

# Fly safely, have fun

**Flying safely in the mountains is a choice and the choice is yours, says Jacques Noel. His article, outlining ten areas for the aspiring mountain pilot to note, begins S&G's series on Alpine soaring**

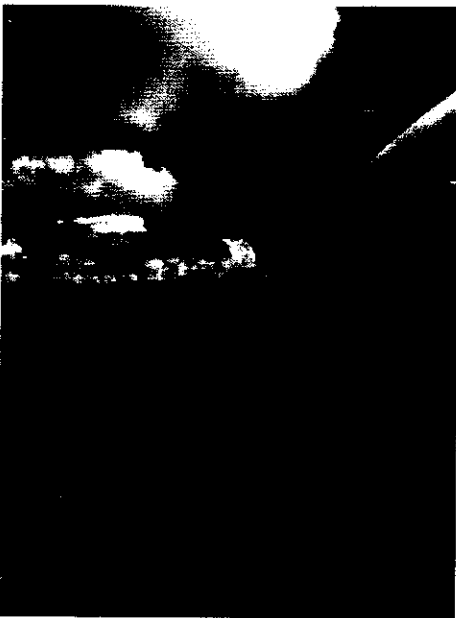
**T**HE STATISTICS leave no room for doubt; mountain flying is a risky business. Between 1989 and 1993, seven per cent of French gliding accidents happened in the mountains. However, they resulted in half of all fatalities at French sites in that period. Such numbers inevitably raise the question of whether it is possible to fly safely and carefully in the mountains. The answer to this question is a definite yes. With the right mental attitude and the proper skills, flying in the mountains can be one of the most thrilling, beautiful and altogether satisfying experiences that a glider pilot has in his or her entire "career". The largest risk is not inherent in mountain flying itself, but in the experience, skill and mental attitude the pilot brings along during the flight.

In this article I will deal with the technical and psychological aspects of mountain flying, under ten convenient headings, and I will emphasise the importance of proper management of mental stress factors.

## 1. Overall considerations

### Airmanship

Good airmanship, especially in mountain flying, consists of the ability to control and manage a complex process. This is no easy task: the process of flight is dynamic; the



Photographed by Jacques Noel on his courses are John Gibson (above) and Afandi Darlington (opposite)

circumstances can be influenced dramatically by weather changes; many tasks need to be conducted simultaneously and the flight itself suffers many changes and interruptions.

This complexity can be managed by simplifying the tasks of the pilot by means of good pre-flight preparation. Potential changes to the flight plan must be identified in advance and the alternatives that become available at these moments have to be evaluated and memorised. It is useful to make schedules in which alternatives and their implications are described in detail.

### Cross-country and mountain flying

Flying above the mountains is merely cross-country flying with a different view. Mountain flying is flying *in* the mountains. Many "northern" visitors to the Southern Alps believe they are mountain pilots because they've flown, in wave or thermals, high above the ridges. Beautiful as these flights may be, they do not prepare you for what lies at – or below – ridge level.

Often, cross-country pilots have flown over mountainous areas for many years without ever having experienced true mountain flying. Their philosophy is that safety can be guaranteed by flying high above the ridges. Unfortunately, this is not enough to guarantee safety, especially when you don't know the challenges and problems that lie in wait below. You really have to learn about the mountains, for they are just like a wild animal, you have to stroke their fur in the right direction. The challenge lies in knowing the right direction.

Notwithstanding this, many pilots start a flight in the mountains without realising that sinking to or below ridge level is a common occurrence. They do not know if they are within gliding distance of a landable field, nor how to go about landing there. In many instances they do not even know where these are or even that they exist at all... However, experience shows that even good pilots find themselves below ridge level frequently, even on good days.

So a flight in the mountains should never be undertaken without the pilot being fully competent in low-level ridge flying, finding and using lift at low altitudes and possessing a good general understanding and level of mountain flying skills.

Above all, if you come to the mountains from flatland flying you should realise that lift tends to be concentrated and directed by the mountain peaks and crests and that the

valley floors themselves are usually not a good thermal source.

So effective cross-country flights are best made by the more circuitous indirect path of following mountain ridges around towards your objective rather than the straight or near-straight line between points more normal in flatland flying. Even when you are seen passing over valleys, pilots should still understand that the ridges are the best areas for finding strong and reliable lift.

### A major difference

Mountain flying is different from flat-country flying because of the peculiarities caused by the topography of the ridges.

Above the mountains you have all the advantages of normal cross-country flying plus the advantages that the mountains offer, like ridge lift at known locations, or wave. When you descend to or below ridge level the situation changes drastically. The ground seems to come closer rapidly, a well-defined horizon is no longer available, your view of the outside world shrinks, the lift becomes irregular and sometimes broken and so your level of psychological ease and comfort declines – sometimes dramatically. On a meteorological level, phenomena become clearer, stronger and easier to recognise. But sometimes, in periods of transition, they can be much more complicated.

### Rapid developments

In normal cross-country flying, when the weather deteriorates, a pilot loses altitude gradually, giving him time to adjust his techniques and allowing him to make good decisions. In the mountains it is possible to move from a comfortable situation to a difficult situation to a critical situation in a matter of moments. Even an experienced pilot may, by no fault of his own, find himself confronted with a difficult situation. This can have many causes: cloud cover, light wind, navigational problems, and so on. In such cases, weaknesses in flying skills become obvious immediately. It is here that every pilot encounters his personal incompetence level. Incompetence often leads to accidents. Accidents therefore are not an act of fate; they are the result of a sudden confrontation between a pilot and a situation that he, due to lack of planning or experience, is unable to cope with.

### Stress

Stress and panic: impossible to measure, difficult to recognise and even harder to counter. The level of stress is inversely proportional to the competence, training and experience – in short, the actual level of skill – that the pilot possesses. When a pilot

➤ is in a state of panic, he is prepared to cling on to anything: the advice of a colleague hundreds or thousands of feet above him, a GPS read-out, or a vague green spot beneath him. Sometimes, pilots forget the registration of their aircraft or the names of mountains around them; some even forget their own names. Strong sink and turbulence can render a pilot a psychological wreck in a matter of minutes. Delay, the setting sun or the development of a cirrus layer cut-off can also do their bit in this respect.

Some pilots believe that a healthy instinct for self-preservation and the possession of a sailplane with an L/D of 50:1 or greater, or a turbo engine, will make up for their weaknesses as a pilot. Nothing is less true. Technology may, in some cases, prevent problems but it introduces many more – like, for example, over-confidence, a false sense of security and unwarranted faith in two-stroke engines. It is not your glider's engine or L/D that gets you out of trouble, but only your knowledge, experience, preparation and capacity to anticipate.

## Changing horizons

**WHEN circling close to or approaching a ridge, writes John Hoskins, beware of the changing apparent horizon: it is above you when facing the ridge and below you when facing away. (You cannot see your true horizon to judge your airspeed). This change creates a tendency to raise the nose/lose airspeed on approaching the slope and lower the nose/gain speed when flying away. The first of these is more dangerous: you are likely to be going downwind with the slope getting closer. Downwind means groundspeed must be higher than airspeed, but this gives the impression of flying too fast. Equally, as the ground gets closer "ground rush" makes you feel you are accelerating. CHECK your airspeed to ensure you are not misled by these impressions. Speed variations from up-slope to down-slope can be very easily detected when circling some distance from a long slope. If you are constantly having to stretch the circle in the direction of the up-slope to stay in lift, check that you are not losing speed when facing up-slope, gaining it when facing down-slope and so moving the circle away from the thermal. Couple this speed change approaching the ridge with a circle too close and you are in serious trouble. The wind against the slope will shift your circle. A 15kt wind moves the air mass you are flying in some 500ft towards the rocks in the time it takes you to do a Rate 6 360° turn of 840ft radius at 48kt. In any wind above 5-10kt watch out and compensate for this drift. Remember stalling speed goes up with increased angle of bank and a low-g, steepening, panic-induced turn with an already low airspeed is asking for trouble. Fly wisely, fly safely and live to enjoy the mountains.**

## Situational awareness

A concept becoming increasingly used in aviation is that of "situational awareness". This can be broadly described as the pilot's ability at any one time to simultaneously be aware of, and to include in his short-term and long-term decision-making, all the relevant external and internal factors, such as the immediate and forecast weather, the terrain through and towards which he is flying, and so on.

A pilot who can maintain good situational awareness will be able to make sounder and more rational judgements and decisions than one who "loses the plot" and fixates on one particular feature or item. A pilot's ability to lower his (or her) immediate workload by persuading or forcing himself to relax will free up his attention span to enable him to consider all of the factors necessary for his survival or avoidance of an outlanding.

In this regard, the ability to "park" (that is to maintain height in an unflustered, relaxed manner in some suitable source of zero sink or minor lift source) will give the pilot time to reconsider his situation and to decide upon the best plan of action to continue with or to abandon the flight. Fortunately, in the Alps, such areas of minor lift are quite frequent, often well below the tops of the ridges. If a pilot learns to fly "comfortably" close to the slopes in such conditions he is well on the way to becoming a successful "mountain pilot".

## 2. In practice

The mountain flight begins when we launch. The tug will bring the glider close in to exploit possible ridge lift. Turbulence may make the tow uncomfortable.

### The golden rule

There is one golden rule in the mountain: when flying to a ridge, you must, as an absolute minimum, do all that you can to arrive above it:

- It's more comfortable;
- You have a 360° view – in other words, you have all other mountains, escape routes, landable areas and airfields in sight;
- You can circle in the convergence of all available lift from both sides of the ridge and hence, even when soaring conditions are weak, you can climb. Lower down the ridge this may not be possible.

### Practice makes perfect

As mentioned earlier, the level of pilot stress is inversely proportionate to training, experience, preparation and alertness. In a practical sense, stress is countered by:

1. Mental arithmetic: base your calculations on an L/D of 20:1 for normal two-seaters and 15-metre sailplanes and an L/D of 30:1 for Open Class gliders – irrespective of the claims of your aircraft's manufacturer. Use this L/D to calculate which fields you can reach given your actual position, altitude, wind direction and strength. Do not rely on a final glide computer or GPS but use your brain instead.

2. Be aware of the fact that you may be obliged to follow the ridge, thus making your flightpath much longer.

3. It is important to realise that in the high Alps the L/D of your glider is usually greater than the slope of the valley. This means that you never have to land high in the mountains. There is always a way out, even if you feel trapped. Just follow the ridge or slope downwards all the time seeking to regain or retain altitude (when possible) on the one hand and searching the vicinity of an official outlanding field, on the other. For example: if you are struggling at 2,200m (7,220ft) in the mountains you can glide at least 25-30km towards the Durance Valley, during which time you would be unlucky not to pick up some lift.

4. Building on your experience: the more (recent) experience you have, the lower the level of stress. Practise maintaining height in unhurried slope soaring at or below ridge level as a good confidence-builder.

5. Training: carefully practising the situations that occur during mountain flight gives the serious pilot the tools to enjoy the flight as well as to survive it.

The three most useful exercises are:

- Finding lift low on the slope, climbing in figure-of-eight turns and transiting to full circles only when ample space is available. In order to do this, it is essential to make an exact fix of where the lift is found, to fly at that exact spot in order to use the lift and to take an altimeter reading and to monitor whether you are actually gaining altitude. The French call this "planter le piolet" (planting the ice axe). Note that areas of lift are usually small and narrow, especially at low altitudes.

- Getting accustomed to the changes in aspect and appearance of the faces of the mountain – especially when flying towards a ridge to find lift (see also box, left).

- Planning the route to the next mountain: calculating the height you need and deciding on your path. It is very important to establish different fallback positions and to know the possible outlanding fields and to know, off by heart, their altitude.

*NB: Remember always to set and fly on a QNH altimeter setting for reasons of both oxygen and terrain.*

## 3. Ridge soaring

### Wind

In ridge soaring it is essential to follow the right trajectory over, or next to, the slope. In order to do this we need to understand what the wind is doing. Gradient wind at altitude is different from the valley wind. These two winds can work against each other, but also amplify one another. The valley wind changes with different weather conditions and times of day. An important measure is the balance of wind strength: 15kt is a reasonable minimum wind strength for most ridge soaring and we need to know whether the local wind is less than, equal to or greater than this speed.

## Speed

One of the principal – and potentially and factually lethal – hazards of mountain soaring is the risk of encountering high vertical gust velocities, both positive and, even more dangerously, negative, when flying close to the mountain face.

Unless you are flying with a sufficient margin of airspeed to not only stop you stalling but also to allow you to turn away from the gust, you run a very real risk of hitting the hill and destroying your glider and very possibly yourself. So always fly with enough airspeed to ensure that in the conditions in which you are flying you have a manoeuvrable glider, which will allow you to turn away immediately from the mountain towards the valley if you hit a gust that causes your glider to sink or drop suddenly. This speed will not be constant and you should vary it according to the strength of the turbulence and thermals. In a very smooth valley breeze in the evening the speed margin might be small but in strong thermal and/or rough conditions it could be of the order of 25-30kt above stall speed. Always be alert to the possibility of a strong gust so that you can react immediately and turn towards the valley almost automatically. It will help to ask yourself frequently during flight: "do I have a manoeuvrable glider?" – especially when flying near mountain faces. Be aware that in certain conditions, such as wave interference, turbulence may be so strong in certain valleys that it is impossible to control the glider safely at any speed. In such conditions you must fly to another slope.

## Intercepting or crossing ridges

Do not maintain any unnecessary and/or involuntary angle of bank when flying towards the mountain face, level the wings when you are nearing the ridge and never intercept or cross the ridge line at an angle greater than 45°. This last is most important, since in the event of encountering strong downdraughts, the smaller the angle of turn needed to "escape" the better your chances of survival. An approach at 90° may mean a turn of up to 180° (of which 90° is still taking you towards danger). If the decision is made late, you may not have enough room.

The vario determines how close we need to fly to the ridge. The trick is to find the energy line, it is strongest somewhere, you just have to find it by trial and error.

In slope soaring in smooth conditions when you are turning away from the hill, you can start to reduce your speed so that it is reduced to a safe minimum when you are furthest from the hill and is increased to the original value as you fly towards the hill again.

## Turning

You should normally fly figures of eight by turning away from the slope or parallel to the ridge. A complete circle lower than the top of – or close to – the ridge should only be made with great care. When new to mountain flying, and until considerable experience has been gained, it is advisable not to make

complete circles until there is room between you and the slope at your closest point to it, for a circle equal to at least half the diameter of your intended circle. This margin should only be reduced with experience and recency.

## Vigilance

It is perfectly possible to stall the glider and even to end up in a spin without an obvious piloting error. This can occur because of sudden turbulence, strong lift inducing a high angle of attack, or due to fluctuations in airspeed as a result of a changing wind gradient or windshear. In the mountains you must always be prepared for such sudden occurrences, especially near the ridge. If you feel any indication of stalling or wing drop, take urgent avoiding action by easing the stick forward immediately to regain speed and turn away from the mountain face. This must become second nature, for it is better to be safe a thousand times than sorry once.

## Adaptability and flexibility

Ridge soaring means constant adaptation to the geography and topology of the mountain and to air movements near the ridge. All mountains are different in this respect and the same mountain is also different in different circumstances.

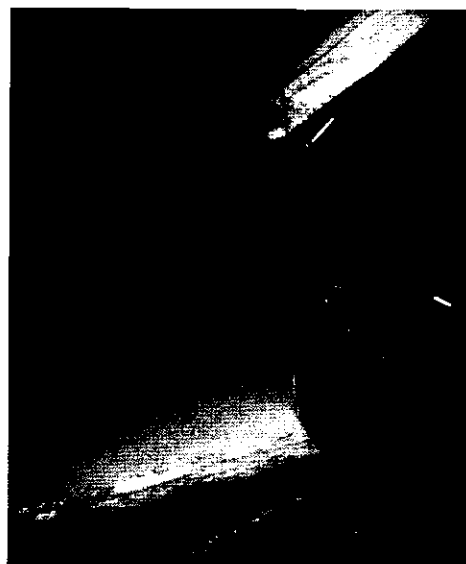
Instructors from non-mountainous areas will often advise you to have significantly too much speed all the time. But that is an over-simplification. You have to continually judge the circumstances and adapt your flight regime to the conditions of the day and your proximity to the slope.

For instance, in small, weak areas of lift at low altitude, flying too fast can result in being unable to exploit the lift and having to land out, just as flying too slowly in turbulent conditions may result in a stall or spin. Fly prudently!

## 4. Wave flying

I will not go into the technique of finding the wave via rotor; but general remarks about safe flying in wave seem appropriate:

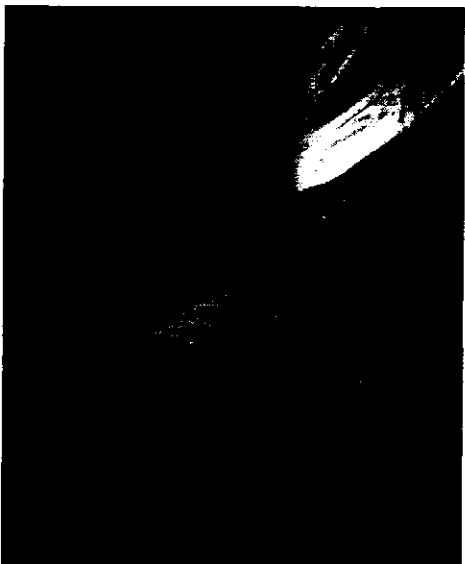
- Beware of turbulence, it can be often be extremely violent;
- Keep an eye on the sunset time (in the valley the sun sets earlier than at altitude);
- Icing may be a problem – descend when it occurs;
- Gliders are often not manoeuvring and can sometimes be hard to see in wave, so keep a good lookout. The wave area is small, and despite the apparent size of the sky, many other gliders may be close to you;
- Outside wave lift you may encounter strong sink so watch your fallback position;
- Keep an eye on your VNE (velocity never exceed) and Max Rough Air limits and remember that the flutter limit is a True Airspeed and must be reduced by 6 per cent for each 1,000m or 2 per cent per 1,000ft amsl (above mean sea level).
- A shortage of oxygen will lead to tunnel vision, a reduced ability to think, tiredness and an unwarranted sense of euphoria that may lead to bad decisions. When >



After descending from height to below ridge level, the situation changes drastically (photos: Jacques Noel)



Above and below: Arrive at or above ridge height to maximise your options ... and plan for alternatives



## ALPINE SOARING

- you think your flying is fantastic, it's time to descend!
  - Beware of altitude sickness. This affects the brain, starting with headache and nausea. Extreme cases can lead to brain oedema.

### 5. Other general safety points

- Right of way: in the mountains the pilot with the mountain at his right wingtip has right of way. If you meet a glider going in the opposite direction when the mountain face is on your left wingtip, turn outwards from the slope for avoiding action;
- Watch out for power lines and ski-lifts;
- Keep a continuous lookout for other aircraft: there may be 600 (yes, 600) gliders airborne in the Southern Alps on a good day.
- The danger of mid-air collisions is higher early in the season. This is due to several factors: pilots watching GPS and other slow reference instruments; low afternoon sun, especially when the canopy is dusty, and many aircraft being in the same area.
- In this latter case you should mark the position of other aircraft and assess the future flight paths of the most critical "neighbours".
- I strongly recommend bright orange coloured anti-collision bands on the fuselage and wings in some conspicuous scheme – preferably over a part of the structure which doesn't have a foam sandwich. A strobe light just behind the cockpit is also useful.

### 6. Body and mind

- The pilot has an obligation towards himself as well as his peers to be in good shape mentally and physically. Avoid:
- Tiredness: eg, as a result of a long trip, change of food and rhythm of life (especially on days three and four of your holidays), and lack of fluid because of dry air, heat or excessive use of alcohol;
  - Altitude sickness and lack of oxygen;
  - Hypothermia from being motionless in low temperatures at altitude;
  - Lack of sugar, fluid and salt, which may occur within an hour of starting the flight;
  - Stress before and during the flight: take your time when putting your glider together, start your flight well rested and nourished, prepare it well and without hurrying; and don't let yourself be pressured into things that you feel insecure about... especially when striving for measurable achievements like distance or altitude records.
  - Empty your bladder and intestines before flying, especially before high-altitude flights.

### 7. Two-seater instruction

To become a competent mountain pilot, one check flight is not enough; nor is one introductory flight in a two-seater! It is essential that over a series of flights the pupil gets to know the same mountains under different circumstances and at different altitudes, ranges and aspects. It is also important that he has flown under different atmospheric conditions and levels of light. Perhaps most importantly, the pilot must experience and appreciate the different



Keep asking yourself if you have the speed to manoeuvre away from the ridge should you need to (Jacques Noel)

psychological and physical phenomena and prove that he is master of the essential skills of mountain flying. This means always being able to calculate safe heights required to reach the next target, the discipline of always being in gliding distance "local" to a landable field; the ability to find and exploit safely lift at low altitudes; a good sense of orientation and a high degree of vigilance.

### 8. R/T procedures

Use the right radio terminology and be disciplined. Get to know local customs and regulations, especially terms that have to be used for reporting downwind. Be especially careful to learn by heart names and altitudes of mountains, ridges and slopes. Mountains are often given different names in French club R/T calls to those shown on the map.

### 9. Flight preparation

Study in detail information on outlanding fields provided in the FFVV regional publication. Learn their position and altitude by heart and programme them into your GPS. Visit them all on the ground in order to establish what they are like at the time of your visit. They are often in regular use by farmers and may have some embarrassing new feature like a fresh ditch, some long poles close to the field or a heap of bricks in the middle of the landable area to spoil your day. It is very useful to fill in the location and altitude information on your map and to draw 10 and 20km circles around these fields with the minimum height needed to glide to the field. This simplifies flight planning considerably.

Do not try to land in wind speeds of 20kt or more (an outlanding in these conditions can be very hazardous) – a safe outlanding cannot be guaranteed. Moreover, 20kt or more of wind guarantees good ridge lift – so you can always get home.

It is also a good idea to mark useful ridges with a bright-coloured marker; the locals can tell you which the useful ridges are. Of course, be aware of the weather and wind direction: different ridges work in different

circumstances. Reinforce the back of your map with tape; it has a longer useful life that way.

You are also encouraged to carry an ELT emergency beacon. There are different kinds on the market; those that work after a crash (rather expensive) and non-automatic types.

- Also, bring an emergency pack with:
- Matches with striking paper and some dry combustible material like magnesium or paper, stored in a plastic film container;
  - Mirror, with a hole in the middle for aiming the flash;
  - rope;
  - Aluminium survival blanket;
  - Whistle;
  - Torch.

- Standard equipment carried must include:
- Good clothing, right for the conditions;
  - Plenty to drink (dehydration can easily occur);
  - wholesome, easy-to-digest food;
  - Good sunglasses with plastic lenses;
  - Sunhat with no brim at the front.

It is important to be safe and comfortable when you are in the air: use a well-shaped energy-absorbing cushion and make sure there are no loose objects in the cockpit, especially heavier ones like cameras that may be dangerous, especially in turbulence.

Finally, check that the battery is charged, oxygen bottle(s) filled, and camera loaded. Put your map and flight plan in the cockpit and "book out" on the launch sheet. Carry out your checks, including radio check, and don't forget to remove the tail dolly.

Set up your electronic instrument systems before take off, with your barograph/logger "on". Make regular radio calls in flight on the pre-arranged frequencies, announcing your position, height, the flight conditions and your intentions.

### 10. Don't rely just on reading!

Finally, you can only become a competent mountain pilot with practice, experience and, especially, instruction. This brief introduction gives only a small idea of what is involved.