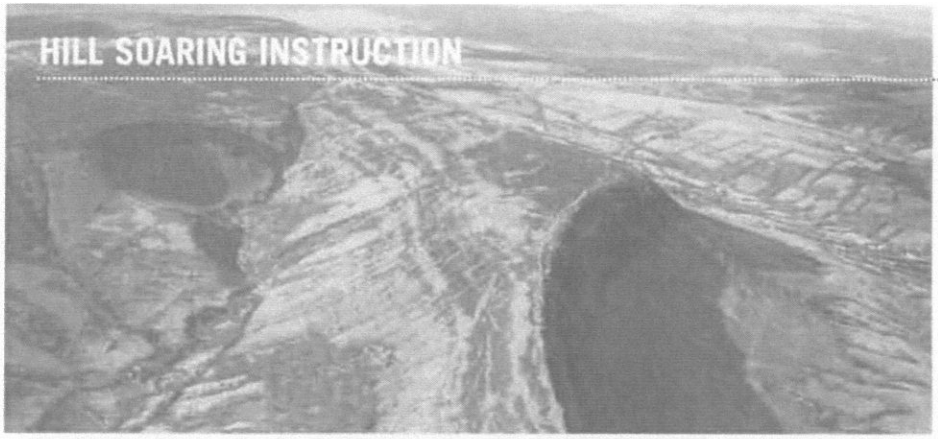
There are few things more satisfying than gliding towards your next hill and hearing the sound of the variometer as it confirms you have lift.
1. Keeping well clear of potential sink, approach the hill by the most expeditious route, normally 90° to the ridgeline. Keep a good lookout for other aircraft, assess the best route to avoid conflicting with them and continue to fly at best L/D.
2. Look out for potential landing sites, in case you arrive too low or the hill is simply not working.
3. Don't visually fixate on the hill: just as with thermals, another pilot may have exactly the same intentions as you. Continue to keep a good lookout.
4. At a reasonable distance (which can only really be shown by practical demonstration), increase speed and introduce a 45° turn – this allows you to judge your next turn more easily.
5. As the variometer indicates an improving situation, and before you get too close, progressively turn through a further 45° plus a wind correction angle, level the wings and follow the hill contour.

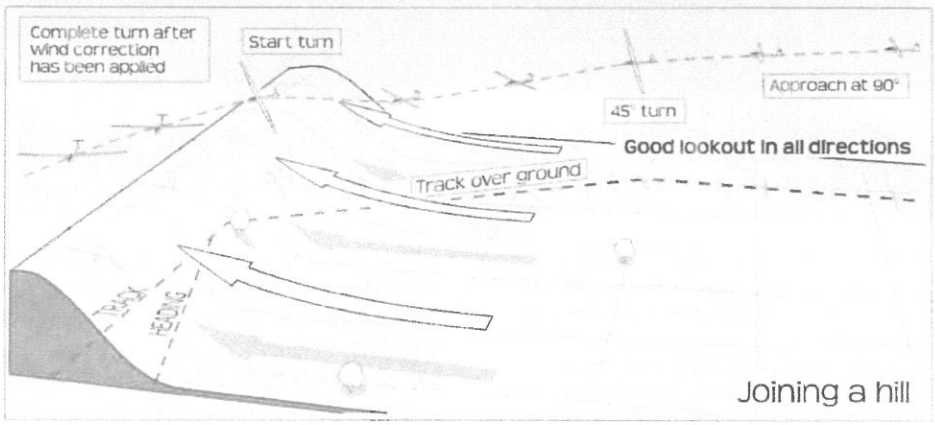
Speeds to fly should be higher than normal to start, to give you the opportunity to identify any potentially turbulent areas safely. Gullies, areas of marked change in hill direction, wind shears or wave rotors can have surprising effects on your own airspeed.

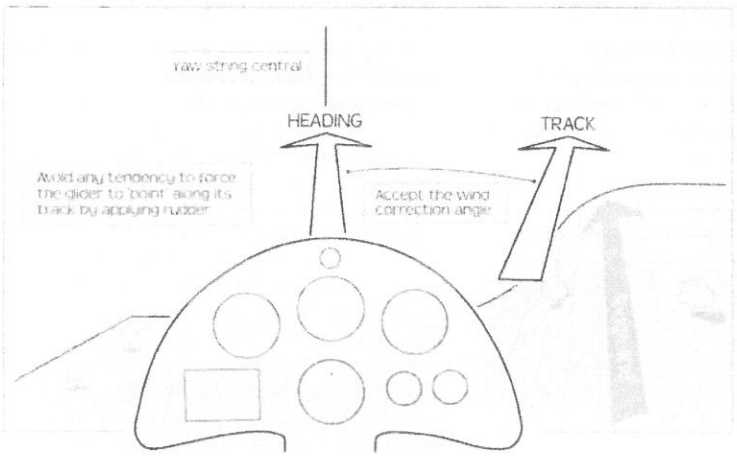


Climbing up below the top

1. Below the top, the best lift is normally, although not always, fairly close to the hill.
2. As you get nearer the crest, the lift should improve. Conversely, the lower you are, the weaker the lift will be, and at some point there will be insufficient to sustain you.
3. If you are in weak lift, at a high point along the ridge, try flying to a lower section. Air often leaks over these sections and provides stronger lift as a result.
4. As you climb, you will need to reposition yourself progressively in relation to the hill surface. Shallower slopes are a particular problem because gains in height quickly move you away from the hill.
5. You should allow for a drift angle, and accept the fact that your heading and track will be different. Try to keep the yaw string straight.
6. Maintain a very good lookout, and pay particular attention to blind corners. It is normally safer to move further away from the hill and improve the forward visibility. Don't forget that it is not only gliders soaring ridges. Meeting a slow moving paraglider can be quite disconcerting.





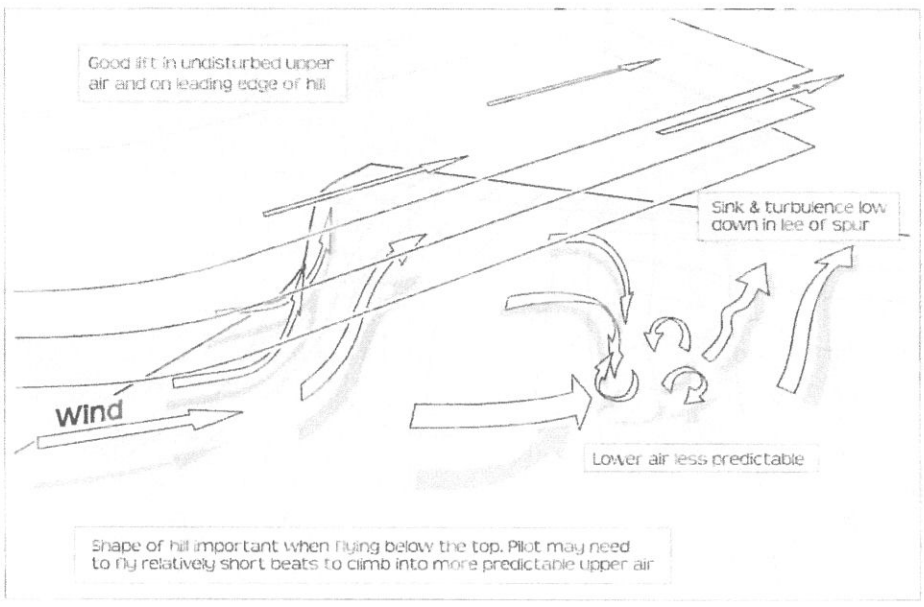


Top: footpaths can mark the ridge crest, as here at Cats Back near Hay Bluff, looking north-west to Hay on Wye – taken from ASW 20 464 (Robbie Robertson)

Above: Figure 3 – How to join a hill

Left: Figure 4 – correcting for drift

Below: Figure 5 – effects of terrain



7. Below the top it is quite common to find sink areas in the wind shadow sections. Pay particular attention to this, if the wind is not square on to the hill.
8. Do not attempt to slow down if you hit an area of stronger lift.
9. Judge gullies carefully – many can be too small to negotiate safely.
10. Never attempt thermalling below the top: drift will quickly get you dangerously close to the hill. S turns are a better method of using a thermal and are quite reasonable providing there are no other aircraft in your vicinity.

Locating lift above the top

Identifying the hill's crest can be difficult. Slopes are never as obvious from the air, where the flat top becomes a steeper incline is the crest. Sometimes these are marked by footpaths – where walkers get a good view.

As the line of the top of the hill wanders in and out as well as up and down, the pilot is continually repositioning the aircraft to stay in the best air. A good rule of thumb is to maintain a similar angle from the crest as the actual hill slope itself.

Any tendency of the aircraft to turn should be used to help the pilot fine-tune his position. Many pilots have developed a habit of chasing the yaw string with the rudder; this is actually counter-productive and can drive the aircraft away from the better air. The yaw string will deflect quite normally if the aircraft starts to roll even a small amount.

The roll is caused by a lift differential across the sailplane and should be corrected with both aileron and rudder, and the information then used to guide the pilot towards the best lift.

The pilot should be aware he is soaring the section of hill directly beneath his wing; if he uses the forward appearance, he may position himself poorly.

Climbing up (above the top)

1. Above the top, the best lift is normally forward of the ridge, and at a steady angle from the crest. The higher you are, the further into wind you should be. The slope angle of the ridge has a marked influence on your ideal positioning.
2. As you climb, the lift will get weaker. As your physical separation from the ridge increases, the safer it is for you to reduce airspeed. Reducing airspeed will allow you to take advantage of the weaker upper air.
3. The best lift is likely to be over the highest parts of the hill.
4. The airflow is normally much more reliable than lower down, and does not normally suffer from the wind shadow effects experienced below the top.

Turning

Particularly in weak conditions, accurate turning makes a big difference. Near the hill gliders must fly faster for safety reasons, unfortunately this can mean very large radius turns. Large radius turns often take you away from the useful lift.

1. Always look out before turning, look well ahead and be certain there is sufficient time to turn before any distant glider passes you (closing speeds of 150kt are not unknown), then check behind and ensure there is no conflict with following traffic. Below the top, following gliders may not be able to pass you on the hillside, there is simply not enough room, and a glider catching you up may be very poorly positioned in relation to your intended flight path.
2. As you turn, use a good bank angle and slow down. Removing any excess speed, but still maintaining a safe margin above the glider's stalling speed in a turn, will reduce the radius of your turn. Your speed will reach a minimum value when parallel to the hill and travelling in the opposite direction. You should still be in lift and reasonably close to the hill.
3. Increase speed again and roll the wings level by the time your flight path is 45° to the hill. Remember the glider will not roll quickly and you must allow sufficient time to get the wings level. If you got stage two correct, you will be reasonably close to the hill already.
4. As the glider approaches the correct position in relation to the hill, turn away from the hill and level the wings after the drift angle has been applied. The glider should now be pointing away from the hill and in the ridge lift.
5. Turning below the top requires accuracy and good co-ordination. The lack of natural horizon can make turning particularly challenging.

Hill soaring instruction

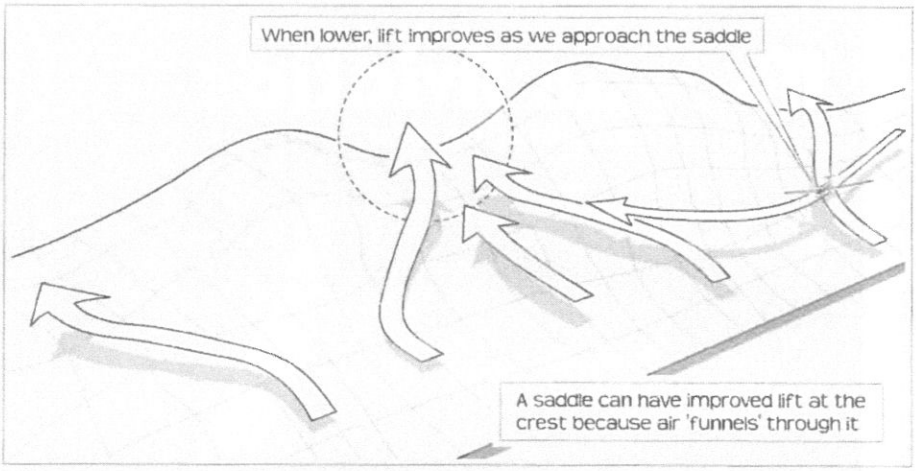
Hill soaring instruction should always start above the top. Developing the pupil's flying skills is normally necessary: most pilots will need to unlearn some training. This is much safer if well away from the hill to start with. Any tendencies to...

1. Fly by ASI;
2. Lead with the rudder in a turn;
3. Look down the wing in a turn;
4. Chase the yaw string;
5. Pull up in the lift;
6. Allow the nose to go down in the turn;
7. Mechanically pull back on the stick in the turn without reference to attitude and speed;
8. Fail to look out;
9. Slow down when approaching higher ground

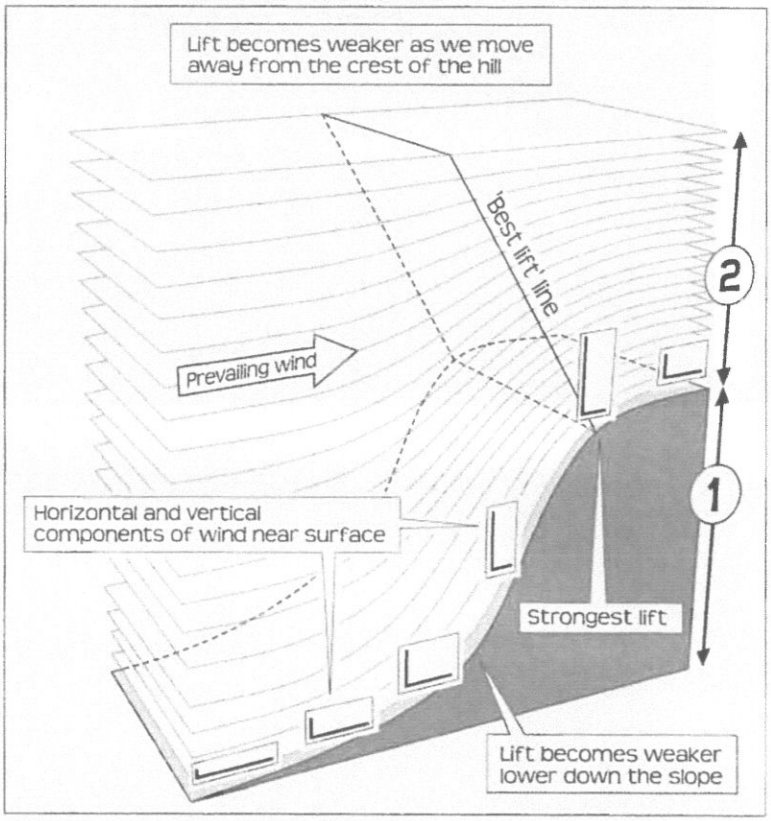
...can all be resolved BEFORE the "below the top" training begins.

Hill soaring is technically demanding and an excellent platform for pilot development. It is a useful way for pilots to not only remain current during the winter season, but it is probably the most technically demanding form of soaring today.

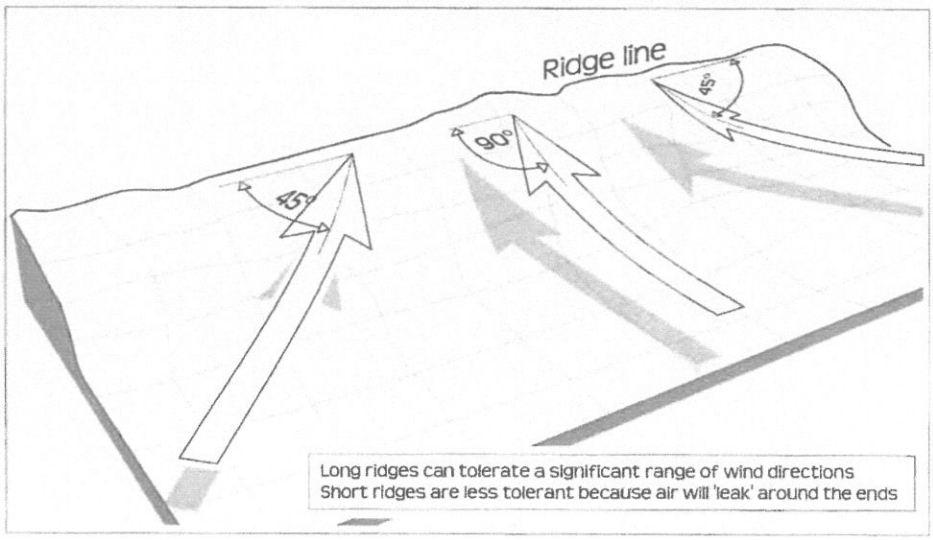
The biggest single challenge to hill soaring instructors is the improvement of the pupil's basic handling skills. After a few hours on the hill, most pilots see a new set of standards that they need to attain.



Above: Figure 6 – funnelling of air at a saddle



Right: Figure 7 – positioning to find best lift



Below: Figure 8 – how the ridge length and wind direction can interact

All diagrams: Steve Longland