HOW TO BE A BETTER PILOT

CFI Tim King continues his series aimed at the beginner paraglider pilot

NO 11: HOW TO AVOID THE ROUGH STUFF AND KEEP SAFE

It's vital to learn to recognise the flow of air, to aviod the turbulence that may lead to a collapse, PHOTO: PHIL DOWNIE

This month I'm taking a look at how to recognise and avoid turbulence. The very nature of our sport immerses us in an environment that is in a constant state of flux. For the sake of our enjoyment and safety, it's vital that we learn to recognise how the flow of air around us works and effects our flight experience. If turbulence is too great it can cause our wing to collapse, possibly with very bad consequences indeed!

Factors which create turbulence:

- **Wind over terrain and objects (mechanical)**
- **Strong or wind-blown thermals (thermic vertical shear)**
- **Wave (upper atmospheric or lower terrain, or mountain wave)**
- **Shear (airmass interference/friction).**

A good way to help budding pilots visualise how the air moves is to get them to imagine how water flows over surfaces, and apply this analogy to the air and the surrounding terrain. For example, a fast-running shallow stream or river will highlight eddies or areas of turbulence downstream of rocks. The water is behaving in a similar way to wind flowing over uneven terrain. Next time you are out on the hills, imagine water flowing over and around the terrain that you see, and imagine where it would form eddies, also constrict and accelerate or open out and slow down.

Whenever you arrive at a flying site you should begin to study the terrain in this context. Work out how the air is flowing over the immediate take-off area and see how this could effect you on launch. Imagine where you will be flying and what you are likely to encounter on the way, and study the various landing options (this could be back on top, on the slope or at the bottom - or indeed many km away in a completely different topographical region). It's all about recognising, firstly, if you should be flying in this area today, and secondly, where the safe sectors are and where to avoid.

Launch and top landing

Remember, the stronger the wind the stronger the venturi effect and the greater the turbulence. Have a look at the available take-off options. What's just in front over the edge of the ridge? Is it smooth, or is it overhanging a rocky thermal trigger or rotor-inducing trees? If you have the option, launch where these obstacles wont be upwind of you. If it's windy, can you go forwards slightly to lessen the venturi effect? What's over the back - spine-back or flat fields? Always stack as much as you can in your favour, leaving nothing to chance. Don't struggle and take risks when you can analyse the area and position yourself in the safest place.

The ridge

Is the wind more than 30 degrees off the slope? This will give any spurs or outcrops a large lee-side (downwind) area that will cause rotor or, at best, sink. Give these areas a wide berth and head for the next section that is facing the wind. Are there any large gaps in the ridge that the wind will accelerate through? If you are not sure how windy this area is, proceed to cross the gap well upwind and check your groundspeed. If it's not too strong you can feed yourself back towards the ridge on the other side of the gap.

Bottom landing

Consider the effects from any obstacles up wind of your landing zone. The stronger the wind the further back and the more severe the rotor will be. You will have been made very aware of this in your CP course, but it continues to catch pilots out. Think water flow and eddies!

Check out the surface to determine if could be a thermal generator, possibly pumping out rowdy air at low level. Areas of tarmac, tin-roofed buildings or dusty dark fields, for example. If you have no choice, prepare yourself by flying actively, concentrate, keep it all together and have your legs ready for landing.

Wind shear

This can exist at any altitude, caused by two airmasses conflicting in direction or speed, or both. A common example exists above Alpine valleys. Whilst thermalling high among the summits you are well above the valley wind (air flowing up the valleys at thermic times of the day to replace the lifting air higher up in the mountains). When you descend into the valleys you will encounter a layer of mixing air where the top of the strong valley wind meets stiller air above, often a region of turbulence several hundred feet deep.

Wind shear can also exist nearer the ground where wind gradients and topographical features add to the mix. It can also be present at higher altitudes, for example if you have climbed to the top of an inversion layer and then broken through into the upper-level wind.

Thermals

While strong thermals on good days present us with good and reliable climbs, an element of thermic turbulence will also be present. This is the result of air being rapidly displaced as the thermal rises, with areas of vertical shear created in its wake and at its edges. Add a hearty 15 - 25km/h wind and the thermal can become torn, shredded and elongated, giving rise to rowdy air. Again, imagine water - but here the air behaves as if it's boiling, or like a vast lava lamp. If we could actually see the air moving about us it would look far too intimidating to fly in!

On days like this you can often see turbulence around the clouds PHOTO: ANDREW MCLOUGHLIN

On windy days you can often see low clouds rolling in the rotor, or higher cumulus clouds being rolled and torn. On the next windy, unstable day, look for the smoother leading edge of the cloud and the hooking or curling lee-side – turbulence in motion for you to see.

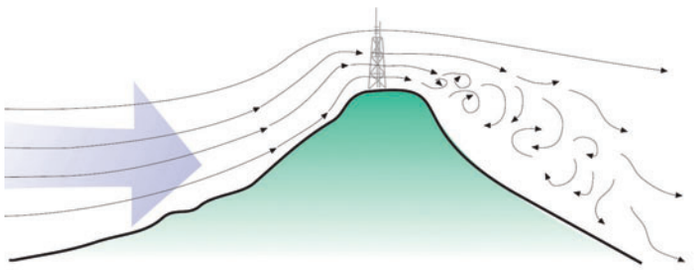
The lee side

Finally, I had better mention lee-side thermals. Basically, if an area on the lee (downwind) side of a ridge or mountain is producing strong, reliable anabatic flow or a constant supply of thermals, as long as this flow dominates the prevailing wind coming over the top of the mountain, we can be flying in the lee yet in a rotor-free environment.

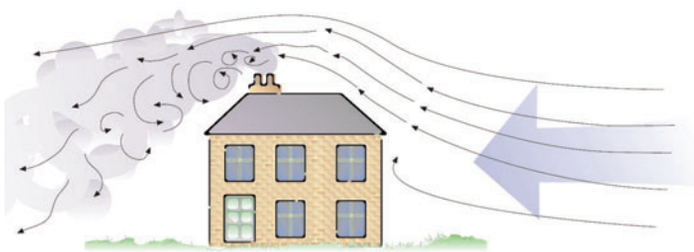
This is however a fragile model. If the thermals shut down or the wind increases, our little haven can turn into a hell-hole. And if your climb-out takes you high enough to clear the top of the mountain, expect some shear where your thermal encounters the prevailing wind.

There are some popular flying sights that are flown purely lee-side; for example many island sites in the Canaries. Local knowledge is a must on any lee-side site - any slight change in conditions can have dramatic effects.

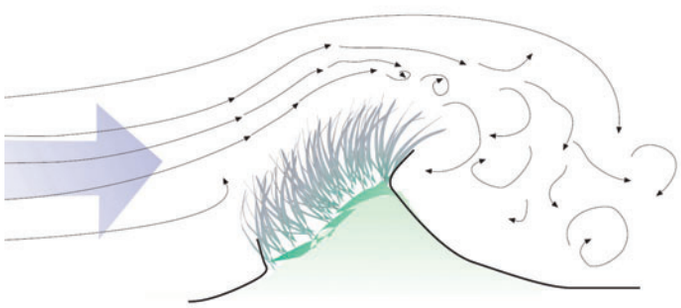
So, broaden your knowledge and understanding of how the wind and air works, and practice visualising the airflow. You'll be able to avoid some of the horrors that exist out there... and exploit the beneficial fun bits!



Turbulence behind hills and mountains



Turbulence behind man-made structures



Turbulence behind natural ground features

Tim King is CFI of Sky Paragliding (www.skyparagliding.co.uk). An earlier version of this series of articles appeared in Skywings between October 2003 and June 2005. The present series has been substantially revised and updated.