Understanding the Alps

Not a classic foehn effect as the air was too dry, but you can see the cloud evaporating on the high peak right of shot. PHOTO: KELLY FARINA

Kelly Farina continues his new series to help you get the best from Alpine flying

Part 3: Should we fear the Foehn?

I've been living in the Alps since 1995, and one question that is often asked by our clients flying here is, "What is the Foehn?" [It's spelt Föhn by the Germans, who also use the word to desCribe a hairdryer!] In my early years of flying I read the excellent *Touching Cloudbase* but it only glances at this phenomenon. Over the past years I've experienced the Foehn from the air and, more safely, from the ground. So I thought I'd pen a short article about it, hoping that pilots outside the Alps will learn a little about how to keep themselves safer in the mountains.

Several times I've landed early due to an expected Foehn, to see pilots hacking themselves off the hill with little knowledge of what's in store for them if this wind suddenly breaks through. A lot of it is "monkey see, monkey do." They've just seen someone land so it must be safe to fly. Little do they know that in 30 minutes a sedate glide may turn into a full SIV programme with the pilot becoming a passive spectator.

The Foehn is generated when there is an airflow perpendicular to a mountain range, in our case the Alps. Usually the classic pattern of weather over the Northern Alps goes like this: after a cold front passes through the airmass becomes unstable. A high pressure with dry air moves in, cloudbase rises, thermals are good and the wind is light and usually from the north or north-west in the beginning, slowly backing. As the high moves east across the Alps the wind slowly moves to a westerly direction.

Conditions around this time are still good, but could become more stable as the warmer air comes from the south-west, slowing the thermals down. With the next low over the north-west of Europe, a southerly stream will reach the Alps after it has crossed the Mediterranean and gained a lot of humidity. Once the wind switches to south it generally gets stronger with the approaching low. A dry, warm turbulent wind blows on the north side of the Alps - Foehn storms can easily exceed 130km/h. Definitely unflyable!

Sometimes this wind is just a laminar south wind and is soarable if not too strong, but usually the air is unstable and thermals help slow the wind down. With an unstable airmass the wind is allowed to go over the main ridge of the Alps - the Alpine Divide - unhindered. However if the air is too stable after the high pressure there could be inversions at the higher levels.

In this case the wind is constricted and accelerated over the Alpine Divide, around 3 - 4,000m up. As it tumbles it creates a massive rotor which can extend for 20 - 30km. Even more dangerous, the lower inversions may break and allow this rotor to run through the valleys. The wind then rotors again as the terrain changes direction. This wind will normally persist until a front arrives, restoring a more equal pressure on the north and south side of the Alps. Cloudbase will drop and the wind in the valleys will change to a strong, damp gust front. After the front passes through a high will usually begin to build again.

The same happens on the south side of the Alps when the north wind is strong from a low to the north. The northern Alps can be damp with a low base, while in the south the north wind howls over the mountains and makes for very turbulent flying.

The Foehn is a warm wind due to most of its moisture having been being deposited on the windward side of the Alpine Divide as rain. As it is forced to rise the moist air cools at the Saturated Adiabatic Rate of around 1.4 degrees C per thousand feet. The moisture becomes precipitation over the windward slopes and high mountains, and when the air descends on the lee side of the mountains its temperature increases at the Dry Adiabatic Lapse Rate of 3 degrees C per thousand feet.

Thus the air on the windward and leeward sides of the Divide can be at markedly different temperatures at the same level. At 1,000m on the south side the temperature can be 21 degrees while at the same altitude on the north side it's around 27 degrees. It reachers the plains as a very dry, very warm and very strong wind - the Foehn.

The Foehn is not good news in the winter either. This warm, dry airflow eats snow like you wouldn't believe due to its temperature and ability to absorb moisture like a dry sponge. Native Americans used to called similar winds from the mountains the Chinook or snow eater.

So what does the Foehn mean for paraglider and hang glider pilots? The worrying thing about the Foehn it that it's not just the wind strength that is the problem. Long ago, when I was young and foolish, I used to think, "If it goes over 30km/h that's fine - my glider goes 50km/h. With speed bar and ears and I'll go forward no problem." Experience has shown me otherwise.

The air in the Foehn is not a laminar flow, as is normal in the Alps, but a gusty, twisting rotor that can produce serious sink, lift and extreme turbulence. It's a little like flying in out-of-phase wave, only the mountains which are starting this wave are over 3,000m high. It feels like you are always flying in the lee, which of course you are. It's almost impossible to accelerate the wing in these conditions (in fact without extensive use of the brakes the glider probably won't stay open long).

The saving grace of the Foehn is that it's mostly short-lived and relatively easy for the forecasters to predict. We have several ways of telling if the Foehn is "in the post" thanks to mountain stations and nearby lakes.

A final word. The Foehn can break through very quickly. A pressure difference of just 4 - 5 millibars (or Hectopascals - hPa) between the north and the south sides of the Alps is enough if the other conditions are in place to produce the squeeze and rotor. Sometimes the wind can even be felt in the valley before it is felt on launch, or between two inversions lower down. These are not ideal situations. Even a slight shift in the wind direction at high level, or the arrival of a nearby front, can produce massive rotor in the valleys. So if there is Foehn in the forecast, please be careful. If in doubt, don't fly. It's just not worth it.

A short video I made explaining the foehn is at www.youtube.com/watch?v=d_287Kf-GKc.

Kelly Farina has lived in the Alps for 12 years and has over 1600 hours of flying experience, mostly Alpine. Pilots wishing to learn to fly confidently in the Alps can contact him through his website at www.austrianarena.com.