Lee – flyable or not?

The road to heaven is paved with good intentions; and one of these is to not fly in lee. However, if we don't find any lift on the windward side, maybe we'll get lucky over on the leeward side?

To do this in relative safety we must understand that lee isn't just lee. Illustration 3.22 depicts a lee situation on a stable day. It could be an autumn day in the north Alps, with high pressure and a strong inversion. The temperature hardly decreases with altitude, in this example only about 1 degree per 1000m, or a temperature gradient (see chapter 9) of 0,1°C/100m.

If the wind is on the face of the mountain it may still be soarable, and the airmass being pushed up over the mountain will still cool down dry-adiabatically, i.e. with 1 degree/100m (3°/1000ft). Once the air mass reaches the top, parts of it will be a 9°C colder than the surrounding air, and very much heavier. On the lee side of the mountain the cold, dense air rushes violently back down, causing extreme turbulence on its way. Flying here is not an option, even for pro's.

To illustrate the violence of such a leeside air movement we only need to consider that thermals begin to rise by temperature differences of as little as 2°C – a thermal stemming from a temperature difference of 9°C would be very extreme indeed, probably showing climb rates well beyond 20m/s.

Illustration 3.23
The same mountain, now surrounded by extremely unstable air where the temperature decreases dramatically with altitude. Again, air is being pushed up over the mountain by the wind and getting chilled dry-adiabatically – but this time the temperature decrease just matches that of the surrounding air since the surrounding air is 11 degrees at ridge level, and the rising airmass has been cooled down to 10 degrees on its way up. It will still sink back down on the lee side, but with the low difference in temperature the movement will be much more benign. Anyone flying into this lee still needs to fly actively, but it is fully feasible and survivable, as opposed to the previous situation.

Both illustrations assume weak winds and are consciously drawn more extreme than reality would normally be, but the example serves the purpose of explaining the differences between lee flying on stable and unstable days.

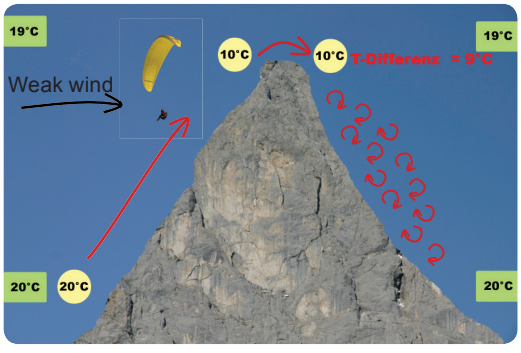

Illustration 3.22 Stable conditions, the temperatures in the valley and around the peaks are almost equal. The airmass being pushed over the ridge by the wind is adiabatically chilled to a temperature well lower than the surrounding air. On the lee side the superchilled, dense air rushes down very violently.

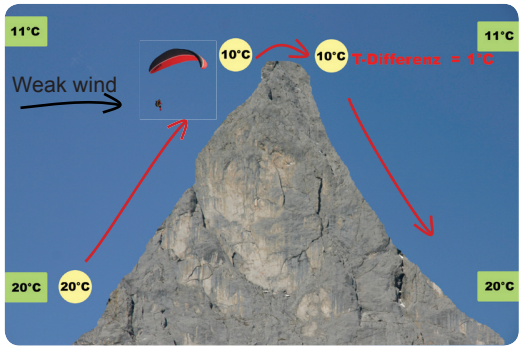

Illustration 3.23 Same mountain, now in unstable conditions. The airmass being pushed over the mountain decreases 1 °C/100m in temperature just as it did in the previous example, but this time the surrounding air is cooling down almost as much with the increasing altitude. The turbulence on the lee side remains within flyable limits.