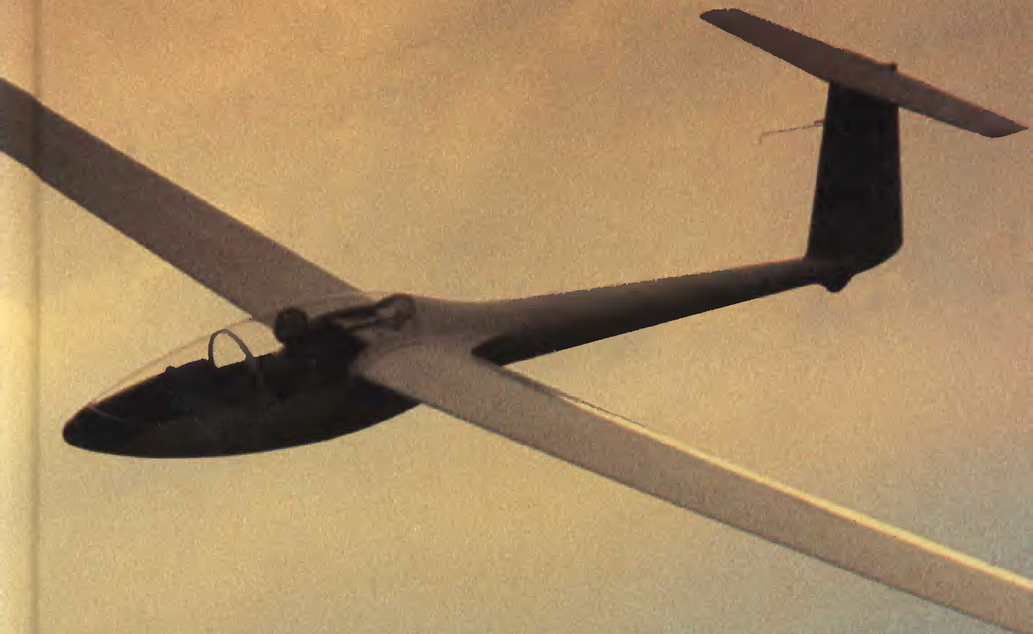
Gliding Competitively



John Delafield

Foreword by George Lee
World Open Class Gliding Champion

Gliding Competitively

John Delafield

Wally,

With great appreciation of all your fun and humour – you've added much to gliding. Thanks

John Delafield

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Foreword

The last ten to fifteen years have seen a significant growth in the number of books dedicated to the sport of competitive soaring and the enthusiastic newcomer need no longer complain of the lack of suitable material to assist him in fully realising his potential. Competition gliding is a complex and demanding sport, both technically and psychologically, and John Delafield is highly qualified to give detailed advice on how to prepare for, and fly in, the first all-important competition. John has represented Great Britain in several World Championships and he is one of the finest tacticians in the sport. He is also a highly motivated competitor and in reading this book one is struck by the attention to detail and the sheer professionalism of his approach.

No matter how well prepared the newcomer may be generally, it is very difficult to prepare for the psychological hurdles associated with flying in the first competition. There is often a tendency to under-estimate the importance of this aspect, and it is therefore all the more pleasing to find that John has included a detailed analysis of competition associated emotions.

Competitive soaring is one of the most challenging of individual sports, both mentally and physically – it must also be one of the most addictive! The newcomer will have his own reasons for wanting to give it a try but, whatever his motives, the attainment of his personal goal will be made a lot easier by the excellent material contained in this book.

George Lee

To my family

Preface

In this book, the term competitive gliding refers to racing gliding – the completion of closed circuit flights around specified turning points in the shortest possible time, where other pilots are also flying the same course. I am not concerned with height gains or duration flights, or with the business of cross-country record flying, although this has many connections with competition gliding.

I am writing for the pilot with basic experience who wants to succeed with task flying and competitions, and I have assumed that my readers will know most of the basics of soaring flight. The book is a training guide, with plenty of tips and advice based on my own experience. Broadly, each chapter represents a stage in a pilot's development, from local soaring through to competition flying, with the idea that he will be improving and developing his skills all the time. Some aspects are touched on early in the book and are developed more fully later, and to this extent there is a degree of overlap between chapters.

Competition gliding provides the impetus and opportunity for a pilot to stretch himself to his limits and realise his full potential. My aim in writing this book has been to stimulate a search for finesse and for achievement amongst my readers, but, above all, I hope that it will help *you* to avoid some of the many pitfalls I have encountered in my soaring experience.

John Delafield

Metrication

Wherever miles are quoted in the text, the reference is to nautical miles: therefore any metric equivalent must be calculated at 1 nautical mile = 1.85 kilometres *or* 1 kilometre = 0.54 nautical mile.

Metric measurements are now generally used in the gliding world, and all record and badge qualifying flights use metric terms. In the text, both imperial and metric distances are given. The conversion, however, is not intended to be precise: metric distances are suitably rounded in number, as exact equivalents would not be helpful, eg. 10 (nautical) miles is expressed as 20 kilometres rather than 18.5 kilometres.

1
Developing your flying – local soaring

Consistently safe cross-country and competition gliding is built on the skills learnt through local flying at the home airfield and there is no justification for flying out of gliding range of your home site until you have fully mastered the fundamentals of gliding.

In particular, you must first learn to soar your glider under a wide variety of weather conditions. Second, you must be able to make consistently safe approaches and landings in different wind conditions and from difficult positions in the circuit pattern. And third, you must have received formal training in the techniques for making safe landings away from the home site, be it in English fields, Australian paddocks or Texan scrubland. To omit any one of these steps is to court disaster; a broken glider is probably the lowest price you can expect to pay.

In this chapter we will examine just a few ideas which you can usefully bear in mind whilst local soaring. You will gain much by putting them into effect whenever the opportunity arises; this will give your local soaring a worthwhile objective and will go a long way towards giving you the necessary background for successful competition flying. Some of the suggestions put forward here will be developed later in the book.

WEATHER CONDITIONS AND THERMAL RECOGNITION

Clearly, the first requirement for successful soaring is to have suitable weather and it will be worthwhile spending time now in considering the main features of the most common cross-country soaring weather. With an appreciation of some of these points the soaring itself will prove to be that much easier.

Cumulus weather

To my mind, the most sought-after thermal soaring conditions come with a sky blossoming with cumulus clouds, evenly spaced every mile or so. Surely the weather glider pilots dream about? But, as with all things, soaring in such weather is not necessarily straightforward and no two days will necessarily give the same conditions, however similar they may appear. It is essential, therefore, to appreciate the various extremes of soaring under conditions of cumulus cloud because between these extremes will be a myriad of different themal characteristics.

In simple terms, cumulus cloud can be associated with 'short-life' or 'long-life' thermals. In essence, short-lived cumulus clouds are characterised by their small size and by their generally fragmented appearance. Short-life thermals associated with such clouds normally last for only a few minutes and are often linked with a particular thermal-producing source on the ground. Whilst their short duration can prove very troublesome – the thermal has gone by the time you get under the cloud – they have the advantage that the same ground source normally produces a steady series of thermals. In practice this means that if there appears to be no lift under your chosen cloud then the next thermal from the same source can often be located by flying into wind a little way.

Cumulus clouds associated with longer-lived thermals normally have a fairly substantial appearance; they can have a useful life, as regards lift-producing qualities, of about twenty minutes, sometimes

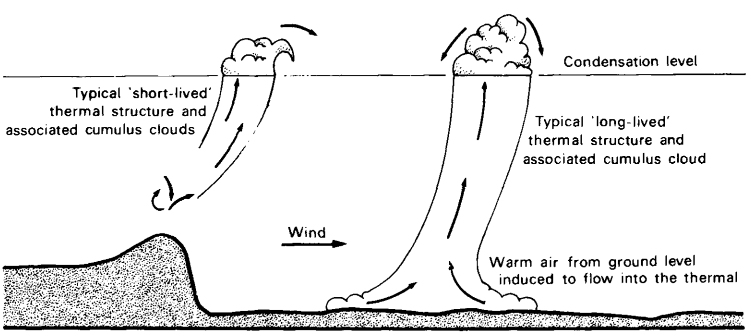

Figure 1. Diagram to illustrate the essential differences between 'short-lived' and 'long-lived' thermals and cumulus clouds

longer. Such clouds may well be formed initially by a thermal from an obvious source on the ground, but, once started, they sustain themselves by inducing further relatively buoyant air to break contact with the ground and flow into the thermal feeding the cloud in question. In general you can consider the thermals below such clouds to be columns, whereas the short-lived type should be thought of as bubbles. Figure 1 illustrates the essential differences.

Regardless of the type of cumulus, its lift-producing qualities can best be detected by very careful and painstaking observation of both its growth pattern and its general form. To be more specific as to what I mean by growth pattern, the give-away sign I always look for is movement or growth of the cloud itself. You can often see this best by closely watching the clouds and observing, on those producing lift, wisps of condensation displaying a rolling motion or at least showing clear signs of movement. This is not an infallible method but it normally works, especially for the smaller clouds. Large clouds tend to be easier to recognise for their lifting properties – the crisp-looking ones with solid-looking or firm dark bases are normally good but this generalisation does not always work and you therefore need to establish by trial and error a correlation between 'looks' as you perceive each cloud, and 'lift'. However, you can gain some comfort from the fact that even with large clouds, it is frequently possible to detect movement, particularly in their upper regions, and that this is often an indicator, though not an infallible one, of lift below their bases.

When you are flying it will often pay to operate somewhat below cloud base so that you can get a good perspective on possible lift-producing clouds, particularly their bases, because this will help you to better appreciate which ones are most likely to be active. Beware, however – clouds can still be active and lifting but you will sometimes find that the lift has decayed at the lower heights, so that if you plan to intercept the thermal related to such a cloud too low down you may be out of luck. In this case, by searching around below the cloud you may find a remnant to get you back up a few hundred feet and you may even intercept a fresh thermal travelling up the same path as the decayed one, but you must not rely on this.

When practising soaring under cumulus conditions I think the most important thing to aim for is to fly so as to gain an appreciation of the normal location of lift in relation to each particular type of cloud. In the case of very small clouds, particularly those which appear to have a rolling motion, the lift is often associated with the part of the cloud showing movement. But this will not always be the case and, therefore, you must go out to learn from experience the significance of the detailed shape and movement of the cloud in relation to the associated lift. With larger clouds of longer duration the problem is really twofold. First you must learn to appreciate the tell-tale signs of a cloud's growth and decay and second, you must learn where the likely areas of lift are in relation to the cloud. Small clouds, with their relatively small horizontal dimensions don't present too great a problem, but the area to be searched under a larger cloud for the core of any thermal makes it imperative that you learn to find the lift as early as possible if you are not to waste height and time. Remember that in a competitive situation someone else who can locate such lift more quickly than you will have a substantial advantage.

The lift associated with cumulus on any one day often follows a pattern, the lift being located in a similar position with each successive cloud. As a broad generalisation you can consider that the thermal is normally found a little into wind of the cloud: this is invariably a reasonable assumption to use at the beginning of any one flight although you may need to modify it in the light of experience on the day in question. In England, it seems to me, the lift is generally on the sunny side of most clouds, but I suspect that this is more likely due to the sun being on the same bearing as the prevailing wind during the normal soaring period (that is, south west) than to any other cause.

There are many variations in the positioning and characteristics of thermals associated with cumulus clouds and there is, therefore, almost no end to the worthwhile experience you can gain whilst soaring locally.

Cloud streets

Clouds often form linked lines which we call cloud streets. There are many types of cloud street; the 'classic', the convergence, and the wave influenced are amongst those most commonly met.

By considering just the 'classic' type we will cover the principles of using the other types as well, as they are very similar. Generally speaking, 'classic' cloud streets occur with moderate to fresh winds and with an optimum depth of convection for the air mass in

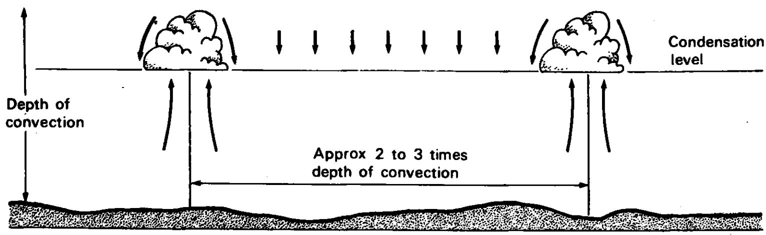

Figure 2. Cross section to show typical flow pattern around cloud streets (highly simplified)

question. Under these conditions they do not generally appear to originate from a particular source on the ground, but rather the cloud streets which result seem to be sustained by a larger scale flow within the convective layer and by the basic instability of the air mass itself. They may well be initiated in the first place by a series of ground sources but, as soon as any vertical development of the cloud takes place, the whole process becomes more or less self-sustaining. Figure 2 illustrates simply the type of large scale flow which is often associated with cloud streets.

Under 'streeting' conditions the relationship of the lift to the clouds can sometimes be confusing, especially when you are flying nearer to the ground than to the base of the cloud. Quite frequently under such conditions, the thermals will be choppy low down and distorted by the wind. Also, the lift may not be immediately below the bulk of the cloud street, but displaced to one side and forming apparently conventional thermal cells. Higher up, however, the lift normally becomes aligned with the cloud and is, therefore, easy to locate.

When practising local soaring, you will find it worthwhile to deliberately intercept the thermals associated with streets at different heights so that you can become familiar with the varied characteristics of such thermals.

Likewise, the distribution of lift along the axis of the street can take some getting used to and I suggest your practice takes the form of climbing in a thermal under the cloud until the lift begins to spread out under the street. Then, rather than continuing a circling climb, fly into the wind underneath the street to give yourself an opportunity to examine its structure. You will find that it will not give lift all the way, but the incidence of lift will be greater than the incidence of sink. As you proceed you should practise flying the correct speed as given by the 'speed to fly' facility on the variometer, having set the datum to a realistic thermal strength, and when you find a strong core you should then, and only then, take the climb up to within about 200 feet (60 metres) of the cloud base. The cruise along the street can be continued thereafter at the new, greater height.

I find that it sometimes pays to cruise under a street at less than the optimum speed to fly, as by so doing you can leave the street at maximum altitude, such as cloud base. This will be worth doing when conditions ahead look less straightforward than you would like and you believe that lift will be weak and perhaps difficult to find.

Once you have left your street you should bear in mind the likely air flow pattern (Figure 2) in transitting to your next lift source. Naturally, you should not forget the constraints of your local soaring practice flight as well, and some of what I have just described can be practised more readily on cross-country than on local flights. You must, however, make every effort to practise these techniques on local flights first.

Blue thermals

Flying in blue thermals is rather like walking through a forest with your eyes shut; you are bound to hit a tree sooner or later. If there is a problem of flying in the blue, though, it is that the convective layer is often shallow, certainly in England, although much less so in hotter climates, and therefore the effective *working* layer between the top of climb and the height at which you need to find the next thermal is relatively shallow. This implies that you may have to accept mediocre thermals purely to avoid dropping below the safe lower level for thermal contact. On the other hand, the location of blue thermals can often be more straightforward than cloud indicated ones. For a start, blue thermals tend to be more evenly distributed and they also tend to come off the type of source you would expect – such as villages, towns and other relatively hot spots. It follows, therefore, that your location of thermals in the blue must be influenced by the terrain below.

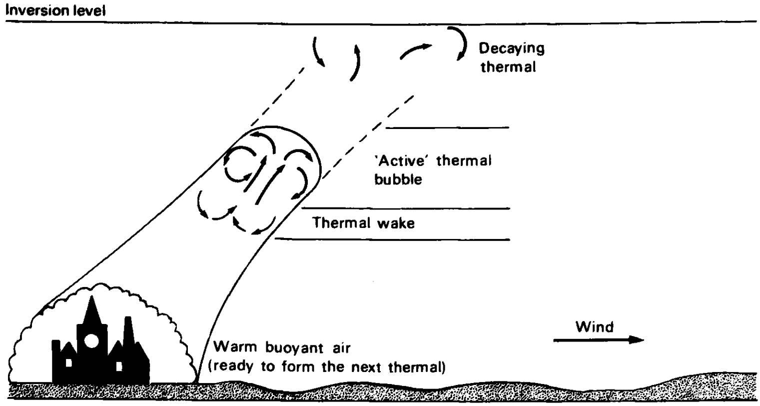

Figure 3. Blue thermals – typical pattern

Blue thermals often take the form of bubbles, or series of bubbles, and this has a marked effect on the way in which you search them out. It will often pay not to rely on there being lift below another glider which you observe to be climbing well in a blue thermal; instead you will need to get used to the idea of flying into wind so as to intercept the *next* thermal from the same source. It will also pay dividends to actively think about likely thermal sources and to fly just downwind of them in order to locate any thermals which they may produce. Figure 3 shows a typical situation under blue conditions.

In moderate to fresh winds blue thermals tend to form themselves into streets. It is important to find out whether this is so as it has a significant bearing on how you locate each one and on how you progress in a desired direction.

On leaving the first thermal of your flight you should fly into the wind and, all being well, you should then find a continuous series of weaker thermals. Eventually you will encounter a strong one, probably at the end of the street, which you can use to regain height. You can then turn to fly in the desired direction, say, cross wind, and on encountering the next area of thermal-like turbulence you should turn into wind until you find a thermal. In this context the usual trick of turning towards the uplifted wing can be used to help you establish contact with the main axis of the thermal street. An air mass readout on the variometer is extremely useful under

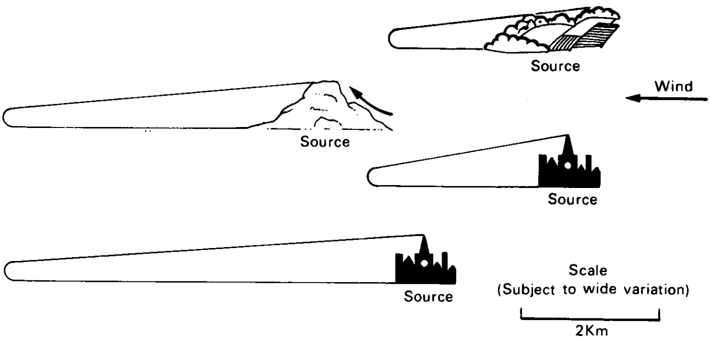

Figure 4. Diagrammatic representation of 'blue' thermal streets

these conditions as it enables you to pinpoint readily the position of each street. Figure 4 is a simplified representation of blue thermal streets, which, from my own experience is broadly correct.

When flying in blue thermal streets, the main point to watch out for is the length of the streets and their lateral spacing. Neither can be relied upon – some streets are very short, especially those which appear to emanate from one particular source, whilst others seem to go on for miles.

Another feature which is common under blue thermal conditions is the tendency for the thermal to spread out near the top of its ascent as it hits the stabilising effect of the inversion. Whilst it will not normally pay to climb those last 500 feet (150 metres) at the slow rate associated with this spreading out, especially when there are stronger thermals around at a lower altitude, I have found from my own experience that it generally does pay to do so at the end of a soaring day. At that time of the day one is often flying for survival rather than for high average speed and any thermal is better than nothing at all. In addition, the large areas of slowly rising air in the upper band of the convective layer can be easily used to improve the achieved glide angle, without in any way spoiling your average speed – on the contrary, they will improve your overall speed by minimising the need to stop and climb. Another reason for staying high at the end of the day is that at that late hour blue thermals are better organised at height and easier to use than those low down.

Opposite – climbing away after a winch launch

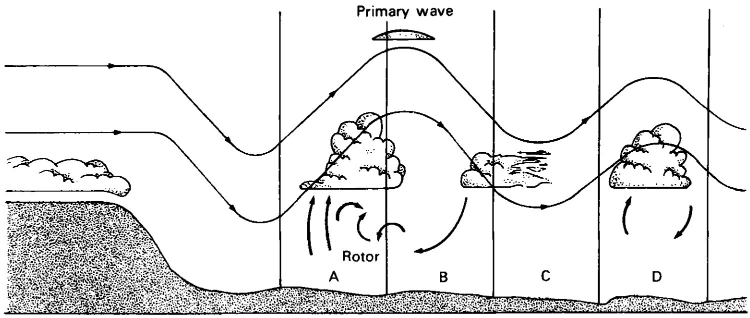

Figure 5. Wave flow influence on convection

Wave effects on thermals

Local soaring in wave can provide useful background experience for subsequent cross-country flights. In the context of cross-country and competition flights based on thermal lift the use of wave in itself is, in my experience, seldom of any real advantage, but I find it very useful to both appreciate and understand the influence of wave on the structure of thermals as well as on their distribution. In the next few paragraphs I will concentrate, therefore, on the influence of wave on thermals, and give only brief thoughts on wave flying proper.

Wave above the convective layer can have a startling effect on thermals below. It can both enhance thermal strengths in places and dampen them down in others; also, in such conditions thermal strengths cannot always be assessed accurately from the appearance of the cumulus clouds, which may be misleading.

Figure 5 illustrates a simplified wave flow pattern and in the text following I will discuss the wave's likely influence at selected points.

At A the upwards flow induced by the wave will be felt in the lower levels of the convective layer. Even when the wave effect is weak, thermals in this region will be both induced and made stronger and as a result unusually high rates of climb can be found compared with those normally achieved on that day. Any cumulus clouds associated with thermals in this area will grow rapidly but the best lift will invariably be slightly into wind of the main cloud mass and, frequently, will be in the blue upwind of the cloud.

When gliding in these conditions you will find that as you climb in the thermal the wind will carry you further across the wave until by the time you reach cloud base you will be directly below the leading edge of the cumulus cloud. Clearly, to maintain good thermal conditions you will need to edge into wind continually so as to avoid being drifted into the down-going part of the wave flow.

At B cumulus cloud is still present, though decaying, and the descending wave is dampening thermal activity, often to near zero. Of all regions, this is by far the most frustrating when flying in thermals influenced by wave. From low down the cloud often looks quite usable and yet the wave will have largely destroyed the convection, which leaves you with the problem of how to realise some order out of this difficult situation. The answers are twofold, I believe; you either stay high in which case the clouds will produce lift for a time, or, if you are low down, you turn either into wind or downwind in order to contact the thermals induced at A or between C and D.

It is common to see lenticular-like medium or upper cloud above the area between A and B and, while this may be a good indicator of the conditions in the convective layer, it cannot be relied upon to indicate the positioning of the thermals below which have been influenced by wave. The wave pattern well below the lenticular cloud may be different from that higher up. What such clouds do indicate, however, is the presence of wave generally and they should encourage the pilot to analyse the air mass to ascertain the effect of the wave on his level of the atmosphere. Once again, an air mass read-out on the variometer will help you to work out what is really happening.

At C is the characteristic gap between wave crests which is normally marked in the convective layer by a lack of cloud; thermals in this region will often be weak. Those forming to the left of C, under the downgoing part of the wave, will show an initial strength which would normally indicate a good thermal, but the rate of climb will fall off rapidly as the thermal is dampened by the wave. Under these conditions you will repeatedly find thermals being cut off whilst they are still well below the level of convective cloud base nearby. It is frustrating to fly in these conditions but understanding the influence of wave will better enable you to move away from the sinking air and into the ascending part of the wave.

Wave above the convective layer can have a strong effect on thermals below – photo from rear cockpit of Janus

At D we have an area of slight wave influence where thermals will be enhanced but, by reason of the reduction in vertical velocity of the wave, its influence will not be as significant as at A. The reduction in vertical velocity will normally continue the further you move downwind from the wave trigger until eventually the thermals and cumulus will behave in the expected way. This will not always be the case, however, as weather conditions conducive to wave can often cause large scale wave motion which can cover the whole of your operating area, and it is not uncommon for the visible signs of this activity to be inconspicuous from the heights at which thermal soaring is conducted. Clearly, this demands caution and concentration if the soaring flight is to be successful.

The general characteristic to watch for under such wave influenced thermal conditions is a marked degree of turbulence in the convective layer, especially in the area influenced by the upwards wave motion. Thermals will tend to be very narrow and they will change their structure continuously, so that a glider has to be almost continually re-centred in the core. As I have already mentioned, thermals off the same general area of terrain will drift into the down-going part of the wave. As a result you will have to keep adjusting your circling so that you maintain the same position over the ground and thus keep in the best position in relation to the wave. If you fail to do this then you will soon be in the area influenced by the down-going wave and, if you are not careful, you will soon find yourself on the ground.

We have looked at some aspects of thermal recognition, but I believe the most effective way of developing this ability is to fly under as wide a variety of weather conditions as possible and to learn as much as you can from the experience. There is no substitute for this and there is no magic, instant, written solution. Resist, at all costs, therefore, the temptation to fly just on the good days. You must do all you possibly can to fly whenever practical, as only by doing so will you encounter the complete spectrum of soaring conditions to be found on cross-country flights.

IMPROVING YOUR TECHNIQUE

For the budding cross-country and competition pilot the potential for developing cross-country and racing techniques during local flights is immense. Once you have mastered the basics of soaring and once you have achieved confidence and consistency in your approaches and landings you should begin to refine your skills. Particular areas for attention are thermal entry and exit; if appropriate, flying with water ballast; hill soaring and, although it is not permitted in all countries, cloud flying. I will discuss each of these and suggest points you should concentrate on in order to make the best possible use of your local flights as a prelude to cross-country flying.

Longer flights

Since most cross-country flights involve several hours of flying time it is important to devote some attention to local practice flights which also last several hours. In club flying the practical problems of obtaining a machine for that amount of time may mean that you can't train extensively in this area, but even so, I believe it is fundamental to successful cross-country flying to have experienced the problems of soaring and concentrating whilst suffering a measure of fatigue. To launch off across country without having such experience is to risk inefficient soaring towards the end of the flight, and, far worse, it produces the potential problem of an away-landing whilst tired. Better to have practised all this within the safety of gliding range of your home airfield than to learn the hard way with a broken glider.

Perhaps the best thing you can do to help is to ensure, as far as possible, that you fly your five hour duration flight for your Silver C before you make any attempt to fly cross-country. This will at least ensure that you have one long flight to your credit, but you should aim to do more than this if you can.

Thermal entry

You should aim to develop your skill in entering a thermal cleanly and centring correctly within the first turn. This is highly important, as time spent attempting to centre will seriously degrade your achieved rate of climb. You may find it surprising to learn that, as a general rule, your average rate of climb is often only half of that indicated on the variometer. The 'loss' is due to the time taken to establish the climb and the time taken to exit at the top, during which the glider may not be climbing at all. You will be able to observe this yourself if you get a chance to fly in a glider equipped with a rate of climb 'averager'; the averager can be started at the moment the glider is decelerated in the thermal and stopped as it leaves. The results will give a clear indication of your thermalling efficiency, and practice will show you clear improvements. Should you have a chance to fly a glider equipped with this device I strongly suggest that you grab the opportunity as it will enable you to see clearly how only small errors in your technique can have a disproportionate effect on your achievements.

If you are joining a thermal which already has another glider in it you must take special care to maintain adequate lateral and vertical separation at all times. Don't fly close to other gliders until you have enough experience to do so. In particular, remember that the glider you are flying can gain several hundred feet during a zoom climb from cruising speed. This means that a glider which is initially well above you as you enter may be a potential collision risk after your zoom. So, watch it!

When learning the best way to establish yourself in a thermal you must first recognise the feel of it from the general turbulence of the surrounding air; often your first indication of an adjacent thermal is given by this turbulence and not by any instrument indication. Your main concern is to determine how long after the initial turbulence and subsequent indications of lift on the variometer you should initiate your turn to centre in the thermal. With practice you will appreciate the delay between the onset of initial turbulence around the thermal and entry into the main core itself. Fortunately, thermal cores generally have a markedly firm feel and give a positive vertical acceleration on entry – a feeling well recognised by the human backside. Initiating your turn so as to achieve an accurately positioned circle will take much practice; sometimes you will need to roll into the turn as soon as you hit the core and on other occasions you will need to delay for a few seconds. The main factors affecting this delay are the thermal size and your own speed, which is why I suggest that you should practise the entry into thermals under a wide variety of weather conditions and from different cruising speeds.

The variometer has a fundamental part to play in assisting a clean thermal entry, and a good instrument with accurate total energy can take much of the 'guesstimation' out of the exercise. Of all factors affecting thermal entry, I am certain that good total energy is by far the most important and it is the one facet of instrumentation you must get absolutely right; there are no half measures in this respect. A good total energy probe will transform previously errant variometer indications into something which makes sense.

A further factor affecting thermal entry is the variometer performance itself. You should ensure, as far as possible, that the instrument gives a dead-beat response with only a short time delay in its indication. You should be certain that the installation does not react excessively to gusts because such conditions can be extremely misleading. The use of restrictors, filters and such like may be necessary. However, whatever variometer installation you are using, you should aim to become completely familiar with it as only by doing so can you begin to appreciate the nature of each individual thermal. Unfortunately, this means that you will often learn best if you confine your flying to just one glider so that you get thoroughly used to its variometer.

Ready for take-off   a pre-production Nimbus 3

Gliding Competitively is for the pilot with some experience who wants to succeed in competitions – a training guide which helps extend skills and develop confidence. John Delafield looks at ways to improve flying techniques, with particular emphasis on weather conditions, efficient thermalling, racing starts and final glides, turning point techniques, interpreting barograph traces and 'fettling' the glider to prime condition. Each stage in a pilot's development is covered, from extended local flying, through advanced cross country to the competition itself.

The author is both a gliding instructor and a keen competitor – he has represented Great Britain in three World Gliding Championships and has been four times British Open Class Gliding Champion and three times British Standard Class Gliding Champion. He is fully aware of the pressures which prevent pilots from flying their best in competitions, and offers plenty of sound advice on how to prepare for competitive gliding. The book provides a thoroughly practical background to this most thrilling and demanding of sports.

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