

Exploiting Opposing airmasses

In the third article of his series about soaring in the mountains, Gavin Wills offers advice on using lift that can materialise when all else fails

IT WAS late afternoon and we were going for gold. Preparing for the 90km final glide home to Omarama, we milked the last lazy thermals off the hot rocks at Tin Hut Creek. Ahead the eastern sea breeze had already crossed the Mackenzie Basin. Out on track the air would be calm and stable. To make the winner's podium we would need all the height we could get.

But we wanted more than the thermals had to give and so, with Jeff muttering expletives, I set off on the long glide home. We were well below glide slope.

"How can you be so confident?" he asked.

"Convergences," I said, "we'll find a convergence."

Like the Eskimo who has 42 words for snow the glider pilot needs a dozen different names to describe convergences. In mountain regions, especially, there are more examples of convergences and associated subtleties than in any other soaring environment.

We recognise convergences as the meeting place of different airmasses. These airmasses may differ in any or all of the variables like temperature, stability, and moisture content and/or wind velocity. Convergence zones may be synoptic in scale and include all the frontal systems that characterise our weather patterns. Or they may be small and local as when a breeze meets itself upon flowing around a hill.

The classic mesoscale convergence so characteristic of island nations is the sea breeze front. But its close relatives can move unnoticed across entire continents and interact with mountain ranges along the way.

Consider first the sea breeze moving into a mountainous area. Figure 1 (next page, top left) illustrates how inland heating can draw a tongue of stable sea air many kilometres into the mountains and far ahead of the main sea breeze convergence.

This sea air is cool and dense and flows like water into the valleys and around obstacles. It slowly fills the inter-mountain

How could Gavin be sure he would make it home? Ripples on Lake Pukaki (in the top left of the picture, right) indicated a 15kt easterly, but on track by Mt Benmore another pond was calm, revealing a convergence zone that always forms in that wind direction

British pilot Luke Roberts took this photo on another day, soaring Southlands GC's Hornet from Omarama



basins with stable air. At the tip of the tongue the cool air acts as a trigger and induces a frenzy of thermal activity. Further back, the tongue wedges up the warmer air mass and prolongs activity in clouds already cut off from their heat sources.

The canny glider pilot will map the progress of this low level tongue knowing that behind it the thermals are dying and the clouds are slowly shutting down.

Imagine this tongue of cool air a few

'Given similar winds, convergence thermals usually occur in much the same place. On a blue day, this is worth remembering'

hundred feet thick flowing all the way around a mountain massif and colliding with itself on the leeward side. The two airmasses are essentially the same except for the nearly opposite directions of arrival. At their meeting place the air on the ground is calm. This encourages heating and the formation of convergence thermals - see Figure 2 (opposite, top right). These thermals bubble

like sparkling water, at first triggered but then shut down by the opposing airmasses.

In convergence thermals it pays to search for your own bubbles of lift. Other gliders may mark the convergence zone but each is likely to be climbing in its own discrete bubble. When clouds are present they will mark the convergence zone. But because the clouds are formed by small fast-cycling thermals they, too, will come and go.

When the prevailing wind approaches a large range of mountains, such as the San Juan Mountains of Colorado, the flow becomes complex (see Figure 3, next page). The wind not only flows over the mountains and is funnelled by favourably-orientated valleys but it flows around the block of mountains as well. Thus multiple meeting places are created for the mighty mountain winds.

In the mountains convergence thermals may form anywhere opposing winds create calm on the valley floor. Likewise, the airflow around the mountain massif may converge with the valley winds and form strong - often well-marked - thermals. Given similar prevailing winds each day, convergence thermals usually occur in much

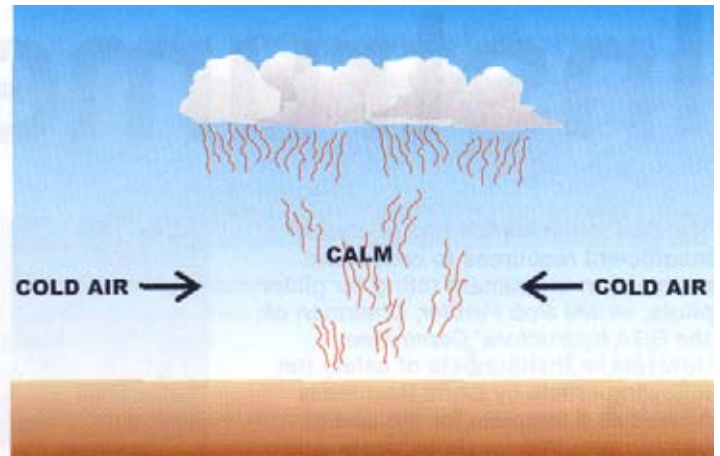
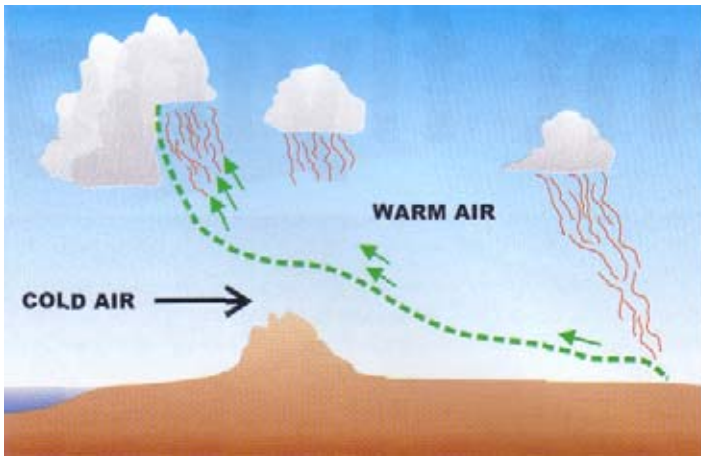


Figure 1: sea breeze front with a tongue of cold air protruding ahead. The canny pilot will map the progress of this tongue, knowing that behind it thermals are dying

Figure 2: when similar airmasses collide, at their meeting place the air on the ground is calm. This encourages heating and the formation of convergence thermals

the same locations. On a blue, cloudless day this is worth remembering.

Converging mountain winds shear and create eddy lines as if in a river. These eddy lines often contain convergence thermals and may form bands of lift in otherwise unfriendly air.

In continental landmasses, mountain areas greet the sun and generally heat up before the cooler inter-mountain basins. This causes breezes similar to the sea breeze effect to be drawn into the mountain valleys as an anabatic flow.

The main difference between this and the sea breeze is that the sea breeze has a never-ending flow of lifeless air from the ocean while the continental anabatic flow heats with the day and often becomes unstable itself. Both the anabatic and the evening katabatic flows will create convergences in mountain areas at opposite ends of the soaring day.

One of the most spectacular convergences known is the giant north-south line lying west of the Rocky Mountains that divides the moist eastern air of the continental United States from the dryer western air.

This line is perhaps the clashing of the remnants of two sea breeze fronts and may be traced south into Central America where Caribbean air meets Pacific Ocean air in one of the most active (and wettest) convergences in the world.

Mountain convergences can be recognised by stepped clouds, a single line of cloud whiskers or cumulus, by unusual changes in wind direction on the ground, lines of haze or dust rising across a valley or even by changes in the colour of the air. Sometimes when the light is just right one can see the denser air flowing like water into the inter-mountain valleys.

When clouds are present, convergences are often marked by stronger or even hyperactive clouds with stepped bases and cloud tendrils. Remember to stay under the higher bases on the warmer side of the convergence, beside the rising cloud tendrils and out in front of any low-level cloud that may form beneath you.

"So where's this bloody convergence then?" pipes up Jeff from the back of the Duo Discus.

The homeward glide has been ominously blue and smooth and we are now only 1,200ft above the ground. The sea breeze has swept across the Mackenzie Basin, shutting down the thermals and greatly

'There is a convergence about 10km ahead, I announce as nonchalantly as possible. You'd better be right, mutters Jeff'

reducing our chances of getting home at all, let alone winning anything.

I scan the lakes and ponds for tell-tale wind signs. Beneath us, Lake Pukaki shows a 15-knot easterly. Suddenly, ahead near Mt

Benmore I spy what I am looking for - a pond with no wind. I alter course. "There's a convergence about 10km ahead," I announce as nonchalantly as possible.

"Damn, you'd better be right!" mutters Jeff. Six hundred feet above the ground, 15km from home and just past the calm pond we meet the wind coming around Mount Benmore from the other side and the air begins to bubble. We pull up into 3kt of smooth lift, gain a thousand feet and head for the finish line.

"How in the Hell did you know that was there?" blurted Jeff

I didn't like to say it, but it always happens there when the easterly blows! Once again the great glide of the Duo Discus and a subtle convergence had given us the winning edge...

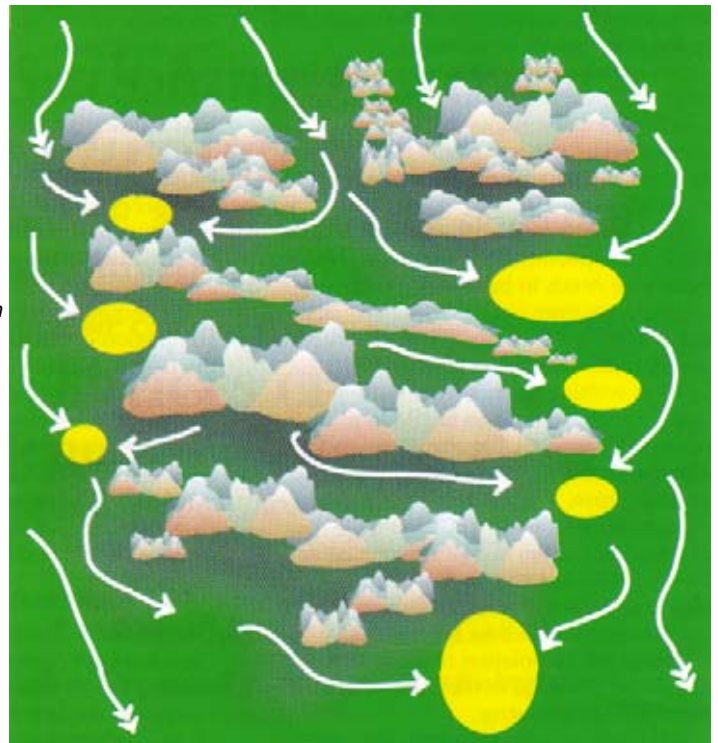
Details of Gavin's mountain soaring school can be found at www.GlideOmarama.com

Figure 3: Mountain convergences created by the prevailing westerly winds flowing around the San Juan Mountains and through some valleys

When the prevailing wind approaches a large range of mountains such as these, in Colorado, the flow becomes complex

The wind not only flows over the mountains and is funnelled by favourably orientated valleys but it flows around the block of mountains as well. Thus multiple meeting places are created for the mighty mountain winds

Diagrams: Jon Hall, HRA



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