SECRETS OF CHAMPIONS

by Dennis Pagen

black-shouldered kite

ILLUSTRATIONS BY DENNIS PAGEN

Secrets of Champions

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To Brad and Joel

Two Friends who Knew the Secrets

ACKNOWLEDGEMENT

I wish to thank all the pilots who sat patiently for hours and revealed their secrets. We will all gain from your knowledge and experience. I also wish to thank Claire Vassort for the expert layout.

Dennis Pagen
Spring Mills, Pennsylvania
(March 2003)

PHOTO CREDITS

Front Cover: Steve Moyes, one of the first champions, launches in the 2001 World Meet. Photo by Dennis Pagen

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All other photos by the author.

ABOUT THE AUTHOR

Dennis Pagen has been flying hang gliders since 1974, ultralights since 1979 and paragliders since 1989,. He wrote his first book Flying Conditions in 1975 and has written 14 other books since then, all related to flying for fun. He has had over 600 articles published in national and international magazines and probably will have more as long as inspiration occasionally drops by.

The author has been a school teacher and ski instructor in Leysin, Switzerland and began teaching hang gliding in 1975. He has been a member of the United Hang Gliding Association board of directors since that time and was instrumental in developing instructional and pilot rating programs. He put on the first Instructor Certification Program in 1976 and wrote the USHGA's instructor's manuals with a new edition in 1994. He also wrote the USHGA's paragliding instructor's manual.

Flying has occupied his time perhaps more than it should over the years, but it has also been a dream come true. Flying was his quest ever since he watched hawks lazily circle up above the fields around his native Michigan home. He currently lives in Central Pennsylvania where he flies every chance he gets.

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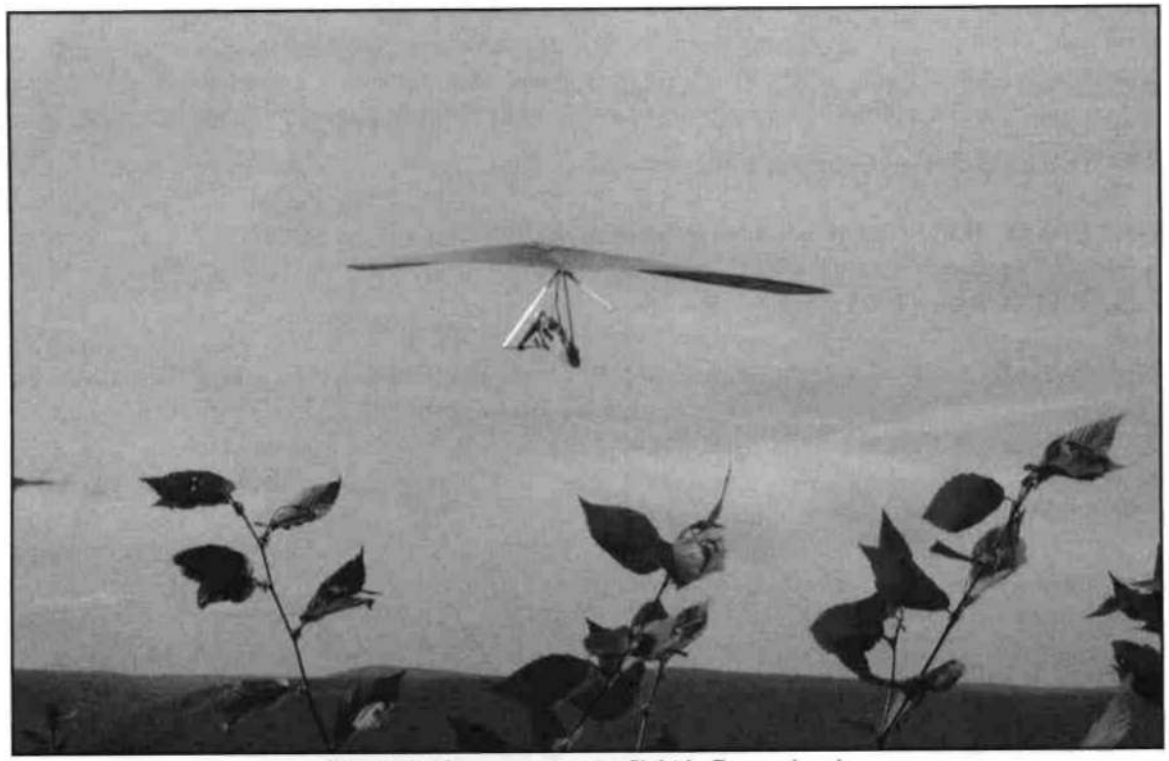


The start of a cross-country flight in Pennsylvania.

INTRODUCTION

We come to hang gliding from different backgrounds. We develop our flying skills at different rates according to our natural abilities and the amount of time we have to devote to our beloved sport. We even fly different gliders, sites and conditions. But we all have the same desires: We want to be the best pilot we can be. We want to get higher, go farther and possibly even win competitions. We may even secretly harbor the fantasy of becoming national or world champion.

While only a few pilots can ultimately be champions, the rest of us can certainly achieve the other goals with the proper motivation and guidance. Sometimes, our motivation outstrips the available guidance. The problem is that it is hard to find a good mentor, an eagle among men, whom we can consult with over the years. How can we best acquire skills? How can we improve judgement? Most of us get bits and pieces of advice from friends, expert pilots passing through and from writings. Wouldn't it be nice to be able to sit down with the world's top experts and pick their brains? Wouldn't it be nicer still to have them always available to consult as our skill and experience improves?

The above thoughts have often come to my mind in my nearly three decades of flying hang gliders. I have had the opportunity to fly with and observe the world's top pilots for essentially all of those years. One additional question kept coming back to haunt me: what makes certain pilots so good? On occasion pilots get together and ponder this question, but I have never come across a definitive answer.

So several years ago, I hatched a plan. My idea was to interview the world's top pilots to learn their secrets. The first big question was, would they be willing to tell their secrets freely? The second big question was, would they be able to articulate what they do in a manner meaningful to those of us flying in less rarefied air?

These questions were answered with the very first interview. The pilot was the three-time World Champion, Tomas Suchanek. Not only was Tomas' flying unequaled at the time, but also as a person he was friendly, unassuming and totally willing to share his knowledge with the public. In fact, he was as intrigued with the questions that haunted me as I was. Why did he and a handful of others become so good so fast? What special abilities did he acquire that rendered him head and shoulders above the rest? His insights and descriptions of how he manages a flight started the process of answering the burning questions. That process has continued over the years with similar interviews that have appeared in Cross Country Magazine.

After time it became clear that we had more material than we could put in articles. Also, we were urged by many readers to consolidate the articles into one publication so that all that golden knowledge wouldn't be lost and would be readily accessible. We listened to these petitions and the result is the book you hold in your hands. We think it will provide many hours of enjoyable and enlightening reading. We also think every pilot reading the book will gain valuable insights that will absolutely improve their flying skills. The quest for higher, further, faster will be rewarded.

AUTHOR'S NOTE:

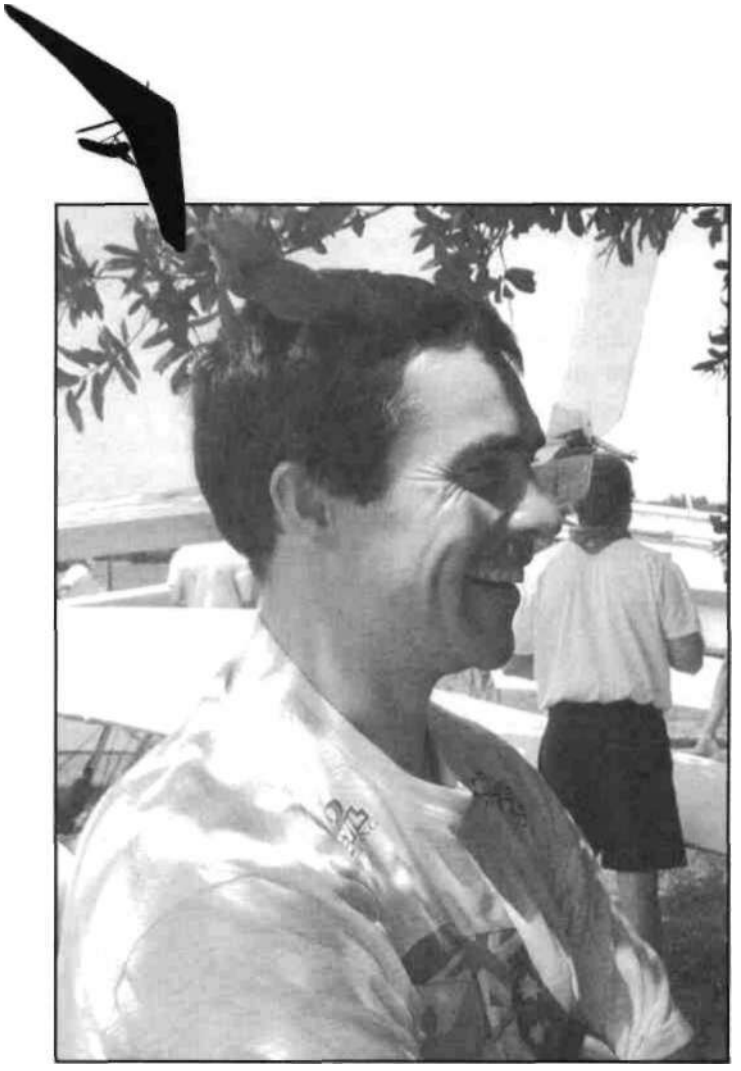
We have presented in this book most, if not all, of the world's top ten pilots including the World champions for more than one decade. We have tried to include pilots with different backgrounds and styles, from a variety of countries. We have tried to ask provocative questions, that both enlighten and lighten the learning process. We have tried to include questions that the average reader would want answered as well as some of the more difficult or technological questions. We are happy to say all of the pilots were eager to share their knowledge.

Finally, we wish to note that the order in which the pilots appear in this book has no particular implications except for literary purposes. In other words, Tomas Suchanek is first because he was the first to be

interviewed and it was thought to be a pleasing touch to begin where it all began. Manfred Ruhmer is last because his whole quest for World Championship was protracted and full of pitfalls until final success. His story adds a note of climax to the entire book. Other pilots appear where they do to either show a contrast or provide a change of subject. All those interviewed have some ideas each of us can use.

Hang gliding is truly one large family of special individuals who have given over all or a portion of their life to the oldest dream made real. Part of this family tradition is for the more experienced to teach the lesser. We all owe a debt of gratitude to the supremely experienced pilots who appear in this book. Their eagerness to pass along their secrets will inspire us all for years to come.

TOMAS SUCHANEK



Tomas smiles in relax mode at the QuestAir competition.

THE SECRETS OF SUCHANEK

Tomas Suchanek hardly needs to be introduced to most hang glider pilots for he is a one-man phenomenon. Tomas has won three World Championships and walked away with 30 to 31 competition wins at last count. He also won a world championship in weight-shift microlights (trikes) as well as major sailplane competitions. Tomas was at the height of his invincibility when I interviewed him at the Australian Pre-Worlds in 1996.

Tomas is an eagle amidst the rest of us would-be hawks, and it was only in the mid-to-late 90's that any other pilot could dare threaten his lofty aerie. The main pilot to do that was the Austrian, Manfred Ruhmer, who has reigned supreme once Tomas retired in 1997. Tomas still competes occasionally in hang gliding, but interests in sailplanes and family obligations leave him reluctant to make the commitment necessary to be a champion.

In the history of hang gliding there have been several pilots who soared above **the** rest—Bob Wills in the early 70's, Tom Peghiny and Steve Moyes for a decade in the 70's, Rich Pfeiffer and John Pendry in the 80's. But none of them were as unbeatable as Tomas at the highest level. Winning a world meet is an incredible feat. Winning three was unbelievable.

Tomas seems to be the first pilot to figure everything out (including glider tuning) to such an extent that he moved up a whole level above his peers. I'm sure you'll be struck as I was by the efforts he has expended to achieve what he has, and his perspective on the art of efficient hang gliding. He is totally willing to share his hard-learned insights, tricks and secrets with the rest of us. **In my mind that** is the mark of a real champion.

Tomas, I'd like to begin our exploration of your abilities by learning a bit about your background. You seemed to suddenly be at the forefront of every competition, but we know it didn 'tjust happen overnight. What lead to your early successes?

I began flying models in my native Czechoslovakia when I was 5 and hang gliders when I was 15 in 1980. Models are very good tools to teach you micrometeorology since they can get even closer to the terrain and are more sensitive to the air than a hang glider. I built my own models, of course, then built my own hang gliders for seven or eight years. We could not afford to buy new gliders and we had to fabricate most parts.

The other problems I faced which turned out to be benefits, were the relatively small hills to which we had access and the lack of automobiles. This meant we had to carry our gliders to the top of the hill. We learned to read conditions exceptionally well by necessity—often there would be only a half-hour soarable cycle and a launch window of only a few minutes! We developed our scratching and thermaling efficiency skills to the utmost for we dreaded that arduous hill climb.

We had a similar hill we flew that required a climb. We often held an informal challenge to see who could launch the lowest on it and still get up to stay.

That's exactly the practice I'm talking about and to this day, I think it was this early challenging flying and decision-making that developed some of my current critical skills.

"I *would devour books about weather, soaring and design. I must say that I think this is one of the most necessary paths to becoming an excellent pilot. We can't possibly experience and figure out everything ourselves, so books and articles greatly speed our learning."*

Later I studied aerodynamics in the university and acquired the equivalent to a Masters degree in aerospace engineering. But my independent study was as important as my formal schooling. In the winter, I would devour books about weather, soaring and design, then try to put the ideas into practice in the flying season. The next winter I would reread the books and learn new tricks based on my recent experiences. I must say that I think this is one of the most necessary paths to becoming an excellent pilot. We can't possibly experience and figure out everything ourselves, so books and articles greatly speed our learning.

Tomas runs into the air at the 2001 World Meet.

Tomas, we would like to get specific about your physical and mental qualities that may set you apart from the average pilot. Do you think there is a particular physical type that excels at hang gliding, and if so, are you that type?

I see all different sizes and shapes of pilots that are top performers, so I don't think any particular physical type is favored, except larger people. It is an aerodynamic fact that larger gliders fly better because of Reynolds number effects, so if a larger pilot flies a larger glider, he should have an advantage, but of course, many other factors are involved like experience and skill.

How much do you weigh?

About 67 kilos (147 lbs).

***That**'s not a lot, so you have to drink more beer or keep designing gliders that **are** too small for the bigger pilots!*

Ha... actually, the trend is for designers to build, and pilots to fly, larger gliders. *[Ed. Note: This trend seems to be reversing in the new millennium.]* As long as they handle well, smaller pilots can fly them and get good climb performance. Part of the ability to handle any glider is to be in good flying shape. I now get about 300 hours of airtime a year and that helps. I noticed some years back that I would do well in competitions in the first few days, then more poorly as the meet progressed. I realized that fatigue was a factor, so I began exercising, mainly by bicycle riding, and it seems to have helned.

"Part of the ability to handle any glider is to be in good flying shape. I now get about 300 hours of airtime a year and that helps."

The only other physical property that I believe is a tremendous asset is my eyesight. I have better than average (20-20) vision and believe I can spot gliders, dust devils, birds, clouds and other signs of thermals perhaps better than most pilots. This is naturally a great benefit in cross-country flying.

What mental qualities are important for top performance in your estimation?

I think a pilot must have knowledge, experience, confidence, good spatial judgement, abundant observation, a certain amount of reasoning ability and a sensitive feel for the air.

*Can you expand on those ideas and indicate which **are your** strong or weak points?*

Naturally, I have knowledge and experience from my earlier devotion to study and my accumulated airtime both in and out of competition. There are a couple tricks I use to increase my knowledge, which we'll talk, about when we discuss thermaling. I cannot overemphasize the benefits of knowledge of micrometeorology and the behavior of your glider in the air to maximize your flying.

I have the ability to observe very well what's going on around me—cloud changes, general pattern changes, flow patterns, gaggles, potential thermal sources, etc. I process all this information in a logical way. I think intuition is only about 10% of my decision-making.

Let's discuss intuition a moment. We often encounter or hear about "natural" pilots and we certainly know excellent pilots who do not have great technical abilities nor can they explain what they do in a logical sense. Do you think they are

*making the same good decisions as yourself based on the same **quantity of information** only in an unconscious manner?*

Yes, I think it is possible. Our brains can certainly assimilate a lot more information than we can recall in our conscious mind. Perhaps some pilots make a lot of their decisions unconsciously and these are the ones we call natural because they can't tell us what they do! However, I also believe we are born with different abilities to orient dynamically in three-dimensional space. Most likely, pilots who seem to excel naturally have this ability to a high degree as well.

A certain amount of this spatial judgement can be learned, which we do when we learn to drive a car or catch a ball. More to the point, as we gain experience in gaggles, we learn to judge the position and trajectory of other gliders—sometimes a swarm of gliders.

Yes, competition definitely improves our aerial judgement. If it doesn't, **a** pilot has too many close encounters or gets caught outside a thermal. But even when we are alone, this spatial judgement is necessary to locate and remain in the best thermal cores. This brings up sensitivity to the air. I believe this matter is exceedingly important and I constantly practice feeling slight perturbations, flow changes and temperatures changes to help me make my in-flight decisions.

So in summation, I believe I have most of the mental qualities I listed that combine to make a good pilot. However, I don't think I was necessarily a "natural" pilot, I had to work in a logical manner to perfect my abilities.

*If you permit me to change the subject to thermal skills, Tomas, I'll begin by noting that you have an uncanny ability to climb through a pack of gliders and top out almost at will. In fact, all the best pilots are in admiration of your climbing abilities. Last summer at the U.S. Nationals, you repeatedly spun your glider to below takeoff and readily climbed up to the top of the heap. And this was on days when many pilots were bombing out! Are you an alien or do **you carry a nugget** of antigravity?*

Actually neither, but I do believe climbing effectively and efficiently is the most important part of flying competition. For that reason I have concentrated in developing these skills. Mind you, I am not a natural climber like pilots such as Alain Chauvet, Manfred Ruhmer, Gerard Thevenot or Larry Tudor. This comes down to their innate ability to visualize a thermal and stay in its best lift. I've had to work hard to develop my logical thermal skills, but now I think I have the techniques and models in my head to do well.

"Cores are always changing and moving because even a smooth thermal isn't static."

Concerning techniques, most pilots can turn circles in a core, but few care to concentrate on making every circle as efficient as possible. Cores are always changing and moving because even a smooth thermal isn't static. I check out my progress on every 360 and make an adjustment where necessary. I'm always trying to picture the location of the core center. I'm always trying to perfectly circle this core and I'm always trying to fly as slowly as possible in this core with a margin of safety. In turbulent thermals, in traffic or near the mountain I cannot fly quite as slowly, but even in these conditions there are times I can slow down a bit if only for half a circle. Every ounce of energy I can extract from the air raises my potential.

When thermal cores are very shifty, it is even more important to evaluate

every circle. The presence of other pilots in the thermal is useful in this case, for they help indicate where the lift is best. If a pilot suddenly sinks, I turn tighter to try to avoid his track. Sometimes, little shots of lift move up through the thermal and it is possible to turn tighter to climb in it through the rest of the gaggle. Naturally, if the thermal is very crowded and confused, this may not be possible. But often thermals are not steady and it's possible to climb away from the traffic by concentrating on maximizing each circle.

I hate pilots who turn too wide in thermals (he laughs). They ruin it for everyone because no one can get the best of the core without having conflicts. But I use a trick in this case that I've often seen Larry Tudor use: I fly close behind the offending pilot, then when a shot of lift occurs, I can turn quickly inside of him and be up and away. I tend to fly aggressively in gaggles, more so than say Manfred, but that's just my style. I try to stay aware of each pilot's location and trajectory so I can alter my path with safety. Again, this is a matter of learning and practice.

/ know you have some specific ideas about the nature of thermal behavior that relate to how to fly them efficiently. Could you tell us your ideas?

Yes, I think it's very important to have an image of thermal shapes in your mind when you are trying to exploit them to the fullest. For example, is the particular thermal a column? A short-lived bubble? A multi-core blob? Does it tilt? Is it wide or narrow? And so forth.

We know that thermals have great mass—tons in fact—so they also have great inertia. That means that they do not move freely with the wind like a toy balloon, but act more like a tethered hot air balloon. The air flows around and over the thermal and distorts it somewhat. My image of a thermal in wind includes an

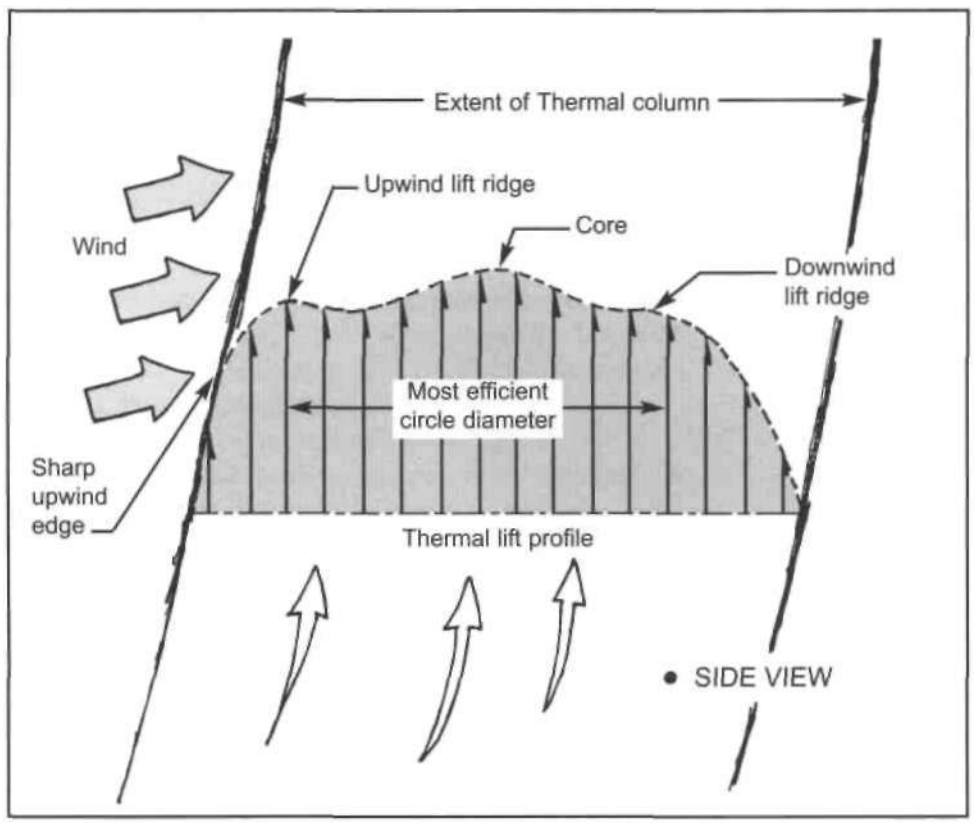


Figure 1 - Thermal Distortion in Wind

increase of lift in both the upwind and downwind side (see figure 1) much like the upwelling produced both in front and behind a post or rock set in a fast moving stream. This is due to mechanical lifting in front and convergence behind.

To make use of this feature, I try to position my thermal circle so that I ride the crest of this outer ring of upwelling air, assuming the center is too small to allow efficient climbing. In this situation, the upwind side is most critical because it has the sharpest drop-off of lift. You can often see pilots go over this edge and lose quite a bit before they get back into the core. This is when all my sensitivity and concentration come into play. If there's any one thermaling secret I possess, **it's** this model of a thermal in wind and my ability to "surf the crest.

Do you change your style for different strengths ofthermals?

No, not generally. I find the techniques I use work the same for most thermals. I think about a 30° bank is appropriate in all but the very small or very wide cores. Again, I try to fly as slowly as I can and maintain control. Of course, in extremely strong thermals more speed is necessary for safety.

We heard tales of you winning meets recently ***without using instruments.*** *How did you do this?*

Well, I often sell my equipment—I sometimes use a different glider every meet especially if I'm developing a prototype. In this case, last summer, I sold my vario. All I had was an Avocet watch to use as an altimeter. I entered several meets in Europe and won them without a vario. Pilots couldn't believe it, but when you consider I spent many years thermaling without a vario (we couldn't afford them), it's not so surprising.

I thermal mostly by feel anyway. I use a vario to confirm my feeling, but it really isn't necessary in most cases. Below 500 meters (1500 ft) I can visually detect my climb. Above that height I like to have a good averager, which I think is the most useful instrument. But with my experience without instruments and other pilots in the sky, I was able to thermal well and win. Developing a sensitive feel for the air by turning off your instruments is a very useful practice.

Can we turn our attention to flying cross-country, Tomas? Part of the key to cross-country flying is finding the next thermal. Do you have any insights into this art?

Tomas landing at goal on the last day of the 2001 World Meet.

Jah, essentially I use the classic signs like you give in your book *Performance Flying.* Above about half the height of the cloud I'm looking for cloud signs. Below that I'm looking for signs of terrain triggers. Of course, in all cases I'm looking both up and down, but the higher I am the more I'm reading clouds and vice-versa. I am looking for probabilities and constantly try to apply the theory I know. I look for the best confirmation of location and conditions to result in the highest thermal producing probability.

What are you looking for in particular regarding clouds?

Well again I'm looking at all the classic stuff such as sharpness of the edges, vertical development, flat and dark bottoms, upwind side, sunny side, etc. Every cloud tells a story that we can learn to read. The tops tell the wind direction and wind can affect the location of lift in relation to the cloud. I look mostly on the upwind side first. I look for a sharp outline and an area of higher buildup.

"Every cloud tells a story that we can learn to read."

It's very important to picture the state of a cloud. Some days the lift is weak and doesn't last long but the cloud lingers because the air is moist at the cloud level. Other days lift might last a long time but the clouds disappear quickly because the air is dry and they evaporate. On moist days the clouds are less reliable and on dry days they may be harder to get to since they come and go so quickly. So it's a trade-off.

Usually all clouds are similar on a given day, so I observe and learn the current cloud life cycle. Then in the air I'm picturing things about three steps ahead. I know where I'm going long before I top out under a given cloud.

There is no substitute for knowledge of weather. It helps to understand the nature of clouds, temperature traces and airflows. For this I recommend your book *Understanding the Sky.*

Thank you. Can you tell us what you look for on the ground?

Again I'm looking at everything for the maximum probability of thermal production. However, perhaps the most important thing I do is constantly be aware of the air's flow at all levels (it often isn't the same). I have spent time canoeing and watching the water drift around rocks and logs helps me visualize the wind behavior over hills and mountains. I always try to picture the wind flow. This helps me fly a site for the first time and figure it out quickly. Ager (Spain) is a complicated area, for example, but the most complicated place I encountered was Fiesch (site of the 1989 World Meet in Switzerland). Most places are easy to understand logically with flatter areas being easier.

To list specifics, if I know the wind direction, I look for the upwind side of hills and tree lines but the downwind side of dark fields, dry fields or parking lots. I also look for contrasts such as dark and green areas or the edges of cloud shadows. Naturally I carefully observe the presence of birds, dust devils, airborne debris and other pilots. Taking into account the present wind I picture the angle of thermals based on these triggers or signs.

Other potential thermal sources or triggers lie in convergence zones which may occur due to a sea breeze or where the air squeezes through a gap or into a narrow valley. This is where my visualization of the wind flow pays off.

We won't flinch at the tough questions, Tom. The other day you landed short of goal while many pilots made it. We were relieved to discover you are indeed human. Can you tell us what happened?

Jah, I was with a group in broken lift that wasn't working very well. I saw two places further on that should produce a good thermal. I went to both of them and found nothing. An internal voice said that I made the wrong decision, but I didn't listen to it. That shows that even high probabilities are not absolutes. Our sport will always deal with unknowns, but that's what makes it interesting.

***That's** a good point. On a more positive note, last summer you competed in the U.S. Nationals and won handily. On one round we noted that you went away from the gaggle that was on course line. You eventually made goal while only Dave Sharp did also and he took an hour longer. What did you do in that situation?*

I saw a line of clouds to the north that looked very good. Once I reached them I went very fast to the turn point and back. Then I detoured further north to another group of clouds so I could have a crosswind leg into goal. On this flight, I used another trick. Since thermals are large masses, they will block the wind. So it is easier to go upwind under a line of clouds than in the blue (see figure 2). Using this trick helped me get to goal on that **day.**

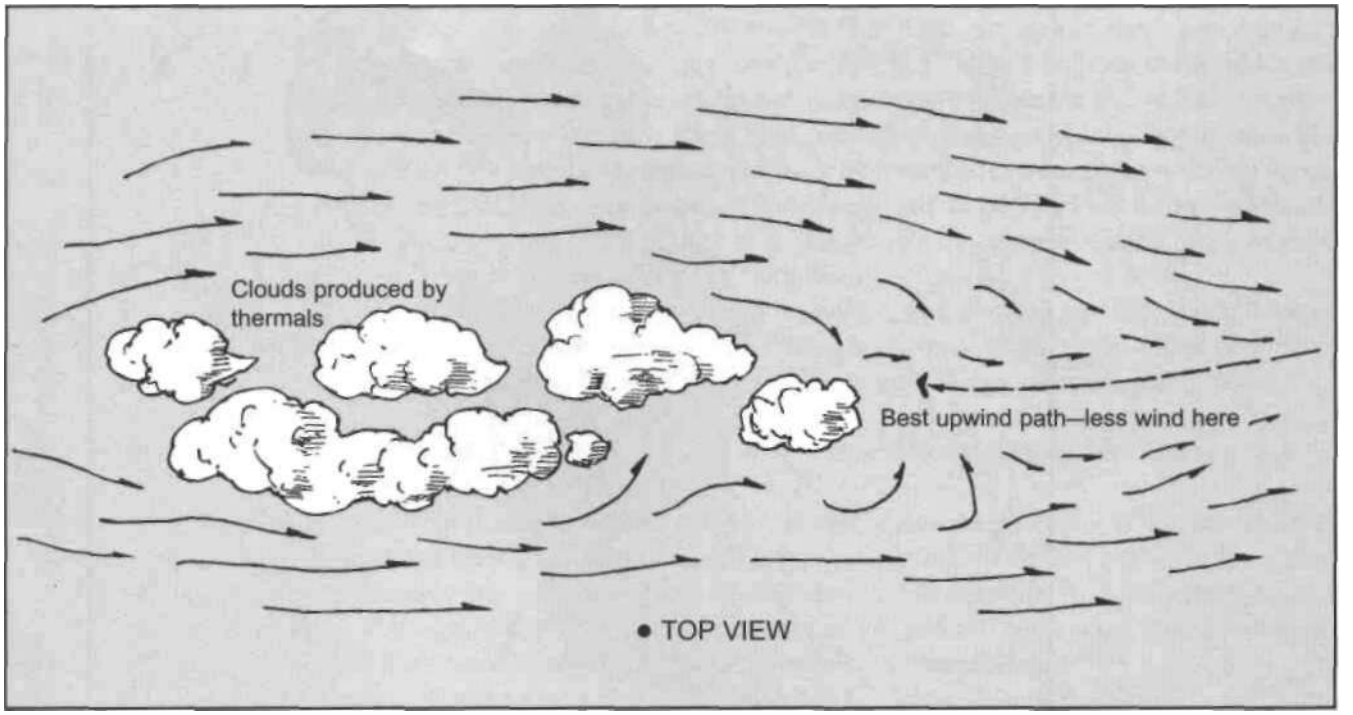


Figure 2 - Using Thermals as Wind Blocks

So you bypassed the obvious thermal the gaggle was using for the chance at a better line. We have also heard many stories of you gliding towards a gaggle and avoiding it to find a much better thermal nearby. How do you do that?

I don't intentionally avoid gaggles, but they are just part of the information I use to determine where to go. In many cases I see signs of better lift such as a bird. Birds are almost always in the best lift in an area. I also try to approach a gaggle or thermal area directly upwind or downwind because if there are multiple cores, they are usually lined up with the wind. Also, if pilots are working several cores in an area, it is sometimes possible to tell the direction in which the best lift may lie by noting who is climbing best. If gliders are strung out vertically, there is probably one good column working, but if there are several climbing groups, there is almost always one area lifting best. The pilots in the group may have not found it and I try to assess that possibility and its probable location as I approach the area.

This also brings up an important technique I use to locate thermals. When I'm close to an expected thermal area, I try to be very sensitive to my drift. I watch my drift with respect to the ground and I carefully feel the bar for any yaw or roll

acceleration. A tall thermal will draw air in all around it, even well above the ground (see figure 3). When I detect a sideways drift, I turn towards the drift direction and find a thermal 80% of the time. These tend to be good thermals if they influence the surrounding air noticeably.

Often when I am near a thermal, I will also use a sailplane type maneuver and make a big square or circle to find the best lift. Again, I try to manage to approach upwind or downwind rather than the side so to have more chance to find the best core.

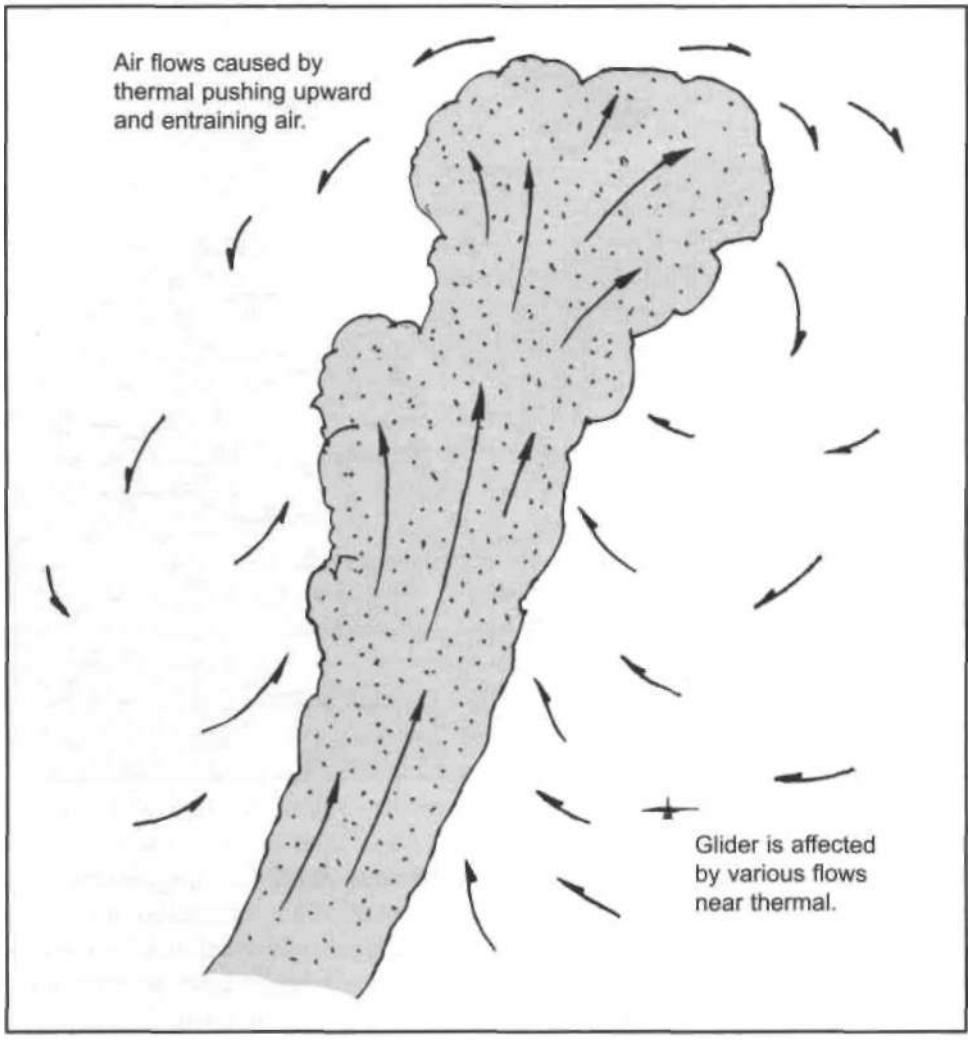


Figure 3 - Sensing a Thermal

That sounds like a good plan. How do you handle blue holes areas where most likely lift is weak or non-existent?

Blue holes usually are sinking unless they are the only sun spots available, then sometimes they trigger thermals. If possible, I will go around a blue hole on one side or the other, especially if the clouds are active. Clouds mean lift and a blue hole amongst the clouds almost always mean meager lift or sink.

Shifting gears again Tomas, let's talk about competition. Specifically, how did you start competing?

Originally I was competing locally and I was just trying to reach my own personal

limits. Then in 1986, at the European Championships in Hungary, I was on a home-made glider that didn't perform too well and I took eighth. I realized that I had the ability to reach a high level so I worked hard to improve in various ways. I began practicing by setting goals on every flight, trying to reach them and getting back to take-off. I began practicing climbing even more by circling down and climbing back up.

I also began working to have the best equipment. I realized that having equipment that is better than others gives great confidence and helps smooth out the mistakes.

Where did you go from there?

My first meet out of the Eastern Bloc was the 1988 World Meet in Australia. It was a miracle that I was able to come since the communists were sure we wanted to defect. There was so much red tape that I didn't believe we would reach Australia. I had to get seven or eight permissions—from the police, secret police, army, communist party, my school, a political group of young people, etc—and most of these were obtained under the table including such tricks as stolen forms and bribes. Then two weeks before it was time to go I had the forms signed and went to the Aero Club. They said "no, you don't have permission." It took days of battle to get an FAI license from them.

All this indicates how much pressure I was under in my first World Meet. I knew if I didn't do well, I would never be allowed to go again. I took 28th place and that was good enough for the old regime. Things are much easier now.

Then in 1989 you took second in the World Meet at Fiesch. After that you won the next three. Is the pressure still there?

Well, after Fiesch I gained much confidence. In the Brazil World Meet (1991) I was very confident because I had a good glider—a Moyes XS—and the conditions were very much like I know at home. The thermals were light, moving, but consistent. After I won that meet it just got easier. I think a big part of competition is self-confidence. You must believe in yourself totally.

For the Owens World Meet in 1993,1 felt very good because I prepared my glider 1 1/2 years ahead of time. I had special maps and a year of practice in the area. I worked out a ballast system, but I didn't use it and didn't even fly with my covers. I never use ballast in competition because I think climb is most important. In the Owens meet, disaster struck (for me) on the second day. I bombed. I knew in previous meets I didn't win with such a bad day, so I totally relaxed and began having fun. Then on the last day Chris Arai was slow crossing the long gap at the Westgard Pass and I won the meet—just barely.

You won again in 1995 at Ager, Spain—just barely. By now most pilots have heard how you and Manfred Ruhmer battled it out down to the last few kilometers of the last flight. You held back while he went on glide. He landed just short of goal. Why did you hold back?

My final glide numbers indicated I didn't have the height to reach goal. It was very difficult to make the decision not to go when I saw Manfred glide on. I knew he could possibly make it and win the meet.

It seems that Manfred is the only pilot that can best you on a regular basis. You and he have been trading wins over the past two years or so. I saw you waiting

on launch at the Europeans in Laragne, France in '94 and again in the Ager Worlds for everyone else to fly, then you and Manfred launched at the exact same time to fly one-on-one. Naturally, this is very exciting for the rest of us to watch. How does Manfred affect your flying?

The only time I'm nervous is when Manfred is around! Actually I think we have pushed each other to be better. As I said before, he's a natural climber and does better than me except in traffic. I think I am better at making decisions, so the only way I manage to beat him is to get away from him. I also think he makes good decisions, and flies fast in the mountains when the way is obvious. Other times he waits for me to go.

Tomas focuses on the task of the day..

I'm used to flying alone because I never had a team to fly with. If I take off late or early I am alone (except for Manfred) much of the time. I use gaggles for information but don't stay with them. If I take off 1/2 hour after the pack I catch up in 1 1/2 hour or so, then have to fly in front, so it doesn't matter when I take off in relation to the group.

We have spoken a lot about thermaling and finding thermals, yet we know that another important part of cross-country flying and competition is efficient gliding between thermals. Do you have any special tricks there?

Well, I know about polars and MacCready speed-to-fly as you discuss in *Performance Flying.* But we are on the edge of performance where we can use MacCready theory strictly. For example, I usually try to climb as high as possible rather than leave a thermal early. Only on good days and when I'm sure the next thermal is close and stronger will I leave a good core. I may leave a thermal 200 m (600 ft) or so below cloud base on very good days. I use the theory of staying in the best lift band.

I now use charts on my uprights for speeds to fly and final glide. My one chart gives me the correct speeds-to-fly for head wind and tail wind. My other chart gives me the altitude needed to glide 1 kilometer for various sink rates and ground speeds. With my GPS telling me how far I am from goal, this chart becomes a final glide chart. I know how high to take the last thermal. It was this chart that told me not to go on glide at Ager.

Of course, the new instruments with speed-to-fly and final glide calculated from a GPS input may make my charts obsolete.

Can you give other secrets for excelling at competition Tomas?

Really, competition is simply climbing fast, gliding efficiently and making the decisions to go to the right place to find the next good lift. We've covered most of that.

One important trick I use is to time my flight so that the toughest part of the

One important trick I use is to time my flight so that the toughest part of the course is run during the best part of the day.

course is run during the best part of the day. To do that I need to estimate the speed I'll make along the course—this varies with the site and conditions—and figure out the day's peak heating time. If it's a very long course, I sometimes can't use this plan exactly or I may run out of time. It should be pointed out the faster you are the more options you have because you can shift your flying period around more. If you're slow you have to take off early no matter what!

Another technique I use is to stay upwind of the course line in the best part of the day so I have a somewhat downwind path when conditions get weaker later on.

Finally, I can say that one of the best ways I practice is by flying a trike. I look **at** distant points that I think should produce a thermal then fly there to see if I'm right. On a hang glider you get only one wrong guess, then you're on the ground. On a microlight you can do this ten or more times in one flight and suffer no consequences if you guess wrong. In this way I practice my judgement and decision-making.

If we've exhausted your supply of competition tricks ***(I'm sure you have a few more up your sleeve), let s talk a bit about equipment.***

I think equipment is very important. I have the advantage now to build anything I want. I fly the Xtralite which Steve Moyes and I developed. I think it is the best glider all-around. *[Ed. Note: Tomas has since moved to the Litespeed.]* I think the general planform is very good and close to ideal with an aspect ratio of 7.5. The fiberglass tips are good for efficiency of shape and for unloading gusts. I have designed the airfoil profile and feel I have maxed it out after much experimentation. In competition I sometimes fly a stock glider and sometimes a prototype. Sometimes the prototypes are worse than stock and sometimes better. It is difficult to find the best compromise between sink rate, handling, glide and speed. I believe we are close to the ideal now. A glider is always a mirror of the designer's philosophy and I think it is very important to have the best glider.

How do you have your glider set up?

I think it's important to have a glider trimmed to fly perfectly straight. For speed, I trim my glider to be 2 to 3 km/h (1 to 2 mph) faster than stall, hands-off. Then when I lay my hands on the bar, it picks up to about 5 km/h (3 mph) due to **the** weight. It is much better to have to pull in than push out when thermaling **for** efficiency.

The general performance of a glider is established in its manufacture and can't be altered greatly. I do not put in stiffer leading edges or tighten the sail because handling deteriorates. I think handling is very important for climbing.

The general performance of a glider is established in its manufacture and can't be altered greatly. I do not put in stiffer leading edges or tighten the sail because handling deteriorates. I think handling is very important for climbing.

For other equipment I use a very light and clean harness I made myself. It only weighs 5 kilos (11 lbs)—half that of other harnesses. It is important to maintain the right body position—not all pilots realize that. I also have a helmet I made myself that is strong and lightweight and a light cross-country bag. My in-flight wing loading is 8.2 kg/m^2 (1.67 lbs/ft^2).

My instrument is a Flytec. I like it because it's small, light, reliable and doesn't give extraneous information. I mount my vario on the right side of my base tube so I can see it better when I'm on glide. I have tried the Arai Tangent and think it may be the future of instruments. I have my averager set on 20 seconds because that's about the time it takes to make a typical thermaling circle.

Well, Tomas, this certainly has been enlightening. I know I have a few more tricks to try and I expect our readers will also. Now that you 've won three World Meets in a row, that's going to be hard to top. Do you have any plans for the future?

Why not go for four... after all, the next one is practically in my backyard *[Ed. Note: The 1998 World Meet was in Australia where Tomas spends most of his winters.]* I also want to spend as much time with my family, my wife Renata and my boy Petr. It's hard to be away from them for months. Then there's another possibility. No one has ever won World Championships in three disciplines.

You have won in two—hang gliders and microlights—could it be that you are taking up ballooning?

Nah—not enough action (wink)! ***[Ed** Note: Lately Tomas has been winning sailplane competitions.]*

Well, we '11 just have to wait and see. In the meantime, I thank you very much and I'm sure all but your closest competitors wish you the best of luck in your flying.

Tomas clears the field after a successful goal.
Note the clean harness profile at the shoulders.

ROHAN HOLTKAMP

Rohan Holtkamp currently stands as Australia's greatest threat.

ROHAN ROCKS!

The current man to beat in Australia is Rohan Holtkamp. And since Australia hosts so many international meets, Rohan is always in the thick of things. He is known to be one of the best thermal pilots on the planet with his specialty being weak or blue days. Indeed, he placed 4th in the 2001 World Meet in Spain, where the conditions were particularly tough. Naturally, we spent most of our time together talking about thermaling skills.

Rohan, before we begin, fill us in a little on your flying and competition background.

As of now I've been flying about 15 years. I learned in Victoria, Australia where we have shitty cold winters. But I flew every day I could, come rain or snow. I learned in the month of September and entered my first comp four months later. This was the Flatties in Parkes (Australia). In my first comp on the first day I made goal! It was an 85 km (53 mi) task. My first X-C flight had taken place just the day before. Maybe it was beginners luck, but I ended up placing 16th out of about 80 pilots. I was the top B-grade pilot.

Grant Heaney told me before the meet to just get high and follow the map. Well, at home sites I was always top of the stack, so I just tried to get to the top and head out to the next thermal and it worked! I was flying an EFG, which was a single surface rigid wing with tip rudders. All the other guys were on new GTRs and I couldn't keep up with them in glide.

After that, I went to my second meet—the Bogong Cup—where I placed 3rd. There were only Aussies there, but all the top guys were in the meet (Mark Newland, Grant Heaney, Danny Scott, Steve Moyes, etc.). What helped me is the

fact that I got 500 hours of airtime that first year and 300 the next.

I continued flying my EFG until 1991 when I was given an Airborne Blitz. I started being able to keep up on glide and my competition results improved. I was 36th in the Australian ranking the first year, 16th the next and then in the top ten ever since. I've won the Canungra Classic and have been the top Aussie in our Nationals four times. At the Forbes meet this year I set the Australian speed record around both 100 km and 100 mile triangles. I hold the Australian out-and-return speed record for 300, 200 and 100 km, and the maximum out and return world record of 346 km (215 mi).

That's pretty impressive, Rohan. I'm sure a big part of your success stems from your uncanny ability to find thermals or stay up when others go down. Let's dive right in the thermal stuff. Give us some tips on finding and using thermals if you please.

To begin, let's talk about blue days (days exhibiting no cumulus clouds). Blue days are generally the hardest for X-C flying, but in some ways they are easier. For sxample, on a blue day you aren't suckered into going to false signs like fading clouds. Even on good cloud days when you are up near the belly of the cloud, you can't see ahead to tell where to go. So my blue days solution is to use feeling and drift to help detect or find lift.

My blue days solution is to use feeling and drift to help detect or find lift.

The feelings to notice are the roll, yaw and pitch actions of your glider in reaction to the air. These actions come both alone and in combination to give you different messages. A prerequisite for you to be sensitive to these inputs from your glider is to have a light grip which means your glider must be tuned properly. It helps to have a good friction surface on your base bar so you can lighten your grip and still be in control.

Rohan Readies for high altitude in Florida.

Let's start by looking at the roll and yaw reactions of your glider. Those two things along with variation of ground speed or drift give you a feeling of where to look. Very often there's something visual that indicates a thermal presence like a bird, a bit of straw or a glint of dust, debris, etc. The feeling of the glider tells you where to look. It's amazing how often this happens—at least every second thermal. On blue days especially, I can usually see the thermals and get in them every time.

To illustrate this feeling, imagine a table cloth spread out with hang glider models on it. Now you pull the center up and what happens? The models roll away from the center (their wing closest to the center lifts more) but drift inward (see figure 1). It is the rolling/yawing/drifting action that you must learn to detect. Myself and other experienced pilots do this subconsciously.

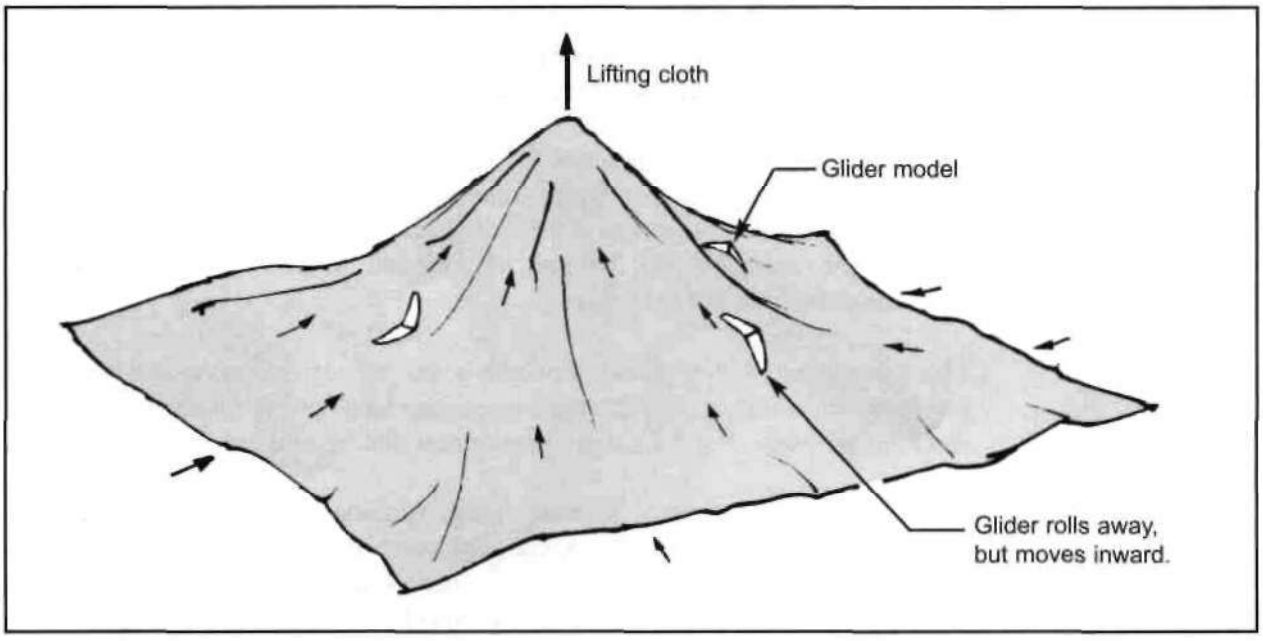


Figure 1 - Action of Gliders Near Thermals

The way to develop this sensitivity is to practice at your home site. Some people may blindly feel lift, but not be thinking "What do I feel before I hit the thermal?" The best practice is when you have ridge lift to keep you up. It may be a boring ridge day, but there's almost always thermals to play with. Go out in front of the ridge and try to feel what happens. See if you can locate thermals by feel before you reach the core. Repeat this practice by going back to the ridge to get high and try again. This is quality practice.

Relate to what you feel each time. Practice this procedure until you can detect a thermal 1 or 2 km before you get there. Thermals generally have a much wider influence than most people think.

My friend Joel (Rebbechi) used to fly really slowly in lifting areas to detect lift. The variations in the glider behavior are most easy to pick up when you're flying slowly. In gusts, however, you have to be careful of flying too slowly because the sudden variations can cause stall and control problems—hold some airspeed in reserve.

Just like roll and yaw changes, you have to feel the pitch changes. There'll also be airspeed changes, loading changes and vario inputs. As far as I'm concerned, a vario is good for telling you your average climb, but it shouldn't be what you fly by. A vario is just a backup. If you rely on your vario too much you won't develop sensitivity. My first vario was a Makiki. *[Ed. Note: this vario was made in Hawaii and consisted of a flask with escape holes which allowed air to flow out or in when you went up or down. The airflow would lift colored pellets in a clear tapered tube to indicate the amount of lift or sink].* It had no sound and sometimes the pellets would stick. So it really helped me to develop my feeling for thermals.

As far as I'm concerned, a vario is good for telling you your average climb, but it shouldn't be what you fly by.

Rohan, let me break in with a question here. I notice you and most of the other top pilots are not flying with full-face helmets. What's the reason for that and isn 't it riskier?

One reason is for performance. When I first flew with a full-face helmet, I did

poorly because it obscured my peripheral and downward vision. I couldn't get the normal ground speed information and couldn't find the cores right away. So I threw the helmet out. Most of us agree that full-face helmets cut down on your perceptions.

I am very concerned with safety; I run one of the largest schools in Australia and safety is what I preach. Consider this: I know two guys who had crashes with an open-face helmet and the doctor said they are lucky they didn't have a full-face because their chin took the impact, not their neck. I feel less indestructible with an open-face helmet, so I fly more conservatively on takeoff and landing and I choose my conditions carefully. I'm more conservative setting up my approach. I believe flying with an open-face helmet has made me a better pilot because I make safer choices, but also can get to the cores quicker and get higher to have more options.

That's an interesting viewpoint, Rohan. Three years ago I had a discussion with James Freeman (Australian competitor) who was a neurosurgeon and is now an emergency doctor. He said essentially the same thing and noted that it s much easier to repair chins and cheeks than necks. Now let s get back to your thermal discussion.

The next thing to focus on is pitch effects. If you are observant, when you get to a lifting area the first indicator is a change in your glide angle. If the change is slight or gradual you may feel no other change. But this should alert you to pay attention. Then, as you enter more lift you should feel your bar move out (forward) as the nose wants to pitch up, and then the G forces build. At this point I endeavor to keep my wings level. You should also be assessing how much to slow down according to the turbulence you feel.

Then you should perceive the horizontal acceleration toward the direction of the thermal. It may be a yaw away or feeling of drifting sideways a bit. It should be clear that if you enter the thermal influence area off to the side you will feel more roll and yaw effects. However, if you enter it pretty much straight on, you'll feel more pitch effects and should be able to detect an increase in ground speed as the thermal draws you in like a chimney. If one wing gets lifted, you should fight to keep the glider level.

The vario may start to show zero or 100 to 200 up and increasing. As the increase in lift continues, be extremely sensitive to the feeling of G's. Once it goes back to one G, begin turning on the side that was lifted.

Don't be fooled into delaying your turn by an increasing signal from your vario for it usually lags. The turn rate and bank angle you produce are determined by the number of seconds since you hit good lift. The definition of good lift is where the sudden G loading occurs (see figure 2). When you hit that high G, put out a mental marker. The faster you fly, the quicker that mental marker drifts behind you. Your first pass is for mapping and that should be your focus.

Your airspeed should be a little bit higher for the first two 360s or so, then relax and max your climb. This initial airspeed lets you maneuver better to center quickly and helps overcome any turbulence that tries to dump you out if you are on the thermal edge.

This procedure is appropriate for any size thermal and any altitude. However, lower down with smaller thermals it may take 2 to 3 seconds from the start of the feelings of the thermal to the time of turning. Higher up, it may take as much as

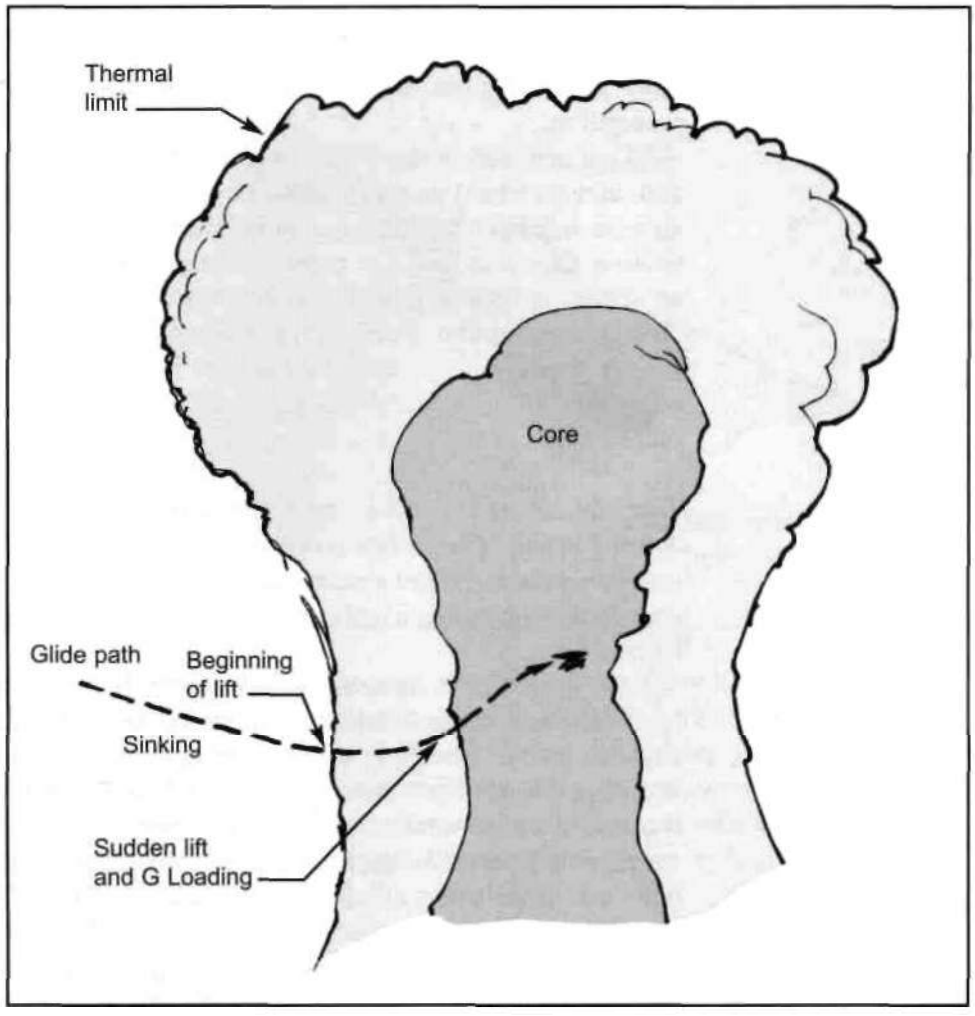


Figure 2 -
Feeling G Loading

20 or 30 seconds to do the process. If you feel a sharper entry (or exit) of the lifting surge, you should turn more sharply.

When you are low you should detect the ground speed change visually with your peripheral vision. When you are high, it's still a visual matter, but you should use objects around such as clouds (see figure 3) or distant mountains. You should also be able to feel the forward or aft G's as you get accelerated forward or you get slowed. Once again, when you are flying slowly these effects are more noticeable because there is a greater percentage of change in your relative ground speed. By the way, you can't use a GPS to detect these speed changes. I've tried it and it's just too slow.

So once we have found the thermal and reached the core, I assume there's more to do.

Certainly. The process isn't over just because you are circling in lift. You still have to fly to the top. The movement of the thermal has no relation to the ground, but it will be influenced by the air around it. In places like Govenador Valadares or the flatlands, there are often lingering wind shears that push around the thermal as it climbs like a hot air balloon. So there's how to proceed:

As you do your first circle, you may notice that one point will give a better

climb. This is not just told by your vario, but more accurately by the feeling of G's in your harness *and* variations in ground speed. So if/2 or % of the circle feels better, shift the circle in that direction by opening the turn a bit to move toward the better lift, then tightening a bit to circle in it. This way you are chasing the best lift. After a few 360s you should be in regular circles with the lift steady all the way around in a steady thermal. *You must develop all the above processes so they become automatic to free up your work load.*

If a thermal is highly changeable you have to apply this process continually all the way up. You have to elongate into better lift. While this is happening there may be a bird or other glider going better. The only way to tell is to see if it goes up in relation to the distant horizon (many times I have seen a pilot actually climbing better come to me by mistake). If you detect a better climb within reasonable reach, go for it.

The centering process can be sped up considerably by having extra airspeed on your first turns. The airspeed allows quick control.

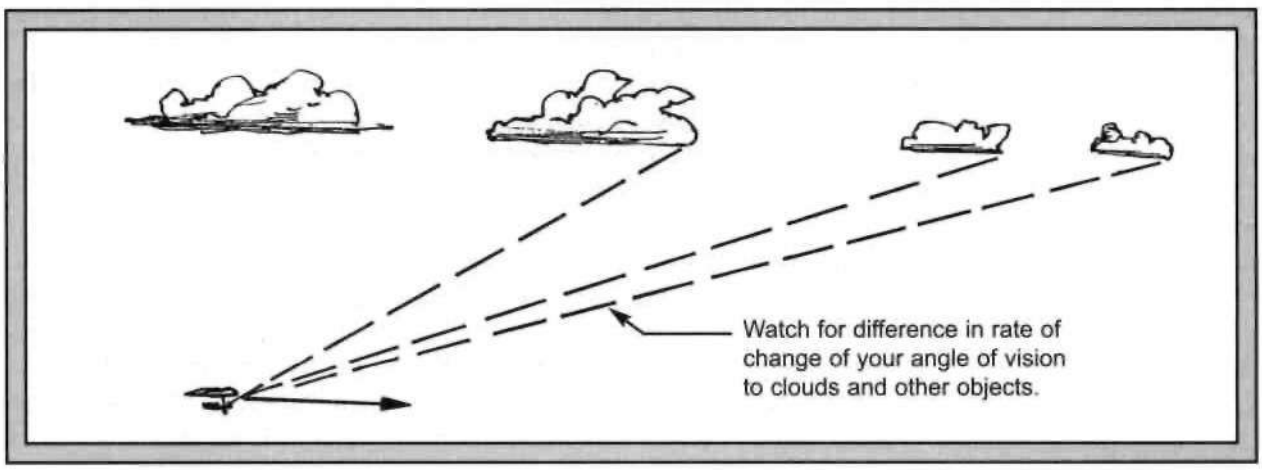
The centering process can be sped up considerably by having extra airspeed on your first turns. The airspeed allows quick control. If you feel a sudden unloading of G forces, use the extra airspeed to suddenly crank a bank back into the lift, rather than spending half the turn out of the lift. You can imagine sticking your wing in the lift and spinning around it. At least one part of your wing should be in contact with the best lift at all times. Once you have centered, then you can go to minimum sink if the texture of the air allows in terms of control and safety.

***You** 've mentioned changeable thermals, Rohan. Would you give us your technique for dealing with inversions?*

Sure. On a blue day is when you are most likely to encounter a serious inversion. You can usually see a very definite distinction of clean air above an inversion and dirty air below. You will also encounter turbulence at the inversion level. The thermal will tend to get more broken or variable.

When you see you are at the inversion level or you feel the turbulence increase, you should increase your bank angle both for safety (it gives you a higher airspeed) and for the smaller lift patches. Then you apply the above techniques very aggressively. You have to turn abruptly and vary your circle without hesitation or you will lose the elusive little bullets or parts of the original thermal that will push up through the inversion. You have to be ready to hook that good one that punches through.

Figure 3 - Visualizing Speed Changes



Newer pilots tend to underbank, especially in this situation. They feel the thermal break up, so they broaden their circle to go through the various parts, but they miss the chance to ride the elevator. They're usually wandering around chasing their vario. As an example, in the Algodonales World Meet (2001), many of us were in a slow climb and everyone left except Manfred and I. We tightened up and climbed through the inversion nearly 1000 meters (3,300 ft) above the others. We found a 25 knot tail wind—very smooth—at that level and glided over everybody's head, gaining 20 minutes on the rest of the pack. The only reason we got such a good climb is that we held on tightly to a small core.

Remember, climbing is like filling up a fuel tank. You have to use it to the max.

Remember, climbing is like filling up a fuel tank. You have to use it to the max. The time to play the racing game is when you've had time to analyze the day to see if it's worth racing. I rarely leave when I think I can get above the inversion.

Of course, on any day I will try to maximize my climb efficiency, but on the tough days is when I try to go through the inversion most often. When reaching the inversion, you feel the thermal getting lumpy and the climb rate slows down. When I feel this roughness I pay attention to my averager to keep an eye on the big picture. I recommend a 15 second averager. I used to use a 25 second averager, then dropped down to 20 seconds. But now I find the 15 second setting best because you can get half a turn in and assess the lift. When racing you have to quantify your climb, which means making decisions about what's good and what's not in the situation you are in. I'm not the fastest racer in the world, but I am one of the most consistent.

Speaking of racing, can you turn your attention to the gliding aspect of X-C flying?

Well, every pilot should understand speed-to-fly concepts. Once I got a good speed-to-fly instrument, I soon discovered that I was flying up to 15 mph (24 km/h) too fast! I thought flying fast on a course was merely a matter of pulling the bar in. But I sat down and did some calculations and realized how too much speed actually slows you down by wasting altitude. Then when I got a speed-to-fly vario it made me slow down my glides even more.

I used to come into a thermal, push out hard and crank around. By watching Ricky Duncan I learned to slow down to best glide as soon as my sink reduced to 200 FPM (1 m/s) or less. Then I slow to minimum sink as soon as lift starts. By the way, the more rapid G buildup you pull in a thermal, the more losses you sustain due to induced drag. You should always try to avoid pulling negative G's and too strong positive G's. Fly smoothly.

Bethino Schmitz and Manfred fly way slower than you think is possible when they encounter lift on glide. Any good instrument with a correct polar will tell you to fly this slowly. However, you must be very careful of the increasing possibility of a tumble when flying slowly.

How do you defend against tumbles, Rohan?

First, you have to determine what percentage of your airspeed is being changed by the gusts. If you are getting a 10 mph (16 km/h) increase or decrease in airspeed, for example, you should be flying at least 10 mph above stall speed. If a thermal is very strong or rough, an increased bank angle is safer. Also, you can increase your bank in a thermal sometimes to get back into smoother air if

you've wandered to the edge.

The classic rough thermal situation is in high pressure conditions, in high winds or in lee side thermals. These types often show a smooth area only in the very center with the edges being pretty rough. You have to keep a tight circle and stay in the core to climb to safety since in general thermals get bigger and less edgy higher up. In any case, intermediate pilots shouldn't be flying too slowly until they learn to assess the air perfectly and know the stall behavior of their glider at all bank angles intimately.

Getting back to gliding...

Yeah. To go X-C rapidly means conserving altitude without flying too slowly in sink. So the whole idea is to maximize your glide and the time you are high. The latter point is more important than it seems. The fact is, you go faster for a given glide the higher you are because of lower density. The old adage of get high and stay high is very apropos. Joel used to tell John Durand Jr. that it's better to scratch high than low. This means if conditions aren't booming, use the lift all the way to the top so your glides are high and you have more options.

Rohan scans the sky for signs of lift.

It's important to explore a lifting area for the best lift, not necessarily take the first bump you come to. It seems many pilots think that thermals are different strengths during the day. But more commonly it depends on your position in the thermal. If you find a good 1000 FPM (5 m/s) thermal, then they are probably all the same, but you just aren't finding the best core if you're not repeating the good climbs. You always must assess the climbs with your averager to compare and seek the good stuff.

What do you look for on glide?

Well, I'm a flatland flyer mostly. I find wheat stubble to be the best and most reliable generator. This is especially true past the peak of the day. The stubble holds a layer of air to be heated and acts like thousands of radiator elements.

A plowed field is not as reliable because cool air tends to come in as thermals cycle up. Just imagine you are walking along the ground and looking for the areas most likely to be hot and humid. That's where you expect to find the thermals. *[Ed Note: In dry areas that Rohan is referring to, humidity helps the thermal climb because water vapor is lighter than air. However, in moist climes humidity usually means the surface is evaporating, which tends to cool the surface and suppress thermals.]* In Australia the pine forests work better than the gum (eucalyptus)

trees. For example, at Myrtleford Hill (near Bright, Australia), the pine forest has the best thermal in the area.

Vehicles—especially tractors—are usually good. A tractor turning over the earth is the best. You get a dry area (unturned earth) and a moist area (the turned earth) nearby, which makes a triggering density difference. Farmers often cultivate from the outside inward, which is good. That sucks all the moisture to the center when a thermal lifts off. Also, the tractor heat and movement can act as a trigger. A couple of days ago in the World Meet a group of us were low. We went to a tractor with half a field plowed, went up and went to goal.

When you are going X-C, whether racing or not, you can't always rely on going to ground trigger points. You'd be zigzagging and lose a lot of height. When you get high, I recommend you go as straight as you can on course line. Just trust in mathematics (the law of averages) to hit a thermal. Most areas will commonly have the thermal spacing for you to get from one to the other with today's gliders. This is especially the case in dry flatlands where thermals all interact in a regular pattern known as Bernard cells. In mountains, the triggers tend to be high points and faces into the wind or sun. In this case you have to fly to these points.

Inter-thermal gliding is very important. Your line should be chosen well before you go on glide. That also goes for the next thermal. I advocate going on long straight glides on course line—not too many deviations, particularly if there are regularly spaced thermals. If an expected thermal is more than 30° off course line I usually won't go to it. It has to be twice as strong as a thermal on course line to make it worth it. If a good line appears not right on course line, I'll take it, but zigzagging is not good for racing.

Being able to guide your glider into small threads of lift (lifting lines) is important *[Ed Note: for more details on this matter, see other interviews in this book]*. You must pay attention to changes in the sink and the results of other gliders as you glide along. For example, yesterday (during the World Meet) we went from turn point 2 to turn point 3 at cloud base following a line. Some pilots went straight, but myself and others went a bit to the side to a street and got 5,000 ft (1500 m) above them.

Let's talk a little bit about equipment, Rohan. Start with giving us your ideas on VG use on a modern hang glider.

To begin, with some gliders, around 1/4 to 1/3 VG in smooth thermals can assist with climb rate. Remember, the modern gliders have much more VG travel than the old ones because the crossbar is much stronger. The result is the loose setting is very loose and may not give the best performance—it is mainly for landing in very rough stuff. Of course, in chunky thermals handling is more important, so you have to experiment with your glider to find the best setting for the conditions. Today's gliders handle very well if they're set up properly, so some VG in the thermals is what most pilots use.

On glide, when it is smooth, I suggest close to full VG. However, on a brand new glider I don't recommend full VG because it only stretches out the sail sooner. I suggest using full VG as it gets older. One reason to use full VG is when gliding to goal. In that case the sail will sit on the outer sprogs (dive sticks) and the glider goes straight (as long as the sprogs are tuned properly) at very high speed.

In rough air I use maybe *Vi* VG on glide so I can go straighter and not fall off to one side. I'll never glide with full VG between thermals because you can't turn

when you want to as you encounter lift. It's a big disadvantage to be knocked into sink with a stiff glider.

How about telling us a bit about your equipment?

For a harness I use my own design. I make training harnesses and an intermediate one with two risers and a slider that is comfortable and allows you to get upright easily. In competition I'm using my top-of-the-line scorpion. It has hands-free angle adjustment with a trigger in the shoulder area. It has a single riser with a rolled and milled formed aluminum back plate. The mains and backup go at 20 G's.

For an instrument I just started flying with a Brauniger connected to a GPS unit. I used a Flytec but couldn't make a lot of sense out of it. The Ball had chip problems. The presentation of the speed-to-fly on the Brauniger is best for me. I don't have to punch in the lift of next expected thermal and it has a calculation that gives the height above goal as you progress. You can speed up and slow down and see if your situation is getting better or worse.

Most people pay attention to the drag of equipment and harness, but they forget about interference drag. That's why new gliders and harnesses are getting rid of angles.

Most people pay attention to the drag of equipment and harness, but they forget about interference drag. That's why new gliders and harnesses are getting rid of angles. It's more important than people think. The flow of the pilots "bow wave" around the uprights is important and the fact that our gliders yaw a lot leads me to not recommend the new deep chord airfoil uprights. Of course, if we had zero drag we would never land. But since we are dragging, flying the right speeds is very important.

For this meet I came with a totally stock Airborne Climax 13 (141 square feet). I weigh 70 kg (154 lbs) and 84 kg (185 lbs) in harness with water. The glider is a nice and light 33 kg (72.6 lbs) without bags or pads. It has a cam VG system *[Ed Note: levers at the end of the crossbar to spread the leading edges]* so the crossbar doesn't have to be as beefy. A cam system VG is an advantage because it compensates for any slight differences in the left and right side of the sail. With a normal VG system you have to cross-tune the sprogs to take out turns caused by sail imperfections.

The VG system is very light with the easy cam. It gets about 25% more travel than earlier cam systems. I find I can glide with Manfred in this meet. The setup system of the Climax is also refined. You simply choose the zippers to capture the sprogs, for example. Much of the glider development came from Joel Rebbechi.

/ know that one of your main interests is instruction, Rohan. Do you care to leave us with some insights into what we can do to be better pilots?

For sure. I see a lot of competition pilots that have sub-optimum takeoff and landing skills. I see slow takeoffs with a high angle of attack with the A-frame in front of the head. Sure, they get off most of the time, but their margin for error in turbulence isn't there. I believe in a full-arm contact launch position (grapevine grip) with the first step being a walking step. Then the steps shouldn't get any faster, but longer for acceleration. There should be no angle of attack change on the glider in most situations.

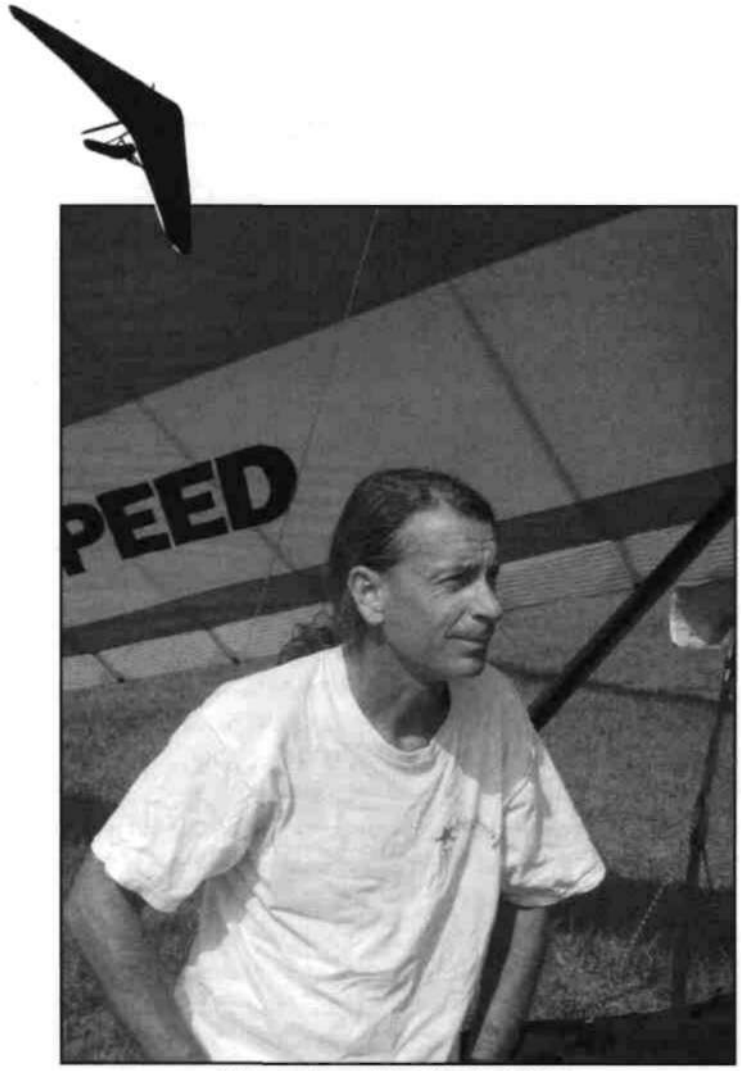
In landings I see bad setups with low-level 360 turns and other bad approaches. Many pilots have no decent base leg and wait to the last to stand up. They also

come in too slow on final. Once again, they get away with it most of the time, but there is not enough margin for the unexpected. We should all work to perfect our basics just like we work to perfect our performance.

Well, thank you for all the fine insights, Rohan. I'll be sure to watch my setups. I wish you much success in the coming meets and I hope to join you in a thermal or two.

Pilots clutter the goal area in Spain and discuss their happy flights.

MIKE BARBER



Mike contemplates the day's task.

BARBER'S CUTTING EDGE

Mike Barber began flying hang gliders with three days of lessons at Kitty Hawk Kites in 1978. He learned his lessons well, for Mike has recently (spring of 2001) been the U.S. world team points leader. Of course, much of Mike's flying savvy comes from the school of hard knocks. In addition, Mike had an early head start. For one thing he acquired national competition experience in the early '70s in sky diving. He participated in the world's first canopy relative work and the first free-fall tandems. This boy is at home in the air.

He also was exposed to hang gliding excellence from the beginning. In 1977 he was a roommate with Roy Haggard (designer of the groundbreaking UP Dragonfly and the Comet). He worked with Gary Dourise (designer of the Free Flight Enterprises LARA Gold reserve parachute) and rubbed shoulders with hang gliding excellence from the beginning. In 1981, Mike had relocated to Florida where he took up wind surfing and stopped hang gliding for five years. As yet, Florida wasn't the hang gliding Mecca it later became. But Mike's time wind surfing wasn't necessary a life gone astray, for he became intimate with the ways of the wind.

When he came back to hang gliding in 1986, he started flying X-C for fun. Then in 1994 he started competing to get faster in order to fly for distance records. Surprise... competition was so much fun that he stuck with it and started climbing in the ranks. He won the Chelan Classic in 1997 and was first in the U.S. point system in 1999. He is a World Team Member and recently flew the world's

longest X-C flight at 441 miles (706 km)!

Mike has not failed to let others benefit from his success for he currently runs a business called the World Team Academy at the Wallaby Ranch. I caught up with Mike at the Wallaby Open competition.

Mike, I understand you have five graduates of your school in this competition making goal. That must be quite a fulfilling accomplishment. How did you get the idea to start a X-C school of higher learning?

Well, the impetus came from a conversation with my brother who is a tennis pro. He asked me, "How do people in your sport get better when there is no training beyond the basic level?" That sent me talking with Mark Gibson (Gibbo) and we didn't rest until we had an X-C training program put together. Then Gibbo got into trike manufacturing and I took over the business with Malcolm Jones (Wallaby proprietor) as a partner.

Mike, you have a unique perspective as a multiple World Team member and a cross-country instructor. So if you '11 allow us to mine your resources, let's get into some of the things you teach your students. What do you concentrate on, at first?

Everyone is different, of course, but the average pilot has a very large database of everything he or she needs to know about soaring and flying X-C. It comes from books, observing and talking to other pilots. But it's like having a radio and knowing what all the buttons do, but not knowing how to apply the knowledge in a practical manner. Despite all the right signals, no music comes out.

The first thing I try to teach is the correct logic sequence for making the right decisions.

So the first thing I try to teach is the correct logic sequence for making the right decisions. 1 teach how to put the decision making into a step-by-step process so the pilot doesn't get overwhelmed. Since I started teaching with this initial focus on the psychological aspects, the learning goes much faster. Everyone is more successful.

Can you give us an example of the step-by-step process?

Sure. I try to break the whole decision process down into yes or no answers. If more than those two answers are possible, the question isn't broken down enough. Let's look at the simple question of going flying. You arrive at the site and make a simple yes or no choice to drive to the top. Next you make a yes or no choice to set up. Then you make a yes or no choice to launch. If you take the original question "Should I go flying?" there are many possible answers, usually starting with "that depends on…" Naturally, we don't make decisions this simplistically, but new X-C pilots need to simplify in this manner in order to avoid being confused by all the inputs.

To be more to the point, take the decision to leave or stay in a thermal. I may give them a logic series like this: Is the climb rate dying off (yes or no)? Am I as high as I have been in other thermals of the day (yes or no)? Are there other thermals within easy glide that are marked by gliders, birds or clouds (yes or no)? Have thermals been easy to find (yes or no)? Are there plenty of possible thermal generators in front of me (yes or no)? and so forth. I might suggest that if they have three yes answers out of the five questions that they leave the thermal to go on glide. This method of making decisions is simplistic, but it's an effective way to start out until much of the information processing and decision making

becomes subconscious and automatic. As the students acquire more decision-making abilities, they can handle more complex questions.

Is every student handled the same?

No, actually I point out that there seems to be three types of pilots. The first is intuitive. This type of pilot doesn't think about what he or she does. They just do it. The second is analytical. This type of pilot is always thinking and analyzing each step in a logical manner. The third type is a combination of the two. They may be the analytical type who uses intuition on and off. I point out the differences to the students and suggest that the third type usually ends up being the most successful pilot. I want them to explore their own decision process and try to develop into type 3.

I give the students the model of the stock market or blackjack in a casino. You can hedge your bets by studying a particular company's business practices or counting cards, but still intuition must be used to deal with the mob psychology in the market and other players' reactions at the card table. I refer to that model often in my seminars, for the effective discovery and exploitation of thermals has too many variables for us to process the inputs logically. We should do our learning and keep the lore in convenient logical compartments, but we should access that lore and make much of the here and now decisions using intuition.

Are there other psychological aspects you work on with your students, Mike?

For sure. I try to develop a positive attitude right from the start. The point is that the conditions usually are better than they look and the percentages usually play out in your favor if you think like this. That's a good way to look at flying and it continually provides incentive to improve.

Mike gets ready for another XC flight.

Other things we work on are confidence and fear. Many times the confidence comes with simple practice, especially when they start out flying next to me. Most pilots have to be nudged along to take that first cross-country step. I may fly ahead and find thermals, or auger down to them and help them center in the core. It's a good way for a student to progress and it's great practice for me.

If a student is overly fearful, I am careful to use small steps for them to achieve success. For instance, I may take them on an easy route with lots of big landing field options. I'll stay with them and make sure we are very high as we traverse from thermal to thermal. I recommend this approach to new X-C pilots in any case.

How do you assess your students at the start of your seminars?

I first spend up to half a day testing them and discussing with them various subjects like thermal triggers, thermal types, picking gliding lines and so forth. Then when we go flying I fly around them to determine what their strong and weak points are. The first thing I look at relating to flying is a pilot's landing approach skills and climbing skills. I check to see if they can get up from low—say 500 feet (150 m) up. Usually the first thing I work on is low altitude search skills. I tell them "until you can get up consistently from low, it will be hard for you to go far or get to goal."

Until you can get up consistently from low, it will be hard for you to go far or get to goal.

That's a good point, which we need to explore, but before we do, can you explain your emphasis on landing approach?

One of the primary prerequisites for being a successful X-C pilot is to be able to set up landings (and touch down) well. With good solid landing skills, you have more latitude for thermal search. In general, what people fear most about X-C flying is landing out. But I assure them that more often than not they can choose a bigger, safer field than the home field when flying X-C. If a pilot in my course doesn't have strong landing skills we work to improve them. We also discuss judging wind, landing field status and selection from the air. Approach skills are the most important as a bad approach has a lot more potential to hurt you than a mistimed flare!

Most people tend to level out and get in final position too close to the ground. That gives them little time and reduces their options. I teach them to round out so their feet end up about $1^{1/2}$ ft (.5 m) above the ground instead of dragging through the grass. I think the late roundout is the number one reason for bad flare results.

That's interesting, Mike. Can you give us specifics about lower altitude thermaling as you mentioned?

You bet. I first discuss with them the different models of fhermals such as columns or bubbles and see what their concepts are. I explain that fhermals vary greatly and point out that they should be prepared to handle all types. I start them assessing each thermal by asking such questions as: "Do the fhermals come through and lose their strength quickly or do they last? When the core is lost is it found upwind or downwind more often? How wide is the area of usable lift?" And so forth. The idea is to get them thinking about thermal shapes, behavior and the changes that take place. The main thing I work on is their concept visualization.

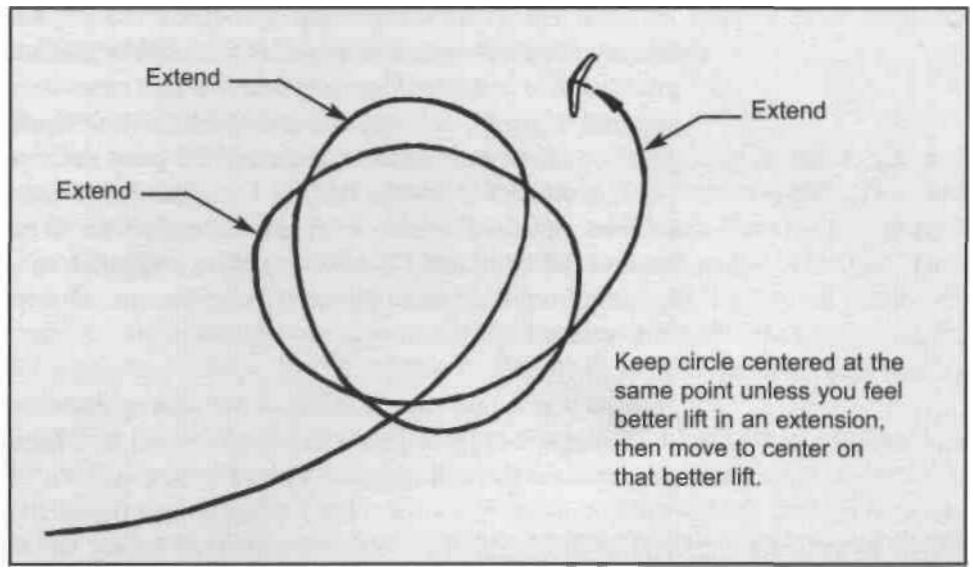


Figure 1 - Cloverleaf Search Pattern

Then I work on their abilities to find the core of a thermal and stay with it. I point out that when low, many cores are short-lived or erratic since the lift hasn't coalesced yet. This means that being able to center in and track a core is very critical if the pilot wants to stay up. I point out that the sink around the core can be equal to the lift and when you add the glider sink in, the result is decking it in 30 seconds if you lose the core. (I'll be dramatic sometimes to motivate students.)

Then we talk about and practice search patterns. I call my pattern a cloverleaf. It looks like this (see figure 1). With this technique the pilot does 360s, but keeps trying to extend them in different directions to explore the dimensions of the core of lift distribution. This pattern is particularly useful down low when things are broken and the core is surging in different places.

The cloverleaf pattern is not a random exploration, but has some rules. First, an upwind extension is a good choice. Also, a direction in which any earlier thermal seems to have moved is a good choice. Naturally a direction that seems to produce a bump of lift should be favored. The lobes of the cloverleaf are not very big. The search should not extend more than one wingspan with each 360. If your vario isn't instantly responding with increasing lift, you must move right back into the core. Immediately! The idea is not to find the sink, but the edge of the core. Remember, 10 seconds outside the thermal can lose you 100 feet (30 m) easily. Half a turn too wide can deck you or cause you serious stress as you lose precious altitude.

If the vario responds with an increased signal, center upon that new wingspan width and the next time around take one more wingspan bite in the same direction. Edge over cautiously until you are no longer getting gains.

I like to have my students think of a thermal as a toroid, more than a bubble and get them to imagine surfing the high point of the toroid. Any misalignment with the toroid will result in losses. The idea of the search pattern is to help you find the toroid alignment and keep you riding it.

Mike, that sounds like a good search and climb technique down low or anytime things are tough. What's next in your course?

Well, we continue working on thermaling technique. I tell the students to

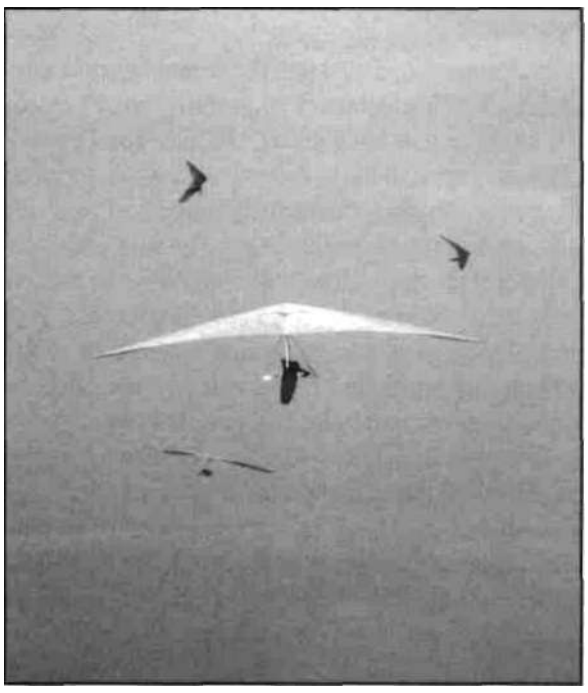
focus, especially when low. That means no distractions. The pilot shouldn't zip up, shouldn't adjust the vario, shouldn't be playing with the VG and not worrying about other pilots unless they are near the same level in the same thermal. Focus! As part of this policy, I want students unzipping at least 700 ft (210 m) over the ground when they are sinking out (I also recommend the same when a pilot is a couple of miles out from goal). The reasons for this rule is so they are prepared to land if necessary and can focus totally on getting up. I recommend this rule for all pilots.

/ want students unzipping at least 700 ft (210 m) over the ground when they are sinking out. The reasons for this rule is so they are prepared to land if necessary and can focus totally on getting up.

Pilots shouldn't change circling directions when they are low. That means they need to be equally comfortable and adept at thermaling both to the left and right. Thermals are usually encountered a bit to one side or the other and a pilot who has to hook around to turn in a favored direction is at a great disadvantage. I have students practice to their "bad" side, which every pilot should do. If a thermal has a rotation, it's better to be going against the rotation, especially down low. This is a hard one to detect, but dust devils in the area can give you rotation directions. Also if after some time in the day's thermals you notice one direction give you better climbs than the other you should stick to that direction. This is mostly for flying down low.

I like to talk to students about bank angle. Most students turn too flat, especially down low when things are smaller. Sure, a steeper bank increases your sink rate, but if you are turning outside the core you're going to sink even more. Larry Tudor pointed out long ago that every glider has a bank angle "sweet spot" that it likes and provides the best climb. It's up to each pilot to find that bank on his or her glider.

Glider setup is important as well. Unless you're high-siding you're not flying efficiently. *[Editor s Note: High-siding is the term used for the technique of being on the upper side of center when in a steady-state turn. Some gliders are set up to require this more than others by virtue of anhedral adjustment].* Manfred Ruhmer says, "If you're not high-siding, you're not climbing." Most people are slipping a bit in their turns, which kills their sink rate. They are pushing out but not high-siding so they are in a slight uncoordinated turn. To thermal efficiently you have to get your hips out. This technique takes effort, but there's an added trick that helps.



Pilots gaggle up in Slovenia.

Most expert pilots carry a little extra speed through the patches of poorer lift and turbulence as they circle. Then when they hit better climb they push out and high-side to adjust the bank angle. Pushing out slows the glider to take advantage of the better lift and pays off speed for extra altitude. At the same time it turns the glider so that you tighten up in the lift. Then you high-side to adjust the bank and balance. High-siding is a yaw input, and this pitch and yaw control method is actually less fatiguing than trying to roll the

glider in an elusive or broken core. The whole process is a form of dynamic soaring with finesse.

I'm not describing a process of pushing out and boating around. That's a good way to tumble. I'm talking about dynamic pitch movements and bank control. Once you have exploited a stronger patch the bar should come back in as you continue your circle.

I'm sure our readers will gain from these insights, Mike. Once you have worked on your students' thermaling skills, what s next?

I continue to work on the psychological aspects and decision making. There are three things I stress: 1. How to make decisions, 2. Shifting gears, and 3. Picking a good line. We talked about the first one a bit already. To reiterate, I try to have them reduce each complex decision down to simple yes, no choices. Like, should I stay in this drifting thermal? That's a complex question, but if I reduce it down to: "If I leave will I get up again? (yes or no) and "Is it paying off?" (yes or no), the decision making is more simple. The main question always, is "Is it paying off?" Naturally, we can't always answer that question easily or correctly, but we learn form the wrong answer as much as the right answer (it's just that the right answer is more pleasurable). The main point is not to get bogged down in the decision making process by considering all the possibilities and overwhelming inputs. Simplify the process and the learning comes more quickly.

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1. How to make decisions
2. Shifting gears, and
3. Picking a good line.

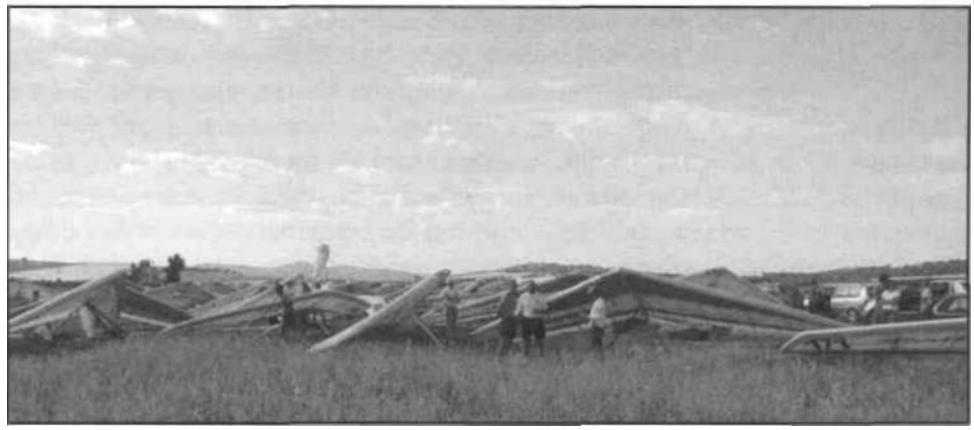
Tomas Suchanek once pointed out that when flying cross-country, you're making a decision every couple of minutes that affects the rest of your flight. The decision you make now will affect you two hours from now. So you see the reason I concentrate so much on the decision process.

We all make blunderous decisions sometimes, Mike. What do you tell your students about mistakes?

When they get bad results from a decision, I remind them that a good carpenter is one who can fix his mistakes. That's extremely important. We all make mistakes in flight. We have to learn to make good decisions, but also good recoveries when the decisions go sour. This is where the low thermal and weak thermal practice comes in. In competition flying we may make a bad decision and get behind the gaggle we were with. It's important to let the gaggle go and focus on our own task of getting up. This is a certain type of mental toughness, which is important to develop. It helps to know that 75% of the time they'll get stuck further along and you'll catch them up. This sort of understanding is good for your attitude and spirit and helps you pay attention to the business at hand: getting back on track.

I want my students to begin looking for and recognizing patterns in the sky, patterns in the wind, the thermals, the clouds, the inversions and altitude layers and in the day.

But getting back to the decision making process, I like to talk about patterns. I want my students to begin looking for and recognizing patterns in the sky, patterns in the wind, the thermals, the clouds, the inversions and altitude layers and in the day. Learning to recognize patterns lets us begin to categorize types of conditions and make better guesses as to where to find lift according to where it was with a similar pattern. Once again, this is a sim-



Gliders cluster around goal. Bill Moyes, the Godfather, stands in the center.

plification, but that's how a new X-C pilot can avoid being overloaded with too much to think about.

Along with this awareness of patterns, I give them a concept of how to order their focus. I describe three different regimes of focus. These are: the small picture, the medium and the big picture. The small picture is the immediate thermal you are in. If you are below 1,000 feet (300 m) above the ground, this should be your only focus initially. This focus should include finding the core, staying centered, maxing the climb rate and where will you go if the thermal dies (downwind of a field to find another one, for example).

Then once you are out of the danger zone and climbing securely, I teach that you should expand your focus. You should start looking for the next one to two climbs ahead. As the climb continues, you should get a more and more confirmed idea of where you should go next. You should be looking for what I call "signs from God"—dust devils, birds, gliders climbing, a switch in the wind, clouds, etc. This process begins above 1,000 ft (300 m) and extends the higher you get. Top pilots rarely leave a thermal without a clear idea of where they are heading.

At this point, I try to beat into my students the concept of multitasking. At first, I teach them to focus on their thermaling down low, but when they have the" skills so that they are thermaling properly nearly automatically, then I add multitasking. That means they are able to look around and start gathering data for the next decisions coming up while still maxing out the thermal.

As they get better, I get them to practice multitasking lower and lower. They should bring in the concept of patterns we talked about earlier like "is the lift upwind or downwind when you lose it?" Here's where the cloverleaf search method is used. Employ it to first figure out the day's pattern, then use it in a more precise direction once that pattern is established.

I believe many pilots have it backwards. They think they have to focus totally on the thermal all the way to cloud base and then they relax while on glide. For most top pilots it's the other way around. You should be able to mentally relax in the thermal (unless very low) so you can be watching and making decisions. Then on glide is when you have to focus.

We 'II talk about glide a little later, Mike. Tell me about the big picture that you mentioned.

The big picture comes when you're definitely getting higher (say above 2,000 ft—600 m) and you are in no danger of losing the thermal. There may be several

options of where to go to find the next thermal, but here you should be plotting 5 or 6 moves ahead, like with billiards or 3-dimensional chess. You have to take into consideration the next course line, changes in the weather, the placement of clouds, wind direction, the terrain, the presence of other gliders and recent glide results. We're always looking for the big payoff.

Naturally there are many things to consider in choosing a course line, but again I have my students break the decisions down into a few simple questions. Once a decision is made, I teach them to stick to it, regardless of outcome. There is usually much more lost in going back on a decision than there is with a poor decision. The pilot that warfles back and forth is the one that never gains confidence and never learns from his or her mistakes or successes to make good decisions.

This big picture decision making must take place on the way up, for if you wait until you're near cloud base, you can't see the cloud patterns. When you are high the clouds are one of the primary determinants of where you should go. They are the lift flags. You better have your decision made long before you top out. Remember, your chosen path is intended to set you up for the future, as much as an hour or two ahead.

Mike, I swear I'll never be late in making a glide decision again. Earlier you talked about the three things you stress, decision making, shifting gears and picking a good line. We discussed the first one, can you illuminate the other two?

Sure. Concerning shifting gears, the best pilots are those who know when to race hard and when to slam on the brakes and stop or slow down. Sometimes it's faster to go slowly like the proverbial tortoise racing the hare. If you are running like the hare when it gets weak, you'll be stuck low or on the ground moaning about your stupidity.

Once again, to help my students' learning process I break the situation down to simplify matters. In this case I use parts of the day. There are four cases:

(1) In the early day weaker conditions I recommend pilots top out **more.** Every decision should be made with more caution.

Mike Barber has been a multi-sport top competitor.

(2) As the temperature reaches **the** trigger point and the thermals crank up it's time to race faster. If lift becomes more consistent and stronger, race faster. If nearly every decision you make pays off, push harder still. I teach speed-to-fly concepts in relation to the reliability of lift, recognizing that **that** reliability changes throughout the day. The thing I work on here is when to take the risk. Generally in the middle of the day is when we are most willing to up the ante.

(3) The third period is late in the day. Here cloud base will be just as high, but lift gets weaker and glides to the next thermal are longer. It is necessary to slow down and also pay utmost

attention to glides. The proper line can lead you into great buoyant air in this time period, or the opposite. If you are in competition and not heading downwind, great patience, tenacity and skill must be used in this time period.

(4) Finally, not an actual daily time period but a phase is when another factor influences the conditions. This may be a sea breeze moving in, an over-development, a valley wind, high cirrus, a wind change, a blue hole or whatever. The best pilots are totally open-minded and prepared for such changes. They don't have such a lock on the vision of the day's behavior that they can't switch over to a different mode of decision making. These top pilots recognize the condition change immediately and do whatever necessary to deal with it. If required, they go into survival mode which means using every scrap of lift, backtracking to lift if necessary and waiting in weak or zero lift until it develops. Remember, we are always gambling ;hat we will stay in the air and the most perceptive gambler will win.

If you can't figure out the patterns of the day I advise you to slow down until you do. When I get wishy-washy because things are getting too complex, I slow down and try to rely on intuition. That's what our intuition is for.

If you can't figure out the patterns of the lay I advise you to slow down until you do. When I get wishy-washy because things are getting too complex, I slow down and try to •ely on intuition. That's what our intuition is for. To be a better pilot, learn to recognize all the signs in the air. Look at that as your main job.

Remember, everyone has to enter survival mode occasionally. This is when gliders are decking it all around you and your only goal is to stay in the air. You take anything you can get and don't mind drifting downwind. Just to stay aloft is your prayer. You don't have to be below 1,000 ft (300 m) to be in survival mode. Perhaps you have encountered a large blue hole or a massive over-development shading the countryside while you are several thousand feet up. It may be time for survival mode. In survival mode be ready to take a zero sink patch and circle in it. It will either turn into a usable thermal or dissipate in which case you will be no worse off unless the wind is drifting you the wrong way. Survival means *hanging* out and *hanging* on to *hang* in the air until you cross the tough area, or conditions change for the better.

You have referred to gliding several times before and it is one of your three main points. I know you have some specific ideas on the subject, Mike, so how 'bout it?

As I told you before, on glide is where I really try to concentrate. We used to rest and relax during glide, but now that we have better performance we have learned what the sailplane pilots have known all the along: glides are as important as climbs. A good glide line can be worth one or two thermals and can put you one or two gaggles ahead. Strong climbs and good glide lines can get you furthest or at goal the fastest.

Most people can pull in the bar and go fast through sink—the basic speed-to-fly concept—but what many don't realize is that just to the left or right they may encounter 400 FPM (2 m/s) less sink. I try to work the sink like most people work lift; even high up; even when flying X-C alone. I like to use the image of altitude being money in the bank. You should spend it wisely. You worked hard to earn it. So don't squander it.

When between thermals we must go with the feel of the air. It is extremely

important to be sensitive to what your glider is telling you. Does it fall off to one side? Is the sink getting more or less as you ease one way or the other? Mostly you should try to use intuition or "feelings" here. The clues are subtle. In the blue (with no clouds) this approach applies even more. You have to imagine the thermal patterns, for lift streets, thermal groupings, convergence and wave bounce all occur the same in the blue as they do when there are clouds. When in the blue or in thermals, go with the feel.

Remember, when in 700 to 800 down (3.5 to 4 m/s) almost anything you do will be an improvement. You should change your course line 45° and do so very quickly. If you see an improvement in two seconds, continue on. If it worsens, change back and try the other way. This procedure is especially important if you are running parallel to the wind (it's not as important when flying crosswind). If you are in big sink when flying up or downwind, almost anything you do will be an improvement. It's an easy choice: angle either left or right.

In all this gliding it is important to be able to detect the nature of the air. Most of us don't have an audio sink alarm on in all sinking air, so the visual dial is important. I do a quick scan of it every few seconds. I'm also studying the air, the terrain and looking for "signs from God."

This concept of using less sink as if it were lift is the most important aspect of gliding.

This concept of using less sink as if it were lift is the most important aspect of gliding. This is also probably the most common concept missing from pilots' cross-country soaring skills. I see too many pilots fly too fast on glide. Perhaps they have heard of speeds-to-fly, but they don't really know how to use it precisely. I can tell you that most top pilots rarely put more than 50% of their next expected climb into their MacCready ring. Remember, the faster you fly, the less sensitive you are to the air and the more chance you have of blowing through a patch of lift. There is a time for blazing, but remember that altitude bank and the need to spend your investment wisely.

I apply the little, medium and big picture concept to my gliding as well. For instance, when leaving a thermal I may leave on a 30 to 45° angle to avoid the usually greater sink directly downwind (see figure 2). I try to leave on whichever side tends to be working better. Sometimes I try that same type of entry when gliding upwind. On the medium scale, I may detour to make use of cloud lines or visible climbs while on the large scale I'll look ahead and choose a line to avoid blue holes, lakes and the like.

Before we wind up, Mike, could you say a few words about competition?

Be glad to. Of course, much of what I was talking about applies directly to competition as well as X-C flying. One of the main things I want to add however, is the mental aspect. New competition pilots can get overwhelmed by the added work load and added pressure. The best way to reduce the pressure is to begin with the right attitude. People should enter competitions to learn, not to win so much.

I'm still entering to learn and I learn something every time. You can learn more from one competition than you can from a whole year of flying, even if that flying is cross-country. The only way to learn to go faster is to enter comps. Going faster will help you going further in your recreational flying. In fact, recreational flying with its premium on staying high can teach you not to go fast. Unless you have a few buddies to fly with and call a task, you don't get fast flying out of

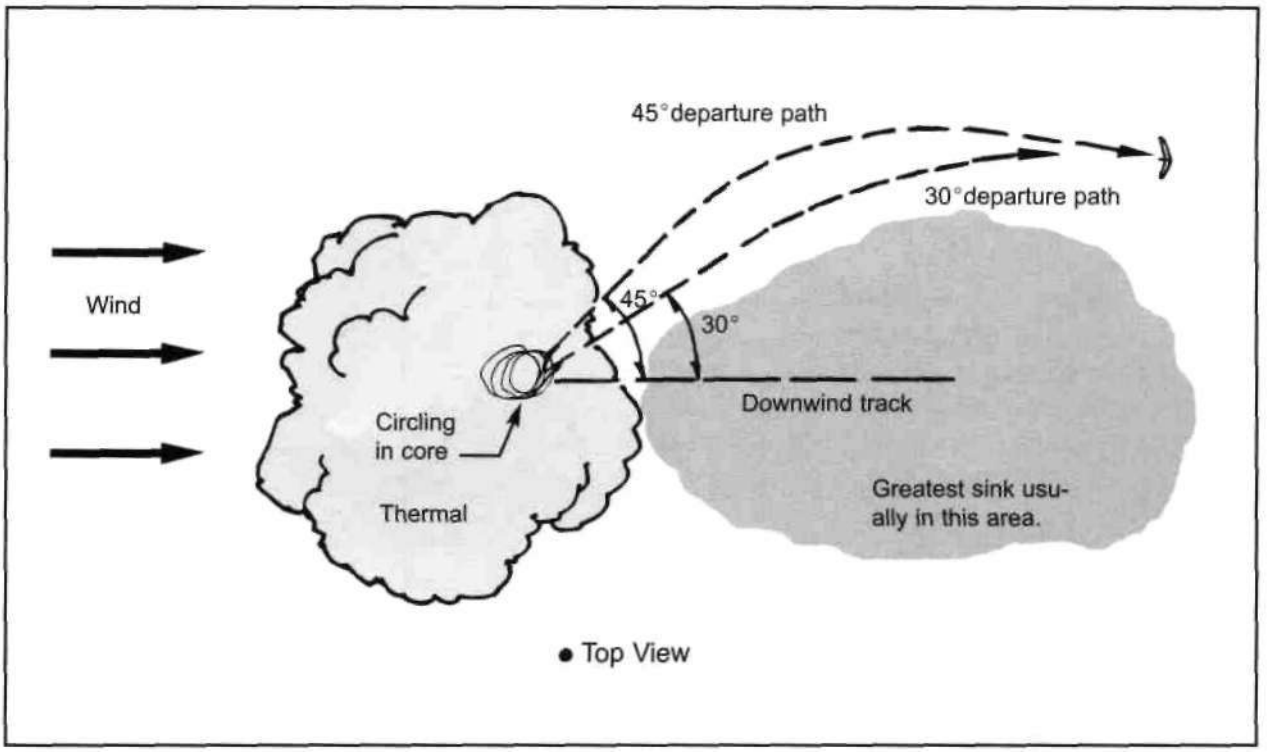


Figure 2 - Thermal Departure Strategy

competition. Myself, I rarely ever just blunder off downwind. I'm always trying to fly to goals, often crosswind or in triangles. This practice will help expand your repertoire even if you can't compete.

One of the important things you learn in competitions is timing. Most thermals are short-lived and if you aren't there in a timely fashion you won't get up. In a comp you may have a hundred or so gliders spread around the sky to show you the nature of the lift patterns. That's valuable learning. Also, you have the example of the top pilots flying around you to watch and learn. Where are they going? How do they thermal? How fast are they gliding? There's no other way to get such a "free" tutorial from the world's best.

Well Mike, since you are among them we can only thank you for the tutorial you presented us here. We wish you the best in your upcoming comps. Now we have a lot more ideas and techniques to practice so we can join you with the elite.

Good luck and good flying.

BOB BAIER

Bob Baier has been a strong player on the German team for over a decade.

BAIER'S HIGHER LEARNING

Bob Baier has been at or near the top of Germany's national ranking for over 10 years. When we consider that Germany has had one of the highest per capita pilot populations, that achievement comes into focus. As of this writing, Bob has been national champion eight times. He has also placed in the top ten in numerous competitions including European Championships and World Meets.

Bob currently holds the German cross-country distance record of 378 km (236.25 miles) which he set in Australia. Tomas Suchanek flew the exact same flight on the same day tandem with German pilot Corinna Scweigerhausen. These flights are significant in themselves, but they also reveal a matter important to our discussion: Bob and Tomas are good friends and fly together often. Thus, Bob refers to Tomas and his tricks at times in our interview.

Although Bob has been flying since 1975, he only gets 100 to 130 hours a year in the air. This may seem like a lot to some recreational pilots, but for top competitors this is a moderate accumulation. Bob's job of managing a machine shop for his father prevents him from flying more often, so his techniques and insights should be especially helpful to those pilots similarly limited in time.
We cornered Bob at the first World Air Games in Turkey and spent an afternoon stealing his secrets by our hotel pool.

Bob, we have been interviewing champion pilots for the sole purpose of determining why they excel over the rest of us, if possible. To that end, could you

*explain a bit of your development as **you** rose in the ranks?*

Well, when I first started competing I would observe other pilots who were clearly better than me. I tried to watch them carefully to pick up as many tricks as possible. In the early era of competition, nobody was freely giving away their secrets, so I observed and practiced, observed and practiced until I gradually got better. It took time back then for everyone to progress because we learned as individuals by trial and error. Now there are more books and articles like this one, which can help.

Another thing that helped me, which I think is important for all pilots, is flying at many different sites and different terrain. This practice develops skills and judgement because you encounter many new situations that require different decisions and different insight. For example, thermals were very short-lived in Brazil—they would often die part way to cloud base and require frequent searches—so all that practice there helps at home when I occasionally encounter short-lived thermals.

*/ **can** remember a similar situation, Bob, when I first flew out West in the U.S. I learned a lot about dust devil flying. Now, on the rare occasion I encounter a dust devil in the green areas where I live (Eastern U.S.) I know how to use the thermal associated with it. If I had never flown in the West, I would never have encountered enough dust devils to develop such understanding.*

I have rarely had a chance to watch a meet with top-notch competitors as I can here in Turkey. I can clearly see different techniques and strategies being used. It seems to me that the best possible arrangement for a pilot interested in competition would be to watch such a meet along with an experienced competitor commenting on different points he observes. Would you agree?

Jah, I wish I could have had such a thing when I was learning. Watching good pilots can give you clues as to how to max out a thermal, how to handle traffic, when to launch and so on. But I want to caution new competition pilots and lesser skilled pilots in general. Many of them may think they should launch when the great pilots like Tomas Suchanek or Manfred Ruhmer do. If so, in many cases the not-so-skilled pilot will be too late, for Tomas and Manfred are so fast that they can launch when it's normally too late for peak conditions or even to finish the course and still win the day. We have seen this many times in many meets. That is why it would be good for a new pilot to be guided by an experienced competitor so the new pilot can distinguish what to copy and what to avoid until later in his or her development.

Even when you learn all the tricks and techniques of the good pilots, there is something more that sets the great ones apart. That is their ability to make very fast and mostly correct decisions.

Even when you learn all the tricks and techniques of the good pilots, there is something more that sets the great ones apart. That is their ability to make very fast and mostly correct decisions. Tomas and Manfred seem to realize faster than the rest of us what is about to happen or what changes are occurring and what they have to do. Sometimes they do this only a few seconds before the rest of the pack, and sometimes it's longer. But only a few seconds can make a big difference when reaching the next thermal or avoiding suddenly sinking air. That's why those guys are the best.

Perhaps it would be good to emphasize that point. You are saying that not only is it necessary to develop understanding, experience, skills and decision making ability, but for true greatness, these decisions need to be made quickly and accurately.

That is correct. A pilot must be able to accept lots of inputs, a bombardment of data, and be able to sort out the right solution immediately. This cannot be done with mostly logical, linear thinking. Much of this process must take place subconsciously. As you have discussed with others before, there is a logical way of flying and an intuitive way. We are all different, but I think the best pilots combine the two although some lean more towards one or the other. I think Tomas is more logical and Manfred more intuitive, for example. Myself, I am mixed but it's hard to tell exact proportions.

Baier fully geared up before a competition task.

Clearly much of the flying in competition must involve a lot of intuitive thinking. In this process our mind probably makes decisions based on a lot of stored data that isn't in our conscious memory. We will not even be aware of the decision making process. We simply "feel" the right answer and go with it. If we try to access the situation logically we may or may not get the right answer but it would certainly take more time and we may get confused trying to analyze so many inputs.

So would you say an aspiring competitor should try to train his or her intuitive thinking process?
Jah, as much as possible.

How would you go about this?

I think a pilot should practice when free flying to stop being conscious of every decision. Try to quit talking to yourself in your mind. Leave thermals when you feel an urge, go in a direction that "feels" right, fly to a spot that you "will" to produce a thermal. Certainly you'll make some mistakes with this practice. But the goal in the beginning is not so much trying to avoid errors but to develop the ability to listen to the inner urges that tell you what to do. If you are always carrying on a dialogue in your brain these urges will not come through.

Once you learn to follow your intuition you can begin to discern when to trust it implicitly. This trust is important for confidence and confidence is one of the mental attributes that all good competitors have. With practice your intuitive decisions will be more accurate than any decisions based on logically trying to weigh all the observed points. And they will be quicker decisions. Again we should make it clear that intuitive decisions are probably weighing even more data than logical analysis, it's just that the intuitive process does not take place consciously.

I only assume that this intuitive training process takes place over time along with practice and learning.

That's right. The learning and study is half of the store of information that the

subconscious mind can use. The other half (or more than half) comes from actual flights and thinking about what you felt. Notice that I said felt rather than saw because feeling—not just touching, but soaking up inputs from the entire environment—is how the intuitive mind stores data best while the logical mind is more connected to vision. Vision overwhelms the other senses, but it is not necessarily a more accurate recorder of what is taking place.

Anyway, I back up my experience by reading a lot of books. These consist of sailing books, flying books and weather books. Anything that can enhance my understanding, I read. I find especially good to read about significant flights of others because such descriptions often produce a feeling that can also develop my intuitive sense if I can imagine myself in the situation making decisions.

Do you review your own significant flights?

Absolutely. I go over every flight, good and bad. In competition I think about where I lost time and where I made good and bad decisions. I also think about places where I didn't make my own decision but followed the choice of other pilots. This point is very important for we all must learn to make our own decisions. For example, Tomas says he always looks at other gliders, but what they are doing is just information and he makes his own decisions. This policy is what I try to follow.

Bob, in my study of sport psychology I have read that it is important not to focus on mistakes or over-analyze bad decisions. Would you agree with that?

Sure. In the early days, if I would have a bad round I would get frustrated and then demotivated. The result would be more pressure and poorer performance. After time I saw it was important to forget a bad flight and approach each new day as a new step, a new chance to have a great flight. If you can't do that, one bad flight can ruin a whole competition. If you're unhappy you increase your pressure, which lowers performance. When you are frustrated you can't enjoy the flying which should be the main reason we fly in the first place.

Approach each new day as a new step, a new chance to have a great flight. If you can't do that, one bad flight can ruin a whole competition.

One of the main things a competition pilot can learn is to put away a bad day. If you fly with a relaxed, positive attitude and focus on the fun, you have the best chance to perform well.

I also learned to control my emotions when I have a very good day. This situation can be hard to control. I used to get over-motivated and overly aggressive which isn't necessarily good for top performance in our sport. I now try to keep everything—good and bad flights—on a more even level. I don't go up or down so much in my moods or excitement and I believe this helps me keep in focus and control.

You mentioned the possibility of being overly aggressive. Why do you think this is a detriment?

Being overly aggressive can increase the pressure on the pilot, unless he is too unaware to realize the potential dangers. We have seen such pilots lose their confidence if their aggressiveness ends up causing too many narrow escapes or accidents. I have seen too many accidents and I step back from risk in competition. I will not jeopardize my safety to win. Naturally each pilots has his or her own lim-

its, but people in the sport a long time who want to continue improving **are very** aware of the risks and leave a reasonable safety margin.

Turning to more physical aspects of our game, do you think it's important to be in particularly good shape, Bob? We ask this question because you appear to be everyone's ideal of a fit athlete (he smiles).

When I started out I was flying stiff gliders and I exercised regularly. Back then we often had tasks without end—open distance or endurance triangles. I was running and playing ice hockey. Now I don't exercise so much but I try to stay in good physical shape for I believe it's important for all cross-country flyers. Good physical shape helps the mental game, especially for long competitions like the World Meet in the Owens Valley. In that meet much endurance was required and the fit pilots were more competitive by the end of the meet.

Good physical shape helps the mental game, especially for long competitions like the World Meet in the Owens Valley. In that meet much endurance was required and the fit pilots were more competitive by the end of the meet.

Being in top physical shape obviously isn't for everybody, nor is it absolutely required for top performance. However, the worse your physical shape, the more mental toughness required if you are going to avoid fading towards the end of a meet. I prefer to stay in good shape.

*Before we turn to the subject of thermaling, **Bob,** could you **summarize** some of your ideas to help new pilots develop?*

I'd be glad to. First I suggest you learn as much as possible about the area you are going to fly in. Learn about the wind flows and changes throughout the day, especially in complicated areas like the Alps and other mountain systems with varied peaks and valleys. In general pilots need to learn more about general weather and local conditions. This matter applies to free flying as well as competition.

Secondly, pilots should realize or predict what's going to happen on each step of their flight. Especially with cross-country, this means flight planning by going over maps and deciding where to go for finding the best lift and avoiding dangers. Third I would say that each pilot should consider and understand the potential risks they are willing to take. When making this consideration it is very important to allow enough safety margin to avoid trouble and always fly safely. One accident or even a near accident can set you back considerably. Pilots who try to learn too fast often get into trouble and end up developing slower in the long run.

Fourth and finally, be sure to have fun at each step of your learning. That's why we fly. If you are not enjoying every second in the air, you chose bad conditions or you are not focusing on the right thing. Change your habits or change your attitude and you'll improve in all ways.

Bob, can you begin our discussion on thermals by giving us an overview of the techniques involved?

Well, to start I want to make it clear that to be good pilots we must develop different techniques for different types of thermals. In fact, we may have to use several different techniques as we cross different terrain on a long flight or as a thermal rises through different layers of air. We especially need to be prepared to

change our techniques as we venture to other sites with greatly different topography, ground cover or weather.

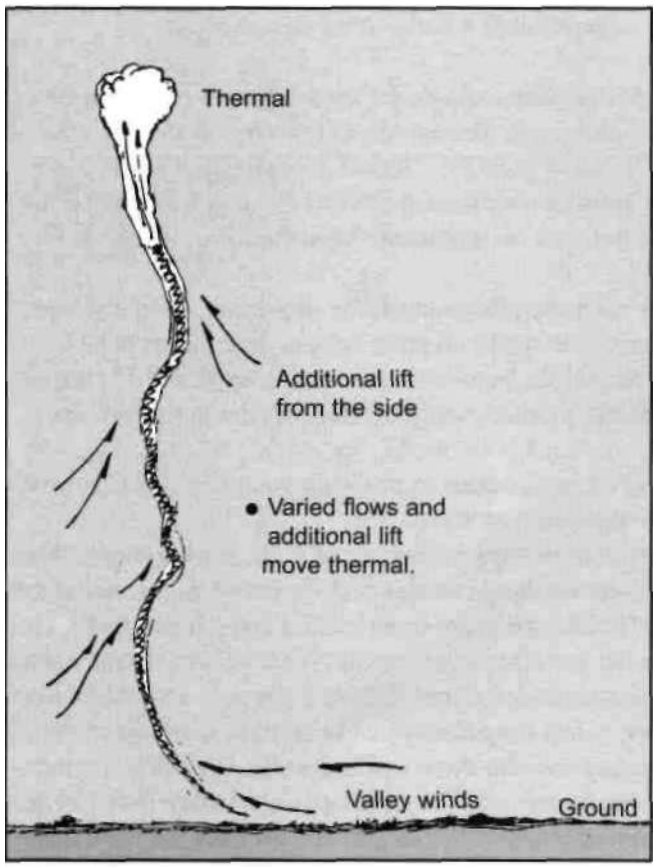
Let me make this clear. Imagine a thermal in the Alps that you catch low along a mountainside. At first it may be a bit unorganized but have some residual drift from the valley flow. In this case you have to concentrate on staying with the core by adjusting your circle with each turn. Then, as the thermal rises up the mountain, it may stop its drift but pick up warm air heated on the rocks on **the** mountain. This effect causes strong shots of lift moving through and often multiple moving cores. In this section we may have to shift our position several times as the good core we are in dwindles and another surge develops nearby. Finally, as the thermal climbs above the mountain it may be joined by other upslope flows or thermals from the other side which accelerate and possibly change its drift. Here we may have to widen our circle or tighten it to achieve maximum climb.

This example took place in one thermal at one place, but even more dramatic changes can occur if you change from high mountainous humid areas to dry, flat areas. Also, when inversion layers are encountered, thermal characters change and techniques must change.

It seems to me that when you refer to changing techniques you aren 't speaking so much of how you turn your glider but how to envision and pursue the thermal.

That's right, although when thermals are moving or core strengths change, you must alter the position of your circle or your bank angle (circle size). If thermals are very variable it is important to constantly alter the turn to take advantage of stronger surges. But these are the mechanical skills that are applied to the different conditions you learn to envision. Most of us can learn to turn efficiently, but harder to develop is the ability to stay with an elusive thermal and change our style for the occasion. This process is mostly mental and the mental aspects of flying take the longest to develop.

Figure 1 - Various Winds and the Presence of Other Thermals Constantly Shift a Thermal.



Can you give us an example of the mental techniques you use to exploit a thermal, Bob?

Jah, in the Alps where I fly usually, thermals don't drift as much as they do in windy areas, but they move around a lot so you must keep re-locating the core center (see figure 1). I have observed that if I haven't flown for six to eight weeks, I am not as good at staying with the thermal. That indicates to me that the mental process requires constant practice even though it's mostly a subconscious thing as I discussed earlier.

Actually the process is both mental and physical, involving the conscious and subconscious mind as well as physical feelings. It is important to let your body react to what it feels. The more airtime I get the better my feeling for the thermals get. It is hard to express this in words, and I think the best way to describe it is to say when I'm most

in tune with this automatic thermal-following process it's like I get the "picture.'

This "picture" is a feeling of where the thermal starts, where it's going and how to handle it. It is a mental state where I see the way I have to go without thinking about it. When I get the "picture" I can maximize performance.

When I am well-practiced, I get the "picture" almost every day. The feeling may come and go in the course of one flight. Unfortunately, I sometimes lose the "picture" or feel it's only half there. In fact, what I'm working on now is developing the ability to form this "picture" all the time. The situation I must work on most is flat land flying which is where I have less experience.

It sounds to me that you are still describing a subconscious learning process. How do you think a pilot can best promote this process?

I think there is one main secret: you must relax in the air and the learning will automatically take place. It should be made clear that if a pilot is afraid, overexcited, pushing too hard or thinking too much—anything that prevents relaxation—he or she will not be able to learn how to get the "picture" or if the ability is there it can't be used. So the first rule in becoming an excellent thermal pilot is to mentally relax. Maybe that's why some pilots catch on faster than others—they are naturally relaxed or quickly learn to relax.

The first rule in becoming an excellent thermal pilot is to mentally relax. Maybe that's why some pilots catch on faster than others—they are naturally relaxed or quickly learn to relax.

Some pilots may learn by reading or thinking about what to do, but for me, it was practice and letting the feeling soak in that worked best. I know all pilots aren't the same. For instance, Tomas Suchanek likes to analyze things to know as much as possible what's going on.

***Perhaps** for most pilots the fastest way to perfect thermaling is a combination of **the** practice you recommend and study. In regards to relaxing in the air, I have always felt it to be important to have good grip material on my basetube so I don't have to hang on too tightly. That way my hands can feel the variations in the air more readily. Such sensitivity to the air seems an important part of the feeling development you refer to.*

I agree, and also, I find basetube placement to be important. Over the years the bar position has moved out (forward) maybe so we can dive faster, but I think some gliders have them too far out for good roll response. In any case it is important to be familiar and comfortable with your glider for maximum performance.

Before we leave the subject of thermal training, Bob, can you point out some specific skills that pilots should develop?

I think pilots should learn to always be aware of their surroundings. This means what are the winds doing, are there changes at different altitudes? What are the clouds doing, how is the lift changing, are there natural signs (dust devils, circling birds and so on) and what are other pilots doing? This awareness may start out being a conscious constant assessment, but it should become a subconscious skill as soon as possible. New pilots may actually have to train their eyes to spot all these matters first before they can use them automatically. We often see inexperienced pilots who fail to go to a nearby climb that is obviously much better than the one they are in. Is it because they are so focused on what they are doing

that they don't even see the others? If so, such behavior can be dangerous in traffic where we must be even more aware of each nearby glider's position and trajectory. Again, my advice is to relax, expand your focus and learn automatic controls. The more automatic your immediate controls and decisions, the further away and further ahead your focus can be.

In my observation, Tomas Suchanek and Manfred Ruhmer feel a core movement and anticipate a change long before the rest of us. They seem to find a core 20 seconds before the rest of the pack at times. In 20 seconds they are up and away leaving the herd below. I attribute this to their ability to observe and sense changes in the air.

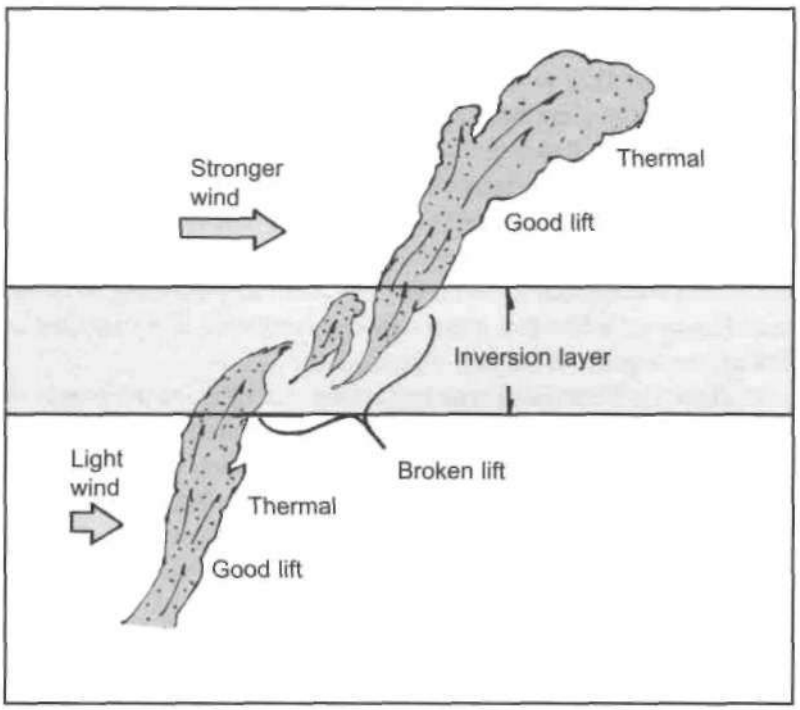


Figure 2 - The Effect of a Thermal Shifting in a Wind Shear.

In most cases I would point out that every thermal circle must be made with awareness that the next one may be a bit different. Related to this awareness is the important realization that when thermal lift suddenly dies, it may be because the thermal stopped or it just moved over due to wind shear or other effects (see figure 2). Lots of practice can help you feel this possibility better, but it is important to be aware of what **can** happen.

On a recent flight here in Turkey many of us were climbing in a strong thermal that suddenly stopped. Some pilots moved on, but four of us searched around and found it going up strongly 100 meters (100 yards) downwind. We ended up well above the others. The lesson here is to be aware of the possibilities and exploit them when you can. Shears are frequently happening, especially in high mountain areas.

When I find something that works in a given area, I often try to do it again. **For** example, when another thermal stopped abruptly I tried the same thing—I moved downwind and found it. Part of being aware is to have a catalog of thermals you have encountered before, especially at a given site with similar conditions. Thermals often repeat their behavior, for after all, if they rise through the same air mass they should have a similar lift profile.

It's also important to note differences. Is this thermal stronger at this altitude? Is it moving more? Remember, thermal character can be different in different valleys if the air masses are not the same. Part of being aware is to make a note like: "we had this before but it can change without a permit."

I would summarize these thoughts by telling pilots to use the familiar but be ready for the possible.

That's a good way to put it. Thermals and the air in general are so varied that there are always new challenges and novel things to learn. The big fun in hang gliding is always getting better. Like tennis you can be almost perfect and still not

always win or reach a goal. But that's the drive to go back and do it better the next time. If a pilot feels he or she isn't getting better it's time to reevaluate the flying style, the mental approach and simply the method of practice. One important way to practice is to get as high as possible, then try to go as low as possible and still get back up. If you constantly orbit above takeoff you'll learn very little. I still practice with this method, for like I said, the learning should never stop.

Before we move on, Bob, can you tell us the type of flying you enjoy most?

Sure. I prefer to fly in stronger conditions where high altitudes can be achieved. What I really enjoy is great visibility for long-range planning. For instance, in the Owens Valley we get extremely high—at least to the legal limit in the U.S. (18,000 ft or 5488 m). This place has long distant views and strong thermals. I have been there four times and learned the place well. I've had good competition results there and can remember several flights that were perfect. I was in tune and going with the flow. I seemed to do everything right. In short, I had the "picture" throughout the whole flight. That's the ideal way to fly and when it happens a flight is magical!

We have seen how much value you put on flying "by feel" and training to make intuitive decisions. However, when you are flying cross-country don't you make conscious choices where to go?

For sure I combine my observations with my experience to make an informed choice of which path to follow to not only find the next thermal, but also maximize the possibility of finding future thermals. The general route is as important as the location of the next thermal unless, of course, I am low and in danger of going down. However, I want to make it clear that even when leaving a thermal and flying onward, the subconscious has a great role to play in choosing the best course, especially in veering to the next thermal if necessary.

But if we just look at conscious decision making, I can review what I do. I try to look well ahead while I'm thermaling and check for the best routes. These routes are determined by the location of clouds, mountains, sun position, wind direction and ground cover. In general I plan to go towards good cumulus cloud lines while avoiding blue holes. I also want to go to the windward side of mountains, especially if this face is into the sun.

A more subtle but important consideration is where two airflows may come together and rise up, which helps thermal production. Of course, I look for the classic things on the ground—sunny fields, dry crops, small hills or changes that may act as triggers. All these factors can be different at different sites and on different days, so we should always be aware and we can learn new things on almost every flight.

We are always playing a game of probabilities. The trick is to combine as many positive factors together as possible to maximize the probability of finding lift.

We are always playing a game of probabilities. The trick is to combine as many positive factors together as possible to maximize the probability of finding lift. For example, a mountain often helps thermals form. If wind is blowing up its face there's an additional chance that a thermal will be above it. If sun is directly hitting this face the chances are improved, and if a cloud is forming above it the probability of finding a thermal over the mountain is greater, and so forth.

So the picture I get is that you weigh the probabilities of the different points you can possibly reach and go where the chances of finding good lift are greatest.

Jah, but like I said, the total route is important too, for I wouldn't want to go to a place that has a great thermal but requires me to cross a large blue hole or terrain that looks poor. I have to factor in where the following thermal is likely to be, then the next one and maybe even the one after that. But like I said, some of this process may be unconscious and we should train for this process just like we do for thermaling, by learning to totally relax in the air and develop a feeling for the general flow of things. Also, much of the route decision making can be done before the flight by studying the map (or practicing at the site for a competition) and choosing the best looking routes based on the terrain and wind direction. Of course, in all cases we must be flexible in the air to change our plan if conditions are different from what we expected.

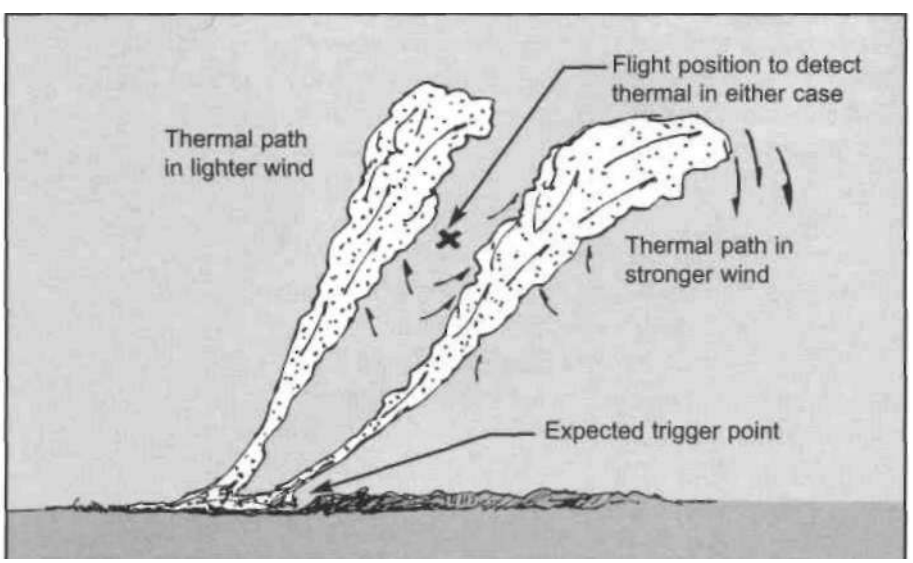
When I leave a thermal I always like to have more than one option. I try to observe and calculate these possibilities while I am climbing. If I am racing in competition I may leave a thermal as soon as I see better lift ahead or I can reach the next cloud or thermal source with good altitude.

Often the success of such a strategy depends on timing. In the mountains and most other places, thermals pump cyclically, maybe every 5, 10, 20 minutes and occasionally longer. If clouds are around you can usually watch these cycles. If you are out of phase you'll always be flying with the red light on. It is with this timing thing that I believe intuitive flying can help for when you get a feeling for the whole "picture" of the area you can position yourself to be in phase with the cycles. If I can become aware of the cycles and I feel the thermal will develop, I will go on glide 5 or 10 minutes earlier to get there when it breaks loose. Again, this ability requires a total awareness of a broad area around you which can best be dealt with by your subconscious mind. I can not over-emphasize this matter of timing when trying to succeed or excel at cross-country flying.

Do you follow different plans or use different tactics in different areas such as flatlands or mountains?

Well in the Alps where I fly most often, you can have very strong valley winds but light winds on top of the mountains. In between the wind may be varied. Sometimes I'll use a trick Tomas Suchanek taught me: I'll fly between the expected drift areas of a thermal rising in weak winds or strong winds in hope of detecting the thermal no matter what the drift (see figure 3).

Figure 3 - Locating a Thermal with an Indeterminate Drift



But this practice requires you to have a good three-dimensional picture of the air and a thermal's reaction. I gained a lot of this ability by flying with Tomas—we are often partners. I am not as

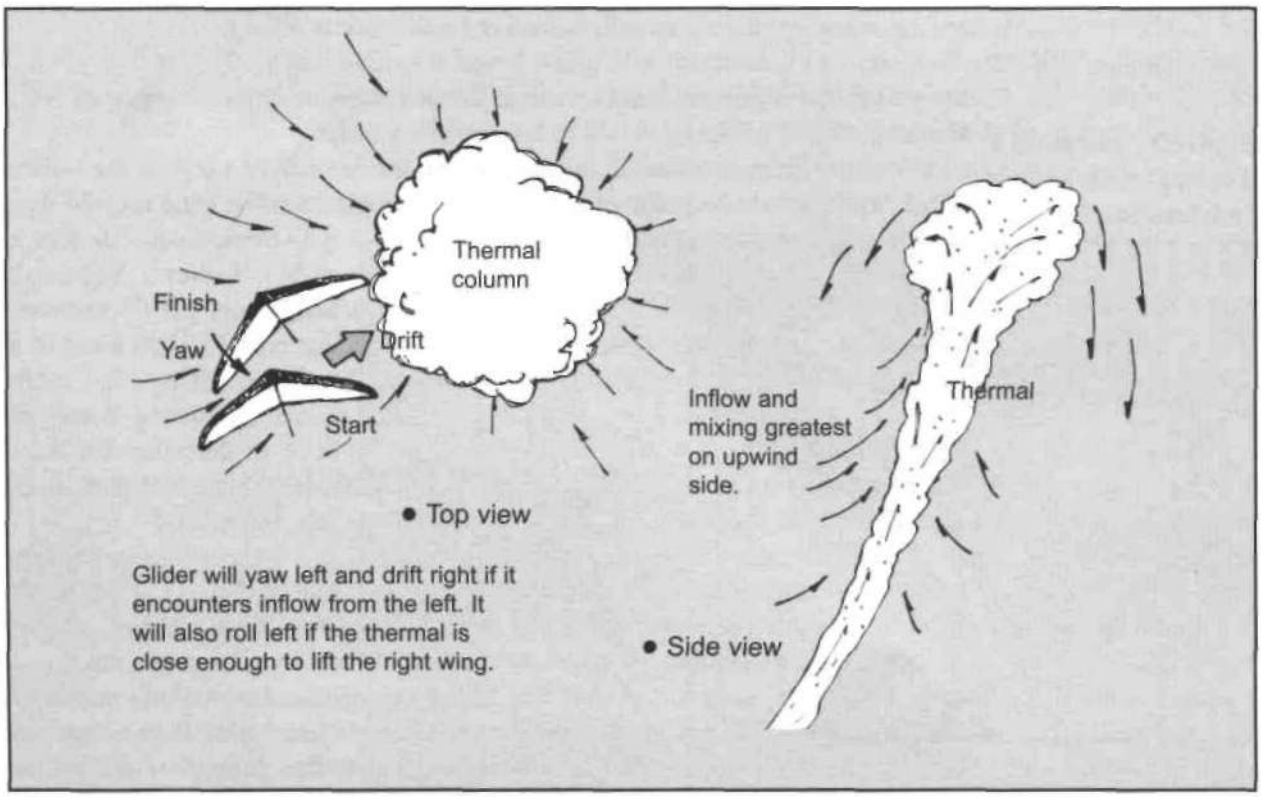
confident over the flatlands as Tomas, for he'll go as low as 150 meters (500 ft), but he taught me to sense the slightest lift and drift. His idea is that close to a thermal column or bubble there is an inflow that you can detect and use to direct you to a thermal. We practiced this in Australia and at first I couldn't do it, but after a little while I could feel the thermal the way he described as a glider reaction to changing air.

/ have discussed this with Tomas in an earlier interview, Bob. If there is such ***an*** *inflow below a thermal, it should drift the glider towards the thermal while it yaws it away from the thermal (see figure 4). These two actions may be very slight but combine to make the glider seem like it's skidding in the direction where the thermal is rising. Also, if we are close enough, our wing toward the thermal may get lifted which is the usual signal most of us use when finding thermals. I expect stronger thermals would exhibit such properties more than weaker thermals, so at least for learning, an area like Australia or the Western U.S.* ***would be*** *the* ***best*** *location. What do you think Bob?*

I agree, although in the Alps I always try this technique and maintain a **three**-dimensional viewpoint. In the flatlands the wind is not so blocked or altered, so I often look for streeting effects or the downwind linear extension of lift. This factor is very important. If you detect lift stringing out in the direction of the wind, **your** search for future thermals should include as much precise flying downwind or upwind from previous thermals as possible. In such cases you should expect the sink is lined up with the wind as well and if you **encounter a long period** of sink move over to one side or the other to escape it.

In streeting conditions timing is again important. If streets are varying you **can** be in phase or out of phase with them. Sometimes this is just a matter of luck.

Figure 4 - The Effect on a Glider from a Nearby Thermal



Many of us have seen a street in front of us that continuously moves tantalizingly beyond our reach. Other times we may blunder into one and get a free ride. The important thing is to be aware of the possibility of streets or elongated thermals in wind and use them when you can. This idea is even more pertinent in blue conditions (without clouds) for streets can exist without clouds to guide you. In this case tracking directly downwind from your last lift is the necessary tactic.

How does your mountain flying differ?

In the mountains clouds are generally not streeting but they set up on the mountain tops. The best policy is to hop from one to the other, of course, but in this case the track may be crosswind or even a little upwind.

At home I practice cross-country tasks most of the time. I have occasionally set a goal downwind—I once flew to goal from Germany to Como, Italy—but mostly I do out-and-returns or triangles. These tasks make me practice upwind flying. Such practice is extremely important for competition because there are often portions of a course that are somewhat into the wind. Upwind flying requires a change in judgement as to how far you can go to reach lift and how high to take a thermal as it drifts away from your goal.

Upwind flying requires a change in judgement as to how far you can go to reach lift and how high to take a thermal as it drifts away from your goal.

I also practice getting low, then getting back up a bit and moving on to find more lift. This practice helps me learn to fly thermals lower down and is especially good for reducing pressure when you get low in competition. If you are the lowest pilot with others 50 m (150 ft) above you it is necessary to focus on your own flying and find the lift yourself. Only practice will make you good at escaping from this situation.

What is your opinion of diving into lee side areas in hopes of finding strong thermals?

Some pilots get away with such risky flying, especially in the Alps where the winds are lighter. Sometimes thermals can grow larger in the protected lee side of mountains, but they will often be more turbulent and may be dangerous as they get mixed in the rotor conditions. In the past I have used lee side thermals but I now think it's dangerous, especially with topless gliders. Pilots may hear of others trying it and getting away with it, but eventually it will result in an accident. It's much better to go on the windward side and use dynamic lift to wait for a thermal.

I can recall the flying in much of the World Meet at Fiesch (Switzerland) was lee side and several tumbles were the result. In the Owens Valley World Meet there were at least two tumbles due to lee side flying.

That's right. The prevention of tumbles depends a lot on the pilot's reactions, of course, just like the result of collapses in paragliding depends on the pilot's controls. Of course, the outcome of a potential tumble also depends on how quickly it happens and what your bank angle is (the steeper, the better as I learned in the Owens Valley).This brings me back to a point I made earlier: if you are afraid of your glider or doing risky flying like diving into the lee side of mountains, you won't be able to relax. As a result you'll probably not develop or be able to use

your more subtle skills. I believe pilots should be in competition and flying in general for the long run. Being overly aggressive usually burns you out if it doesn't injure you or worse.

How do you go about pacing yourself during a long competition, Bob?

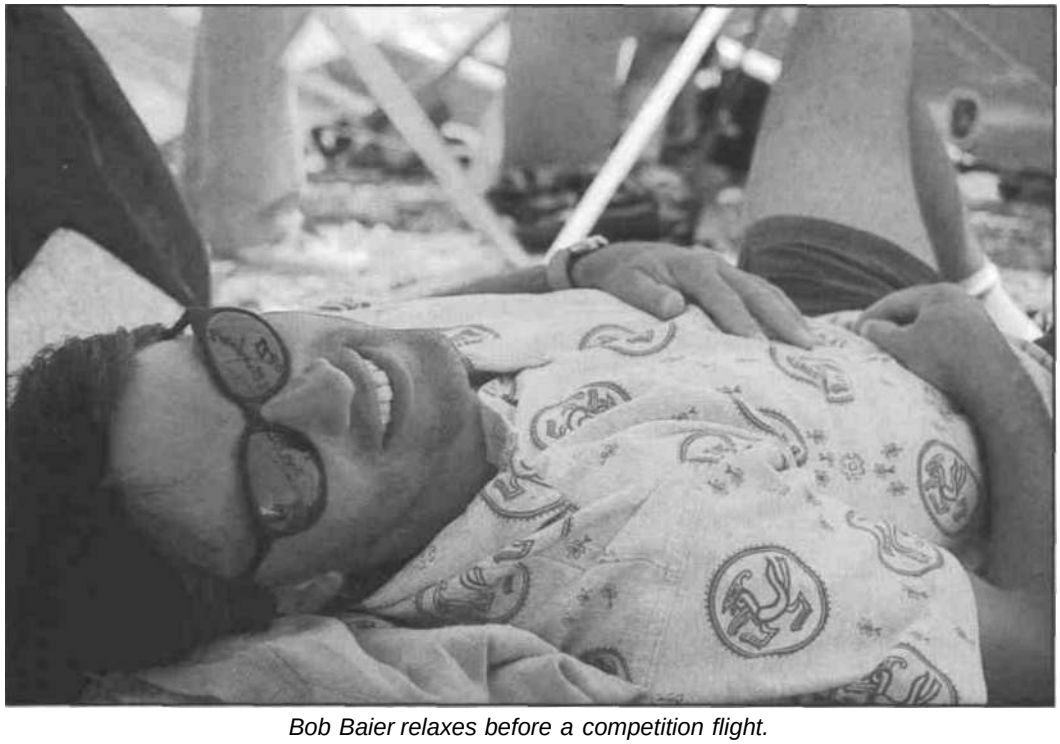
Well, first off I relax, as I said. My strategy is to try to fly consistently and let others tear up the sky. Tomas taught me the importance of relaxing and letting my glider fly. He can get so angry with himself if he risks too much and goes down or gets beaten, but still, he is relaxed the next day. If I'm trying to push the limits, I'm not totally at ease, and ultimately, my performance suffers. I'd rather fly a little more conservatively and consistently.

What are your strategies on launch in a comp. ?

That depends on the scoring system. With the GAP system you are rewarded for taking off earlier in the group. However, I prefer, and my main strategy is, to launch later to let slower pilots start out and mark thermals. I try to time this to arrive at goal with the first pilots. Such a strategy requires that you fly fairly fast (which means efficiently) along the course and you are able to make decisions on your own to leave gaggles behind.

Later gaggles tend to be slower so I try to move on by leaving thermals once they slow their climb and go on longer glides. The idea is to spend more time on glide and less on climb.

Later gaggles tend to be slower so I try to move on by leaving thermals once they slow their climb and go on longer glides. The idea is to spend more time on glide and less on climb. This practice requires you to pass up medium and weak lift to use only the stronger stuff and requires a willingness to get lower than the more cautious pilots. I will watch a gaggle in front to see if they make



Bob Baier relaxes before a competition flight.

wrong decisions or get stuck somewhere so I can take a better route and catch up with them. My vision and attention are focused one or two gaggles ahead and I only pay attention to the gaggle I am with to avoid conflicts and max out the thermal climb I am in. It's almost like I'm flying alone, even in a gaggle.

I prefer to fly alone, and that's how I practice most often, but in competition there are many good pilots now and if you are in the lead gaggle, the flying is very fast and efficient. When on glide, the pilots will fan out then come together again and climb when someone finds a thermal. When you are with the lead gaggle, it is very difficult to break away for the pilots are generally the best. Also, if conditions are weak as in the 1996 European Championships in Hungary over flatlands, it is almost necessary to stay with a gaggle in order to make goal even if it is a slow one.

The possibility of jumping gaggles and flying faster only exists in good conditions, usually. It is more possible to fly alone in the mountains or some place like Hay, Australia where thermals are high and strong. The weaker the lift and the lower the top of the lift the more I am willing to fly with a gaggle.

Before we close could you give us a brief description of your equipment?

Sure, I am sponsored by Moyes and Flytec. My instrument is the Flytec 4030 which I have connected to a Garmin 2+ GPS (I can get three flights out of a set of batteries with this unit). I like this setup because besides all the normal functions it gives me a final glide calculation. Final glide can be a significant portion of a flight to goal and it should be as efficient as possible for maximum performance.

My glider is the Moyes Litespeed. I like this glider for its coordination and performance. It gives me the right amount of feedback and control. I think it's very important for all pilots to find a glider that suits their style of flying well. For me it is the Moyes gliders.

Most everyone knows that you can do things to trade off safety for performance. A few pilots do this, but I think it's crazy. I'd rather fly a stock glider that has passed a strict testing than one that may have a slight edge but requires me to be always vigilant or on the edge when things get rough. After all, I think it's important to remember we fly for fun and pushing past the safety margins for a chance to win is not my idea of fun.

Thanks, Bob, for taking the time to share with us your thoughts, insights and secrets. It is clear that you have spent a lot of time developing your techniques and mental process over the years. I'm sure we'll all benefit from your higher learning.

KARI CASTLE

Kari on top of her game at the 2002 Chelan Women's World Meet.

KARI`S CASTLES IN THE SKY

Kari Castle is the ultimate outdoor life-stylist. When she isn't hang gliding or paragliding she's mountain climbing, roller blading, hiking or skiing near her home in the Owens Valley of California. She's the picture of health. But it wasn't always that way. According to her she used to be a cigarette-smoking overweight couch potato. Then she turned her life around and look what happened: she's **a** world record holder and world champ and a world class athlete.

I sat down with Kari in April 2001 at the Quest Air (Florida) tow meet. At **that** meet Kari qualified for the U.S. World team by beating several hot contenders, **all** vying to make the team for the Algodonales World Meet. She had previously been on the Women's World Team many times and has been the U.S. Women's National Champion 13 times. Since that interview Kari has also set another World Record.

Kari, I've known you a long time, but I don't have a clue how you started hang gliding even though we grew up within 50 miles of each other in Michigan. What's the story?

When I was just out of high school in 79 I was in Golden, Colorado and saw hang gliding. I wanted to go tandem in the worst way, but I couldn't. I always had dreams of flying—no question about it. I could see my neighborhood from above as a kid in these dreams. One of the highlights of my childhood was when I won **a** ride in a biplane in a raffle.

Then, I was out hiking the Canadian Rockies **with a boyfriend when I saw a**

guy wearing a hang gliding T-shirt. I asked him where I could learn and he directed me to the Wright Brothers school in Calgary. So I learned and haven't looked back.

In 1982 I moved to the Bay Area (near San Francisco) and really learned to fly. Mark Lillidahl became my mentor and really helped me. At some point he asked me "Why don't you try competition?" I was intrigued with the idea and I entered the '84 Silent Air Show. It was a duration/spot contest. I ridge soared and stayed up all day. I won the comp and was hooked!

Could you give us a rundown of your successes since then?

My first really big win was the 1993 Sandia Classic. It was just before the World Meet (in the Owens) and all the top pilots were there. Driving to the comp I had 13 hours to ponder the possibilities. I was hoping to make it into the top ten. Then I suddenly realized that the rest of the top guys were thinking they were going to win. After all, my glider was as good as anyone's and these were my kind of conditions—medium strong, light wind and long tasks. I was on!

During the meet I was having fun. It came down to the last day with Mark Bennett hot on my tail and Nelson Howe (2nd) and Larry Tudor (1st) in front of me. It was a race start *[Ed. Note: All pilots start in the air at the same time by photographing an insignia on the ground that appears at start time]* with a 70 mile (112 km) course.

If I may interrupt, Kari, I remember that day and saw what you did. Most of us limped around to the right, following gaggles. I recall you went more directly and I thought at the time, "where's she going? "

Yeah, I broke away and did my own thing. That was most rewarding. I kept seeing little clouds starting along my route and flew a textbook flight. I made goal before Larry and Nelson. They came in 15 to 20 minutes later. I was so excited because Jim Lee was there with his calculator figuring out the scores on the spot

At the Quest Air meet Kari enjoys some shade before the round.

and he told me I had won. That was sweet.

In 1995 I won the Canadian Nationals. Larry Tudor dropped back because he forgot to take a turn point photo. Chris Muller and I had been neck and neck the whole meet. We were 1 to 2 points apart until the last day. We raced to goal and Chris was a few seconds behind me.

In the Women's World Meet situation, I won the '95 Pre-Worlds and the '96 Worlds in Australia. On this last meet the U.S. team got a penalty because Gibbo (Mark Gibson, the team leader) had been flying the course. Other team associates were doing the same thing, but we got protested against because we were leading. But despite the penalty I had enough points to win.

I had been second in Japan (1993) and in Chelan, Washington (1994). Then I won the Women's Worlds in Greece in 2000. There I had the right attitude. I had just taken a year off because of knee surgery and was rejuvenated. The place was fun and we had a great meet. Lastly, I won in 2002 at Chelan.

I've also set numerous world records. The first one was in Hobbs, New Mexico where I scored 187 miles (299 km) for the women's open distance. It was also a dogleg record *[Ed. Note: A dogleg record includes at least one turn point]*. I was flying a Magic Kiss. In 1991 I was the first female to fly over 200 miles. That was a 209 mile (334 km) flight in the Owens *[Ed. Note: Kari's current women's world open distance record is 250 miles (400 km) along with a distance to goal record of 217 miles (347 km)]*.

Kari, now you live in Bishop, California smack dab in the famous Owens Valley. Let's explore your experience there. How did you end up in the world's most famous big air spot?

Actually, it was kind of a radical act on my part. One of the first cross-country competitions I ever entered was in the Owens. I was in fourth place until I tumbled. It scared the living shit out of me. But a good thing happened at that meet because I hooked up with Gibbo (Mark Gibson). We ended up staying together for six years. He helped me tremendously by working on my fear, increasing my knowledge and having a good attitude.

On the fear factor he just kept saying "Shut up and fly!" He wouldn't put up with my wingeing. He tumbled two times before *[Ed. Note: see the interview with Mark Gibson in this book]* and couldn't understand why I was having a hard time. He didn't miss a beat. When I would be reluctant to fly he would encourage me and I eventually got over the fear. Gibbo was fearless and very good in the Owens, so I learned watching him. It was tough moving to the Owens with the big air after I tumbled there.

Free flying with Gibbo was a trip. He was a goer and pusher. I fed on his competitiveness. At times I did better because of his enthusiasm and get up. We just had fun flying together and would go out every flyable minute. I'm not so obsessed now—I have varied interests—and I can pick conditions better. I like what I call Kari air.

How do you keep flying safely in the Owens?

I run a paragliding school in the valley now, and I teach my students many things about safe flying there. When I confront people who are scared of the Owens I tell them first that timing is everything. The best times to have great mellow flights in those high mountain conditions are September and October. July

can be ass-kicking. The best days are with cumulus clouds (not lenticulars that signify waves and high winds). Blue days with wind tend to kick your butt. Cloud days with the clouds torn apart are also no good. A south to southwest wind is best. North sucks, in general, but the Sierras are OK in north.

Remember, you are flying big air with big mountains in the Owens. There's a desert out there with 10,000 feet (6250 m) vertical walls on both sides of the valley. You'll encounter different air masses, strong valley winds, strong thermals and you can get into strong upper winds.

Remember, you are flying big air with big mountains in the Owens. There's a desert out there with 10,000 feet (6250 m) vertical walls on both sides of the valley. You'll encounter different air masses, strong valley winds, strong thermals and you can get into strong upper winds. You have to be aware of changes because things change fast. In spring, especially, the area is volatile. It can be the nicest flying or the worst. There is still so much cold (snow) on the mountains while the valley is in the 80s (degrees Fahrenheit—26 to 31° C). Fronts come through and accelerate the changes in that season.

We always watch the sky. When lennies appear (lenticular wave clouds) we believe the signs and don't get high unless we're ready to get in a wave and very high winds. In the Owens you can see 50 miles (80 km) in either direction. Watch for signs of change.

What you do and where you go in the Owens has a large effect on safety. For example, even on a strong forecast day you can fly a little hill, stay low and be safe. We often use Flynn's, a 1000 footer (300 m) near Bishop in this case.

One of the problems of flying the Owens is a matter of perspective. The distances are bigger than they appear. You can land out and it doesn't look like you're far from a road, but you end up miles away.

One of the problems of flying the Owens is a matter of perspective. The distances are bigger than they appear. You can land out and it doesn't look like you're far from a road, but you end up miles away. You must be well supplied with water, spare radio batteries, etc. You should also be prepared to spend the night out. Your radio communications must be perfect. You should take the flying seriously. Incidentally, flying in the Owens helps you with competition flying because all that preparation gets you ready for any comp.

Pilots come to the Owens and think it's like home only bigger. But there are many subtle differences. For example, pilots' takeoffs and landings may be poor due to fatigue from the effects of fighting the air and hypoxia. If they are used to flying close to the hill they have to break that habit. Also, there are no trees or grass to tell you the wind direction. We rely on the drift of turning 360s above the landing field and the general drift when higher. You must always be aware of the wind in the Owens, not just when you land. Throughout the flight you must be aware of your drift to avoid getting pinned back in a canyon or on a mountain. When we can, we look for dirt roads with cars kicking up dust and the few Cottonwood trees.

You can't assume the wind is the same everywhere. On long flights you can encounter very different directions. For example, one time I was in a hard south wind all the way up the valley to the north. I got to Benton and things had changed. During my landing I turned to head on my downwind to the north and it actually was a head wind. I didn't pay attention and turned final to the down-

wind direction. It was 8 to 10 mph (13 to 16 km/h) and I was headed for a fence, trees and a house. I cleared the fence, went through the trees, flared and landed on a woodpile in front of a picture window. Lesson learned: pay attention!

Over the years I've gained the necessary experience to fly safely in the Owens. I look back at my tumble and can see what I did wrong or what I could have done to prevent it. Here's a list:

1. *Avoid or be more aware and alert in certain hot spots.* You'll always find big air lurking to stomp you there. These spots are (from Horseshoe Meadows north) Mt Whitney, Onion Valley, Mt Williamson, the Westgard Pass, Black Mountain, Silver Canyon, Coldwater Canyon, the Barcroft area, White Mountain, Pellicier Flats, Boundary Peak and Montgomery Peak.

2. Have a good grip. If you don't relax your grip in the potential bad areas, you probably won't get caught off guard.

3. *Use oxygen.* I came from the Bay Area (sea level) and was probably hypoxic. I always recommend using oxygen over 12,000 feet (3,660 m).

4. *Glide a little faster, especially around the hot spots.* Extra speed gives you better control or more pitch stability.

5. *Fly a glider not prone to tumble.* The Magic I flew did not have a great reputation in that department! If you're going to be flying the big air you should have the right equipment.

Kari launches at Chelan Butte, WA, where she became Woman Champion for the third time in 2002.

To fly safely in the Owens you should make it a general policy to fly 5 to 8 mph (8 to 13 km/h) faster than your normal speeds (for hang gliders). Also, another important factor is to be willing to leave an area that is too wild. Go find something nicer. Don't try to hang on because, hey, this is the Owens and it's big air. Sure the thermals are booming and the air is more textured than at other places, but there are limits and these limits apply to everyone.

Once you find a thermal you can handle, try to get high and stay high. That goes without saying for the fun factor, but also for safety, 'cause things are usually much smoother higher up. Some people tend to leave and stay low in rowdy conditions, but they'll often find it smoother higher and they'll be safer.

When you hit a thermal, expect 1000 FPM (5 m/s) shots. This effect can definitely pitch you up, stall and dump you. Carry extra speed when approaching lift, then be ready to pull in more and ease into a turn. Use a steep bank to avoid falling out and to stay in the smoother core area.

Finally, an important safety factor is to carry extra control speed on landing setup. You can be hit hard only 10 to 20 feet up (3 to 6 m). One pilot was landing in strong winds, got turned on final and landed downwind, breaking both legs.

That's not a pretty picture, Kari. I'm sure that as an instructor in the Owens you

have to deal with fear a lot in your trainees. What do you tell them?

Everyone—male and female alike—has to solve certain mental problems such as confidence, independence and fear. Women may have to work harder to solve these problems if they haven't been in many adventurous or athletic situations. For dealing with a confidence, fear or hard decision matter, it's important to first recognize the situation. Don't ignore or block out a fear until you've carefully analyzed everything you can think of. Then, weigh the advantages of doing it or not. If the reward to risk ratio isn't high, I suggest not doing it. Of course, you must be realistic about both the rewards and risks. I find in the long run this approach builds confidence because you begin to rely on your own judgement. You know you won't make hasty, dumb or overly risky decisions. You become a better pilot overall.

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Women, in general, may have more problems with fear factors. However, it may only be that they are more vocal about their concerns. They're willing to admit their fears while men aren't. But the big point to remember is that facing your fears and overcoming them is one of the biggest rewards in life. Conquering your insecurities and doing well is one big high.

Facing your fears and overcoming them is one of the biggest rewards in life. Conquering your insecurities and doing well is one big high.

If you find you can't deal with your fear all by yourself, find a mentor who can guide you and help you make safe decisions. The mentor should work together with you and give you constant encouragement. That's what I do in my classes. The more my students talk about their fear factors and fearful situations before a flight, the more they gain confidence and relax as long as I point out to them correct actions and decisions. Knowing what to expect solves half the problem. So the obvious conclusion is to learn more about all aspects of flight and especially conditions in the air.

Since you mentioned the subject, Kari, can you give us any insights relating to women or small people in hang gliding?

First of all, many small people have equipment problems. Control bars are bigger relative to their size and gliders may be heavier. Often they fly with lighter wing loadings too. But it's important to realize that there are benefits as well as deficits. For example, you can often get off the ground sooner in light winds and can climb better. Work to perfect these strong points. If you're worried on launch about a heavy glider, get on a program of strength training. That has a lot of other benefits as well. Also, I strongly recommend you go back to the training hill to work on launches if there's any doubt. Keep working until there's no problem. For example, I wasn't sticking my landings some time ago (according to my high standards) so I took repetitive tows to practice until I was satisfied.

In regards to women, so many times men want to do everything for you. If you accept too much help you never learn to do the things yourself. I see lots of women lost without their significant other. If you make it a point to carry your own glider you build strength, your feelings of self-reliance and confidence.

Let's talk about your thermal skills or ideas, Kari. Are you a logical process flyer or an intuitive type?

For me looking for thermals is entirely intuitive. I feel I fly mostly intuitively and perhaps I should be more logical, but perhaps I wouldn't be better. But probably a better balance would be more versatile. I don't feel I read the clouds or terrain very well, but I seem to be able to integrate the big picture and make the right decisions. In the mountains I'll go along and know intuitively **where I'll hit a** thermal. But in the flats like Florida I believe I'm taking more chances because I don't yet have everything formed in my mind. That comes with experience in **an area.**

Some days my instincts are right on and some days right off! I can recognize my good days, but I don't know why they're there. When I'm not on I don't do as well and I think everybody's decision is better. Bad days are when I'm in follow mode. Sometimes I can't get out of this mode. When I do get out of it, I do better. For example, on one of the Quest Air days there was a strong head wind. I started following and almost got into that mode, but then struck out on my own and did better. I tend to make good decisions when I'm alone and that builds confidence. Following does the opposite.

It must have been a confidence boost to make the U.S. World Team.

Yeah, that was a long haul. I have been in the standings to make the team before, but never at team selection time. Now (April 2001), I have succeeded. If Revo (Steve Rewolinski), Chris (Arai) or Jerz (Jersey Rossignol) had kicked ass they would have knocked me off. But I beat all of them in at least one of the two spring meets.

Kari poses in front of the Florida map at the Wallaby Open.

This is the first time a U.S. woman has made the World Team (Francoise Mocellin from France and Kathy Rigg for England made their teams this same year). Years ago it was my goal to make the team, but then I gave up because I saw what the guys had done to make the team. They were taking risks to do well—flying near thunderstorms or over no-landing areas—and I wasn't willing to do this. However, now meets are more my style because the risk has been greatly reduced with the use of some sense and task committees. Now it's more **a** contest of skills and less *cojones.*

Do you recommend competition in general?

Absolutely for at least one reason: competition is one of the best X-C seminar you can invest in. If you look at it that way it becomes **a** great mind set. You're going to learn organization of equipment, efficient flying and decision making, all with the guide of the best pilots in the world. You get daily lessons. You can take advantage of the opportunities for learning by discussing things with the top pilots. You learn some truly amazing things when you get together. There are some there who are deadly

serious and some just having fun, but they all will share info, ideas and insights.

Also, you become part of one big extended family. A couple of times when I thought I'd give it up I realized I'd miss seeing my friends. The friends you do meet here are not run-of-the-mill friends because we all share a very unique passion. When such a special group gets together the energy is unbelievable—everyone is pushing their limits and discovering new things about the equipment, the air and themselves.

I've had some of my highest highs in competition. I just smile and glow. Then, of course, there's those character-building lows. Dealing with lows—a bad flight—is tough with me. I try not to look people in the eye and just lay low. But I know I have to manage this aspect of competition because everybody has bad days. Sometimes I torture myself too much instead of looking at the mistakes or decision points and getting over it. My goal is to learn from pilots like Jim Lee. He can have a bad day but smile right after it. He's very level headed and a good role model.

The mental aspect is everything in competition. It's a game and mostly a mind game whether you're making judgements or decisions or dealing with equipment problems, time factors or a bad day.

The mental aspect is everything in competition. It's a game and mostly a mind game whether you're making judgements or decisions or dealing with equipment problems, time factors or a bad day. Second-guessing is not good. Only with experience and lots of mistakes do most people get good. Dealing with disappointment is the biggest challenge, but when you are successful it helps make you philosophical. When you get a handle on this mental thing in competition there are many benefits in other aspects of life too.

When I'm flying well—the days I do best—is when my equipment is working well, I know the route and I'm focused. Then I'm not second-guessing my decisions. I got into the error before of thinking others are making better decisions, but now I know it's not necessarily true. I got out of that rut by imagining all the rest of the pilots in a meet were my students. It gives me confidence in my own decision making. I find when I make my own decisions is when I do the best.

Well thank you Karifor baring your soul about the fears and waffling most of us experience at some time or another. We hope to see you and our other friends on the competition scene for many years to come. Good luck in the next season

JIM LEE

Jim Lee in relax mode before a round

LEES LESSONS

Jim Lee has been flying and competing in cross-country events longer than almost all of the other pilots in this book. He started hang gliding in 1976 at Point of Mountain, Utah. Jim was interested in hang gliding in 1972, but it wasn't until he saw competition in Utah that he took the plunge. He bought a used 18 foot standard (the original hang glider design with no battens) with a harness for $200. He stayed up all night reading magazines to learn how to fly and in the morning went to the hill and put the glider together through trial and error. He climbed halfway up the south side of the Point (about 50 m—160 ft) and took off. He stalled back into the hill and broke the leading edge and crossbar. Jim went back to the guy who sold him the glider and took a lesson. After a few pointers Jim was airborne and gradually earned his place in the sky.

Nine months later he moved to Taos, New Mexico to work in the ski industry. (He is currently head of the Taos ski patrol where he oversees forty patrol persons with EMT through paramedic level experience.) In 1978 he began flying from Sandia Mountain at 10,300-ft elevation. This was with single surface gliders. Anyone who has flown Sandia knows its washing machine reputation. But Jim says that back then they didn't know any better and the good handling of the gliders helped mellow the experience. But today he has plenty of respect for the area given the current gliders with more rigid flying surfaces and stiffer handling.

Jim soon found himself working for the hang glider manufacturer Electra Flyer and flying their Olympus glider. With this bird in hand he began flying

cross-country. Never mind he didn't have a radio, chase crew or oxygen and his harness was an uncomfortable knee hanger. He would get frequent 20 to 40 mile flights and hitchhike back with his glider. He flew for five years with this devil-may-care plan.

Jim's first big competition was the Pico Peak (Vermont) meet in 1978. He shared first place with this author and two others (bad weather prevented a runoff). That meet enthused him for the many learning opportunities of competition, but he soon became disillusioned with duration and ground pylon turning events. He was a X-C addict.

During this time the Owens Valley was heating up. Gene Blythe and Trip Mellinger had managed to pull off world record 50-mile flights. Other pilots migrated to this mileage Mecca and upped the ante, with Jerry Katz getting the world's first 100 miler in July 1977. Eventually, Eric Raymond scored a 121 mile flight and everyone knew that the place to be for X-C was the Owens. Everyone except Jim.

In 1981 Jim flew 168 miles from Sandia Peak in a new UP Comet. This was a stellar world record and it resulted in UP's President Pete Brock sponsoring Jim in the first Owens Valley cross-country competition. I asked Jim about his Owens experience.

Jim, weren't you intimidated by the Owens Valley big air rep and the prospects of facing the top U.S. pilots?

No, actually the conditions I had been flying on the front side of Sandia Peak were every bit as robust as those in the Owens. I was used to hanging on tightly. I did have a bit of adrenaline flowing of course, not from fear of the competitors, but from the general hype and excitement of competition. I think many pilots experience that feeling even in today's safer meets. That's one of the things that a competitor has to learn to manage in order to better focus on the important stuff.

Jim begins launch in the 2001 World Meet.

How did that meet go for you?

Well, I didn't blaze up the sky—I believe I took 13th—but I learned a lot. That was the year of the "pods." Rich Pfeiffer and Chris Price among others had rigid pod harnesses with large Plexiglas dome head covers. They were cumbersome, inconvenient and hot, but they obviously greatly reduced drag compared to the conventional cocoons of the day. It got me thinking seriously about drag reduction.

Is that where you got inspired to create your famous harness? (Jim flies an all-composite sleek rigid harness of his own design. He is easily recognizable in the air from afar in his gleaming white missile.)

You bet. I came up with a design in several pieces that had a spring-loaded hinge at the waist and bomb bay doors for the legs.

It sounds very similar to what you're flying today.

It was. In fact, most pilots wouldn't be able to tell the difference. I worked the design out on paper then sent it to my friend, Steve Hill, who worked at the Appleby Sailplane factory south of Albuquerque. He looked it over then showed me how to lay up the fiberglass. I built it very quickly then took a couple of flights off Sandia to compare it with the performance of other local pilots. I killed them on glide, but had no hard data. Then I painted the harness and went to the Owens for the '82 meet. Actually, Steve built the first harness, with my help. He was the one with the expertise, and I was learning from him

How did it go?

I won, hands down. That was the biggest performance difference I have ever enjoyed-all on glide of course. My glide advantage was greater than that of today's rigid wings compared to flex wings. I remember one flight to Mazurka. Ten of us left in one big group gliding to goal. I was the only one to make it. Even Rich's Bulletman harness didn't compare.

My harness has an oval cross-section, and back then the widest part was only 12 inches (30.5 cm). That's an incredibly small frontal area. My current harness is 14 inches (35.5 cm) wide to accommodate twenty years of growth. Steve and I went into production with a one-size-fits-all of 16 inches (40.6 cm). But that size lost a lot of performance advantage, and pilots of the time did not want to put up with the extra weight and chunkiness. So Steve and I abandoned the commercial idea and now only a few pilots and I fly the harness. My current model weights about 11 pounds (5 kg) without the parachute and is made out of carbon and Kevlar. I no longer think it has much performance advantage over the current slim cloth harnesses, but I fly it because it is so much more comfortable, with no pressure points. Every couple years I try a cloth harness but go back to my harness for the comfort advantage. I am thinking of ways to reduce drag even more. My current harness measures 11 inches top to bottom and 15 inches wide.

/ understand you used to make helmets as well.

Yes, the composite skills I learned naturally led to making helmets. I came up with a very protective helmet that incorporated a face shield. I believe it was the safest helmet available for our purposes, but I no longer make it due to liability

reasons. I will make a harness, though, if someone wants one. It takes me 150 hours to build it so it costs $3,000. It will be form fit and weigh less than many cloth harnesses.

Before we leave the subject of Western U.S. big air flying, let's talk about oxygen. Do you fly with oxygen often?

Sure, at home we are usually above 10,000 ft MSL (3,000 m) and everyone experiences some level of hypoxia at that altitude. It is recommended that airplane pilots use oxygen above 5,000-ft (1500 m) when flying at night and military jet pilots use it down to the ground at night for visual acuity. Most people don't understand how important oxygen is for performance and for vision. Being clear-headed is a major part of competition; it's all about who can analyze the situation the best and who can come up with the best decisions. I live in Taos at 7000 ft MSL (2130 m) so I am better acclimated than most, still I always go on oxygen from 12,000 ft (3,600 m) and above in competition. When I'm flying cross-country for long duration I'll go on 02 at 14,000 ft (4,300 m). I also advise pilots on high altitude launches to breathe oxygen for 5 minutes before taking off to maintain a clear head.

Being clear-headed is a major part of competition; it's all about who can analyze the situation the best and who can come up with the best decisions.

I have played a bit with a Pulseox, which measures oxygen content in the blood. We found at the ski area (Taos) that people new to the area are typically oxygenated in the mid-eighty percentile and can easily be in the low eighties. The mid-eighties is considered a medical problem. Because of my acclimation I am in the 92 to 94% range. I found that breathing oxygen can bump you from 90 to 98% within two minutes. Again, I strongly recommend breathing oxygen for higher altitude flying.

What setup do you use personally?

I use the Mountain High EDS (Electronic Delivery System). I think it's the only way to go for our type of flying. The EDS delivers exactly what you need at all altitudes. It's very compact, convenient and reliable. I use a small aluminum tank for recreational flying and a large composite 300 liter bottle for competition—I can breathe continuous oxygen for up to eight hours with this unit. I believe I could fly up to 25,000 feet with this system if it was legal. Above that pressure breathing is required.

That's some serious altitude, Jim. I know we used to get permission to go to 22,000 ft (6,600 m) during the Sandia meets, and the thermals would sometimes carry us that high. What's the highest you've been?

I can say without fear of FAA reprisal that before Part 103 *[Editor's Note:* ***Part*** *103 contains the U.S. aviation rules governing hang gliding]* was instituted we used to fly very high off Sandia. My personal best is 21,400 feet, again, before part 103.

That's an experience denied to many hang glider pilots who live in more humid climes. Something we frequently encounter in the Eastern U.S. as well as in the West is cloud suck. Can you provide us with any insights into how to handle it?

I'll begin by saying that in the earlier days (before Part 103) hang glider pilots would occasionally fly in the clouds. I've climbed up over 2,000 ft (600 m) in a cloud myself, but that was with the older, more stable gliders. With today's gliders you cannot white out for even 15 seconds or you'll probably end up spiraling with a good dose of vertigo. We must maintain visual reference with the surface. I don't recommend cloud flying because it is illegal and dangerous.

With today's gliders you cannot white out for even 15 seconds or you'll probably end up spiraling with a good dose of vertigo.

Of course, sometimes a pilot can get caught in cloud suck. In that case it is important to have a GPS or compass—a compass is better. What I recommend—if you can't dive out of the cloud—is to slow down to best glide or maneuvering speed and be flying straight and level when the clouds engulf you. Do not turn, but aim straight. Don't move your head, but only your eyes to avoid vertigo. Maintain a steady body position as much as possible and avoid radical control movements. Be patient and wait to fly out of the side of the cloud.

If you haven't yet entered the cloud and are still ascending even though you are diving at top speed, you can try entering a spiral to maximize your descent rate. But remember, when you are spiraling you are not moving to the edge of the cloud. Also, be sure to level out before you reach the cloud and get sucked into it.

In a very intense situation, for example if you are in a Cu-nim (cumulus-nimbus, or thunderstorm) and getting higher, you may have to take drastic action. One possibility is to cut a side cable with your hook knife so the glider folds. Then throw your parachute when you are well clear beneath the storm. *[Editor's Note: With this suggestion Jim is speculating because it is not feasible to practice such a feat. Some potential problems are the folded glider may be spinning so rapidly that you cannot deploy your chute. Also, when the 'chute opens below the thunderstorm cloud, you may well be sucked back up under canopy with even less control and fewer options. At least one pilot has* ***cut his hang*** *straps and free fell to escape a thunderstorm. However, he had skydiving experience. Note that our 'chutes are not designed for the opening shock of free fall, so the additional drag of the glider as with Jim's suggestion is beneficial. Even though these options are fraught with problems, they are no doubt better than being carried to 30,000 ft or more and dying byfreezorfrom hypoxia. By 20,000ft your judgement will be impaired, so emergency procedures should be initiated long before that point. The most important policy is never get caught under a thunderstorm.]*

Jim Lee soars his Talon with talent over the hills of southern Spain. Note his famous rigid harness.

I shudder to think about getting vacuumed into a thunderstorm. Jim, sinceyou're one of the older pilots competing—almost as old as me—do you find yourself disadvantaged or threatened by the young stars who are blazing in the competition scene?

Actually, I find their presence and the enthusiasm they bring a refreshing challenge. There is no doubt that the skill level of pilots has improved along with the performance of the gliders in the last few years. We've all had to move the bar up one level. When someone like Manfred comes along, we all have to work to keep up, but those with the will and right spirit will improve. So the collective skill of all of us—even recreational pilots—benefits.

Being older and wiser is not really a deficit, for all your experience helps you assimilate new techniques readily if you keep an open mind. I do perform forms of energy management. For example, on the ground I try to relax and keep things low key. I avoid getting worked up about the rules, weather or scores, so my focus is on the upcoming task. Whenever possible, I try not to fly the day before a contest unless I have to test fly a glider. Naturally it is ideal to have your equipment worked out long before the meets starts, but the realities of competition often mean you're getting new equipment just before a meet. Pilots should remember that sometimes it's better to fly last year's model than hop on a new glider that isn't in perfect tune.

I want to have my energy tank as full as possible before a meet. I always try to have a good night's sleep and don't drink too much alcohol (probably none is best, but I'm not an extremist). I'll do some stretching and visualization exercises. I don't visualize things to get my adrenaline flowing, such as diving to goal, but relaxing things such as entering a thermal smoothly.

I find my wife Kathy and daughter Rachel are good for my energy. Kathy has a calming effect on me and she is very supportive. She likes the sport and the people. I think the situation where a pilot has a spouse or girlfriend around who doesn't want to be at a competition is very draining. Try to avoid it.

The point I should emphasize is to stay calm. Most of the top pilots are of calm demeanor. That's where age can be an asset. You don't see too many 45-year-old excitable boys. I have been in six or seven world meets so I'm not intimidated at any level of competition, especially since comps are safer today.

How have you performed in the Worlds, Jim?

I have been in the top ten three times and took 5th in Brazil (1991). **I've** also been the U.S. National champion.

That's a great run for success. Do you have any energy saving tricks for in-flight?

Sure do. Any time I can relax in the air I take the opportunity. I may hang an arm or go completely limp with my body. I also try to stretch every 15 minutes or so. I'll straighten up my head, look around to the left and right and then tilt it down and look straight back. I start this relaxing and stretching process at the beginning of the flight because hang gliding competition is very intense and it's hard to get the energy back once you're behind the eight ball.

I like to refresh myself mentally as well. I'll give myself little rewards, especially after a hard section. For example, I may pop in a new stick of gum, take a sip of water or pop an Advil. I carry Advil on board and usually take one after three hours or so. It takes away the pains for the last part of the flights. Little aches and pains can be distracting which takes away the focus. Anti-inflammatory drugs like Advil don't just mask the pain, **they** prevent it by reducing inflammation.

Keeping hydrated is an important process, especially for older pilots. As you age you lose your ability to detect when you are dehydrated.

Keeping hydrated is another important process,

especially for older pilots. As you age you lose your ability to detect when you are dehydrated. Your thirst response is unreliable. Usually, by the time you are thirsty you're already dehydrated. Many studies have shown that dehydration leads to lower performance both physically and mentally. Many aviation accidents have been attributed to dehydration. There's a reason for those old Owens Valley T-shirts: "Hydrate or Die!" In most cases it isn't that extreme, but pilots running out of energy for safe landing judgement may most often be dehydrated.

Right along with dehydration is the ability to pee in the air. Modern harnesses allow most male pilots to do this. If you can't pee (or don't have to on a long flight), chances are you aren't hydrating enough.

I'll remember not to fly under you, Jim. Do you have any other particulars that can contribute to flying excellence?

Yes, I think vision is the most important thing to develop. In Chuck Yeager's book he talked about what made him such a good pilot in comparison with others. He claimed it was his vision. Chuck related a story of how he could walk the bullets into a target during practice. The instructor wanted to know how he did it and he simply said "I can see the bullets hit." No one else could.

I think soaring pilots need good vision and the best pilots have very good sight

I think soaring pilots need good vision and the best pilots have very good sight. I believe soaring birds see dust, bugs and itty-bitty things carried aloft in thermals from far away. We have all seen birds turn while on glide and find a thermal. I once read a story of a kamikaze pilot who practiced seeing the stars during the day. We may not be that dedicated, but I think a committed pilot should practice spotting things like birds and gliders all the time.

I use photo gray prescription glasses, so my eyes aren't perfect, but I am constantly trying to observe. I am aware of using my vision as the number one thing when flying. It's also important to focus, of course. Too many pilots focus on discomfort or a complicated flight deck for example instead of seeing. One sailplane author said we are making an important decision every minute or so of flight—that's 60 per hour. Decisions such as "should I leave this thermal," "what's my speed ring setting" and so forth are important. If we're focusing on the wrong thing we will not make these decisions properly and will not be observant.

Jim, let's turn our attention to thermaling technique. I have shared many a thermal with you and know you are one of the best climbers around. Do you have any words of wisdom relating to this elevating practice?

I'm glad you asked. Thermal climbing is very important. You can rest assured that all the really hot pilots are good climbers. Tomas (Suchanek) always climbs great. He doesn't downsize his glider, but flies the biggest one he can handle. I think equipment and technique both play a role here. I find my current glider, the Wills Wing Talon, is a great climber and the Tangent vario is very responsive and accurate. That's important.

Concerning technique, here's what I do. I like to rock up a bit (tilt the front of the harness up) when thermaling. This position is more comfortable; I have more control and improved visibility. I don't think this position adds significant drag at the slow speeds of thermaling. In my tests I have found the airflow to be nearly parallel to the keel at such slow speeds, so the head should be a bit higher than when gliding.

On course, when on glide the head should be down so the body parallels the airflow. It's important to have a harness that will go down and stay down for minimum drag at all speeds up to dive.

The actual technique I use is to turn a fairly flat turn as long as everything is even. But when I find a hot spot (area of strongest lift), I'll push the bar out with just the slightest bank input so when the glider reacts with a bank it will rotate or yaw in the correct direction. Then I'll follow up with a control input to either make it wrap up or straighten out, depending on the lift I feel throughout the maneuver. Most top pilots use a variation of this technique. Oleg Bondarchuk is a master at this. *[Editor's Note: This pitching-yawing technique is discussed in other interviews as well.]*

An important thing to note is that to maximize climb rate you have to analyze each 360. Ask yourself: "Am I centered? Has the lift changed? Is my bank angle too shallow?" You can't just lock in and climb if you want to excel. You have to work. You can get another 10% or more if you really put effort into it. I think all the good pilots are working hard to maximize climb when it's important.

In the past I've always been a crank and banker. I would find a core then crank out. I notice that Tomas cranks tighter than Manfred. Lately my technique has been to put in slightly flatter turns to check for best core position. I'll make a few turns tight, then flatten out to check my position, then tighten again (see figure 1). This technique is especially helpful in snaky thermals like those found in Brazil or Florida.

The correct bank turn is the one that gives you the best climb rate. Monitoring this factor is what your instrument is for. You must have an averager on your vario. Adjust your bank angle until you get the best climb rate, and expect to readjust every 50 feet (15 m) or so. Normally, I rarely look at my instruments, but I carefully monitor the vario audio.

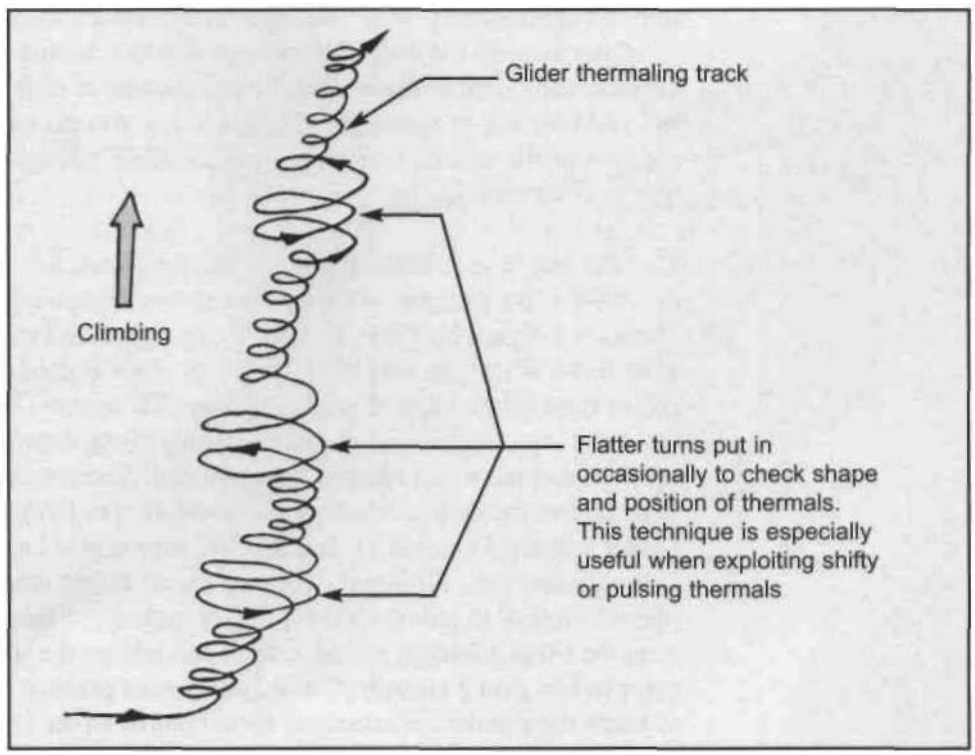

Figure 1 - Thermaling Technique

It is important to fly slowly to maximize climb, but there are definitely times when I'm not pushing out. In a 1500 FPM (7.5 m/s) gnarly sucker I'll be flying around at 40 mph (64 km/h). I don't care how fast I'm climbing, I just want to stay upright. Remember, every thermal has its proper technique.

Another very important point I'd like to make concerns the center of gravity tune of the slider. Many pilots fly a glider with a "fast" trim. In other words, their glider is trimmed at least 5mph faster than min sink. Then they have to push out against the basebar to slow the glider, or worse, fly at trim speed in the thermal. Either one restricts a pilots' ability to climb well. It is imperative that a glider be trimmed near stall to have a light touch on the bar in order to feel the glider. Also, much energy is saved by not having to constantly push out against the glider. Of course, a pilot needs to be careful not to inadvertently stall the glider in this configuration, especially right after launch.

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Those are interesting insights, Jim. Can you give us some hints about finding thermals?

You bet. When looking for or coming to a thermal, sensitivity is important. On glide, I'm always paying attention to the track of my glider and am assuming that the air entrains you into a thermal. I'm always trying to detect if the air is moving me in a slightly different direction than what I feel the wind is flowing. The higher you are, the harder this is to do. But I believe it is possible and it works. Of course, you must be paying attention and if you are by yourself you *better* be paying attention or you'll soon be on the ground.

A prerequisite for this technique is to have a glider that absolutely flies straight, hands off, in smooth air. Any pilot who doesn't use this technique should make it his or her goal for the day to practice detecting drift. Your X-C skill will improve dramatically once you have acquired such sensitivity.

Once you use the drift technique to head to a thermal, you should then be sensitive to additional changes. Usually the amount of drift turbulence and sink will tell you how big or strong the thermal is. As you get closer still, be sensitive to the sink or lift turning you away from the core. Always turn the opposite direction to what the air is trying to force.

Can you tell us your techniques for entering thermals?

Well, I like to separate the technique into downwind, upwind and crosswind entries (see figure 2). When you are flying downwind it's pretty easy. You should slow down when you feel the thermal (or reach a good-looking cloud) and veer left or right if necessary if you feel greater lift on one side.

Most pilots turn too soon when entering strong thermals. I may fly straight for up to 10 seconds when entering a big thermal. Seven seconds is common. Usually you can feel the core as a sharp rise. Normally I'm flying with the VG on tight as I enter a thermal area, so I'll take the VG rope in hand and be ready to pop it off. If there's not time, I'll initiate a strong decisive turn when I find the core. Often there is no time to jerk the VG off before turning, so the sequence is: initiate hard turn, then slow glider to pay off energy and release the VG. This process all takes place in less than 2 seconds. Clearly pilots must practice these techniques in order to know their glider's reactions to these control inputs intimately.

The important thing is to start the turn. I may initiate a slight bank ahead of time so I can turn fast in the core if I think it is near. Even though I slam the glider into the turn, I may not tighten it up, but keep it flat if the lift is wide. The trick is to be constantly assessing the situation in order to maximize the lift. Without some such techniques, you can easily lose 200 ft (60 m) in the sink rather than gain 200 ft in the first 360.

Upwind entries are the second easiest. The thermal cores tend to be near the upwind side of a lifting area or cloud. Once you enter the lifting area, the core is likely to be found sooner than the 7-second guideline used for downwind flying. Again you must be sensitive to lifting wings and the feeling of lift. Remember, however, that thermals are like snowflakes—every one is different.

Crosswind entries are the most difficult. Most of the time I like to turn towards the upwind direction when I detect lift in this situation and everything else is equal. For that reason it is essential for all pilots to thermal equally comfortably in either direction. If you can't you are greatly limiting yourself.

I'll often explore with wide sweeping turns with my VG on and the rope in hand when I feel a thermal is near on a crosswind track. There is a good chance

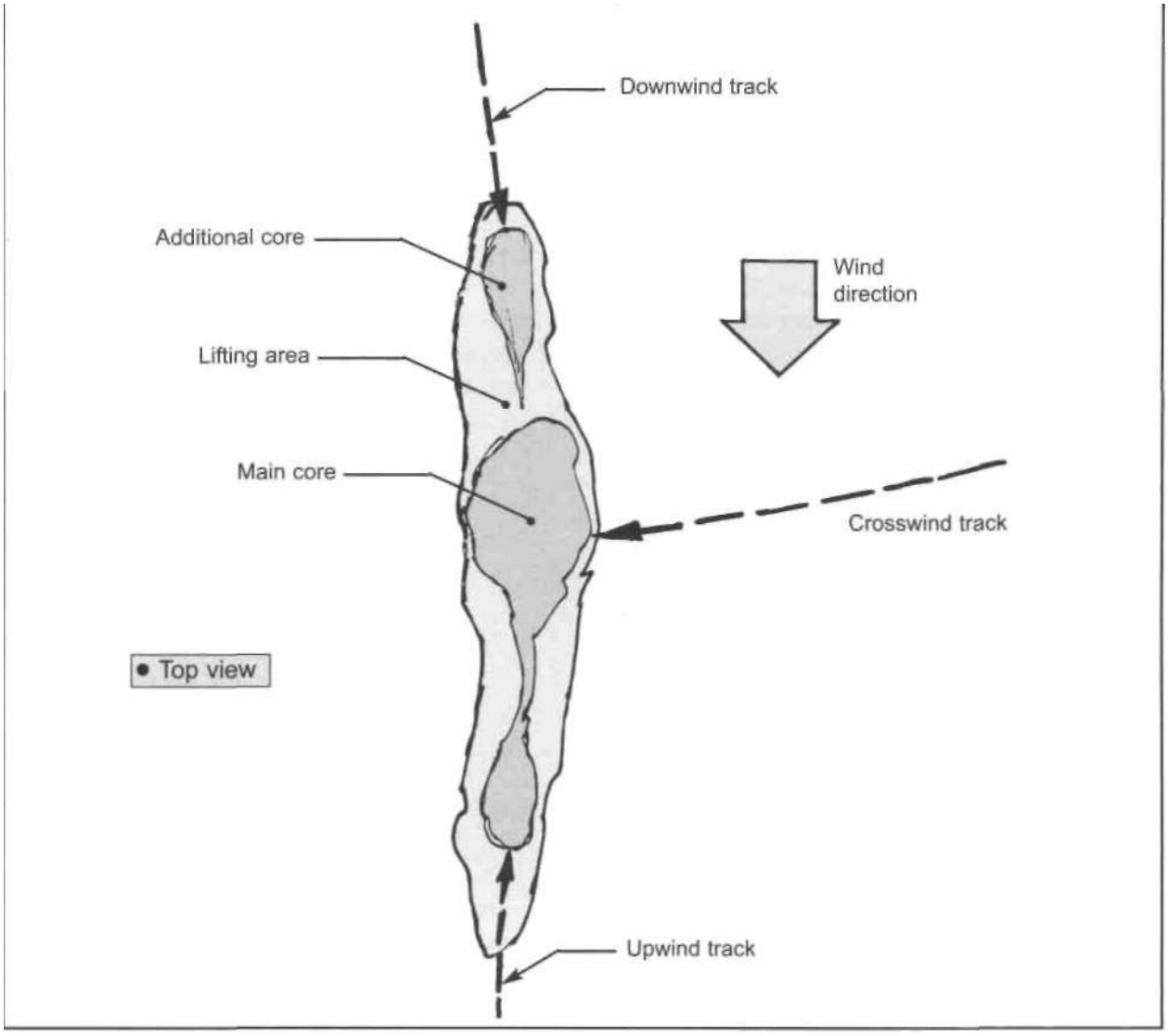


Figure 2 - Entering Thermals in Different Directions

that you'll pass up a core when flying crosswind if you don't fly sensitively and use a search pattern.

It is interesting to note that most recreational pilots have experience at upwind thermal entries from soaring at a site and waiting for thermals to blow through. Cross-country pilots add to this by doing downwind entries. But only competition pilots regularly practice the more difficult crosswind entries. If you want to become a better pilot, go out and practice some crosswind courses. Learn to relate daily patterns to where you find the cores. For example, if you find cores 1/4 of the way back from the upwind edge of a cloud, head for that area as you fly crosswind, keeping the proper angle according to your height, of course. Any practice that you do like this develops increased skills, which rewards you with more airtime so skills develop even faster.

Most recreational pilots have experience at upwind thermal entries from soaring at a site and waiting for thermals to blow through. Cross-country pilots add to this by doing downwind entries. But only competition pilots regularly practice the more difficult crosswind entries.

/ like the thought of developing skills faster. Before we close, Jim, can you say a few words about your equipment? How do you tune your glider?

Well, I believe you have to high-side a glider to get maximum climb performance-if you're not high-siding, you're not getting it. *[Editor's Note: High-siding is remaining a bit on the upper wing side rather than the center of the control bar when in a turn. The more anhedral (downward angling of the wings) a glider has, the more high-siding required, and vice-versa].* A looser sail that allows you to remain centered in a turn is best for recreational flying, but not best competition quality performance.

I want my gliders to be flat and tight. The first thing I used to do with a glider is add shims and shorten the haulback. That was my ritual with the (Wills Wing) Fusion. I also tighten all the battens, especially the tip battens. These actions all hurt handling, so there is a fine line to walk. Too much tightening hurts overall performance if you can't turn in the thermals.

New pilots to competition should know that it involves work. But also being tuned into your glider is of utmost importance. The more "tuned into" it you are, the more you can "tune" it because you can anticipate its behavior. You should only tweak out a glider to the point that it remains safe and is improving your overall performance. Then, no more.

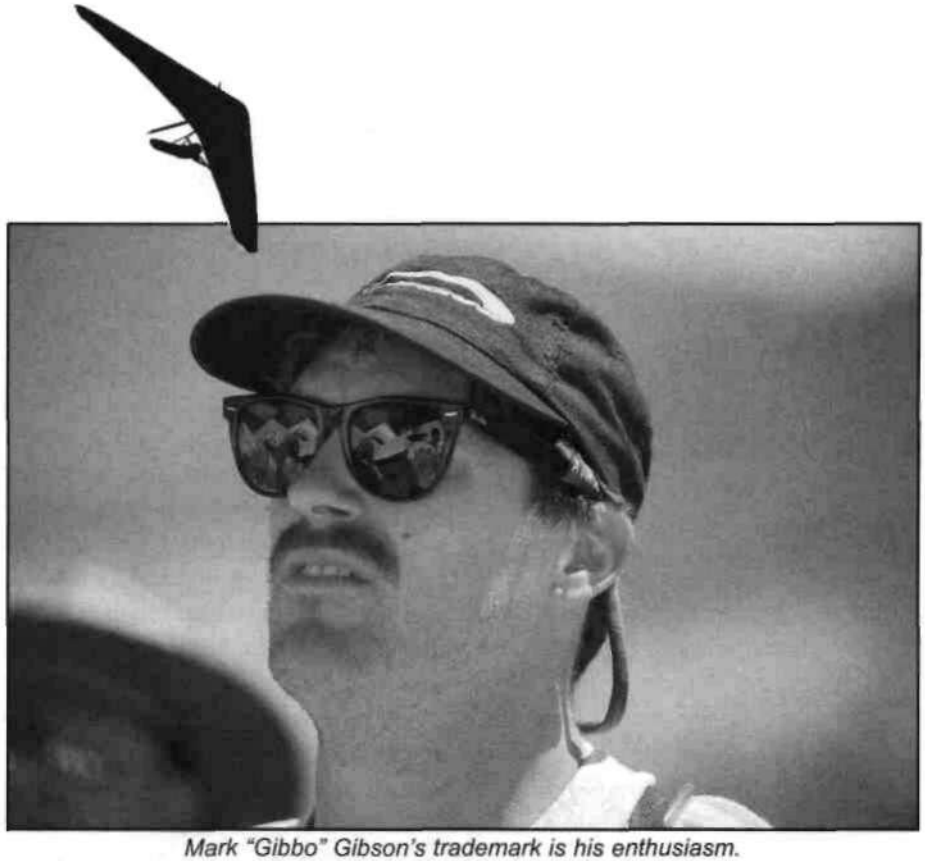
Jim, you 've a loyal—and successful—supporter of Wills Wing since as long as I have known you in the late seventies. Why is that?

For one thing, I like the folks and I like their glider(s). They are conveniently located in the U.S. and I trust them to build a safe glider. They also seem to have gliders good for me—maybe it's because they listen when I make suggestions. I really like the Talon's climbing abilities, stability and speed. The gliders just keep getting better!

You sound just as enthused as you did 23 years ago.

You bet! I intend to continue competing 'cause I enjoy it. I like where it takes my family and me. In fact, hang gliding is the best thing I've found to take me to cool places where I meet cool people.

MARK GIBSON



Mark "Gibbo" Gibson's trademark is his enthusiasm.

GIBBO'S GONZO GUIDELINES

Mark Gibson, known as "Gibbo" to the hang gliding world, was a long-time participant in the international competition scene. He hasn't been competing for the last couple of years because he has been devoting all his time to the development of his trike manufacturing business. But we deem it important to include him in this book because of his unique perspective, his unique attitude and his unique experiences. For example, Gibbo spent 9 years living in the Owens Valley in California and knows big air flying perhaps better than any other pilot. He's also conversant in glider design, having developed Airwave's last glider the Concept, and his own Extreme. Talk about extreme, this big boy has been under canopy more than any other pilot. He has had three parachute saves and gives us some interesting insights.

Gibbo started flying in 1976 when he was a kid in his native Washington State (his father flew hang gliders at the time and still does). He moved to the Owens Valley in the mid-eighties in order to "get better and stir up the U.S. World Team" in his words. He was successful in both these endeavors. He was on the team in '93, '95 and '98. He took third in the 1993 Worlds in the Owens. He was always near the top in the three World Meets he attended and has been rated number 1 in the U.S.

Gibbo has won numerous U.S. meets and took a fifth in the 1996 European Championships. In this latter meet he was 3rd until the last day when, in typical Gibbo style, he went on his own to try to win all the marbles and got stuck. In the '98 World Meet in Australia he flew almost exclusively alone. This willingness (even eagerness) to go it alone is indicative of the Gibbo style. Another aspect of his style is the almost pathologically positive attitude. He believes almost every day is a great flying day and every task makeable. His well-known line when pilot meetings drag on or everyone's waiting for conditions to improve is: "Let's go hang gliding, dude!"

Back in the Ager, Spain Pre-Worlds (1994) I was with him on the U.S. Team and was impressed with how Gibbo pumped up the team with positive energy. He was a leader in more ways than one.

I caught up with Gibbo at the Wallaby Ranch in Florida a couple of years ago. He was involved in the World Team Academy along with Mike Barber. He was finishing up the development on his Extreme design and at the top of his form.

Mark, I know that you lived in the Owens many years and survived in the biggest air on the planet. Can you tell us about your survival skills?

Man, in 9 years I flew the gnarliest stuff. We were jumping valleys, waiting for gust fronts to pass, blasting through virga and snow and so forth. But I probably wouldn't fly like that today. I'm older and wiser, but I also don't think today's topless gliders are as tumble-proof as the older kingposted gliders *[Ed. Note: Gibbo was referring to the first generation of topless gliders. Today the designs have improved considerably and a well-made and tuned topless design is at least as pitch stable as kingposted older gliders].*

I'm always aware of the feeling of the air. When it starts to get weird I start flying more cautiously or move to another area.

I've had to throw my parachute three times but they were all due to aerobatics. I've never tumbled in the Owens. The reason is, I'm always aware of the feeling of the air. When it starts to get weird I start flying more cautiously or move to another area. For example, on my first 200 plus mile (320 km) flight I felt some bad air at 12,000 ft MSL (3660 m) behind Black Mountain. I immediately left. But Jeff Lyons, who was flying with me, didn't and he tumbled. I think a big factor that will help keep you safe in many situations like that is to have the confidence that when you leave such an area you will find other lift. With the current gliders you can actually choose two or three thermals before you hit the deck. Knowing this concept helps you leave a scary area when you should. I'm never worried when I leave a thermal that it will be my last.

You mentioned a 200 or more mile flight. Don't you hold a record in the Owens?

I did, but the records were broken since. I held the dogleg World Record at 258 miles (412 km). Of course, it's still an Owens Valley record.

Back to flying in big air, can you describe your specific survival techniques?

Well, leaving bad areas is a big one, but it's also important to maintain more speed for control as well as for pitch stability. When your body is forward you act more like a dart than a tumbling leaf. In thermals there are two main points:

1. Thermal with steep banks. When you are banked steeply the vertical shear

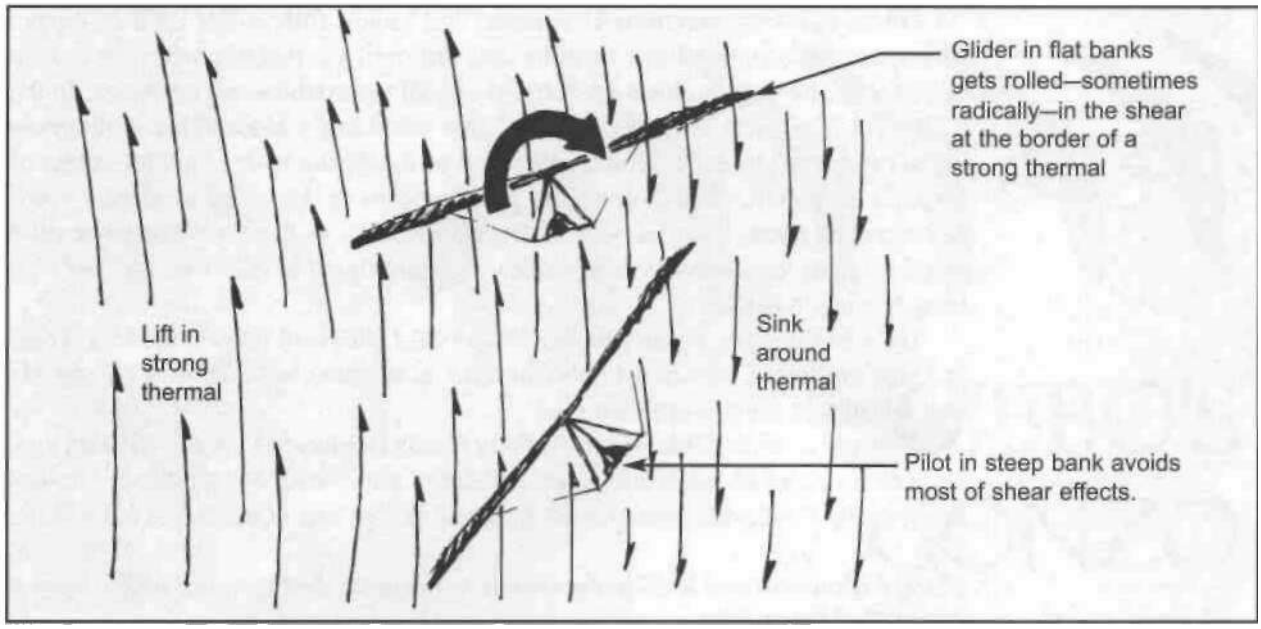


Figure 1 - Steep Banks for Safety

at the thermal edges doesn't have as much wing to work on (see figure 1). The result is there's less chance to be rolled over in a tremendously strong thermal. You know, pilots who fly the Owens regularly mostly learned there and they think that 1500 FPM (7.5 m/s) on the averager is normal lift. Usually when they go to the flatlands to fly they have a problem with banking too much rather than the other way around, which is more common. I can't emphasize enough how important it is to keep a steep bank in real blasting thermals. That means at least 45° bank and sometimes up to 60° in a real tight gnarly sucker.

2. Keep your speed up. This goes hand in hand with a steeper bank, because your speed goes up as the bank increases, but the speed you should fly at in your circle is faster than stall speed. No way should you be pushed out in big air. The bar should be at least at your chest when a really big turbulent monster is hauling you up.

Every time I've seen someone tumble (and I've seen many), it's because they were pushing out. I like to visualize strong thermals like a fart in a bathtub. How would like to go over it all pushed out to spend as much time as possible in its noxious interior? I go in it with lots of speed and lots of bank. When I'm flying along and feel a big surge coming on, I move forward and to the side automatically. That's the way to stay upright. To me the air is like a river. I visualize the terrain and flow and can predict the place where bad air is likely to develop.

When I'm flying along and feel a big surge coming on, I move forward and to the side automatically. That's the way to stay upright.

Once, years ago, I was flying with Jim Lee in the Owens Valley and we were trying to set a world record. We ran into some bad air and left the mountains after 30 miles (48 km). We both agreed that we were glad to be on the ground. The next day we found out there were pilots who stayed up and came down under canopy.

In another case, the 1992 Pre-Worlds and the '93 Worlds—both in the Owens—had a number of tumbles. Bruce Goldsmith tumbled twice on a (Airwave) K5, once each year. Robin Hamilton tumbled his K4 and Brad Koji tumbled on a (Wills Wing) HPAT. The U.S. pilots were flying Magic Ills and

modified HPATs back then. The modified form hadn't been on the test truck, but we didn't have problems for the most part.

The pilots who tumbled were diving into the lee side of canyons and flying too slowly. I watched Bruce Goldsmith coming up the canyon wall all pushed out, when he went over. I think the pilots from England and places where you have to scratch with great tenacity are the ones who had the most chance of tumbling because they have it ingrained in their head that they have to fly real slow to maximize their climb.

The pilots who tumbled were diving into the lee side of canyons and flying too slowly.

In big air or gnarly situations it's important to keep that speed up. Here's a little example. When I first got an (Airwave) Klassic I went to Fort Funston (California) to try to loop it. I kept aborting the loop, but then I decided to go for it. I dove at full speed, then went straight up. I realized then that the glider didn't have the speed retention to go over the top. I stuffed the bar straight to my knees, the glider pitched level and I flew away, happy to have dodged that bullet! The moral is, when in doubt get forward.

This might be a good time to talk about your parachute experiences, Mark. How did they happen?

You know I've always been an extreme pilot. That being said, I don't take safety lightly and I do not recommend relying on a parachute to erase every possible screw up. I've been lucky and my last one was a pretty close call.

My first one happened in 1978. When I was 17 years old I was hitchhiking down to San Francisco to visit Dan Racinelli. He was my hero then and I wanted to be a freestyle pilot *[Editor's Note: Dan Rac, as he was called, was known to be the best aerobatics pilot of that era. He died in Australia in 1987 when trying to rescue a teammate who had landed in a power line. The suspended glider swung in a gust, touched Dan and electrocuted him].*

We had a small competition at Dog Mountain (Washington) and I invited Dan up. He brought a big 164 Stratus V with him *[Ed. Note: The Stratus V was a bowsprit, curved tip glider that was known to be about the best aerobatics glider at the time].* That glider suited me fine since I'm bigger than most pilots. I dove it radically to try to loop it, but the bowsprit sheared off! They had added dihedral to the wings, which made the cables going to the bowsprit move up and put the bowsprit out of column. It was too weak for the loads of a loop in that configuration.

The wings folded back and were flapping. I was aimed straight down like a lawn dart. I looked for clear air and threw my chute. It was a chest-mounted 20 gore Bennett model. I felt a huge shock and then looked down to see that I was going to land in the reservoir (water). But then I drifted over the rocks along the shore and got real worried. However, the drift took me into the trees and the landing was soft. I could have been seriously hurt had I hit the boulders considering my descent rate.

My second deployment happened in France in the late eighties. Gerard Thevenot (owner of La Mouette) saw me flying my Sensor and wanted me to fly for him on his Hermes. He towed me to 5000 feet (1500 m), I released and I did a wingover. Then I did another one and the crossbar failed! I began spinning rapidly, but I was quite high so I had time to do the right thing. The problem was I couldn't get the parachute out with one hand—the Velcro was too tight and wide. So I let go of the bar to use two hands. The G forces in the spin pulled my body

out into clear air and I threw the parachute into the spin. It didn't open so I pulled on the bridle and it inflated. There was a lot of surging of the chute and it was spilling air. Also, the bridle was rubbing against the uncoated cable so I had to hold the bridle out and couldn't prepare for a landing. I was descending straight into huge power lines, so I didn't look down. I looked straight out in front and pounded the ground. I hit so hard I compressed a vertebrae.

That parachute was an Odyssey 20 gore. It was clearly too small and had way too much closure Velcro. I ran into Randy Haney (former Canadian top pilot) at the Pre-Worlds and found out he broke his leg landing under a parachute. I determined to have a better, bigger system, so I went with a new LARA annular parachute, side-mounted.

That's what I had when I tumbled the third time, which happened last spring at Induga (a large German free-flying exposition). I was on an Airwave prototype we were calling the FR for full race. I had looped it many times on the Isle of Wight and in the Canary Islands. I had a lot of confidence in it. But we had a crossbar that was not extremely strong and this one had an all Mylar sail without much twist. I towed to 1,000 feet (300 m) and at 700 feet (210 m) I did a loop. When I came out I had so much speed I decided to do another one. I just started to pull up when I heard a shotgun blast—*boom*! I immediately knew the crossbar had broken. I was only at 300 feet (90 m) and I could see cars and people below. My chute came out so easily it was like a gun, but it flipped over the base tube in front of me. I had to pull it back and throw it behind me. I saw the grass as the glider tumbled, then the chute opened. I estimate I was only 30 to 50 feet (9-15 m) above the surface when it slowed. I woke up under water—I had ended up over the lake. The parachute acted like a kite surfer and pulled me up out of the water. I was finally able to climb out of my harness and swim to shore. The glider was in the lake for a half-hour being pulled around by the 'chute.

All these experiences were borderline. They all could have had very serious consequences. For that reason I have formulated some parachute safety rules that I'll tell anyone who wants to listen.

We're an eager audience, Gibbo.

OK, here are the guidelines:

You should have the biggest 'chute possible. Everyone who has come down under canopy says the same thing.

l.You should have the biggest 'chute possible. Everyone who has come down under canopy says the same thing. For a small extra price you get a bigger 'chute. Do it.

2. Your 'chute should be well maintained, which means repacked regularly. In all three of my silk excursions my 'chute lad been repacked within a week before.

3. Your 'chute should be readily accessible. No behind the leg stuff which is barely reachable. I believe in a side mounted 'chute because it comes out in one motion. I don't believe I could have pulled a chest mounted 'chute out fast enough in the last case. Certainly, if the Velcro had been stuck I would have pounded. You should always practice the look, grab, look and throw sequence.

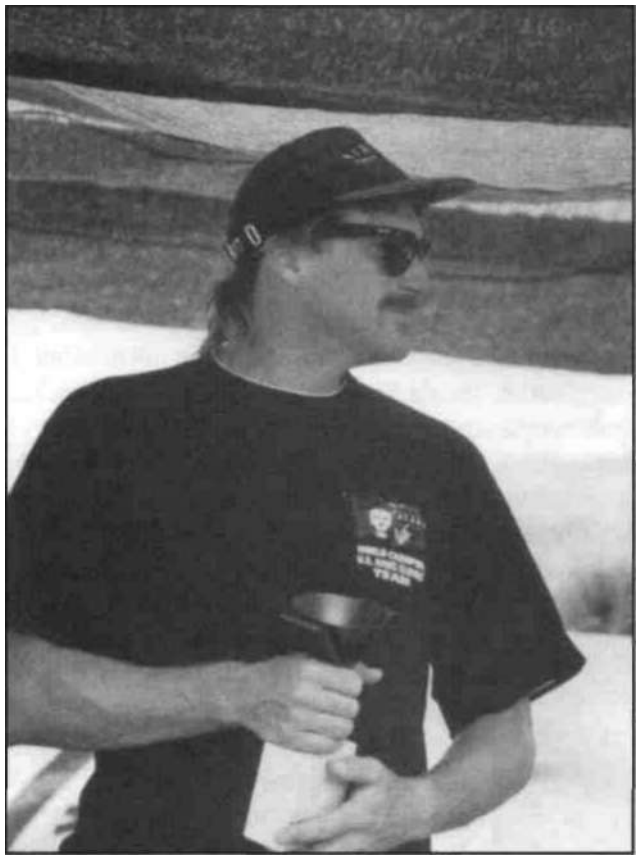
4. Once the 'chute is thrown, the process isn't over. You must monitor it to help prevent further problems. Try to stabilize your glider and protect yourself on landing.

5. Don't do things that will compromise your glider or parachute system. I'm not paranoid of the air or my 'chute, but I want to reduce the risk to a minimum.

I've learned the hard way not to trust prototypes. I'll still fly them, but with a lot of awareness and caution.

So let's pick up the thread of your experience in glider development. I know you used to fly for Wills Wing in the early 90s, but then moved to Airwave.

Yeah, I flew for Wills Wing for 3 or 4 years. The best part of that was moving to California and flying with a higher caliber of pilots and improving myself. Jim Lee—a long time member of the Wills team—is my hero. He took me under his wing and showed me stuff. It took a long time before I ever beat Jim.



Mark Gibson on the podium at the 1995 World Championships in Ager, Spain

At Wills Wing I never felt part of the inner core of pilots. It was like I was someone they had to have but not necessarily wanted. I didn't get along with Larry Tudor, but Jim, Chris Arai and Brad Koji were really supportive. I owe a lot of my development to those guys.

The breakaway came just after the '93 Owens World Meet. The Ramair was under development then, but we couldn't get one. We flew modified HPATs. The leading edges were bigger—62 mm—and the gliders were very tuned out with shims and so on. After that meet I got a Ramair and hated it. I flew my AT at the Lakeview Nationals following the World Meet. Then I went 10 months only flying sailplanes. I couldn't see a future in staying with Wills Wing. I wanted to try my own ideas and eventually that opportunity came when I went to Airwave (on England's Isle of Wight). They were going through some changes and I worked at first with their chief designer Brian Gourley, then on my own when he quit to race sailboats.

My interest in designing is that I know what I want out of a high performance X-C glider as well as lesser performing gliders. I found many design decisions were being based on things from the past 1980s thinking. But with new materials and concepts, some things that didn't work out before may pan out now. Also, I believe if you want it right you've got to do it yourself.

My approach is mainly cut and try. If I come up with an idea I'll chase it, even if it takes 6 months to prove it right or wrong. I'm not afraid to fail, 'cause each failure is a data point (or lots of them).

*Is that the concept that produced the Concept, Airwave's last glider?**

Yes, the Concept was supposed to be a topless glider. But we had a limited supply of carbon crossbars to build prototypes. We broke everyone of them on the test rig. So we put a kingpost on it and it was flying so well we kept it. It flew as

* At this time Airwave had closed its doors, a victim of hang gliding's shrinking European market. It has since reopened under a new ownership.

well as the topless gliders at the time, except for high speed glide. So we stopped development and ended up behind the other companies. I think now the topless gliders are performing much better.

I think the excitement of topless gliders has rejuvenated people—pilots and designers alike. People are experimenting with new airfoils and many other things. But Airwave had lost its heart and soul, so I decided to break away and design my own glider. The result is the Extreme.

That's the glider you've been competing on lately, isn't it?

Yeah. It's the first glider I designed completely by myself. In its first year Mike Barber took a 4th or 5th in several meets and it was the only one in the meet. I was 14th in the Worlds ('98) on my Extreme and won two comps with it in the U.S.

My intention with the Extreme was to take the Concept one step further. From my experience with sailplanes I knew that a higher aspect ratio with a heavier wing loading would be a winner if I could keep the twist down. That took lots of sail work. I went through a couple of prototypes, which I modified at least 20 times to control the trailing edge profile. I found the best seam line positioning. I changed the luff (leading edge) curve, the lower surface lie, the keel pocket height, the tension on the crossbar, etc.

I incorporated a few tricks to aid development. I had a very quickly removable sail. I could take it off in 10 minutes to make an adjustment to the frame, or the sail itself. I had an adjustable base tube to adjust the glider's anhedral. I had a keel pocket with two straps so I could adjust it in the air (that really changes trim speed). I had a very wide-ranging VG system to find the optimum. The best part was a Velcro attached undersurface. I would stand on the base tube and adjust it in the air!

Ideas about hang gliding equipment and flying techniques get traded on the competition scene, as is the case here in Algodonales, Spain.

The important point is the Extreme was designed in the air. Most of the changes were worked out by making variations while flying. The sail work was done to make it perfect in the air. It may not look clean on the ground, but it is immaculate in the air, which is the important point.

I've experimented with many different airfoils—those of others and my own. I've settled on a combination airfoil with a forward high point for stability. The smaller Extreme has a slightly flatter outboard section for handling and stability.

The big Extreme took eleven months to go from an idea and first prototype to certification. The little one took about a year. Unfortunately, about the time I had evervthing set we changed the crossbar. That changed

many things like the center section and the sprog support method.

One of the main things I have achieved is excellent glide performance. I think it has the best glide going for a standard glider. It's even going better now than my World Meet glider and that's without stripped wires (removed plastic from cables to reduce drag). I didn't feel outglided by any tricked out glider of Manfred's.

I think we have evolved gliders so much that we don't have to go to the Owens or other strong places to get high and go far.

You know, I think we have evolved gliders so much that we don't have to go to the Owens or other strong places to get high and go far. I have flown over 100 miles (160 km) on the Isle of Wight off a 200 foot hill. Big air can even slow you down if there's thunderstorms or weird complications on your route. Chris Arai came to England and we flew together to Southampton with a cloud base at 2,500' (760 m). We got close to the shore and hit the sea breeze. The next day with a 5,000 ft (1500 m) base we flew to the east coast for another 100 miler.

I don't really see the need to go fly the crazy stuff. At the World Meet (Australia) this year there was plenty of very strong thermals without the complications of rotors and mountains. If it had been in the Owens there would have been tumbles.

With my recent experience in glider development and work on the test rig I can see the level of safety we have. I realize the HGMA or BHPA standards are a very good target, but there are still limits. People think that bar pressure is pitch stability, but it's not—it doesn't even relate in most cases!

We must be very careful with the current crop of gliders. They are harder to keep out of clouds because they perform so well. In the same breath we have to note they have a more important redline speed as well. That's the speed you shouldn't exceed if you don't want to break your glider. You can go about 80 mph (128 km/h) with these gliders, but if you do you had better use finesse or you're going to over-stress the glider. You must be very easy on the pitch. When designing you have to factor in the lowest common denominator. Maybe the top pilots can fly gliders at the limits, but not everyone can. I'm having second thoughts about certification in competition. I think maybe it should be reinstated.

In general, though, I think hang gliding is safer because of tow parks. It's made training better and brought a country-club atmosphere to the sport. People can come with their families and hang out. They can fly in mellow but good conditions without being twanged off of launch. In that I think the U.S. is leading the way, except perhaps for Australia.

Gibbo, let's turn to your thoughts on flying techniques like thermals and X-C flying.

When it comes to thermaling, I think I'm above average, but I'm not necessarily the best. My size (over 200 lbs—91 kg) doesn't help compared to a 145 pounder (66 kg). I climb well, but can't stay with Tommy and Manfred. But I have other advantages. What I lack in climb I make up in glide skills. I'm very observant and very aware of other gliders, birds, sunlight on the ground and what has happened on previous days. When flying I'm very spatially aware. In comparison with others on the U.S. team I seem to spot things early. Good awareness of your surroundings keeps you in the air.

To me, not going down on glide is like climbing. It's like **money in the bank.**

I keep my vario set on the most sensitive setting. I want to keep track of the slightest beep when conditions are tough. That helps the psyche, for if there's the slightest beep, there's hope. Sometimes I think you can hope yourself back up.

Gibbo, you're famous for going it alone on course. How do you come by that work ethic?

I could never follow the pack. The gaggles don't always follow the best way. When I'm making a glider structure, I'll sometimes flip things over in my mind and come up with alternatives. When flying I do the same thing. I can see 100 pilots go one way, but if I see a different way I may go that way.

I'm willing to take performance risks. Many times I make choices and moves where I say "If this doesn't succeed I'm gonna be on the deck." If I do deck it, it doesn't bother me for the next day because I've already accounted for that possibility. Now meets have turned into a chess game. You go together and make slow, small moves. That's not my style. I'd rather fly alone and take chances.

In Ager (World Meet '95) I was the only guy to make goal on the second to last day. I was the first to take off. I saw a big storm coming and course was **a** huge triangle. I powered forward early and made it while all the others went down around the first or second turnpoint.

Of course, I'll stick with a gaggle sometimes. I'll go with them until I think there's "gaggle suck." As soon as people don't leave because the gaggle isn't leaving, I'm outta there. In the Australian Worlds there were many gaggles moving from brown field to brown field. I saw some mountains with clouds, which I would normally go to, but the gaggle didn't. So I left and Richard Walbec did too. When we got to the mountain we hit 1500 FPM (7.5 m/s) and took it to base. The mountain was off course, but the cloud street extended to goal. We made it, but most of those in the gaggle didn't.

That ability may be in the personality. I just don't want to follow. It's easier to go with the sure thing, and some people just want to follow, but you'll learn much less. Ask yourself: "Are you the type of guy who sits in the slow lane of a traffic jam or do you try to get around it?" I really believe that if more people would fly independently we'd all learn more and we'd get to goal faster.

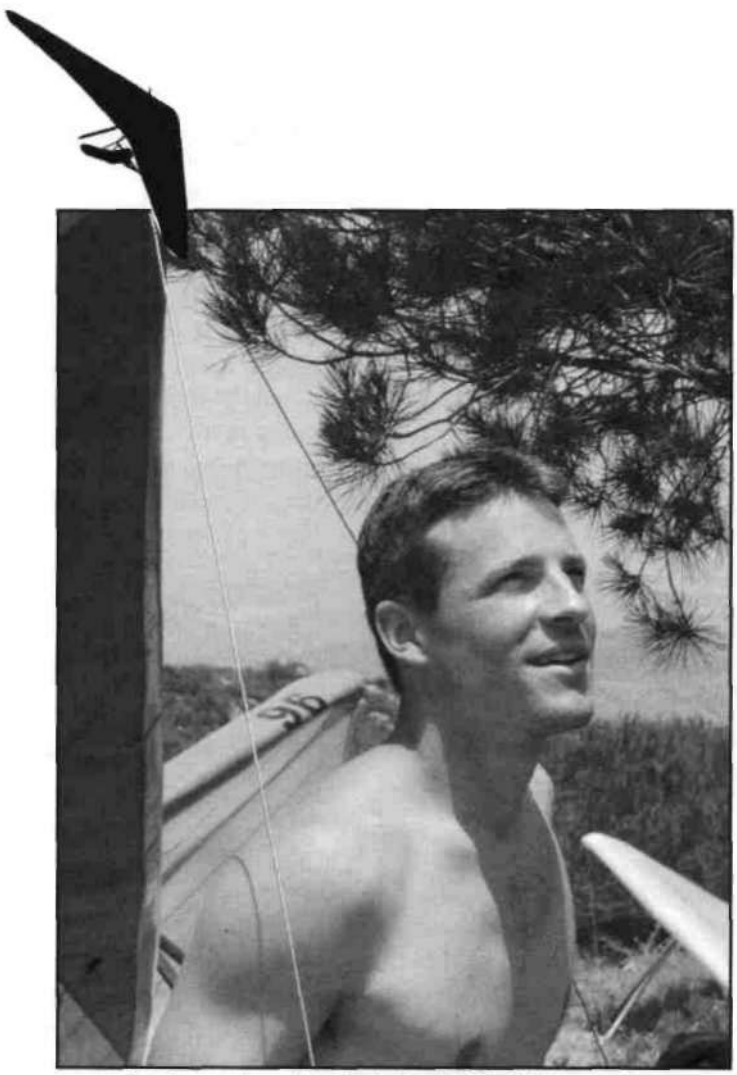
What do you foresee for the future of hang gliding, Gibbo?

I see us getting even more performance. The rigid wings have shown us the way, but the gliders need to be more convenient and easier landing. Also, they can't cost 6,000 dollars. Perhaps we'll see tails and a serious flap system for **landing.**

We're retracing the sailplane steps, but we're 50 years behind. We're making the slow progress to tow fields and flatland flying. Technology will keep going and we may get as much as 40/1 glide with new materials. But we still need to keep the flavor of simplicity, affordability and lightness. I've had almost a quarter century of hang gliding and I think the next quarter will be unlimited. I see new doors opening with totally new design concepts.

Well, Mark, I hope we see some of this new performance soon. The enthusiasm you have for the possibilities makes me impatient. Thanks for your insights ***and*** *good luck with your trike business.*

GUIDO GEHRMANN



Guido watches the sky before a World Meet round.

GEHRMANN THE AIRMAN

Perhaps no other hang gliding pilot had the meteoric success of Guido Gehrman. He began flying in 1991, got seriously involved in competition in 1995 and was crowned World Champion in Australia in January 1998 at the tender age of 23. Was this success a lucky fluke, a result of careful preparation or the bloom of natural talent? We can probably rule out luck, for Guido has continued to perform near the top of the pack and shows no sign of lagging behind. As far as the other two factors, you can judge for yourself after discovering his thoughts and actions in the following interview.

I caught up with Guido during the 1998 Pre-world meet at Monte Cucco in Italy. We had the day off, due to high winds, but the warm breezes stimulated our **talk** of flying. Two things struck me about Guido as he delivered his fat-free version of superior flying: First and foremost was his enthusiasm. I don't think I have met another pilot who conveys the pure joy of flight more than does Guido. Second was his purely intuitive approach to competitive flying. Again I have never met anyone who flies so exclusively by feel and has reaped such success. Guido's attitude and natural talent do not leave much room for analysis of flying techniques or situations. However, because or in spite of this trait he has presented me with some of the most insightful and valuable ideas I have come across in this series of interviews. To discover how Guido developed into the fine pilot he is, where he acquired his interesting approach to flying and how he excels at competition, let's begin at the beginning.

Guido, you said you started flying in 1991, but you don't look that old to me...

No, I was only 16 when I started. I found a German school near Mulhausen in France and learned in one week, then went back another week for improvement. I had been a gymnast before that since the age of eight or nine and I think that experience helped me with body coordination, positional awareness, spatial judgement and other things related to flying. When I started doing aerobatics it was like being a gymnast all over again even though I quit gymnastics when I started flying.

Why is that?

Well, hang gliding was something I could do on my own without as much involvement with coaches and structured practice. I felt more independent and certainly didn't get the support of my parents. They were like most parents and didn't want me tearing up the skies. But I immediately found great pleasure and a positive influence from flying, so I was extremely motivated to continue and excel. I think I always wanted to fly.

/ had a similar experience—when I started flying I stopped skiing for I was always trying to get the feeling of flight on skis by going fast and jumping. Now I ski again, but for a while winter flying was all I needed. Tell us how you developed your flying and when did you start competing?

I had only been flying one year—I was 17—when I entered my first competition. I had never flown cross-country before because I didn't have a car and no retrieval. So I figured I would compete and be able to get rides.

My first competition was memorable. I skipped school and rode to the meet on a motorcycle. I didn't have a cross-country license yet (in Germany, a cross-country license is theoretically required in order to fly cross-country) but I talked the organizers into letting me fly. I hurried my takeoff and had a poor run. My base-tube grazed the ground and knocked my vario off. I didn't think I could compete

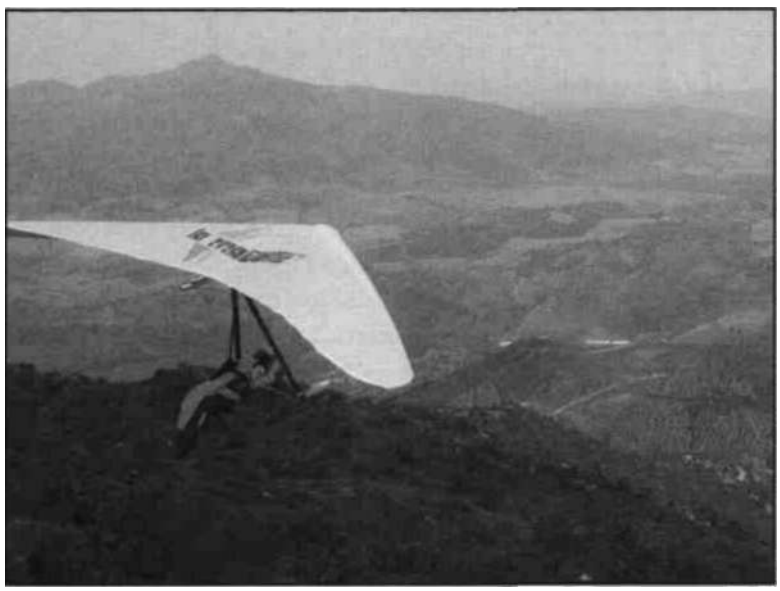
Guido Gerhmann ready to rock.

without it, I did a 180° and landed fly-on-the-wall back up the slope. The organizers said I was crazy and wouldn't let me launch again!

But after that I went to more competitions and wasn't so unlucky. I was always motivated because besides the fun I had something in the back of my head. One day on the training hill a well-known pilot, Ewald Wittenauer, who designed the Rapace hang glider and Advance paragliders said about me: He will be the future World Champion. I worked to improve with added desire after that.

Well, Ewald certainly foresaw the future. I wonder if he can recommend some good investments. What did he see in you that made him say that?

I think he saw how easily I learned and how hard I worked. Because I was younger than the others around—by 20 or more years usually—I had more energy and drive. I would be walking up the training hill and trying new things long after the older pilots were lying around with their tongues hanging out.



Guido steps into his harness just after launch.

So when did you start seeing promising competition results?

In 1995 I got into the German League with the Junior and Ladies Challenge. I was flying a Sensor 610 (European) then and started doing better. By the end of the year I was 14th in the German League. I competed in the Pre-Europeans that year and saw kingpostless gliders for the first time. It was love or I should say desire at first sight!

In the next winter, January 1996,1 got accepted as an assistant to the German Women's Team in Australia. I helped the girls in their meet and got to compete in the Australian meets myself. I didn't do so well, my highest placing was about 20th in the Bogong Cup, but I learned many valuable lessons and had some great experiences, which motivated me to compete even more.

/ can remember meeting you for the first time at the Women's World Meet in Australia, Guido. All the women pilots wanted to meet you (he laughs). The next time I met you was at Gerard Thevenot's house in Dijon, France. It was then that you became a La Mouette pilot. Tell us about that.

In 1996 I had a Moyes Xtralight and I wanted to take off the kingpost and put in a graphite crossbar. I asked the original kingpostless glider designer, Christof Kratzner, about it and he said to go to Gerard *[Ed Note: Christof designed the general topless setup for Gerard Thevenot, Owner of La Mouette, the company with the first production kingpostless glider].*

So I went to Gerard's in March 1996 and after some discussion he offered me a deal to fly for his company, La Mouette. I have been flying a Topless ever since and have had great success.

That spring I competed in Bassano and took second behind Manfred Ruhmer.

In the autumn I was third behind Manfred and Tommy Suchanek in the Europeans. The following winter (1997) I won the Brazil Rally, took 4th in the Australian Pre-Worlds, 2nd in the Bogong Cup and won the German and Italian nationals. That was my best year. So far this year I have won the tow meet at Hay, Australia and the World Meet at Forbes (Australia).

I'd like to explore the reasons for your sudden phenomenal success, Guido, but before we do, let me diverge into a matter that has piqued my curiosity for some ***time. I*** *was at Gerard's doing the flying to write up the Topless at the time that you mentioned before—March 1996. I saw your first flights on the Topless, but I also saw you do your first loop. I didn 't have the occasion to ask you then, but now I want to know: what gave you the confidence, desire and ability to start looping the Topless?*

Well, first I knew the glider is very strong because Gerard told me about the tests and I had seen the photos of people hanging off the ends of the crossbars without them breaking. Also I knew I could loop and be very comfortable at all stages 'cause after all I had done hundreds of loops, flips, twists and other things in gymnastics from different heights on different types of gear. Gymnastics prepares you very well for aerobatics because it teaches you a body sense that keeps you oriented.

The desire came from the beginning when I wanted always to be free in the air to act like a bird. Aerobatics is my way of feeling liberated from the ground, because it is only the earth that says what is down and what is up. If I can do aerobatics, I have cut one more chain of gravity. Of course, we can't totally be free, but we can try. And looping or performing aerobatics without the right training or equipment is dangerous. When I first flew the Topless I knew it had the speed retention to loop easily if I controlled it right.

/ heard about your half loop experience at the Ilinx aerobatic competition. What happened?

Ilinx was great because there were all these pilots serious about aerobatics. They weren't trying to slow me down; they were encouraging me. But during the meet I lost concentration and entered a loop too slowly. I stalled upside down, but hung on as if it were a gymnastic high bar. The Topless proved its strength because it flew very nicely upside down! After a bit I moved to the side and the glider rolled upright. That was exciting, but I won't do it again intentionally.

Did *you think about throwing your chute?*

Not immediately because I was busy holding on and checking the wing. Everything looked all right and I had plenty of height, so I decided to turn it over. I want to make it clear that I'm not trying to be crazy or brave but I have a lot of practice at unusual positions so I think that helped me. I don't think people should do aerobatics if they don't have the necessary experience. There is plenty of joy to be found in flying just from the pure act of leaving the earth for a while and wandering through the heavens.

You told me how you suddenly shot to the top when you started competing on the Topless, but you didn't provide details. I assume that not everyone who jumps on a Topless (or topless glider in general) is suddenly going to find themselves in the winners' circle. How did you do it?

There were three main parts of my development. The first was when I went to meets I would follow good pilots around in the air. These were my beginning tactics. At big meets I would try to follow Tommy (Suchanek) and Manfred (Ruhmer). I found it was the best way to learn, even if I could only stay with them for a few thermals. I would recommend that practice for new competition pilots. But don't follow me!

The second part of my development came when Gerard took me under his wing. He has his own style. Often he goes his own way and doesn't follow or join a gaggle of gliders. His way is unique but many times better. He taught me to lose my fear of getting low or launching in weak conditions or whatever. He always has a calm appearance and supreme confidence. In Bassano and Spain I followed him like a small pilot fish and when we got low he would say: "What? You call this low? There's a hill, there's a field, there are many possibilities. From Gerard I learned confidence, a positive attitude and never to give up. Before flying with him I would think "Oh no, it's landing time!" Now I realize that it's rarely over as soon as most pilots think. I stay calm and stay aware even during the landing process if it happens.

From Gerard I learned confidence, a positive attitude and never to give up. Before flying with him I would think "Oh no, it's landing time!" Now I realize that it's rarely over as soon as most pilots think.

Gerard also taught me to lose my awe of the top pilots. They are human too and make stupid decisions sometimes. This helped build my confidence and I became aware that I could beat them.

I heard rumors that Gerard and you don't fly well together because of completely different styles. Can you elaborate?

Ha Ha. Yes, that's true. Gerard isn't totally cold and calculating, but I fly totally by intuition. That is the third thing I developed or really, I had it all along but refined the process. When I followed Gerard the other day (at the Monte Cucco Pre-Worlds) it was very windy and I wasn't having fun. I wasn't playing my game by following Gerard and eventually I went down short of goal. I found out later that Gerard was lost!

My greatest breakthrough came when I decided to quit following and fly more on my own. This developed in 1997.1 set a goal. My aim in every competition was to fly by myself, avoid the gaggles, make my own decisions and quit following. I resolved not to take too many risks, but said to myself constantly, "It's OK, it will work out, it's always working better than you think." (That's the positive reinforcement I learned from Gerard).

Then I learned some surprising things. If you go in front making decisions, your have power. It builds confidence and you learn much faster. If you follow you aren't learning anything except perhaps tactics. With a group or another pilot you are always playing tactics and are not concentrating on the right things. When you are alone, you are focused on the sky, the birds, the lift signs, the feel of your glider, subtle sensory input and so forth. My best advice for pilots to move beyond the initial stage where they learn by following is to not get caught in the gaggle habit but to learn to do it alone. Make your own decisions and stick to them, even if you go down. You will improve much faster.

Actually, once you prove your ability to go alone and achieve success you will have a power that attracts other pilots. You can always lead and go where you

want as if you were on your own, but if things get tough and you get low, there will be lots of thermal markers around to help. If you're not a leader, you won't have your followers to help.

Guido, from your statements it seems to me that you have developed a tremendously positive attitude and a load of confidence. Can you give us more insights into the thought process that helped you develop this attitude?

The main point is to learn courage. By that I mean to put away your fears—not of doing dangerous things, but of failing to reach goal (or your goals).

Yes. The main point is to learn courage. By that I mean to put away your fears—not of doing dangerous things, but of failing to reach goal (or your goals). The only time I lose my very positive attitude in fact is if I think the flying is risky and I'm not having fun. Usually everybody's courage doesn't go as far as it can go. It is important to switch off the fear of gliding low as does Tommy or Manfred. You must always think that you have enough altitude to find a good thermal.

Even if you go down you should retain confidence by saying next time the decision will work. Don't dwell on your failures, for every day is different and different things may result from the same decisions. Think about the successes to maintain a positive open mind, which is the best way to learn from experience. Intuition is your best friend when flying. I have tried to learn from my mistakes, but I found that each day is so different that I could only generalize. Was I really learning to avoid mistakes or was I reinforcing the thought that I am prone to make mistakes? An example of a mistake I made was yesterday when I went down following Gerard. I already knew in general that I shouldn't follow others. I will not over-analyze that flight, that's past and I'll learn more form my success tomorrow.

In summary I'll say that you can learn general principles, but if you try to analyze specifics it won't do you much good since the next time will be different. You may make yourself reluctant to make any decision of your own. You can only learn general fundamentals from a series of flights so don't focus in detail on one flight.

772a/ is some really good confidence-building advice. Can you break down the whole competition experience into a formula for success?

You are asking for magic, but I think things are simpler than most people make them. I list five important matters for competition:

1 - You have to have the best glider. You can do well without the best, but it is much harder. I fly a stock glider (except for a faired basetube and thinner uprights), but I think it's the best. That's the important point. If you work on your equipment so you think it's the best possible then it is the best for your mental ability. We all recognize that competition is 90% mental.

2 - You have to have experience. Nothing teaches you to compete well like competing. Follow the guides I have given before and you should develop as fast as possible. Remember to keep a positive attitude so you will continue learning.

3 - Thermal well. This matter may seem obvious, but most of our time is spent climbing and it is important not to just climb with everyone else at the hill but to develop top climbing skills. You can work on this at local flying, not just in competitions although competitions help you measure your progress.

4 - Be willing to get low. This is the matter of losing your fear. The top pilots

are racing all the time. They are flying between 65 to 70 kra/h (40 to 42 mph) and often leave lift before it quits. The main thing they do is pass up lift that's weaker than expected. The result is they go on long glides, they only work the best thermals and they reach goal first.

5 - Learn to love all aspects of flying. Perhaps you may not like takeoffs or landings or flying with other gliders near launch. It is important to develop your skills and attitudes until these factors don't matter. It is really important to play around and feel the air. Enjoy it! As a gymnast I like the body dynamics of moving in three dimensions—that's why I like aerobatics. I also like takeoffs and landings because I can sense the motion near the ground. I love so much the instant of separation from mother earth and the reestablishment of contact again. For me there is no greater joy than to touch my feet in a goal field!

With such an attitude, I can see how you would rarely have a fear before, during or at the end of a competition flight. Can you tell us how you psyche up for a day?

Actually, I don't need to psyche up for I have a trick where I just think each day is a continuation of the previous flight when I already felt comfortable. It helps to do that if you are flying six or seven days in a row, of course. But this is what I do and it works.

By always being relaxed I can reach my peak performance on a flight immediately. I can be sensitive to conditions, I can analyze the weather and decide best how to fly, I can concentrate on the important things sooner. I don't have to get used to other pilots or being in the air because I'm just continuing that from the previous day, but now I have a full charge of strength and reserve energy!

Of course, being in the air a lot helps. It becomes a natural thing for you; it becomes a day-to-day experience. I would say getting as much airtime as possible is the best way to prepare yourself mentally for competition, but I would advise taking it easy a day or two before a meet.

Guido, earlier in our discussion you mentioned intuition a couple times. Let's explore this matter. What is intuition relating to flying and do you use it?

Let me begin by telling you about my father. He is a psychoanalyst from the old school. A logical, analytical German. He taught me many things such as flying helicopters, but I rebelled against his way of thinking and I developed an intuitive style. A holistic approach. I am an experientialist—I'll try something before reading the manual. It drives my father nuts, but I learn a lot more that way.

When it comes to flying I am totally intuitive. I believe in experiencing, not analyzing. I don't read anything about flying or weather, I simply observe. For me hang gliding is simple enough: I just point my glider where I want to go to reach the lift I feel should be there and it all works out. Of course, it's not that simple for my subconscious mind is guiding me, but by flying lots of comps I developed this approach. I didn't do what some pilots do by setting goals to achieve. I learned by experiencing flight in competition and letting it flow. I avoid analyzing too much of anything. As I said before, analyzing won't do you a lot of good for things will be different next time anyway.

Do you think this type of holistic or Gestalt thinking is good for all pilots?

Well, I'm speaking mostly of competition, of course, but even for recreational pilots just trying to have fun it can work. They can stay up or get up just as well

and be immersed in the total sensory experience without carrying on a distracting dialog in their head. The result is heightened enjoyment.

For competition pilots I think it is very important to avoid talking on the radio or talking to yourself as much as possible. Language almost by definition is a linear, logical experience and if you are thinking to yourself by carrying out a conversation with yourself—an internal dialog—you will be preventing your intuitive mind from working.

Language almost by definition is a linear, logical experience and if you are thinking to yourself by carrying out a conversation with yourself—an internal dialog—you will be preventing your intuitive mind from working.

Think about this: when you are flying there are so many inputs—visual and audio as well as smells, temperature changes and feelings in your arms and body—that you cannot possibly process them and react on them all in a logical fashion. You have to let your intuitive mind take over, for that's what it's designed to do or you will miss a good bit of information. If you are thinking logically you may absorb the same information subconsciously from your senses, but you will block its use.

I think to go to the next step in flying a pilot has to learn to think holistically, intuitively, naturally.

That sounds logical to me! All right Guido, can you tell us how your approach relates to specifics, for example, thermaling?

Yes. When it comes to thermals I am aware of all the normal signs like clouds, birds, fields, hills, other gliders, etc., but I let my subconscious mind sort out these many factors to decide where I should go. It is not mindless decision making, but decision making on a level that is not in the forebrain to be analyzed. If you are listing the many factors in your mind and weighing them, chances are you are too preoccupied to pick up some of the subtle clues that may be more important than the obvious ones you are thinking about. For instance feeling the airflow between thermals is most important as you get closer to them. Can you do that if you are thinking to yourself?

Guido in his natural element.

I really like flying in weak conditions. Many pilots are negative when conditions aren't so good, but I like it because that's when I switch off all conscious thoughts and use only my senses.

What are your general thermal techniques?

I tend to thermal quite steeply, especially when I'm low at first because I don't want to lose the thermal. Even with a weak thermal, I'll still bang into a steep bank when I hit lift, establish myself in the thermal, then ease the bank back down to the most efficient level. If you hunt around when you hit a weak or small core you may lose it.

When I'm gliding with the VG full-tight, I pop it off at the same time I'm banking. I want sensitivity of control and feeling in the thermal from the beginning. I am always changing and working the thermal... always. You win a bit by

working a lot—that's the nature of the game. A glider itself doesn't necessarily stay in the heart (core) of the thermal. You have to coax it in and train it to stay there by constantly making adjustments.

I am always changing and working the thermal... always. You win a bit by working a lot-that's the nature of the game.

The only time I am not working is when the thermals are big and soft. Up high I try to find the heart of the thermal a bit before I bank too steeply. With sensitivity you can go right to it. Still I am not necessarily satisfied and will feel around a bit while I am 360 turning to see if I can improve my climb. I make adjustments all the time by opening my circle on the strong side and tightening it on the weak side. When I'm flying in lots of wind, I open my circle a bit on the upwind part to compensate for drift. These are general principles and again this is all a matter of feeling. However, after hundreds of thermals, you can see a trend in what you do automatically and that's what I'm describing.

Part of racing is climbing as fast as possible, so efficient thermaling is essential. Of course, in competition you are often caught in conditions where you have to slow down. Recognizing this situation is part of the general awareness that you can develop, especially if you are using your senses effectively. It's not always possible for me to say why I slow down, for the signs aren't always obvious. But large shadows ahead or many pilots hitting the deck are usually clear signs. When I do slow down it's because of something I sense when I'm going with the flow. Slow conditions are weak conditions so I'll be flying totally intuitively then.

Now let's change the subject a bit and talk about winning the World Meet. How did it feel?

Great, I was really happy!

How did you do it and when did you think it was possible?

Of course, it wasn't easy. One day my VG didn't work and I was launched too late to land and refly. I had to hold the chord in my hand the whole flight! It hurt my relaxed mood and I came in 60th that day. But I think when you fly totally on feeling as I do, you have an advantage because logic always breaks down at some point. Sometime, you don't have any conscious information on which to base a decision. So you may get confused or worse, lose confidence.

I experienced a little confidence question in the World Meet. I found myself 300 points ahead partway through the meet. I got nervous (the famous first-place jitters) and had to control it by focusing on the task. I am young and not as experienced as others are, but gymnastics competition helped me there. Eventually I won so it came out OK.

Do you intend to keep competing?

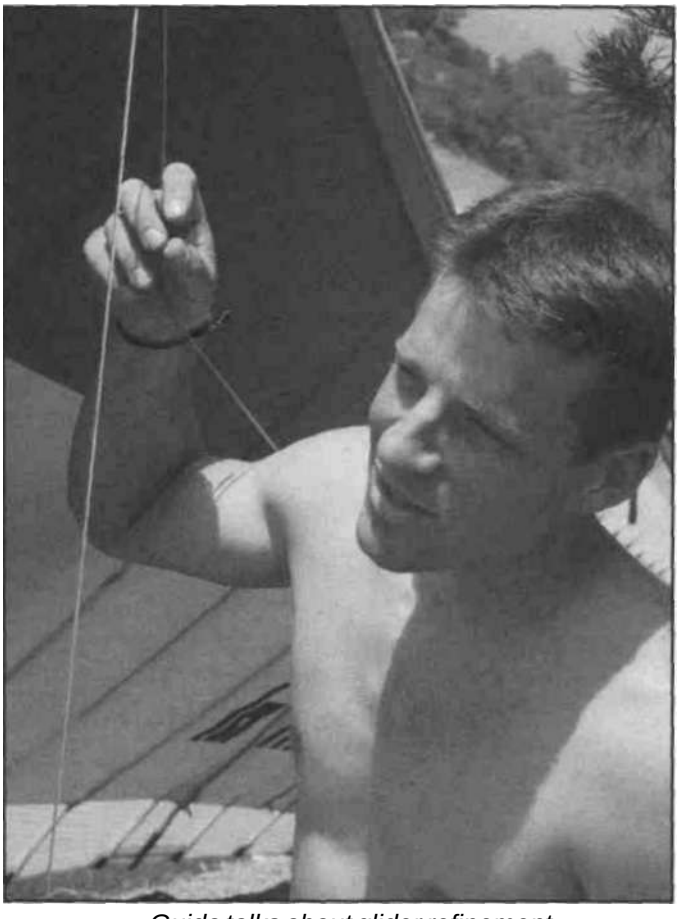
Yes, for sure. I may have to quit sometime to establish a career, but then I'll be back. I'll tell you what I like about competition: Normally in hang gliding you are always alone in the air, but in competition you may be flying with team members and are often in gaggles with other pilots all trying the same thing. There's a magic in that. Hang Gliding people are special to me. Most are really simple but intelligent and everybody's even in the air. I feel connected to them and it's a nice feeling. Even though I'm competing against them, I feel more like we are friends than opponents. We are all playing a game with the conditions, and whoever plays

the best wins. We don't try to beat each other so much as try to beat the sky and clock.

The only sad part about the whole thing is that there are not many women to round out the social aspect. It is too bad that women and young people are missing from the community.

That's a powerful statement from one of hang gliding youngest and most eligible bachelors, Guido. Can you repeat some of the observations you had about other top pilots?

Sure. Manfred (Ruhmer) is better at flying alone and he relies on his own resources. When he goes on his killer glides and gets low he doesn't go to other gliders. He is totally flying his own flight and I admire him for that. What courage! He has supreme self-confidence. He always has the best glider and outglides me, but I can climb with him. Manfred gets pissed in the air—once he nearly broke his base bar. I never get angry and that helps me. Manfred is perhaps better at flying alone than I am... I still get surprised sometimes at how well he does. Tommy (Suchanek, triple World Champion) has a lot of drawers to pull out information. He uses his experience to the utmost. He knows the most and in my estimation he is the best.



Guido talks about glider refinement.

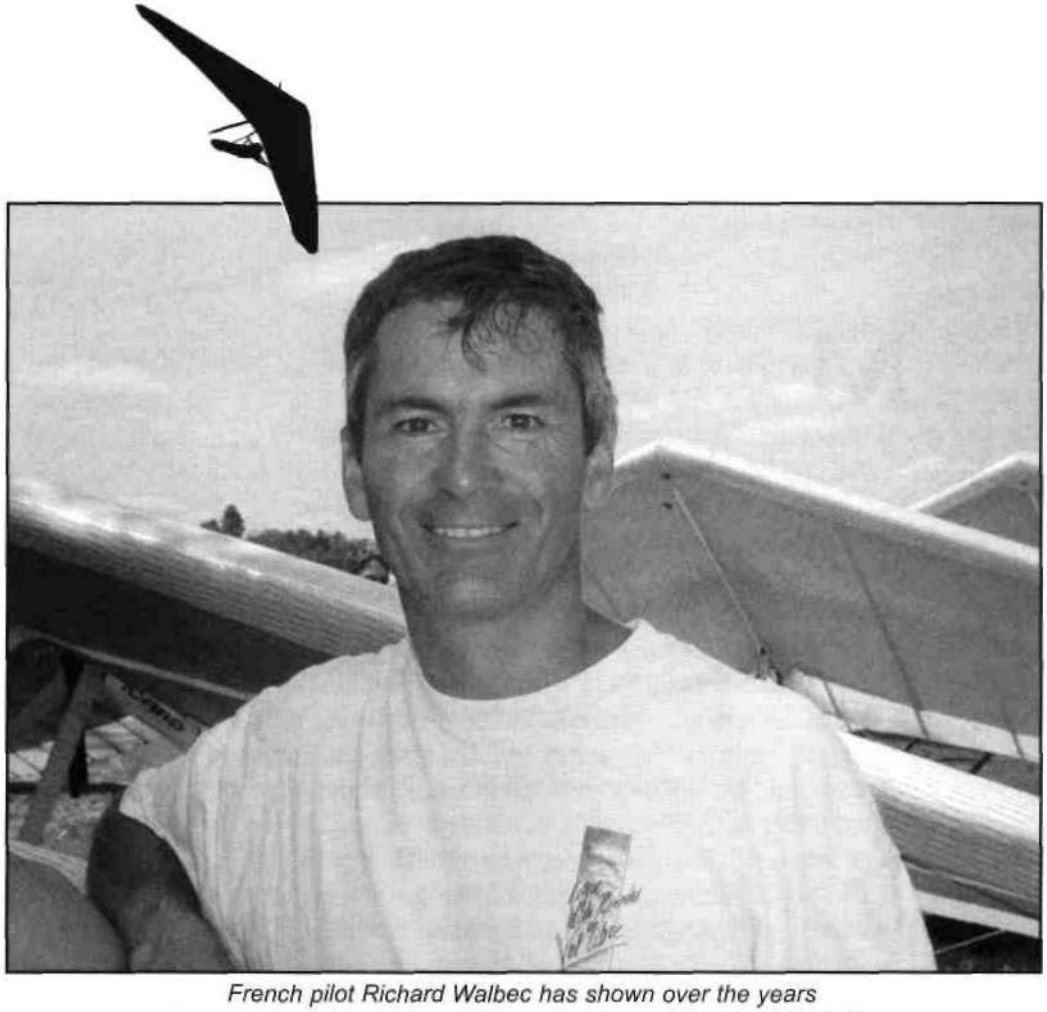
Gerolf (Heinrich, the 1998 Pre-World winner) gets nervous and that gives me the advantage around him. Gerolf lets bad flights or experiences affect him long after they are past.

Oleg (Bondarchuk, constantly near the top) is hungrier than any of us because it's his only way to make money. With most of these guys, it's their job so they put a lot of effort into being good and practicing. That's beneficial. For Gerard (Thevenot, La Mouette Guru), it's his job too, but he has already made enough money so he can relax! But he still flies great.

For me I just fly for fun. I like feeling like a bird and playing in three dimensions. That's my reward.

Thank you Guido. I can't imagine anyone having more fun in the air than you. Your attitude around flying is infectious. I wish you luck and good winds.

RICHARD WALBEC



French pilot Richard Walbec has shown over the years how precise techniques and strategies translate into great results.

WALTZING WITH WALBEC

My talk with long-time top French team pilot Richard Walbec took place in Italy at the 1998 World Meet. Since that time a few changes have occurred relating to equipment and the French team, so these matters have been updated.

It's always a pleasure talking to Richard for he usually has a smile and an upbeat attitude. At this point he was working back from a serious setback. He had a tumble on his hang glider while flying in Australia. We'll let him tell you about it below.

Richard lives in Millau, France where he teaches hang gliding and organizes the French Open. He has been flying hang gliders since 1980 and has been on the French team since 1988 when he competed in the Australian World Meet. He has been the French champion multiple times and took a third in the World Meet in Ager, Spain as well as 5th and 6th places in European Championships. In 1990 Richard flew 300 km (188 mi) in a hang glider, then in 1994 set the French record of 396 km (248 mi) along with Jean Souviron. He also flies sailplanes and has many hours in a paraglider with a 206 km (129 mi) flight in Australia.

Richard has a job to kill for. He is in the French army and employed to do one thing: go hang gliding. As long as he produces reasonably good results the army supports him fully as part of their sport program. He doesn't even have to wear a uniform.

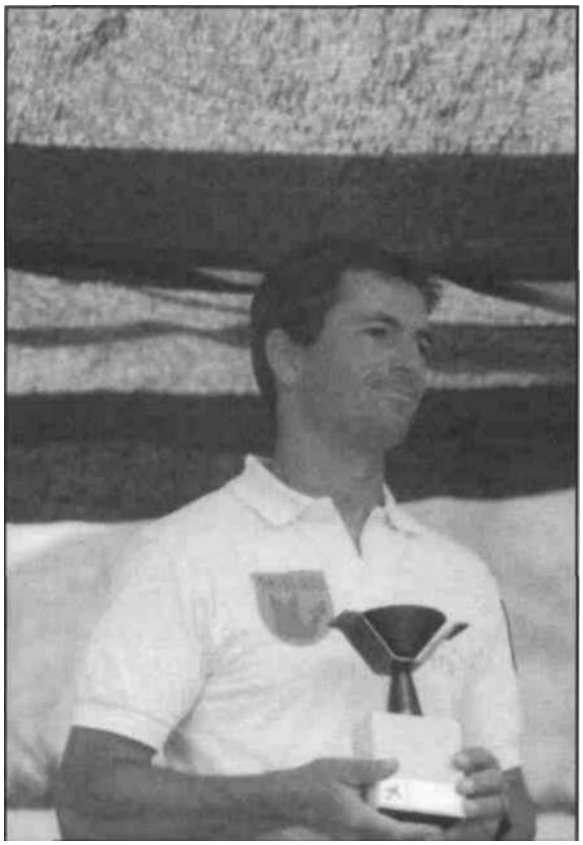
Richard, how long have you been paid to go flying?

Since 1987. I began producing good results at that time and they approached

me with the offer. I was stationed in Briequet near the Atlantic coast and developed my skills on the low hills.

Let's get one thing off your chest—the tumble. Everyone I know who has tumbled has taken a few years to regain confidence. What happened and what are the effects?

I was on a Tecma prototype with no outboard struts. The sprogs were low because I lowered them. I was on glide at 55 km/h (43 mph) according to a recording instrument I had on board. The VG was on full tight as I entered some mild turbulence. The nose went down a bit, then the bar pressure got light and suddenly it went over fast. I hit the keel and was tossed outside the control bar. My harness pitch rope broke and I was left dangling head down. The leading edge broke and then the crossbar went. I was spinning very fast and hard. I could barely reach the BRS rocket handle on my chest.



Walbec on the podium in Ager, Spain.

I deployed the rocket but the parachute tore at some point. Maybe it tore on the Velcro or the wreckage. My rocket was mounted at my calf and it shot to the inside of the turn and got caught on the leading edge. Basically it was useless as I was falling in a spin with an 8 m/s (1600 FPM) descent 800 m (2,600 ft) above the ground. I plummeted into some trees and woke up with a New Zealand doctor attending me. I was really sore, but basically uninjured and happy.

I no longer fly with a rocket deployed 'chute. I use a hand-deploy Metamorphosis side-mounted with a handle on the chest. I think it's very important to be able to reach your handle easily. It's so important to throw your parachute ASAP when needed so you don't get too tangled or disoriented.

I also changed gliders. I now fly a Wills Wing Talon. They have a good pitch stability and give me a secure feeling. I no longer want to be a pioneer or test pilot. I advise any pilot wanting to make a modification to their glider to talk to others so you can share their experiences, ideas and feedback. Today's gliders are certainly safer than the early topless gliders, but you can still alter them so they are unsafe.

How are you dealing with the psychological fallout of your tumble?

Well, I wasn't very brave or bold before. Now I have a hard time coming back. It's difficult for me to keep my VG full-tight when it gets turbulent. But now my results are getting better again because I'm focusing more on success than my worries in the air. For a while I wondered if I should continue to compete, but it's part of my work, so I remotivated myself. What's important for me is to be comfortable in the air and have fun.

What's important for me is to be comfortable in the air and have fun.

Right now my goal is to get back the level of confidence I had previously. Now I make choices that are more safely oriented than for flying efficiency. For a couple of years I had great results (I was always in the top 5).

I know when I get back to my original confidence level my results will return. *[Ed. Note: In the 4 years since the original interview, Richard has indeed regained his confidence and continues to be a threat at the highest level]*

Why do you compete, Richard?

Well, first I need to do something challenging. I've done caving, rock-climbing and so forth. Through hang gliding I found I can improve myself and know myself better. You can't lie to yourself in this sport or you won't progress. In times of stress vnn learn most about yourself. It's how you develop. Traveling does this too, but hang gliding is best for getting you out of the comfort zone and bringing personal growth. I could do something else, but there's great pleasure in flight: setting goals and attaining them and mastering the technique.

Hang gliding is best for getting you out of the comfort zone and bringing personal growth.

/ know you do a lot ***of teaching at many levels, Richard. How do you*** *prepare a pilot for competition?*

I start by having them organize their behavior. I want them to look at long-term strategy such as how do you organize your competition career to achieve the best results. This includes time, money, equipment, where to go, etc. These things are important, assuming we don't have unlimited time and money. I suggest a gradual approach of first entering local meets then moving on up to higher powered meets. The point is to maximize the fun and avoid too much disappointment and overload. The emphasis is on positive attitude of learning, rather than winning at first.

I like to break the learning process down into stages and set goals at each stage. For example, maybe the first stage is to get a good start with the early pilots. The second stage is to make one goal, perhaps. In order to complete each stage it's necessary to make a plan for success. This plan may be different for each pilot. A very conservative or timid pilot may have a different plan than an aggressive one. The first may need to work on getting in the air earlier while the second may need to work on slowing down.

The other factor we work on is the tactics. This is the short-term plan such as how high to thermal or whether or not to go back to a climb—things like that. Discussions of this sort help to establish a plan to deal with many different situations. Again, the tactics may vary for different pilots' flying styles.

The other members of the French team often come to me for guidance and information because of my results. These are some of the matters I talk about. I also point out that hang gliding competition is 80% psychology and 20% technique. I wrote some papers years ago on hang gliding technique. I reread them and realized that the technique is simple. The important part to develop is the psychological aspect.

Hang gilding competition is a game. We must make it fun and be able to accept the negative as well as the positive.

I've been to talks by a professional discussing sport psychology matters. He said that we must keep in focus that hang gliding competition is a game. We must make it fun and be able to accept the negative as well as the positive. I feel the French team lost this sense of fun at one point. Being able to accept the bad days and go on is part of the confident attitude.

To become a confident pilot you must first have perfect technique and elimi-

nate every single factor that could come from bad technique such as poor landings, running from gaggles or launching late. Work on four things: (1) Practice techniques, (2) learn your limits, (3) eliminate extraneous inputs and (4) know yourself (don't lie).

Break your techniques down into simple decision blocks such as: climb in thermal, decide when to leave and decide the direction to go. Avoid getting overwhelmed by trying to figure it all out at once.

Practice by setting a task and goals on every flight. You have to examine yourself to determine where you are lacking and practice these aspects. Design some tasks to do this. For example, if you are often coming out too high or a bit short at goal, choose a goal point and practice reaching it using your instruments. It's good to use a goal on top of the mountain if possible so you can do multiple tries.

Work on getting low and getting back up. Do this multiple times on a flight and try to get lower each time. One of the ways the French team works on this is through towing. That way if we land we can quickly go back up. If you get stressed when you get low, work on landings. Practice relaxing, finding a good reachable landing field, then store the information away and focus on getting up. If you focus on landing you will land.

I give seminars on landing because that's the most visible to the public. Hang gliding is in a crisis in Europe and bad landings don't help the public image. When I see a bad landing I know it's not organized and it reflects that the flight is not organized. So by being aware of organization in the landing phase, you learn to be more organized throughout the flight.

Walbec emphasizes cooperation and communication within the French hang gliding team.

Organization is having a planned sequence of events. Anticipation is important. To have a good flight you must anticipate. A good plan, which you can modify for the unexpected, helps you anticipate. Always be flexible enough to take opportunities you didn't expect like widespread lift in a convergence zone. This programming must be a tool, not an obstacle. As long as I can remember not to make stupid decisions I'm happy.

"Knowledge dispels fear" is a great quote. You have to know yourself, know the conditions and know your equipment. To keep flying safely you have to set limits, which are commensurate with your skills. Keep a detached, cool attitude so you can make good decisions. Each accident or incident makes you lose confidence. You will never fly your best if you are fearful.

You mentioned eliminating extraneous inputs, Richard. Can you illuminate that for us?

Sure. I like to teach others in the air because it causes me to think and I learn new things. However, sometimes pilots ask a question that takes a lot of attention or is silly (sometimes when pilots are in a somewhat stressful situation they regress, which is why they ask the question). I know from these experiences that when

you have to talk it stops intuitive thinking.

In general, I try to stop intuitive thinking because I think it involves things I can't control, so I try to eliminate them in my mind. I'm more of a logical type pilot.

I like to think you progress by building your skills in steps. I most admire Tomas (Suchanek) who built skills by analysis and applying tactics rather than Manfred who was a natural and flies intuitively (birds fly better than us, but we don't put them in the winners' podium)! For me flying is more than a sport—it's a philosophy and a mental state. I could compete in other sports, but this is the one that puts your personality most in evidence. It builds self-reliability.

Gerolf Heinrichs said you were a good pilot on a tricky day. Can you tell us some of your tricks?

I'm not so fast on racing days, but I am consistent. I am able to avoid making mistakes for a long time. I have good thermaling technique and good decision making. But I want to become faster. I admire Manfred—it's hard to beat him—for his aggressive game style and his ability to fly on feel. That's his advantage.

Anyway, I think part of being a good thermal pilot is to be able to be sensitive to physical sensations like acceleration and glider reactions. It's also how you automatically respond to these inputs. Your body will react in a proper manner once it's trained. Thermal skills are very hard to teach and explain. They may be innate. For examnle. I once went bowling with Manfred. He didn't have good skills but he had great scores. With thermaling he is naturally good.

One important thing is to be able to judge 3-dimensional trajectories so you can use other pilots in a gaggle.

One important thing is to be able to judge 3-dimensional trajectories so you can use other pilots in a gaggle. If they go up in a spot you should be able to know when you'll be at that point in your circle so you are ready to slow down or tighten your turn. You have to be open-minded and observant, but also ready to analyze the situation. For example, there should be no glider that turns in the area you can reach that you don't see. At the same time you must be able to tell if they are really climbing and if so, how well. I do this both consciously and logically. Sometimes I'm thinking about the next thermal and sometimes I'm thinking about the present one. In order to be free to think totally of the next one, you must be above the others. In a crowd you have to think about the present, not the future.

In a gaggle you must be vigilant and careful. It's the part I like least about competing, even though I'm comfortable in gaggles. I don't like it because I'm in hang gliding to improve myself, not to beat others. In a gaggle you have to confront others all the time and be aggressive. Every pilot must assess the risk he's willing to take in gaggles. I think cooperating is safer and more satisfying for everyone.

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Tell us about your thermal sniffing methods on tricky days.

My technique on hard days is the same I use when I get low and options are fewer. First off, I am sensitive to the *drift of my glider*. If I am going crosswind, for example, I'll be sensitive to a change in my drift. If the thermal is upwind, I'll drift less. If it's downwind I'll drift more (see figure 1). When I'm not sure of a

thermal location I like to have a logical procedure planned out like this drift trick.

If I'm fairly low I'll go to obvious triggers, but if I'm really low there's not as many options and obvious triggers may be out of phase, so instead I track downwind. As I'll fly along I try to sense the drift and go towards where the thermal is pulling. By traveling downwind I cover more ground plus I know any side drift is caused by a thermal. I feel this is a more versatile and better method than going to trigger points down low. That's a closed option; you go to it and it's not there, you're history. This is especially true on the flats.

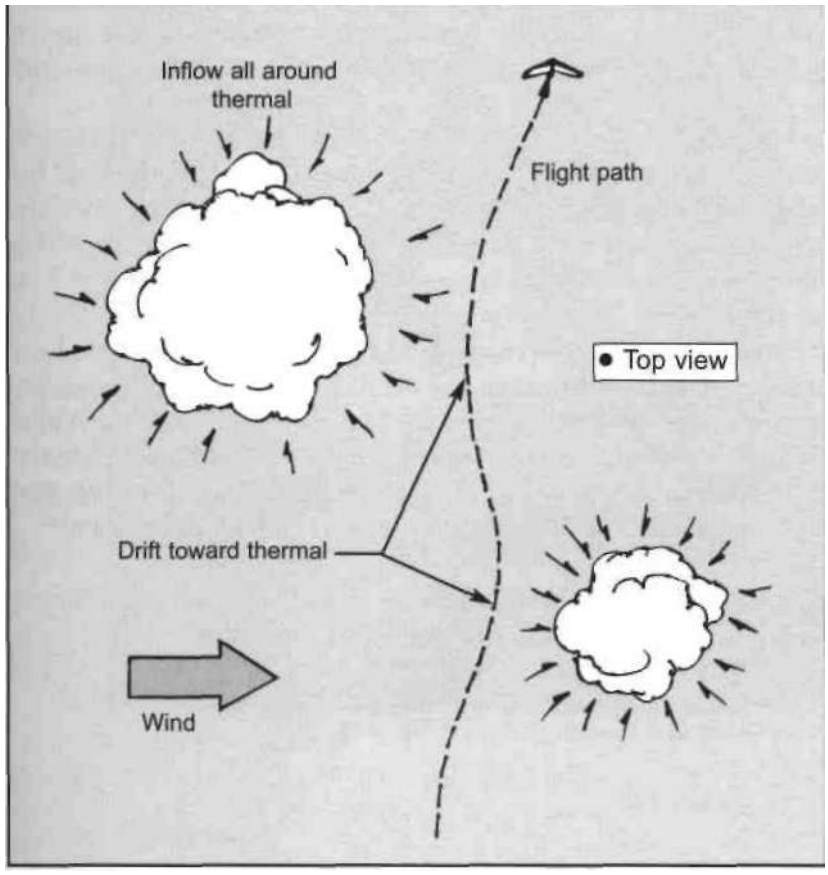
In mountains it's a bit different. The flat areas are simpler 'cause you can put regular methods into practice. But mountains disrupt the flow and complicate matters. You must read the terrain more. Anyway, the drift method is a fallback plan if there's no other information like another pilot, bird or cloud to indicate lift. I use clouds frequently. Even when I'm low I position myself according to clouds. I rarely look at the ground. I'm not sure that's 100% right, but it seems to work for me.

How do you detect that drift exactly? Is it important to know your glider's behavior?

First you must always be vigilant. There should be two things you attune to: feel the acceleration due to changes in velocity and watch your movement with respect to the ground. Always try to sense a lateral movement. It must always be compared to the ground, even if you are high and even if it's in a subconscious sense. This is not as hard as it seems, for no matter what height you are, you are following an imaginary ground track. When ground objects move a little sideways you can detect this if you are aware.

On the other hand, you must be aware of the possibility of wind shifts at different altitudes. For example, on yesterday's flight the low drift was northeast, but it was west-northwest up higher. If you are descending and the wind direction changes, don't mistake this for the sideways drift effect of a thermal.

Figurel - Alteration of Glider Path by Thermal



To answer the second question, it is very important to know and tune your glider very well. It should be easy handling so you have a sensitive grip. If must be perfectly symmetrical or you cannot really feel the air. It's always important to feel the thermal and how it is both when you are approaching it and when you are inside it trying to maximize your climb.

What do you do on glide?

The MacCready philosophy (speed-to-fly techniques) is an offense type approach. It urges

you to push on. But that's not compatible with flying by feel. For example, when **you** are flying against a head wind the MacCready principle says fly faster. But most top pilots are flying slower than the ideal MacCready speed to feel lift lines or patches to help maintain altitude. Only when there's sure reachable lift up ahead do we use MacCready speeds. Ask yourself the question" "Am I in danger of landing?" If no, fly fast; if yes, slow down. My theory is because of the tilt of thermals you should slow down in a head wind below MacCready speeds.

Speed-to-fly concepts operate in a homogeneous environment. That means there's no change over your course line. But in the real world there are many variances. For example, thermals may not move with the wind due to inertia, lift is often organized in lines, etc. You have to be flexible and apply experience to the many situations you are likely to encounter. That's part of what makes a good pilot. There's no substitute for practice and of course, it's fun!

A good instrument helps you make your judgements. I've found the Brauniger with the speed-to-fly function to be a great tool. It helped me and a lot of pilots avoid going too slowly a few years back.

Let's finish up with the subject of team flying. The French team is famous for flying close together (and doing well) like a squadron of flying jets. What secrets can you tell us?

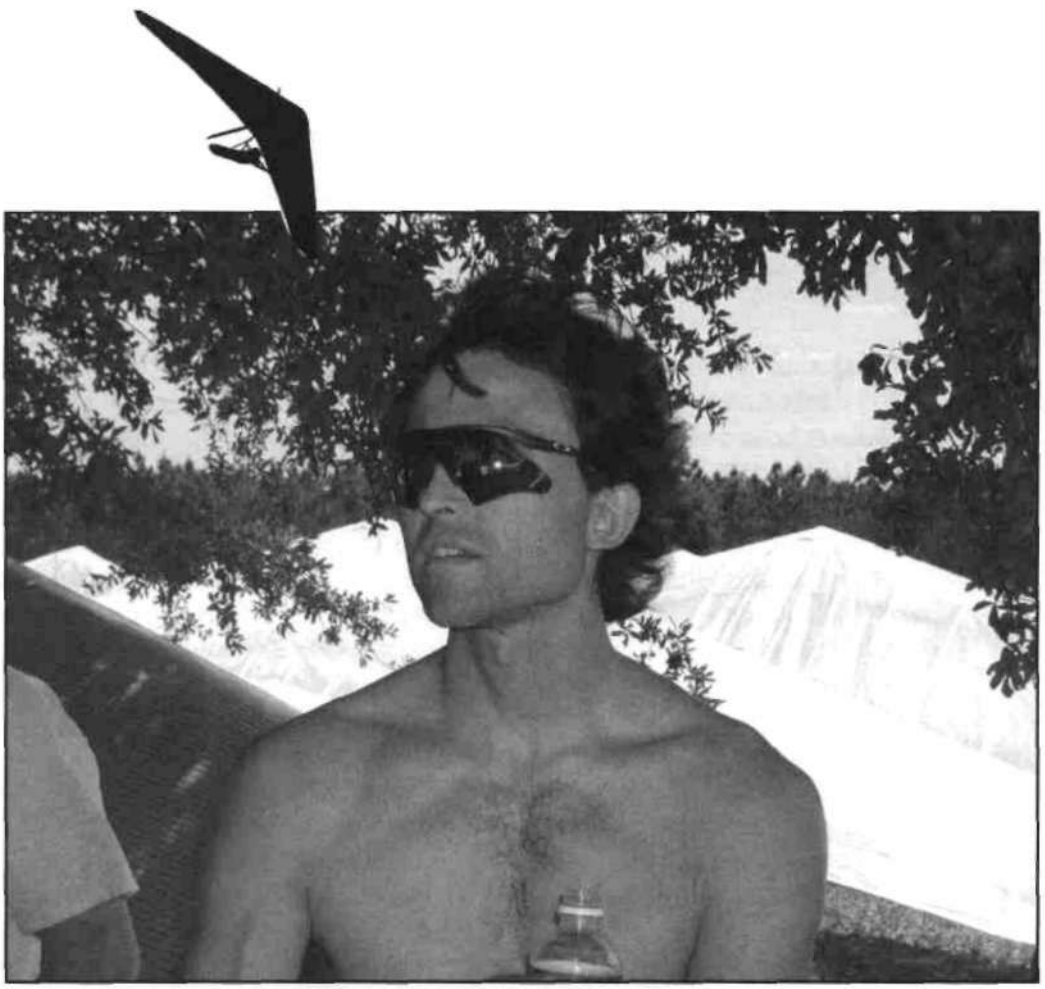
We were the best team in Ager (1995). We were all friends and there were no conflicts. Our talk on the radio was precise and beneficial. When conflicts start it's a bad thing. You receive info like orders and it may disturb you. But we were working great then. Now we're working on our radio use. No message must transmit fear or negative things. We must only send things that can help our efficiency. To work on this, someone on the ground can record a summary on a chart—the pilot said this good, this bad, etc. It's important for a team to work on communications.

Our team has now lost a lot of good pilots. Gerard Thevenot (he was kicked off), Eric Poulet, Alain Chauvet (he's lacking the money), Jean-Marc Dumond (he had an argument with our team leader, Stephane Vieilledent). At one time we had a core of people who were well off and could train together. After Ager my vision was to go further by training more and bringing in outside influence such as sport psychologists. But Stephane disagreed and then left.

We went through a weak spell because we had good results so we relaxed and didn't keep pushing. But now other teams like the Austrians and the Brazilians are strong so we have to get back our edge. We used to get young pilots in and train them like they do in Austria. Also, we used to work close with the manufacturer, Tecma. But now that's over and we have to get back to it. Nothing is better than when you're working with a good team and flying like a well-tuned machine!

Well, Richard, we hope you go on to more glory, great flights and wins. It's been a pleasure talking to you and I'll see you at the next World Meet.

CHRIS ARAI



Chris cooling it before a Quest Air round.

RISING WITH ARAI

Chris Arai began his odyssey in the air in 1974 with a bamboo and plastic glider he and his brother Tim built at home. His first competition took place on the slopes of Mt Abrams in Maine, in 1976. He was flying a standard glider—the earliest production type of glider with a 90° nose and no battens. At the time he was going to school in Massachusetts, but he soon returned to the San Francisco area and competed in the 1977 Regional meet at Crestline, California. His next memorable meet was the first Owens Valley meet in 1978. He placed 7th or 8th.

This Owens Valley meet was the first real cross-country meet ever held. Chris thought that the concept of cross-country flying was incredible at the time and went on to participate in the experiments in sky hiking (flyking) that took place in the Owens Valley. In this endeavor the pilots packed food and camping gear and flew from landing point to landing point in the Owens Valley mountain meadows. They spent the nights in their mountain aeries and the next day would find a suitable launch to get airborne and continue their adventure.

For the next five years Chris competed in the Owens Classics. That was where the big air was and that was where all the world distance records were being set, starting with Gene Blythe's and Trip Mellinger's 45 mile (72 km) flight from Cerro Gordo in 1977 and Jerry Katz's world-first 100 miler in July that same year.

Chris didn't fly much for 5 years starting in 1984. He bought a sailboat and sailed solo across the Pacific. He started in San Francisco and made it to the Marquesas, then through the Tuamotu Archipelago to the Society Islands (Tahiti)

Chris clears the field after landing at goal.

in the South Pacific. It was a trip of 3000 nautical miles and a real character builder. We'll let Chris tell the rest.

How did you get back into hang gliding competition, Chris?

Well, in 1988 Bob Trampeneau put together a team for the Southern California League Meet. He invited me to fly a Sensor for that meet (I had been on a Comet since 1980). I took third in ihat meet and later took 5th in the Owens Classic. In '89 I went on the American team to the pre-pre-Worlds in Brazil and just kept continuing competition. I've been competing for Wills Wing since 1990.

Can you fill us in on your more recent results?

I've been to all U.S. Nationals since 1989 and have been the U.S. National Champion three times. I've also competed in three World Meets. I took second in the '93 Worlds in the Owens. I've also had a 3rd in the Bogong Cup behind Tomas and Manfred and later took a 2nd there. I'm still waiting to win the Worlds.

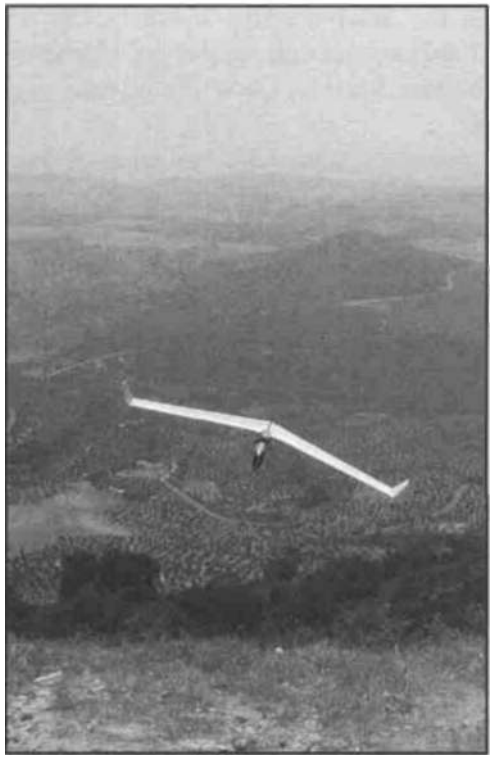
For a long time, Chris, you were stuck in second place in many major meets. You finally broke through and erased that barrier. How much of this flying and winning stuff do you think is psychological?

A good part of it, for sure. In competition, confidence is nearly the whole game. It can't be false confidence—bravura or machismo—it must be based on past experience and success. Confidence waxes and wanes with me. Sometimes I end up just chasing people, which isn't always beneficial. I'll actively try to suppress a lack of confidence by remembering when I've been on or in the zone. I try to rationalize what I did that is screwing up and I try to avoid it. Maybe I was distracted, not concentrating or overly anxious.

In competition, confidence is nearly the whole game. It can't be false confidence-bravura or machismo-it must be based on past experience and success.

I can fall victim to the opposite problem—over-confidence—as well. One of my problems is not slowing down when I hit a tough part. That's a symptom of Owens Valley pilots. We get addicted to the strong stuff and aren't able to enjoy or excel at the weak stuff. I try to pay attention to these potential weaknesses or factors. I used to keep a notebook highlighting what went well and the mistakes. Then I would review it before a competition. Probably it's better to focus on the good decisions rather than dwell on mistakes.

I have been competing for ages, so by now I don't go through sudden rising and falling of confidence. When I'm in second place, I may not have absolute confidence that I can do something tricky or extraordinary to win, but I don't have a sense that the pressure is keeping me out of first. I don't get distracted like I used to. I've gone from doing really well to horrendous and have been able to avoid let-



Brian Porter banks his Swift after launch.

ting it destroy my self-esteem.

I think that guys who get good, peak and then do poorly are spending too much time wondering or worrying why. I remember during the 1993 Worlds when I was flying as well as I ever had. I wondered if it was really me or if it was a bit of luck, 'cause it seemed like every decision was a good one. When I left a thermal or crossed a canyon, it always worked out. I couldn't consciously decide or analyze why it was right. I was bothered because I thought it was possibly just luck. Then I wondered if that's what happened to pilots like Tony Barton or Ricky Duncan who were best in the world but later couldn't win for trying. Confidence is everything.

I've concluded that success can't always be attributed to luck and that the good decisions we make are probably slightly subconscious. However, part of it may be just a lack of memory. When flying, patterns reappear and become familiar patterns. Perhaps that's why we can go so long without practicing and still do reasonably well.

Chris, you have a reputation for doing well despite not really flying much. How much (or little) do you actually fly?

Oh, I get between 75 and 125 hours a year—depending on the year. But 10% or less of that is free flying. The years I do well are when there are a lot of comps that run the whole season. Last year (1997) there were the Australian meets with Bassano and Sandia, followed by King Mountain and our Nats (Dinosaur, Colorado), both of which I won. I really don't go flying unless it looks good for cross-country.

I have trouble staying focused just boating around unless it's been a long time since I've flown or it's a really pretty place. The challenge of X-C keeps me keyed up and interested. I recommend it for all experienced pilots. The essential thing to do is to cut the tether from your home site. You can't just go until you chicken out and turn around. The best practice is when you are required to commit with all you got. Last year, for example, I flew a local record flight of 135 miles (216 km) and didn't have an arranged ride. Even those types of recreational X-C flights build confidence.

Again, the psychological aspect is the key. Sometimes when I'm on I feel that I can't make a mistake. Other times I feel a lack of confidence with a decision.

Can you figure out how to get into that confident state?

During a comp sometimes I'll get wound up. It's usually self-derived, so I force myself to relax. I reflect on times when I felt I was in the zone (on automatic pilot and making the right decisions) and that will help put me in the zone. It's often before a round starts that you can get wound up. It's nice to have in-air starts because you can fly around and get in position. In general though, I don't like starts. I relax more once we get going on course and focus on the cross-country race.

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An example of a wind-up start happened to me in Hay (Australia) my first

year there. I had only towed a couple of times before and locked out on my first tow of the round. It was pretty bad 'cause my release wouldn't release. When I landed I wasn't too worried, but the other pilots were so shaken that I got scared. After two more tows I finally got away, but I was totally freaked. So I got my start photo and focused on relaxing. I felt jittery for an hour and I was late after taking three tows. But ultimately I forced myself to focus and ended up doing well at the end of the day with a 10th place.

When I started doing well in comps I would get to the top and get the first place jitters. I'd get wound up on what would happen if I fail. It was very distracting and can be self-fulfilling. I had to learn to focus on winning.

So you'd say the matter of confidence is dependent on how well you can muster a command of stress, but also how you can tap into past success and follow the same decision pattern.

Yeah, more or less. Focusing is the key concept. In X-C racing I find I can focus much better than in any other aspect of life. Part of it has to do with the urgency and immediacy of the decision making process. You are constantly making choices that produce quick feedback. You sink or swim on your many decisions. There's a Pavlovian factor—you are constantly being rewarded (getting high and flying on) or punished (landing). Without this intensity I find it hard to focus like when I'm wandering around a mountain during free flying. I might focus in that situation when I'm trying to outclimb someone, but I'm generally not cutthroat.

Attitude is a big factor relating to confidence and success in hang gliding. Sometimes I get negative in a team situation and may say something negative. It's not the right attitude and I work to get around it. I sometimes get frustrated with my decisions. For example, back in the St Andre meet I made a bad decision as to where to go and got stuck. I finally got out and pushed upwind. I was in a real negative funk, but I managed to get out of the funk by my success in scratching up.

T have the feelin? that a negative attitude creates reality. Now when I'm low or in a difficult situation I will focus on attitude. I'll say, "No way am I going to land." I'm not sure if it's a real assessment of the situation or a negative attitude that puts me on the ground, but it's important to keep a positive attitude in case it does have consequences in these tough situations. Also, working on keeping a positive attitude in general benefits the entire flight and competition experience.

NOW when I'm low or in a difficult situation I will focus on attitude. I'll say, "No way am I going to land."

While we're on the subject of psychological factors, Chris, what are your thoughts on the fear factor?

Fear is a very real part of the sport. I experience it sometimes myself. I'm a little anxious, for example, when I go a long time without flying. But after a few flights in the spring I'm much more in tune. My main fears are typical: flying into rain squalls and having lightning go flashing by. The thunderstorm thing. Also, gliding over ridges in windy conditions is less than pleasurable. Then there's the lack of L.Z. (landing zones) problem like at St Andre (France) or across the gorge at Ager (Spain).

In those situations I try to spend time to figure out how to do it right. I usually get away from fear when I see others doing it and I realize I have skills as good

as theirs. A higher level pilot rarely makes major decision mistakes. When other good pilots do the same thing I intend to do it reinforces my decisions. With familiarity of an area, fear is greatly reduced.

Following others is a great way for an inexperienced pilot to learn as long as the consequences of not getting away with it are not disastrous. In other words, if you fail you merely land, not crash. A recreation or beginning comp pilot can get into trouble trying to follow a very experienced pilot in all cases.

I'm willing to go over unlandable territory only if I'm confident I can stay up. For example, there's good working clouds or a ridge facing the wind. Nowadays the task calling is better—that's why we have task committees—and it's not necessary to do crazy stuff. In the past we lost some good pilots, Dick Casetta and Pepe Lopez, for example, because of dangerous task calls.

In general, I deal with fear by not getting into fearful situations. I always like to feel I have a safe escape route.

In general, I deal with fear by not getting into fearful situations. My experience allows me to judge when such situations are likely to arise and I avoid them by planning my route or timing ahead of time. I always like to feel I have a safe escape route. The best way for new competition pilots to reduce stress is to work on their gear and equipment to make sure it's reliable. That way no stress producing problems are likely to occur and you can relax before the first round. Having confidence in your equipment gives you a basis of confidence in flight.

It took me years to figure out when to get ready and launch in competition. You normally have to be willing to suit up and sweat in line on single file launches in order to get off at a good time. Following such a plan prevents the anxiety of getting caught out of line or launching late. The biggest mistake inexperienced pilots make is getting stuck on launch. Remember, it usually takes a lot of time to find the lift and maximize your height. One thousand feet (300 m) is 5 minutes at 200 feet per minute (1 m/s). I try to get in the air about an hour ahead of when I want to start the course. Naturally, you don't want to leave just ahead of your closest competitor, but it takes more time than many pilots think to jockey into position for a good start. If you feel rushed you will get stressed and may lose your good decision ability.

Chris, let's turn our attention to thermal skills. Can you take that and run with it?

Sure—it's one of my favorite subjects. I naturally want a good thermaling glider—one that slows down nicely and coordinates easily. My glider does nicely in this department (Chris flies a Wills Wing Talon).

Tm learning how to sense what the air is doing by feel. I can't exactly articulate the process, but I can sense when I'm doing it right. As technically oriented, as I am, I try to put aside a lot of the logic and fly by feel.

Thermaling is also a mental activity, although it shouldn't be a matter of constantly thinking, but constantly processing. I try to create a mental image of what the air is doing to produce a mental map of where the core is. I'm learning how to sense what the air is doing by feel. I can't exactly articulate the process, but I can sense when I'm doing it right. As technically oriented, as I am, I try to put aside a lot of the logic and fly by feel.

Some of the process is observation, of course. You see a bird, glider or cloud wisp. You can also simplify and say turn towards the lifted wing, but the overall

process is more than that. After experience and practice you will feel a familiar bump or acceleration that your muscles react to. The process is not totally subconscious, but it's a fairly low level of thought. On the other hand, you must be concentrating, you can't be spacing out. The trick is to rely on familiar textures of **the** air to help you find the core.

Once I've established myself in a thermal I don't just relax in the lift. I'm always thinking of where to find a better core. I often leave and wander around to find something better. I like to be in a good, fast gaggle, 'cause that's what they **do.** As soon as I feel I have enough altitude I tend to explore and it often pays off. It mostly has to do with what the thermal feels like. I believe the more variable or weird the thermal, the more likely there is something better nearby. The less consistent the lift, the more hopeful I get.

I can characterize my thermaling as never being satisfied with the core I'm in. I hear people say they roll their glider in the thermal and it just stays there. I don't think I've ever flown a glider and thermal like that. Perhaps they're missing something.

When I'm low or in weak conditions I have to tell myself to stay in lesser lift. But even then if the day seems like it should be better I'm more willing to explore. My tendency is to always leave weak lift, which is why I do well on fast days. I never really practice getting on top at the local hills. I leave the thermals to race off. I don't practice topping out weak lift, and maybe I should. My one weakness is I'll work much harder to get up to someone than to stay above him or her. I get more keyed up when I'm below. Jim Lee, Manfred and Guido Gehrmann are the best at staying on top.

When I'm searching for cores I have no particular game plan and tend to use classic techniques. If I'm falling out the back I will correct upwind. Quite often I'll drive upwind as a matter of course. Sometimes there's a certain amount of feel to the air—bumpy, lifting, light lift—which promises lift upwind. It's a matter of subconscious pattern matching, I think. It's hard to tell exactly what's going on, but it seems to work. I drive upwind slowly with a light touch and often find a **core.**

With such an aggressive approach, how do you avoid missing a thermal or two and hitting the deck?

The whole concept is one of risk management. I'm not talking about safety risks—I hope I always fly within safety limits and others should too. I'm talking about risks of landing or getting stuck. The risks I take are a function of how confident I am, which can only be related to experience. Things recreational pilots may think are risky are sometimes due to their inability to judge. For example, some people may think any place unretrievable is unlandable, but I don't. We must always fly within our personal limits.

Risk management is a conscious thing. I'm continuously saying: Is this as good as I can get? And am I high enough to find something better? All that's tempered with observation. Is it blue all around or spotted with clouds? Are gliders getting low ahead or are they high? Things like that.

The main thing is getting a good feel for the conditions and terrain. That means practice at a site. You should find out how low you can go and readily get up. Nothing is more gratifying than a low save, but nothing is more nerve wracking. You should try to avoid it in competition. Racing involves assessing the air.

The U.S. team's strength is racing over regular terrain like the Owens, Dinosaur and Sandia. The Euros fly much more varied terrain like St Andre, Laragne (France), etc. In these conditions I'm working on estimating my glide very well so I can know when to leave a junk thermal.

Here in Florida *[Ed. Note: our interview occurred at the Wallaby Ranch Open]* the lift is often grouped. I'll often pull out of an area and try to glide to a better area. One of the key elements in racing is to cut your losses in weak climbs and leave when you're high enough to get to something else—preferably indicated by a climb, cloud, ridge, dust devil, bird, etc. You must have a certain amount of experience to figure out three important things:
(1) How far you can go with the given conditions and height**;**
(2) How likely is it you'll find lift, and;
(3) How strong the lift will be based on the lapse rate, heating and clouds.

How can a recreational pilot develop these skills?

Almost everyone has access to sites with more than one thermal source. So practice going from one to the other. Try to guess (in a slightly subconscious manner) how others are climbing, then go there and find out. Start working on your guesses and getting answers to build your judgement. When you're climbing, always look to see if someone is climbing better. When you're gliding see if you can judge the climb rate when you're going to it and see if you can tell who is climbing better. Once you can judge climb rates, you can optimize your speed-to-fly heading to lift by setting your instrument on the next expected climb.

Since you brought up the subject, let's talk about speeds-to-fly, Chris. Your Tangent vario supports the MacCready speeds-to-fly theory very well. How important do you think the concept is? [Ed. Note: Chris is designer of the Tangent, the first speed-to-fly hang gliding instrument.]

I think it's moderately important. Speeds-to-fly alone aren't going to win you a contest. It's just one of the tools you need. If you don't understand it or don't have the correct data, you could be losing *Vi* to 1 point in L/D. For competing I find the glide is a very important part of the overall plan. Moreover, final glide is extremely important, especially on the long ones when you can't see the goal.

On glide you don't get direct feedback as much as you do when climbing. There are more subtle differences, they take longer to show pp and they're harder to sense.

If you think that speeds-to-fly is connecting one little curlicue thermal to another with a diagonal line, you're wrong. It's more than that. On glide you don't get direct feedback as much as you do when climbing. There are more subtle differences, they take longer to show up and they're harder to sense. Thermal feedback is fairly instantaneous and we spend much more time doing it. So it's harder to learn to glide well.

When I first designed the Tangent I expected to use the averager for the next expected climb. Now I realize that's bogus. The full setting of the next expected climb is too aggressive in a hang glider. In fact, average climb may have nothing to do with what's happening. For example, in the Owens you can get 1400 FPM (7 m/s) on the averager easily, but you'd never set the next expected climb to 1400 FPM**.**

I used to fly with a calculator on my bar. I worked out the final glide formu-

las and had them programmed into the calculator. It was very instructive. I learned it was hard to put in a precise number when it's turbulent, but I found it was easier to put in an increment. I was using that before we had GPSs. I would try to estimate the distance to goal from a map, estimate the wind and even sink. But I found it was too much to guess all those factors. Sink is impossible without a netto variometer *[Ed Note: a netto vario is one that factors out the glider's sink rate to give a true picture of the air's vertical motion].* I learned that much of that was a ridiculous exercise, but I also learned what was useful and how to display it.

I kept the calculator on my base tube in a clear pouch, but one day I forgot to safety it and I knocked it off with my VG. I saw it fall into the trees 8,000 feet below at Paradox, Colorado, so I **quit** using it.

Is that when you designed the Tangent?

Yeah. I always wanted to design a flight computer. I was working for a company in Berkeley (California) that was designing infrared gas analyzers, which was similar to the function of a vario. I realized I could do it. I thought I knew everything, but I found that while the circuits were easy, the software process was difficult.

In the instrument I sample the airspeed and pressure at a high rate, and do the data analysis with software. That way I have as few sensitive components as possible. I compensate for density changes and the effects on polar and performance every 26 seconds. On a long final glide you can go through up to a 10,000 feet (3,050 m) of altitude change with very different airspeeds at the top and bottom. The Tangent uses an average method based on your altitude to make the final glide calculation.

Chris accepts congratulations from meet director JC Brown at goal in the Wallaby Open.

What do you think the Tangent has done for your flying?

Well, I never won anything before I had it. It has given me the tools to apply " speed-to-fly more accurately. I was not able to use the concept as efficiently before**.** I feel confident **that** I'm gliding better now because of it.

Did it make a change in your general flying?

My flying evolved, so it isn't easy to tell. I probably slowed down some. A **lot** of people who first get the Tangent say they learn to slow down or speed up, depending on their previous tendencies. When they use the Tangent, most beginning X-C pilots learn to speed up in glide—they fly too conservatively. More advanced pilots may have a natural tendency to fly correctly but may be too con-

servative on the speed ring.

The whole matter of designing and flying with instruments is still an inexact science. For instance, consider the wind. If you measure it with a GPS you only get the component parallel to your flight path. If you measure it by detecting your drift while circling, you only get the thermal drift, which is not the true wind. Besides, there's the GPS lag to contend with—at least a couple of seconds.

So I find the optimum wind setting for speed-to-fly is the difference between the actual wind and the drift of the lift source, whether it's a thermal or ridge (of course a ridge doesn't drift and thermals don't go the wind speed, which is why clouds get tipped). This process is very difficult to automate, so in general if I'm gliding into the wind I set my head wind to 1/3 to 2/3 of the wind speed indication. The best distance over the ground airspeed is faster than the best glide speed if the thermals are drifting towards you.

When going downwind, I set the wind setting even less because I don't want to slow down as much as it would indicate. On the other hand, if I'm crossing a valley and it's easy, I'll stick with classic rules by using the correct settings. However, if it's difficult and I want to maximize my glide, I'll set the next expected lift to zero and wind speed to actual. That concept doesn't exactly fit in with classic theory, which is one reason a pilot needs to know a bit about the theory. You should know what "best average speed" is and what optimum settings are, for instance.

One important thing to note is that you should leave when a thermal drops off its lift considerably. You lose more time climbing slowly than gliding slowly. For every 250 FPM (1.2 m/s) of weaker climb you take, you lose an equivalent of 5 mph (8 km/h) on glide. You waste a lot of time circling in weak lift. You lose an equivalent amount of time for a wrong speed ring setting.

That's some interesting insights from a man who knows instruments intimately, Chris. Do you care to say a word about your glider?

Right now I'm flying Wills Wing's latest, the Talon. It is a great climbing glider. It flies really slowly with an outstanding sink rate. I like the way it coordinates. To prepare for competition we don't have to do all the old stuff like strip wires, chop zippers and cut strings because it is already sleek with its clean curved shape and aerodynamic bar! I think having the best equipment you can get and believing in it is on of the keys to competition success.

Thanks for your time and shared knowledge, Chris. I hope you continue to enjoy a successful competition run and your new family prospers.

OLEG BONDARCHUK

The iron man, Oleg Bondarchuk.

OLEG'S LEGACY

Oleg Bondarchuk hails from the Ukraine. He has been a man-to-beat on the competition circuit since 1995. In 2002 he won some of the Australian meets and the two Florida meets back- to-back. His stature in the hang gliding world is admirable, especially considering the economic hardship in the Ukraine during his rise to the top. Oleg's quiet demeanor and humble speech belies an iron will and a great desire to be the best. I sat down to hear Oleg's ideas at the Pre-World of Speed Gliding meet near Mt. Olympus in Greece.

Oleg, I know it was hard to be hang gliding in the Ukraine without a car and money to spare. How did you get started?

I was a student in college in Kiev. I was studying civil aviation and I came across a notice inviting students to try hang gliding. I dropped everything I was doing and signed up immediately 'cause I knew there would be a big response. It was a university club for aerospace students and was perfect for me. I was so enthused.

So I started at a 65 meter (213 ft) hill near Kiev. We had to carry our gliders up, so we learned to soar very quickly as well as read conditions and scratch well. As soon as I started I began reading sailplane articles and a lot of flying books. I still go back and read them now, over and over. I find that as I gain more experience I gain more insights from the books. I recommend this procedure.

My progress was fairly rapid and in 1985 I took part in the Kiev

Championships. I wanted to take part in the Ukrainian Nationals, but I wasn't qualified. But in 1986 I was in the Nationals and won them. There were three tasks and I only won one on a long day. I was probably lucky. That year I had a 120 km (75 mi) flight before the Nationals. I learned to go X-C by reading everything I could. I didn't get a chance to go X-C often, but I was always thinking about flying and working out techniques in my head.

I left school 1 *Vi* years before graduation to instruct for the club at a place called Yampol. It's near the border of Ukrainia and Moldavia along a winding riverbank. The highest drop is 120 m (395 ft), but the sites take many wind directions.

I was working in the club until the USSR split up. Then I went back and finished college. I had no job but wanted to fly. I tried my own businesses, buying and selling and eventually went to work in Moscow. But this wasn't flying. Then Gerard Thevenot (owner of La Mouette in France) invited me to work for him along with Guido Gehrmann.

That's about when I met you, Oleg, for I was staying at Gerard's house when you showed up. Is that when your competition success started?

Yes, I would say so. I took part in all Russian and Ukraine meets since 1989. I was on the team. My first international meet was in Slovenia (part of Yugoslavia at the time) in 1989.1 ended up 24th and I remember Manfred (Ruhmer) was 3rd. Then in the World Championship in Brazil I did poorly. I was flying a Vega MXII, the same as Manfred. I hadn't flown for 4 to 5 months before this meet since it was during the period that the USSR broke up and there were no comps organized.

Oleg at goal—as usual!

But then I went with Gerard in 1995 and he gave me my first topless glider—a Topless, of course. I finished 11th in the World Meet in Ager, Spain that year. I had been in the top ten but did poorly a couple days at the end. However, working for Gerard made me a much better pilot. I was flying the comps in France and test flying all the time. I also got to go recreational flying. I had never flown so much before.

It was a great opportunity and I learned many tactical things from Gerard. Before that I thought I needed to have everything ready and prepared on the ground. But many times Gerard was coming in the morning with no radio, no maps and no retrieve or any incidentals. I learned to fly with nothing and focus only on flying. Now, if there's talk on the radio, I'll turn it off. If you can see a guy you don't need to talk. If you can't see him you don't need to talk. When gliding, especially, it's very important to be very sensitive and concentrate.

All during this time Gerard was telling me that I was very good. He said I could beat anyone and this changed my mind from being doubtful to believing in myself. It was great for my confidence. I felt I had the best glider, so all I had to do was avoid mistakes.

How long did that relationship with Gerard continue?

Well that year (1995) I competed in the World Hang Gliding Series with Guido, Gerard and you among others. Then in 1996 I was in the Europeans in Hungary where I took 13th on a Topless. Then in the spring of 1997 I started to fly for Aeros, the Ukrainian manufacturer. It was difficult for me to stay so far from home because I had a wife and my boy back in the Ukraine.

Aeros was formed in 1992. It had been a small part of the giant Antonov factory. I flew their glider at Bassano in '97, but it wasn't going well. It was a new prototype.

Obviously they kept developing the glider, Oleg, because the Stealth (and now the Combat) became one of the most competitive gliders, especially in your hands.

Yes, soon after that things got better. Later in 1997 I took 4th at the German Nationals in Garmisch, then a 4th or 6th (I don't remember) at the Pre-Europeans in Slovakia. At the French Nationals in St Andre I took 2nd behind Guido. He and I flew a lot together because we were used to teaming together at la Mouette. At the first World Air Games that year I was 2nd. Then in Australia—my first time there—I was 2nd in Hay, 2nd at the Bogong Cup and 2nd in the World Meet.

Oleg poses with his winning glider at the 2002 Florida meets.

That's a lot of seconds, Oleg. I bet you were hungry for a big win.

Sure. The next year in the Pre-Worlds in Monte Cucco I was 6th after bombing out the first day. Guido and I bombed out watching each other instead of flying the air. I took a 2nd at Wallaby that year, then went on to Australia to win at Forbes and the Bogong Cup with a 2nd in the Nationals in Western Australia.

I also got an out and return world record at the Great Australian Bight. It was a 200 km (125 mi) out and return where I averaged about 74 km/h (46.25 mph).

Anyway, as soon as I got a better glider I could glide with Manfred and Tomas and started learning new things. In Ager (Spain) I started to believe in myself. I gained much more confidence and believed I could be first. I could fly with all the top pilots. I saw that even if they are better they still make mistakes. If you have a similar glider you can stay with them by minimizing your mistakes.

The best pilots are Manfred, Tomas and Guido. They tend to make good decisions. Manfred is better in climbing and feelings. Tomas makes the best decisions. Guido is better in tactics. He minimizes mistakes and he always tries to stay higher. He's a good climber and stays on top and only goes alone when he's way ahead.

Manfred climbs better than I do and often takes a better course line. The only way I beat him is by chance. If I'm with Manfred I end up following him which isn't good 'cause I can't beat him that way. I prefer to fly separately from Manfred and use the best time of day or better cycles to beat him. Now I think Manfred

makes less mistakes than ever. Perhaps Tomas is better on the flats, but Manfred is best in the mountains.

I do better on the flats than in the mountains myself. Are your skills still improving, Oleg?

That's difficult to say. But on every flight you gain experience whether it's a good flight or not. Often progress is flat; skills seem to go up in steps. But to be a good comp pilot you must compete often. Otherwise you will forget your decision making and will not have as much confidence. When free-flying X-C you will be more relaxed and not concentrating and learning as much. Also, you **won't** have as many gliders around to judge the outcome of your decision making. For example, one circle extra in dying lift can put you 40 meters (130 ft) below another guy in the next thermal. After ten thermals this is 400 meters (1300 ft) or more often a missed thermal.

To be a good comp pilot you must compete often. Otherwise you will forget your decision making and will not have as much confidence.

Since it's such a great learning method, why do you think more people don't compete?

Probably concerns about time, money, safety and the scoring systems. But the benefits are much bigger than the problems. Competition is a great place to improve your skills, compare your flying and to hang around others who love to fly at the highest level and talk about it. I compete because I'm competitive. If not hang gliding it would be something else. If I didn't compete I might not hang glide as much.

Let's move on to your techniques. Could you tell us about your thermaling process?

I find that if I don't think when thermaling (or gliding) I can feel things better. I try to block out all external matters and logical thinking. This is very important when climbing. When flying I'm always looking around and watching everyone and everything for subtle clues. I seem to react and go places without thinking. I let my body go with the flow—I don't think "there's lift here and I need to push out," or "there's a better climb, I must go there," I just do it.

The other day we were flying together low near Mt Olympus. We were climbing in a weak thermal and you suddenly moved south to find a much better core. How did you know it was there?

I just felt the thermal we were in was slightly better on the south side, so I took a swing out that way and found a better core. It's all feeling since I didn't have a vario that day *[Ed Note: We had been up the mountain for a speed gliding run, but the thermal winds set in early].*

I've discovered for me when there are winds, I widen my circle more often downwind to find or stay in a moving core, especially if the wind is increasing at altitude. This applies even more with clouds to tell where the thermals are going. Maybe this depends on flying style. A person turning very flat may drift out the back of the thermal and have to search upwind.

When I'm gliding and feel lift I slow down and move to the appropriate side to keep the wings level or turn into the lift. But it's incredible to me how many pilots don't look around for a better climb when they hit the initial lift. They don't see other gliders or birds climbing better. Admittedly, it's sometimes hard to find the best core in an area when you are alone, but if you've been in better lift earli-

er and the conditions haven't changed, you should look around to find what you had before. If you are under a similar cloud or over ground similar to before on that day, then the thermal strength should be the same. If all the signs show a similarity to earlier I will look around to duplicate my earlier climb more readily.

You know, your vision is not required for thermaling except for avoiding other pilots or making better turns with other pilots. I use my feeling and vario sound for climbing and am always looking around and out for signs. I almost always find myself climbing to the top of a gaggle. That's because lift is not constant and other pilots don't always pay attention to following the core effectively. Many pilots are not turning steeply enough. If you are able to fly slowly with steep turns it is usually most efficient. If you fly flat and slow you will get tired out because you're always correcting. I often go inside of the circles of these flat pilots and core up above them. To do this you must know where everyone is and be able to track their trajectory.

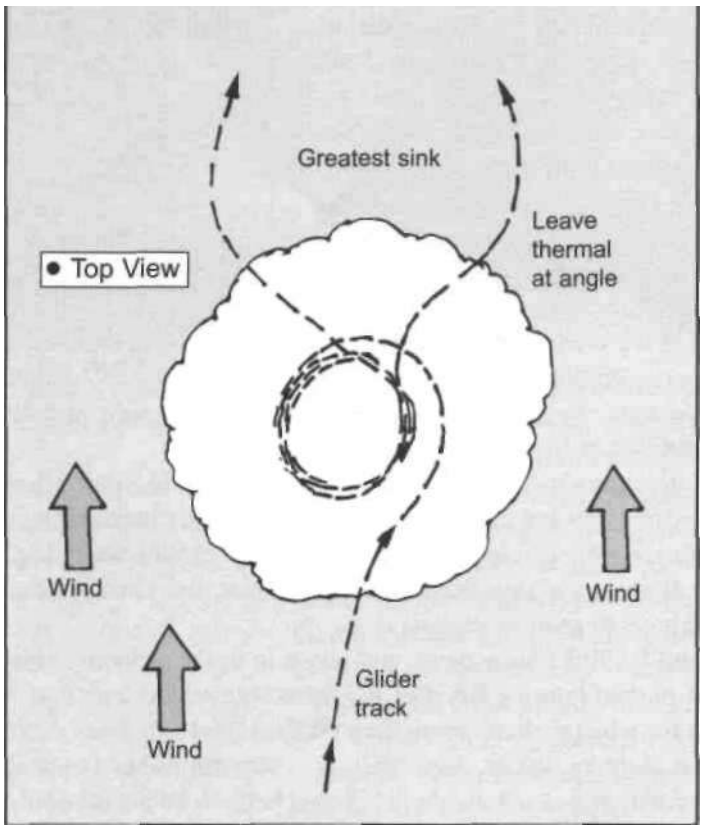
/ you fly flat and slow you will get tired out because you're always correcting.

What can you tell us about your techniques for leaving thermals?

First off, if I'm quite high and the thermal is getting unsteady I will leave. Sometimes if I see a cloud starting to develop I will leave because then the next thermal is easy to locate. If I'm sure there's lift ahead I'll go readily. If there's **a** gaggle ahead I'll use that—I'm not averse to using gaggles. But if they are not on the best route I'll avoid them and go my own way.

I'm always looking ahead one or two thermals before leaving. I'm always watching the clouds while I am climbing because you can't see them well when you are high. Watch the clouds' progress on your way up and watch for changes in the day.

Figure 1 - Strategy for Leaving Thermals



On good days it's important to leave the thermal you are in as soon as you can reach the next good climb. But it's also important to slow down sometimes. I get very conservative (sometimes too conservative) when conditions get bad. It's very important to be flexible and be able to shift gears. If you are very high you can afford to make one or two mistakes, but when you're low you can't.

When I leave a thermal I almost never leave it directly on the downwind side because that's the area with the greatest sink. I angle out 45 to 60° (see figure 1). Then once on glide I continue to change lines when necessary to avoid sink and stay in the best lift. I'll try to glide along cloud or wisp lines. If there are mountains, I'll try to glide along ridges. On the flats it's best to glide over the better-looking fields or along tree lines. If my glider falls off to one side, I go the other way. Lift and sink are always changing, so my glide lines are always moving. It's not good to just follow someone, for there are always spots of lift and sink and you can "see" the air better if you

spread out. But still it's better to go to someone if they are getting a better glide.

At the Quest Air meet this year (1999) on day 3, Tony Marty (top Swiss competitor) and I got in a convergence line and climbed to 1,700 meters (5575 ft) going straight. We glided into goal from 17 km (10.6 miles) out. That's an extreme example of a great glide line, but even when there's not a convergence there will be lifting or reduced sink lines.

How fast do you fly between thermals?

That depends on the day. It depends on the clouds, it depends on the expected lift. I typically glide between 55 km/h (34 mph) and 90 km/h (56 mph). I rarely go slower than 50 km/h (31 mph), even in lift, unless I'm sure the thermal is near. If you slow down to minimum sink when on glide you're sure to get left behind. When I'm gliding towards a gaggle with 3 m/s (600 FPM) sink I'll fly 90 km/h. The more sink and the stronger the thermal I'm heading to, the faster I will fly.

My glider is getting about a 15 to 1 glide. Manfred's and my glider are getting about 1 to 2 points of glide over the others. That's this year's (1999) version of the Stealth. It is built with more tension and will be available to the public.

There are a lot of different strategies depending on the conditions and situation. When conditions aren't good, I'm always trying to be very high. I watch pilots ahead and watch for cloud development. I try to calculate what benefits I'll get if I go in front. If conditions are hard, I generally take more time to get high. I'll keep climbing in weaker stuff than normal to see what others do. Even on a mediocre day I'll stay with the pack, but try to get a little higher.

But if you wait in lift even one 360 when everyone else has left you may be too late. Pilots should leave together and spread out. A pilot who follows directly behind another hurts both pilots. This is especially true when everyone is getting low or it's a blue day. Of course, when you're sure of a thermal ahead it's OK to follow since everyone is going on the same line.

Sometimes we know things in our mind but not in our heart. Too many pilots follow others around when they know better.

When I'm gliding I'm always looking at the clouds in front—at least 5 km (3 miles). It's useful to watch ahead as far as you can to avoid blue holes, overdevelopment, shadows, lakes, forest or wet areas. Sometimes it's a cloud that flattens and makes shadow. Anyway, if there's any area you have to go around, it's more efficient to start sooner rather than later, so the further ahead you can recognize these areas, the better. I always go on the upwind side of these areas when possible (see figure 2).

You seem to be an excellent starter in competition. Can you tell us your secret strategy for getting a good start?

The start gate is usually very important, especially if you're fighting for one minute in the top places. If you are thermaling in very good lift before the start gate, there's no reason to leave soon. You need altitude. Ideally you should stay upwind of and as close as possible to the start gate. If you can't be close, be watching your GPS clock and calculate your glide time to the gate. You have to practice in order to gain experience that helps you judge whether you have time to climb to the top of the lift you are in, or whether you should hang closer to the gate in weaker lift.

If it's a long time before the start gate it's important to have a plan and observe what's happening. Look for the thermal cycles, the clouds and where the gaggles appear. As the start gate gets closer your plan should put you in the best up-cycle

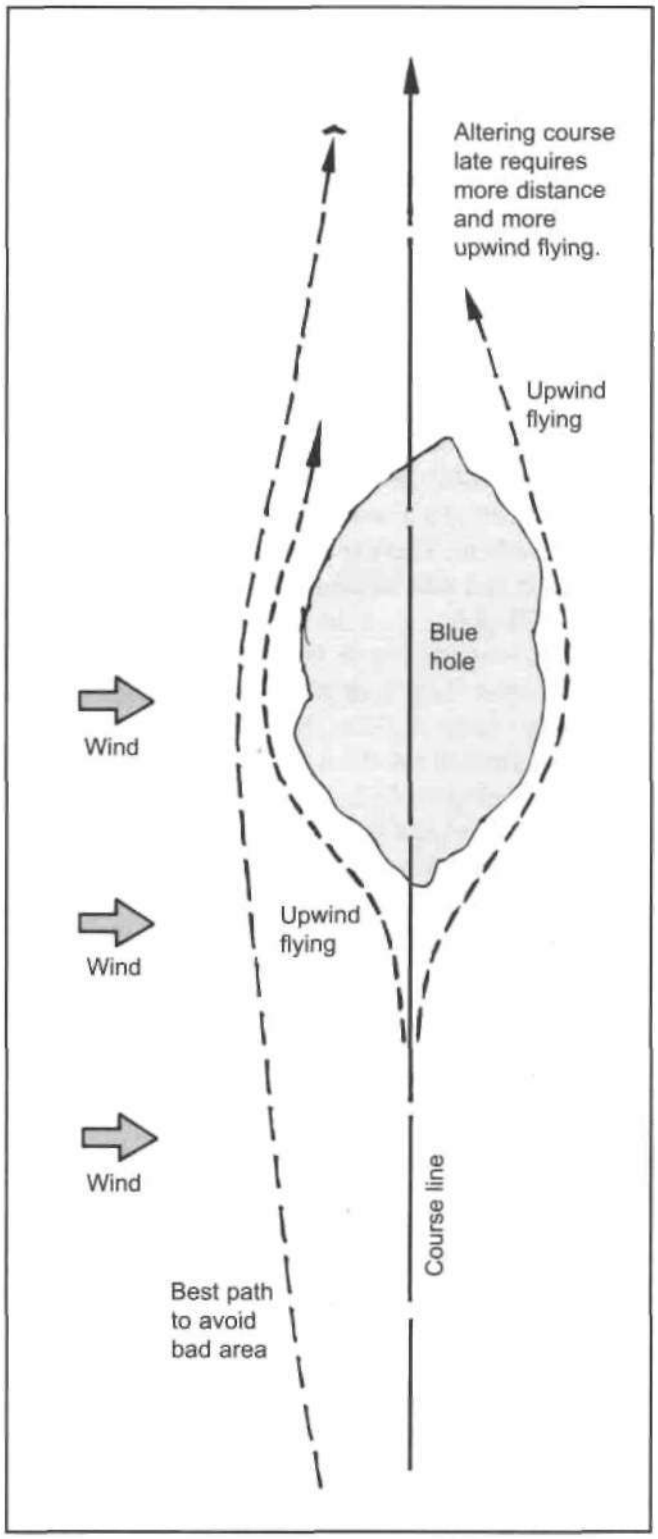


Figure 2 - Technique for Altering Course when Necessary

near the gate. With my experience now, it comes naturally. I don't even have to think about it and I do the right thing. That's the goal—automatic right reactions.

If you are late for the start you will often end up with a slow gaggle, which slows you down further unless you are willing to break away. But sometimes if you aren't too far behind you can catch up with the lead gaggle because the pilots are often slowed by the fact that they have no markers out ahead.

Those are good pointers, Oleg. Let's talk about equipment a little bit. How important do you consider equipment is to the winning formula?

It's very important. You should try to find the best. Watch gliders in competition and if you like something, try it. If you like how it feels, buy it. It's much better to do this comparison in a competition rather than just watching or asking someone. Of course, be careful of who you are comparing to. **I've** flown against Tomas and he was always in front even though his glider was getting worse performance.

When it comes to a harness, cleanliness and hang position are extremely important. Make sure you are gliding nose-down and can stay that way when you're pulling in. If you make a small improvement in drag it's not much, but if you make a number of small steps it's very significant.

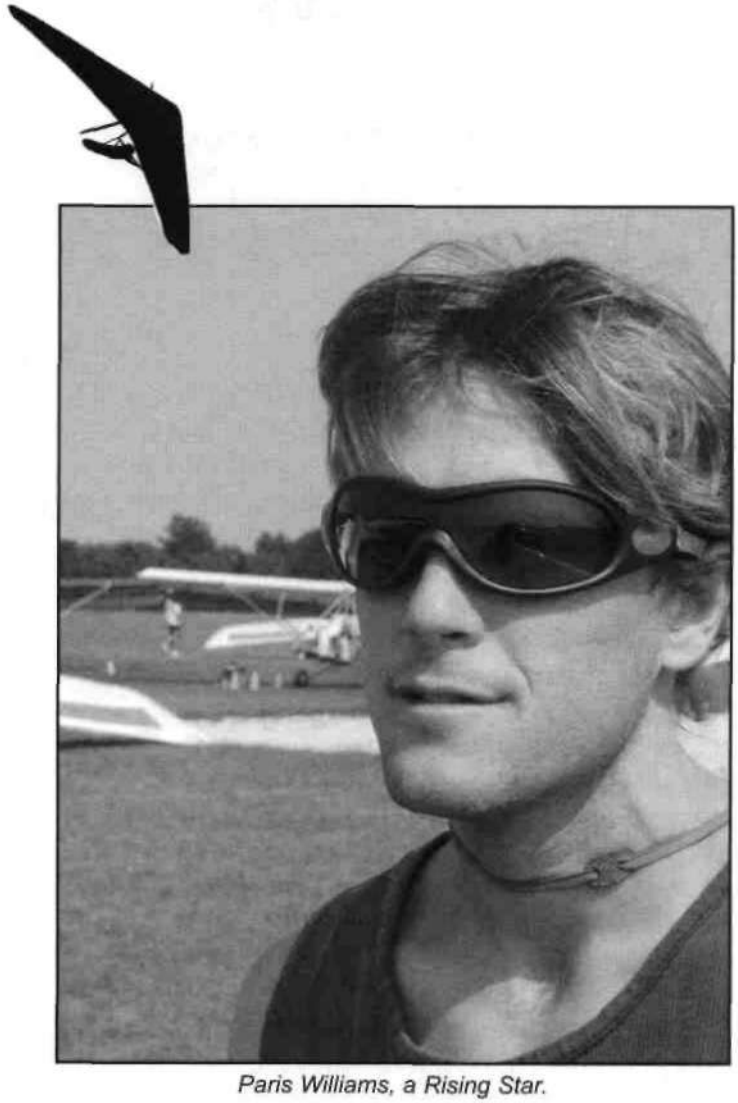
It's very important to be sure all your equipment—GPS, vario, VG system, etc.—is working well. Don't change equipment just before a comp. Get everything worked out first. Know all the details of your equipment (especially your GPS and glider response) ahead of time. Sometimes it's better to stay with old equipment rather than jump on new stuff just before a meet. I personally need 40 to 50 hours of use to max out my equipment.

Those are words of wisdom, Oleg. Before we wrap up, what can you tell us about hang gliding in your future?

That's hard to say, but I'll keep flying for some years if it continues like this. It's important to be motivated, of course. I enjoy making a living at hang gliding and working for Aeros. If there would be more prize money I would continue competing longer and more pilots would compete, of course.

We're seeing more and more big purses in some of the meets, Oleg; let's hope this trend continues. We would like to keep you around because you are one of the quality people in competition. Thank you for sharing your insights and secrets.

PARIS WILLIAMS



Paris Williams, a Rising Star.

IN THE AIR WITH PARIS

Paris Williams is currently a World Champion contender. We sat down to talk at the 2001 U.S. Nationals in Texas. When that meet was over he was the 2001 U.S. Champion, having beaten the best of the U.S. competitors as well as some top foreign pilots. His rise has been steady in the few years he's been competing. I asked him how he started.

My mother had a boyfriend who found an old glider at a garage sale—the classic story leading to disaster. That was 15 years ago and I was 14 at the time. I didn't know any better and took it off a 300 ft (90 m) hill for the first flights. On the first flight I landed on my feet. Hey, this is easy! Then I tried to get higher on a later flight and pushed out until I stalled. I lost control and that scared me. This was at half Moon Bay in California.

I quit for a while, but at 17 I started taking lessons at Mt Shasta (California). Then a year later I was an instructor myself. I taught for Western Hang Gliders at Marina and became a fan of Kenny Brown and his incredible close-tolerance flying. He can do anything with a glider.

When I was 19 I moved to Kitty Hawk and started doing tandems. Since that time I have worked at seven different schools, one in New Zealand, Lookout Mountain, Quest Air, etc. I had my own school in Utah, then I went to Central America for a year. I left with $700 in my pocket and traveled around giving tandem rides. It was great fun. When I returned I worked at Torrey Pines and did

tandems at Aspen and Telluride. I've been a wandering instructor since I was 18. I just love to fly, teach and travel.

It sounds like a great life to me, Paris. I understand you're going to school now.

That's right. I'm only doing one semester a year because I travel so much. I'm studying physics at Valencia College in Florida. At the same time I'm teaching at Quest Air. My friend Bo Hagewood and I are involved in an advanced instruction program called New Horizons. I've always felt that most schools bring students to the level where they can really hurt themselves—the novice level. He or she can go out, fly high sites and get in trouble with conditions or other factors. We work to polish off a pilot's skills and go beyond the intermediate syndrome phase. We are focusing on one-on-one instruction and working on thermaling skills, judgement, restricted landing field use and on up to X-C racing.

That sounds like a winning course, considering it's being presented by two U.S. National Champions. Tell us a bit about your competition experience. How did you start?

At first I wasn't interested in X-C competition. My vision of flying was dynamic, so I started flying freestyle (aerobatics). In 1998 I became the champ in Telluride. It was that same year that my interest in flying began to fade. So I entered my first X-C competition and realized that going cross-country made everything fresh—every time. After that first year of competition I was 13th in the U.S. After the second year I was 4th, then 2nd in my third year of competition and finally I'm first after four years. It didn't come automatically. I worked on things constantly and was doing at least four major meets every year.

Paris Williams at his home site, Quest Air.

Last year was the first time I ever won a day and ended up winning three days in one meet. I also won a day in the World Meet this year. That was the day after I discovered my glider had side cables that were way too long. I had put on different airfoil uprights and didn't realize that they were supposed to have extra brackets at the top. The result was the glider wouldn't turn very well and that hurt in the broken thermals and jammed up gaggles in (Algodonales) Spain. I ended up 1 Oth in that meet and who knows what I would have done with a properly set up glider.

It's amazing how we all still have so much to learn, Paris. Where was that first meet in '98?

It was the U.S. Nationals in Lakeview, Oregon. I took 33rd. Just before that I

had been wind dummy in the Sandia (New Mexico) meet. That helped me a lot because I would launch early, scratched around, then took the clock and did the task with the big guys. I didn't have a retrieve or a radio so I followed roads and hitchhiked back. I made goal almost every day.

I originally thought I could get good by free flying, but I eventually realized the only way to get good at competing was to compete. I was humbled by that first meet at Lakeview. So I started asking lots of questions. I was pestering the top pilots and would latch on to anyone who would answer these questions.

My first mentor was Dave Sharp (we were both flying Predators). He gave me the basis of ideas and strategy that I use more than anyone. For example, he taught me to launch early and climb up and go down several times to get a sampling of the lift bands in the air. One band might be weak and smooth, for example, and another strong and turbulent. The trick is to find a good power band and try to stay there.

For example, he taught me to launch early and climb up and go down several times to get a sampling of the lift bands in the air.

That concept is one of the more advanced ideas and I wasn't able to use it at first. But now I often do. That's one of the reasons I am often one of the first to go. I'll go on long glides to feel the air while waiting for the start times. This practice will give you a sense of the day in the air much better than when you're waiting on the ground. Besides scoping out the lift bands, you can be assessing the thermal nature, the chance of O.D. (overdevelopment), the trend (is it getting better or worse?) and the best time to take the start.

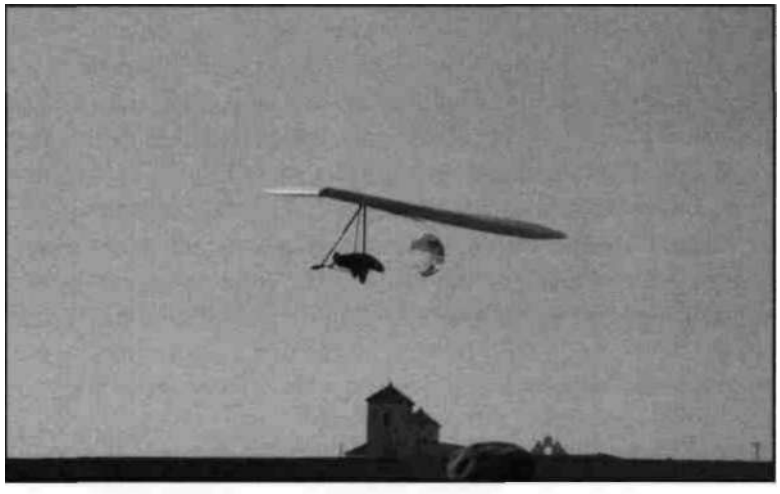
Of course, it's easier to use this tactic in a towing meet where getting back into the air is easy if you go down. Beginners at competition must be careful using such a method at first. Just try to do well by making goal, then apply this knowledge. In any case, you should always be assessing the air on every climb.

Who else was instrumental in your development, Paris?

Mike Barber, for sure. He taught me about different flying modes. This is a really good concept for pilots starting competition. The idea is that you use different approaches based on (1) how high you are and (2) what's ahead of you. This is the familiar "shifting-gears" concept. The important thing to develop is when to shift gears.

I suggest pilots give themselves a survival zone. Let's say 4,000 feet (1220 m) over the ground. Above that you skip weak lift and below that you'll take anything. When in survival mode you may make a 90° turn to go to lift or even go back to a climb if things get tough. What's important is that this concept will help you get to goal consistently.

Pilot on final at goal with drogue chute.



I have taken this idea one step further. I realized that the two factors—altitude and what's ahead—combine to require several "gears." For instance, the fastest gear is when you are high and clouds, birds, dust devils or turning gliders are ahead to indicate good thermals. A medium gear is used when you're still high but it doesn't look so

good ahead. Finally, the lowest gear is when you're in survival mode (you are low and it doesn't look good).

In the past I never had a survival zone. But now that I do I've been more successful. It's important to remember that a meet is long; consistency counts. When you don't know what's ahead (or you know it's not good), it's necessary to shift down a gear. Take anything; gather other gliders and go with them. You should be racing *only when you know you can make it*—you're almost sure to get a thermal.

The exception to this rule is when you have to make up for a bad start in a meet. Then you might as well go for it. I actually like this situation at times (but not too often) because it's an opportunity to try things I wouldn't normally do.

It should be clear that there are two ways to treat doing poorly. You can get down and bummed out, or you turn it into an opportunity. I've learned the most at a meet in these situations. I'll try an early bird start, a late start and especially racing hard.

You really won't learn the racing aspect of competition unless you go for it. And you will go down at times. It's really important not to get emotional about it. You must tell yourself you didn't have a bad flying day, you had a good learning day. You must turn everything into a positive. Every time that would happen to me I would immediately—even before breaking down my glider—go through the flight play by play to see what went wrong and analyze how to do it differently and get past a similar trouble spot.

So you advocate new competition pilots going for it?

Yeah, up to a point. Of course, it's nice to make goal, but after you make goal a few times you should turn the boiler up a notch. It's always harder to speed up your general style than it is to slow down. Therefore, it's better to start out going fast—flying aggressively—and err on the side of too fast, as long as you don't let yourself get discouraged when you don't go very far.

You've got to try things and not be afraid to make mistakes. The only way to get good at competition (or any part of flying) is to build experience. The only way to build experience is to experiment. People who learn slowest are those who are too conservative and afraid to try new things.

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Do you suggest that pilots starting out key on pilots better than they are?

Certainly you can learn a lot from the good pilots. Start by asking lots of questions. Go bug the guys you respect who are doing well. Watch what they do and try to fly with them. That's the most important thing. When you get to fly with the experienced guys, pay real close attention to their decisions. Don't just follow blindly, but try to understand what they're doing and why they are doing it; why they've chosen certain lines; why they've ignored or stopped in certain lift. Then, pay attention to the results of those decisions. Did they work well, or didn't they? Remember, nobody's perfect and even the best pilots make mistakes now and then.

Of course, when you are new you are slow and can't keep up. The time to goal of a new pilot is usually $2^{1/2}$ times that of the winner. So the secret is to take an

early start on course to give yourself the best chance to make it. If you get a late start you will run out of time. Many new pilots are afraid to start early 'cause they will be alone. But if you start late you'll soon end up alone anyway, and when you are with other pilots they will probably be slow pilots making the wrong decisions.

When you go out first the best pilots will catch you, then they'll race on and the next best pilots will catch you and so on. In that way you'll often be with many good pilots and will learn quickly.

When you go **out** first the best pilots will catch you, then they'll race on and the next best pilots will catch you and so on. In that way you'll often be with many good pilots and will learn quickly. If you go late you'll only learn from your own mistakes (and have to make them all to learn everything). By going early you'll learn by watching the decisions of the top pilots.

Aren 't the lead gaggles pretty intense?

Not really. We certainly often leave lift that is weaker so you have to be alert. But we cooperate until final glide. Jim Lee says, "All the other guys are your buddies until final glide!" He always tries to surround himself with good pilots.

There are positive and negative ways to work with other pilots. The wrong way is if you just fly behind the other guy and don't do anything. Even as a beginner you should do your part. Take advantage of the power of numbers and spread out, while at the same time moving towards the guy with a better line. If someone in this situation finds lift he usually stays while other (higher) guys should search a little to see if they can find something better. If so, the others move to it; if not they go to the marker pilot. By working with the other pilots in your gaggle you can accelerate it to beat the rest of the field. Everybody cooperates until final glide.

One of my best meet moments is getting with competition buddies and cooperating into goal. But I like flying alone and only occasionally linking up with others. I have an advantage there because I've been competing a lot as well as flying record attempts. That really teaches you to make your own decisions and pick good lines.

When you are beginning your decision skills are weak, so find someone better to stay with. I like it when others want to stay with me and not hang back, but **try** to jump ahead. Just as long as they aren't pimping.

Explain pimping in its flying form, Paris.

That's when a pilot always follows behind on glide, rather than spread out and cover more sky (see figure 1). A good example happened in this meet. Terry Presley got noticeably better. At first he couldn't stay with me and always followed behind. Then he started leaving at the same time rather than try to follow and we worked together. You could visually see that he learned a bunch in this meet.

You have a little different approach to entering a thermal, Paris. Would you tell us about it?

Sure. When reaching a thermal and feeling a wing lifting, instead of diving right into a steep turn, I like to stay on the edge for a moment. That gives me two things: I find out the size and I can make sure I'm not turning before the best part

of the thermal. Sometimes I'll go a little further until it tapers off to make sure I'm in the best part. Once I do turn, I always turn toward a lifting wing and this action generally takes me to the best part of the thermal.

That procedure is for fairly large, benign thermals. If they are strong and punchy, I'll do a steep turn to hook the core, then flatten out to center and maximize the climb. In Texas and Florida the thermals are big with soft entrances and exits. So I use the first technique to find the best core.

What do you use beside thermal efficiency to outperform other pilots?

When I go through a field of pilots it's because I capitalize on three big mistakes. They are: Either the pilots are too conservative, too aggressive or they stop before they get to the best part of thermal cores. An example of the first case is they stop in weak lift when high. In the second case, they pass up too much lift and get stuck down low. Remember, speed is not about pulling in the bar; it's about flying efficiently. In the third case we should recognize that around nearly every major thermal core are bands of lift (and sink). It takes experience **to** recognize this matter and capitalize on it. If you are away from the ground and the thermal is broken up and down, you are not in the core. The core is solid and smooth.

If you are low you have to take what you can get. But if you are high you have time to search a bit, even if you take 1 or 2 minutes; if you find 400 FPM (2 m/s) you will quickly gain back the time.

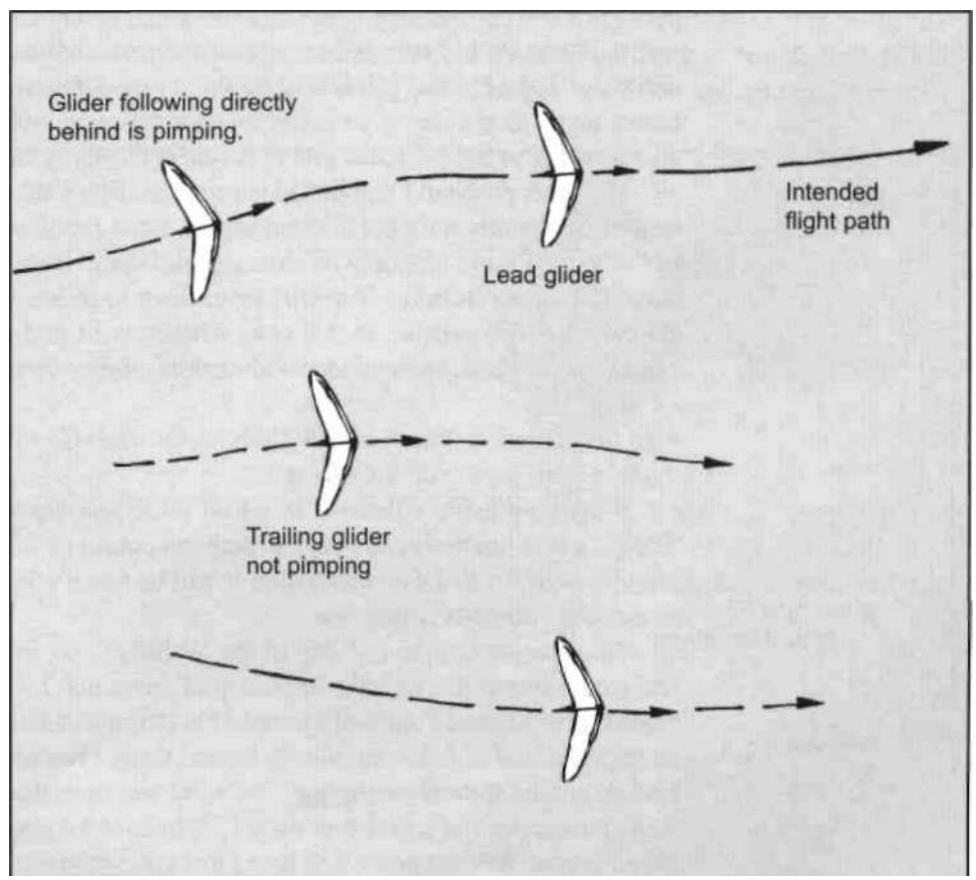


Figure 1 - Proper Etiquette for Group Gliding

I know you faced some pretty serious gaggling at the World Meet this summer (Algodonales, Spain). Can you tell us how you got through it?

Intense gaggles in large competitions can get overwhelming. The important thing for a newcomer is to not run scared away from it. If you're leaving lift just because of the gaggle presence, you will go to the ground sooner or later. There are actually two problems here: pilots who run away from gaggles and pilots who always run to them.

I learned to solve the first problem by avoiding focusing on the entire gaggle. I would look up and get vertigo from all the gliders milling around. But I learned a trick: only focus on the 3 or 4 gliders around you. They are your only threat. Those above or below you aren't an issue unless you climb better or worse than the rest. Then you add a glider to your focus as you near it while dropping off the ones you get separated from. Practice generates comfort. If you run away from gaggles you will sometimes miss the only lift in the area.

Only focus on the 3 or 4 gliders around you. They are your only threat. Those above or below you aren't an issue unless you climb better or worse than the rest.

Timid pilots can be a threat in a gaggle because they throw everyone off by turning too wide or not holding their course. If you are bobbing and weaving you throw the whole gaggle into disarray and then things become less safe. It's actually safer to avoid being too timid. You should keep your head pointed in the direction you want to go. That's our main means of communication. Move your eyes around, but keep your head in the general direction of motion.

By having all those pilots around in the gaggle you can watch the thermal dynamics as it progresses upward. Does it have surges? Is it moving rapidly or drifting? You should always be ready to shift your circle with the group to the best areas of climb. The top pilots will do this often. Of course, a few pilots are combative and will get inside your circle and knock you out. But the mark of a good sportsman is to be courteous and beat others by outflying them.

The other problem I mentioned is common. Many times the gaggle is not in the best lift, especially if it's not the lead gaggle. Look for other signs and don't be a victim of gaggle suck. Not only do slow gaggles slow down your flight, but they also slow down your learning. You will never learn to make your own decisions if you always stay with gaggles. In that case, when you do find yourself alone your anxiety will mount and whatever decision-making ability you have will suffer.

Like all top pilots, you seem to glide really well. Can you expose some of your tricks on this aspect of X-C flying?

When you leave a thermal to go on glide you have to choose the best line. There's a fine line between going straight on course or following a lifting line taking you away from the course. Often it will be faster going off course to fly along or get to an obvious lifting line.

For example, on the last day of the Wallaby 2001 meet, the lead gaggle went straight on course line near the beginning of the round. I was about 2 miles (3.2 km) behind them because I realized I jumped the start gate a few seconds early and had to go back. Instead of following blindly behind them, I turned right to go to a street that hooked around toward course line. The wind was from the right and the street eventually put me right on course line when I got to its end. I went right to cloud base without a turn and flew the entire first leg of that task with only a few 360 turns. The lead

gaggle had to stop and work weak lift. I ended up 4 miles (6.4 km) ahead of them and went on to win the day, 10 minutes ahead of the second place pilot (Manfred).

That's a good lesson, Paris, and it also illustrates how it ain't over 'till it's over. No use in getting discouraged when you make a mistake, because there's a lot of drama yet to come.

Yeah, that's an important point. Concerning gliding, I'm a strong believer in lift lines or strings, as I like to call them. They are especially important to use on blue days because the cloud guidelines to the placement of lift are absent. On headwind days they are equally important because the lift helps to block the wind. Whenever you start feeling some lift, relax and pay really good attention to which wing lifts. To do this you must maintain a light control feel. Usually the line will meander and more often than not will lead you to a thermal core. This phenomenon occurs at all heights and is generally lined up with the wind.

On crosswind courses, it's often best to find a line and run cross-course a bit on a line to find a core. Also, when going to a climb (a gaggle) or lifting area, it's best to go to a downwind point and track upwind to the lift area (see figure 2) because you will be flying in lift longer if it is strung out and may find a better core.

Jim Lee and Manfred Ruhmer seem to be the best at picking good glide lines. When I first was flying with Jim, he was trashing me on glide. I eventually realized Jim was working better lines. Now instead of blasting through bumps, I expect they are part of a line. When going crosswind, a lot of times I'll turn 90° into the wind to go along a line. If it leads to a thermal, good. If not, I gain altitude or lose less and am upwind of the course line.

I always try to choose a line upwind of the course if possible. The main reason is that every time you circle you will be drifting back to course line. If you have to make a low save you can drift and get up. If you are on the course line

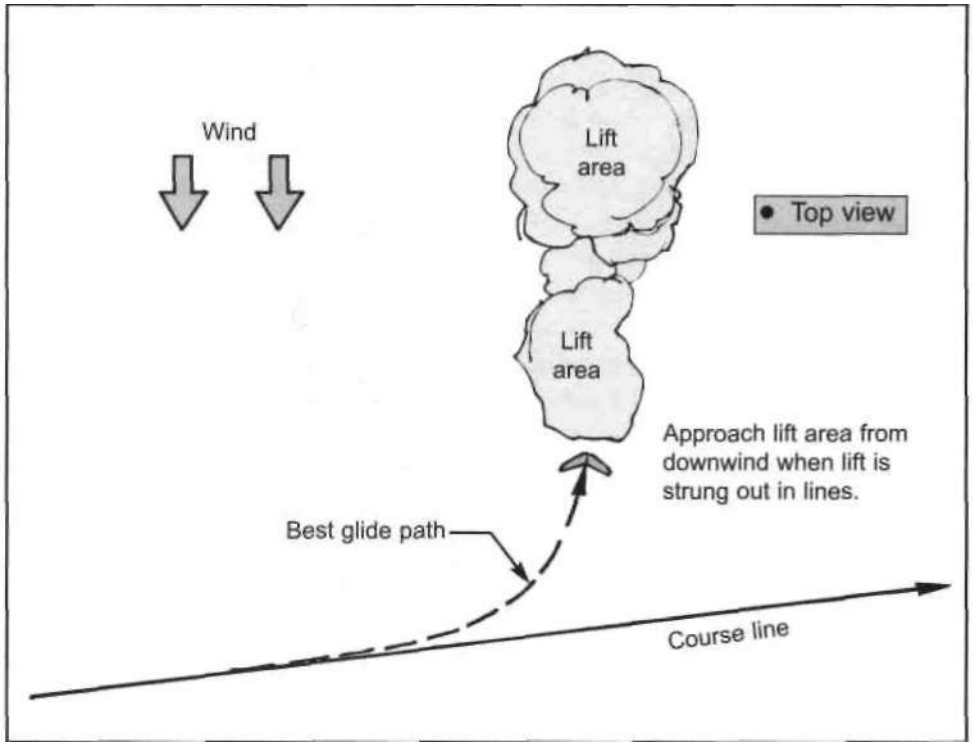


Figure 2 - Going to Lift in Crosswind Course

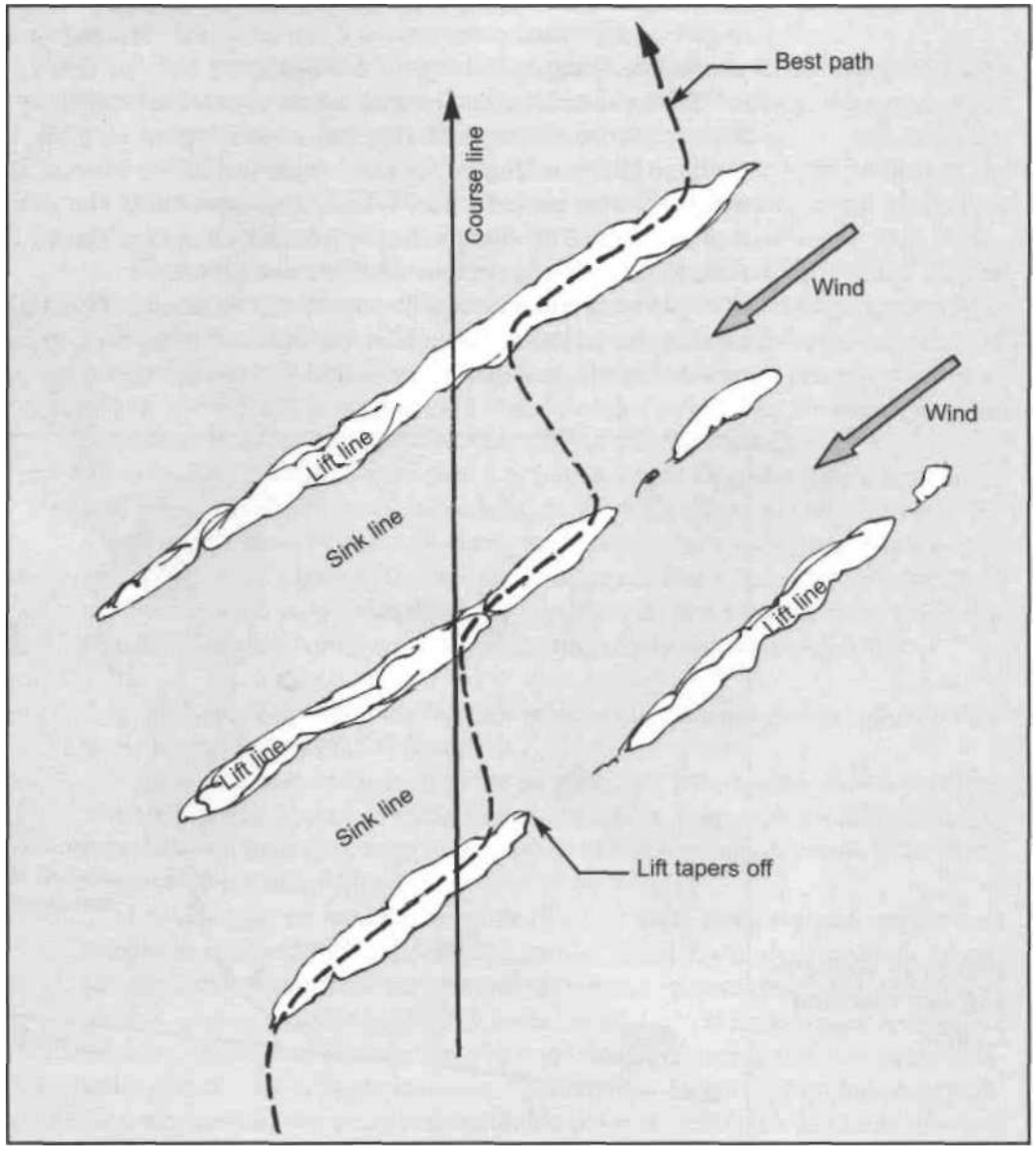
and have to make a low save you will get way downwind and it's hard to get back.

What competition comes down to is who is the best educated-guesser. I believe that there are streets almost every day to some degree—even on blue days. They are especially important to use on blue days because the lift blocks the wind.

I think crosswind flying is even harder than upwind flying. So you must top out in the lift. It's important in a partial crosswind to cross streets or lift lines by sawtoothing upwind. You run upwind until the lift starts tapering off, then jump perpendicularly to the next street and repeat (see figure 3). You usually get **a** choice of several lines. You want to pick the one that's closest to the course line or upwind if the wind is cross.

The only time to dive across a blue area is if you would have to go too far off course line or if obvious good lift is on the other side that you can reach. When you get into a situation where you have to go through the blue, get as high as possible, gather your buddies and go out together in cooperation. If a couple guys are close, wait until they climb up to you to gather some searching power.

Figure 3 - Sawtooth Course when Lift Lines Occur on a Crosswind Course



It sounds like you have a constant awareness of your surroundings and what's ahead.

Yes, I try to be absolutely aware of as much that is going on in the environment around me as possible. There is usually so much going on that it's an incredible feat to keep every sense on high alert and to maintain such a high concentration. I find that when I'm doing this well my level of consciousness is heightened, and it feels like I'm in sort of a dream state. It's a dream where no one thing is taking all of my focus. For example, I find I can put as much energy as necessary into maximizing a shifty thermal, but there's still plenty of awareness left over to study the sky and plan my next action. Then, when I do take action it doesn't consume all my attention. I may be heading for a desirable climb, but I'm still completely aware of that street to one side, that at first glance looked like nothing special, but is now building and lining up a bit more temptingly. Or that band of cirrus that is moving in a bit faster than expected and may soon shut down my current line. Here is where a radio transmission can blast me right out of this state of awareness, and it can take me a good while to find it again.

Another part of awareness is to be on the lookout for our feathered co-pilots. I'll constantly scan back and forth, looking for birds. It's amazing how often you'll see birds if you pay attention. Scanning helps you see motion better, rather than staring straight ahead. Whenever you see birds gliding high, it's often because they just left lift. If it's in my general direction, I'll fly towards where they came from and often get a thermal.

In Florida I fly with a lot of birds. They vary in their usefulness. Turkey vultures can work incredibly light lift. Vultures better be climbing much better than you if you are going to them or you're going to be disappointed when you get there. They almost seem to avoid the strong cores. On the other hand, they seem to hang out in general lifting areas and are experts at following lines. It's usually beneficial to follow their lines.

Birds of prey and swifts or swallows are more reliable and useful. By watching the rate of climb of hawks you can assess the thermal and they are almost always in the best core. Swifts picking up insects are indications of good cores. Black vultures, hawks and eagles have climb rates that are similar to hang gliders, so they give the best indication of the strength of a thermal.

That's a good discussion on birds, Paris. We all need to become more attuned to our natural surroundings, if not bird-watchers. Can we turn our attention to gliders? We've discussed design in the past. What do you think the next step will be?

I feel that class 1 gliders (flex wings) have started to plateau out. But I took a • step back and realized that we need two different hang gliders in one. We need one that gets a very good high-speed glide and one that can slow climb and land easily. What I believe we need to focus on is expanding the envelope of variable geometry. One way do this is to incorporate flaps or variable reflex. I have done extensive testing on this concept and believe we can achieve some real performance benefits.

What we have been focusing on is eliminating drag. We eliminate one thing and realize that smaller and smaller items are important: sleek harnesses with pointy boots, thin wires, faired control frames, etc. There's been a lot of equalizing of contest gear and now the winning is based more on decision making.

How important is the handling setup?

Very. It's always a compromise between handling and performance. A mistake I made in the past was to have my glider too tight. You must always have

100% control in a thermal to climb effectively. One advantage of guys that have been competing for a while is that they can fly a stiffer wing and still be in control. It's a matter of anticipation.

Every pilot has to tune his or her glider to suit their skills. High-siding is very important for a good climb. I set my glider up so it's perfectly neutral in a turn with the VG off. That way I can dial in the amount of high-siding I want with the VG, since adding VG pull increases the overall anhedral in the wing. This is one reason why some glider manufacturers don't use the new cam VG system*. The simpler, non-cam VG system changes the anhedral much more, and this is something that can be used to your advantage.

High-siding is so important because it allows a tighter circle for a given bank angle. But you don't want to be high-siding so much that you wear yourself out. In this sense it comes down to conditioning. The guys who are flying a lot of comps can high-side more.

It's very necessary to be totally familiar with your equipment. You must have a vario with a final glide calculator and you must know how to use it. Practice at home by setting a goal with known coordinates.

An audio speed-to-fly on an instrument can actually be detrimental. The noise distracts you from the all-important skill of feeling the air. I like to use just a visual speed-to-fly to initially set my glide speed, and then I focus on maintaining a more or less constant pitch pressure. As the air lifts or sinks, the nose inherently wants to follow it, so I let it. The stronger the lift, the higher I let the nose rise, slowing down more. The stronger the sink, the more I let the nose drop, speeding up more. I find this method is more instantaneous and more in tune with the air than mechanically following an arrow or beeping signal. The whole key is becoming in sync with the air.

I know you just spent a lot of time at Zapata (Texas) with Manfred Ruhmer setting records. Did you learn anything there?

Well, Zapata is so small there's not much happening at night so we had plenty of time to shoot the breeze. An interesting thing Manfred pointed out relates to racing. He said a lot of people race well, but slow down in the last section—10 miles (16 km) or so before goal. People lose 15 or 20 minutes this way. He pointed out that you shouldn't treat this last section any differently. Use the same speed up, slow down methods all the way through the course to goal.

Zapata was a really good chance to observe Manfred. He is exceptional at minimizing mistakes and covering his mistakes. He's really good at choosing lines as I said earlier, and he's perfect at choosing the right speeds to fly. He knows exactly when to shift gears.

On the other hand, he came off the pedestal for me. I found I could fly with him much of the time and I gained much more confidence. As we all know, confidence is the name of the game in our sport where we're racing into the unknown.

Are there any last thoughts you wish to leave with new competition pilots?

Tame your emotions. Excitement and nervousness will adversely affect your decisions. Keep a clear head and relax, even when you make a mistake or bad decision. The two words I focused on in this meet were equanimity and awareness.

Those are two good words to leave us with, Paris. Thanks so much for your insights and we wish you a long and prosperous run of competitions.

* A VG system that uses levers at the end of the crossbar to spread the leading edges, rather than moving the crossbar fore and aft with a pulley arrangement.

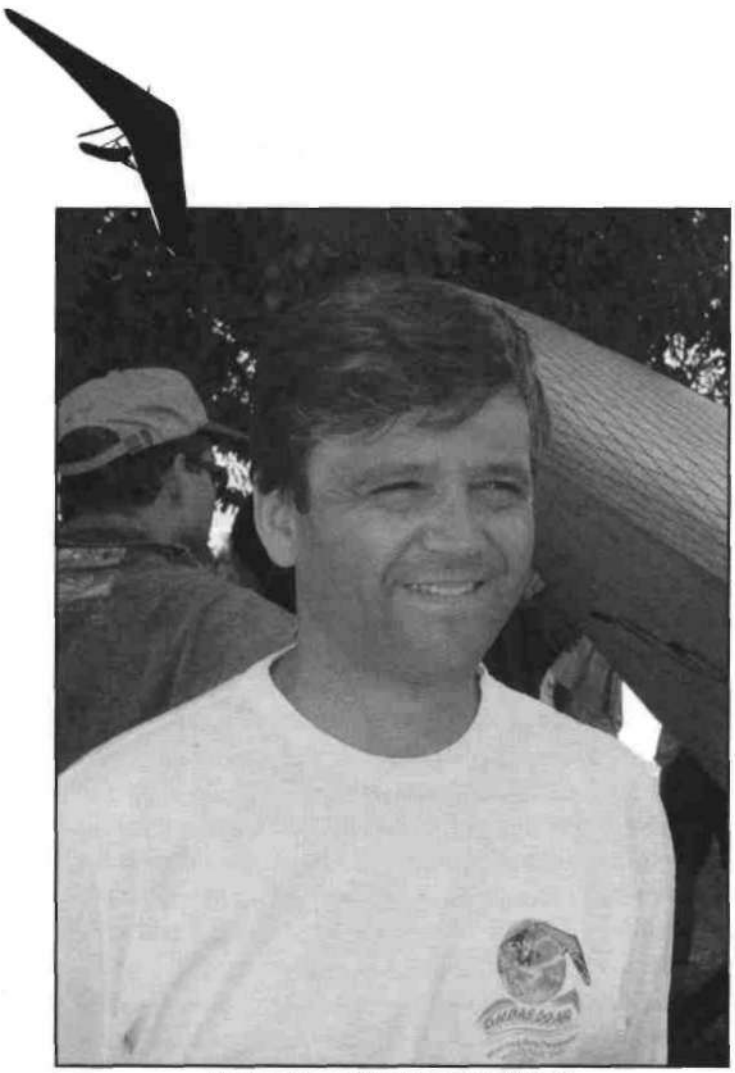
THE BOYS OF BRAZIL

We depart a little here from our standard format to introduce three pilots on the Brazilian team. The Brazilians are interesting in that they come from a country with a relatively small pilot population, yet they have produced world class pilots for two decades (including one World Champion, Pepe Lopez) and have won the World Champion Team title in 1999. Two other countries—England and Austria—share a similar story. The Brits were dominant throughout the late 70's into the late 80's with a couple of World Champions (John Pendry and Robbie Whittall). The Austrians were the 2001 World Champions with Manfred Ruhmer the multiple individual champion. But it seems that the Brazilians have had the longest run of talent and a depth of talent that is unparalleled.

Pepe Lopez won the Worlds in 1981 (he was also the world surfing champion). He and his teammate Phil Hagler were contenders for over a decade. Then we have to remember Paulo Coehlo who rose from the abject of poverty of the Rio favelas to become one the world's best. Finally we come to the current era where the Brazilian team finished 2nd, 3rd, 4th, 9th, 11th, 25th and 52nd in the Monte Cucco World Meet (Manfred won, and the 52nd place went to Carlos Niemeyer who couldn't fly the last two rounds). Placing four in the top ten was just short of a miracle.

With such a legacy we could have interviewed five or six Brazilians and still have been talking to World champion contenders. We met up with Andre Wolf at Govenador Valadares in Brazil, Bethino Schmitz at Wallaby Ranch and Luiz Niemeyer at Algodonales, Spain. But we could have as readily talked to Pedro Matos, Nene Rotor or Gustavo Saldanha and ended up with nearly the same information. Naturally, we were interested in their individual development and insights, but most especially in what makes Brazilians so good in general as a team specifically.

ANDRE WOLF



André, the golden boy from Brazil.

ANDRE'S ANSWERS

Andre Wolf had been flying for 15 years when I interviewed him in 1999. He had almost won the World Meet that year. He was full of confidence but realized he still had more to learn. His success story is a tale of hard work and dedication which has continued to this day to pay off.

Tell us about the beginning of your flying, Andre.

I started when I was 21 near Sapiranga, in southern Brazil. I saw it on TV and said "I have to do this!" That was in December and I took my first flight in January of '84. I went to Los Angeles to see the Olympics five months later and contacted some pilots there. I asked, "Where's the best place to fly?" They said "The Owens Valley!" So I rented a car and drove there. I rented a glider (my first double surface) and a harness (my first cocoon). I told them I had two years of experience rather than five months. I flew from Horseshoe Meadows twice. There were so many thermals I couldn't land! I was scared silly. I decided quickly that I wasn't ready for that and went home with a new respect for the sport.

After that I flew locally at home for four or five years then entered my first competitions, our Regionals and Nationals. I had become better through hard work and determination. But I couldn't beat Beto (Bethino Schmitz). He won the Regionals 9 years in a row. That made me mad and I set a goal to beat him. I ended up flying with him a lot, and that's what made me good.

Beto is a natural (see his interview later), but I'm not. I got better through

effort. I compare Beto and me with Manfred Ruhmer and Gerolf Heinrichs. Manfred and Beto are the naturals while Gerolf and I are the workers. Gerolf learned a lot from Manfred and applied his strong will and desire to get to the top. I did the same. Gerolf quit a career as an aerodynamicist to be a top pilot. He's totally committed. Likewise, I was a planter until two years ago when I decided to rent my farm out to ten different people. Now I just manage it and am free to compete as much as I want. That type of commitment is the key to success, I believe.

I was a planter until two years ago when I decided to rent my farm out to ten different people. Now I just manage it and am free to compete as much as I want. That type of commitment is the key to success, I believe.

If you can only fly on weekends you probably can't be World Champion. The obligations of family, job and distractions take away from your focus. Manfred (and now Gerolf) are in perfect position to be champion because their every day job involves tuning gliders and flying. These guys are thinking about hang gliding 24 hours a day.

My turning point was in 1989 when I saw the Pre-Pre-Worlds in Govenador Valadares (Brazil). It was the spark that made me realize I had to try for the top. I bought an old car and left it in Govenador and would fly by plane to there around eight times a year. It is good all year around and a great place for racing. There are abundant thermals well-spaced clouds and many routes possible.

In 1990 everyone wanted to make the national team. There were five allowed to go to the Nationals from my region and I was the fourth qualified. I didn't make the team, but in '93, '94 and '95 I won my Regionals by beating Beto. After that we both quit competing in Regionals because we were pre-qualified for the Nationals.

My first really good results were for the 1994 Pre-Worlds in Ager, Spain. I was the highest placing Brazilian. Next year I became the Brazilian champion, but I had to leave the World Meet because my grandfather was dying. In the '97 Pre-Worlds (Australia) I didn't do well, but in '98 I finished 8th. The best moment in my flying career up to that point was being Brazilian champion in '95 and that 8th place in the Worlds.

Andre shows his takeoff form at Algodonales.

After that I decided that maybe I could get a little better, so I went to Europe. In the Italian Nationals I took 3rd, behind Guido Gehrmann and Christian Ciech (Italian). Then I won the British League meet at Monte Cucco, Italy just before the 1998 Pre-Worlds. Finally, I hit my highest point so far the next year when I placed second behind Manfred in the World Meet. I was in first up until the last flying day, but I got conservative to avoid losing it all. Anyway, I think Manfred is the world's best pilot and he deserves to win.

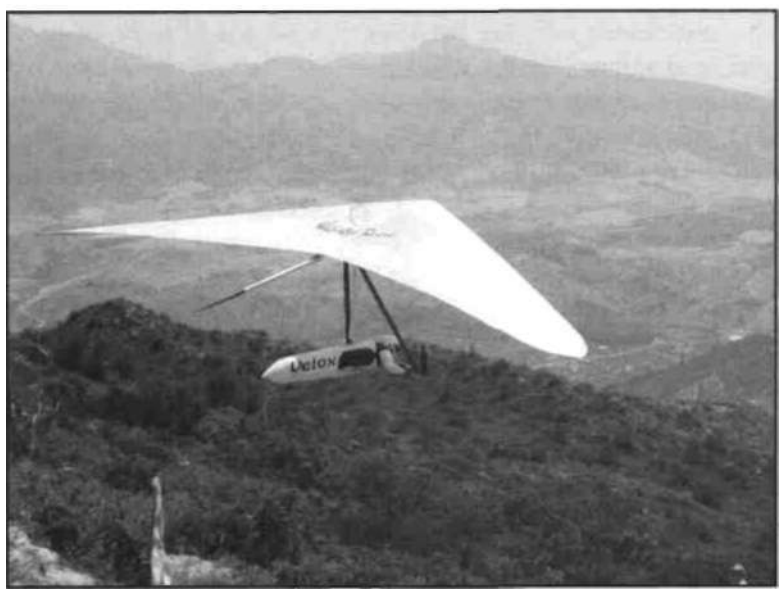
Can you think of anything specifically that you did to get better Andre?

In '95 I looked at the top pilots and noticed they were all skinny from the waist down and very strong from the waist up. So I hired a personal trainer and worked out five days a week. My trainer looked at films of flying and gave me specific exercises to do, which I still perform. I believe it made a lot of difference. In Ceara (northern Brazil) I flew for 7 hours X-C and I knew after I landed I could have flown 3 to 4 more. It was like riding a bull, but I'm prepared for it thanks to my exercise program. I believe the best is to build your upper body if you want to **excel.**

Isn't Ceara where there have been international meets and record attempts?

Yeah. It's a great place to fly because it's dry so the thermals are strong, but it's pretty flat, so even in strong wind there isn't turbulence. It's something like the flat lands of Australia or southern Africa. I went to South Africa in February last year to try to set records, but every day there were thunderstorms.

I find I do better in the flat lands because that's what I'm used to. I usually can't fly as well in the Alps. I don't know why but I think it's because I don't have a feel for how close to be to the big rock walls. I need more practice to get better judgement and experience in the thermals. Gerolf says the thermals are different; they are chalk-bubble thermals *[Ed. Note: small masses of heated air formed on the exposed chalk surfaces common in the Alps]* that are explosive but very short-lived. They're very strong, then they're not there anymore. The trick, he says, is to get closer to the mountain—as close as you can—and turn sharper when you hit a thermal. You have to grab a thermal immediately then leave as soon as it dwindles.



Andre is lean and clean in the air.

Can you give us other advice for getting better?

Well, I already mentioned dedication if you want to be good at competition. I think if you truly want to get better you have to do lots and lots of competitions. Even if you're in a great place but fly alone or with guys who don't practice much 360 days a year, you will not really get good. In competition you will glide with 5 other guys and learn 5 times faster. You simply must compete to really get good, especially at cross-country flying.

If you're flying locally you must set tasks. Do triangles, out and backs, etc. You must have an objective and focus on a goal. You have to set tasks on every flight and try to make a goal. Don't fly just for flying if you're planning to be a top pilot. Have a task in mind every time you launch.

Andre, do you get nervous in competition?

Yes. I'm a chicken on launch. If I don't think the situation is safe I won't launch, even in a World Meet. I won't compromise safety on launch. But once I'm

in the air I'm never afraid.

Part of the nervousness used to be the pressure of competition, but now I'm used to it. The secret to getting over competition jitters is to do them a lot. It made a lot of difference to me in Australia 'cause I was real cool. It helped to be experienced at towing.

A bigger problem for me used to be when I did poorly. I would die and feel like shit. Then three years ago I said to myself, "Hang gliding is so great that I should *never* feel like hell, as long as I don't crash." I came to realize that hang gliding is so complex with different conditions, thermals and other effects every day (or hour) that it's hard to control or predict everything. It's not like swimming where every 50 meters is repeated. Some things are going to surprise you and sometimes you're going to lose.

Usually you can learn more from the hard or the poor flights than you can from the easy ones where everything works.

When I do poorly I think about the flight for 1,2 or 5 hours if necessary to figure out the mistakes and what to avoid. The important point is to learn from every flight. Usually you can learn more from the hard or the poor flights than you can from the easy ones where everything works. Once I do the analysis though, it's important to put it aside and look towards the next day positively.

My original problem was rushing. Sometimes I'd be flying like a jet. I thought you had to fly real fast to be fast. Then I worked on slowing down to make goal. I think it's easier to slow down if you've been going too fast than to speed up if you started out too slow. I think Manfred lost the World Meet in Ager (1995) to Tomas and Australia (1998) to Guido because he was rushing.

I used to fly off on my own, but eventually decided going on my own was not the best. Every time I went on my own I got behind the lead gaggle. Even Manfred who's the best at getting into a thermal right away can't always find the thermal best without the rest of the gaggle helping the search. My advice to pilots coming up is to try to get with the lead gaggle, and once with them don't leave until you have years of experience. I tried many, many times in different ways to beat the lead gaggle and I never outdid them.

Pilots who have reached a good level, tell many more stories of having had a bad day because they rushed, rather than stories that they should have gone faster. One example is head wind flying. I used to have a problem with this until I developed patience. That's how I solved it. Patience is the name of the game once you get to a certain level. Incidentally, Manfred has told us that he practiced head wind flying a lot.

Andre, let's talk a little bit about the mental process in the air. How are you thinking about everything? What about confidence?

Before a flight is when I do most of the thinking. I try to establish a strategy depending on the conditions and where I am in the standings (do I need to be conservative to hold on to a high place or go for everything). Then after takeoff I try to go with the feeling of the moment to carry that strategy out. For example, today (at Govenador Valadares during the World Hang Gliding Series) there was quite a bit of wind, which isn't normal. So I kept reminding myself that things were different. Every drifting thermal helped remind me. I kept telling myself, "calm down, don't rush."

At the same time I'm processing information—what is happening in the distance, how the clouds are developing, etc. I'm thinking of how to stay with the

good guys and how to get an advantage. I'm now getting to the level that I can think of the whole flight and nearly figure out what to expect the entire way. Today, for example, I got a vision of the whole flight and it proved accurate to my experience all the way. I think the good guys do this very well. This practice helps you avoid surprises and also prepares you for the tough sections. It helps you shift gears up or down when necessary.

When we went into the second leg today and hit the head wind we had to change our style of flying. I was able to right away because I expected it and was prepared. Another example of necessary change is when clouds disappear. This ability to go with the flow is another trait you are either born with or must learn. I'm the second type and had to learn the hard way.

The matter of confidence is very important, very important. I developed confidence from lots of competition experience, but I also have a confidence building vision: I always think I'm going to make goal and make it fast! I'm constantly imagining the last thermal and crossing the goal line. It helps draw me on. Confidence is at least 20% of everything in flying, so every pilot should find his own confidence-building tricks.

Now days when I don't make goal, I don't think it's because I'm not good, it's just because I was racing too fast. If I'm in too much of a hurry I may pass up lift or leave thermals too soon.

Can you give us a review of your thermal technique?

At the beginning of my competition experience I was a medium to poor thermal pilot. Now I'm a good thermaler—better then many of the top pilots. I improved my technique by working on getting to the center of the best core right away, within a few seconds. I center by waiting—I feel most pilots bank up too soon. I wait until the instant the climb reduces, then I turn immediately. I slow as much as I can while fighting to keep the wings level. Then when it's time to turn, I turn to the lifted side (if any) of course. You can see Manfred slow way down like this—he looks like a drunken pilot and almost stalls before he turns. Manfred often gets 10 meters (33 ft) on other pilots by slowing in the lift this way. (Of course, you have to remember that Manfred has tumbled twice.)

I think the ability to tell the movement of a thermal is one of the big differences between pilots.

Besides centering right away, the other important thing to be a good thermal pilot is to feel how the thermal is drifting. It's hard to explain, but I can only say it's a matter of feeling. I think the ability to tell the movement of a thermal is one of the big differences between pilots.

When I get more than half way from the ground to cloud base is when I really do well. I observe the relationship of the wind, sun and cloud. I try to position myself to climb to the area on the cloud where the sun is heating it and also the upwind side. I try to use the cloud shape and positions when I'm cloud flying. All this takes awareness and focus.

I climb very similar to Beto—we're rivals but we're also teammates and help each other develop. We both favor flat turns with a strong yaw input on the bar. I have the strength to do this and it helps a lot.

Do you think the glider or equipment in general is important?

Absolutely, yes. It makes a big difference if a guy is connected to the factory. With the factory behind them these pilots can get the best stuff but also have the

benefit of all the tuning experience of everyone on their glider. Tuning is just like for cars in a race. It is almost more important than the driver or in our case the pilot. This is what makes the big difference now days. The top ten gliders, for example, are completely different from the stock factory gliders.

If you don't know how to tune a glider with all the tricks, you need to learn.

If you don't know how to tune a glider with all the tricks, you need to learn. I spent 30 days with Gerolf and he told me as much as I wanted to know. He believes that things should be shared to promote growth in the sport. We all should pull together so everyone goes up. Many good pilots are like this and are willing to share.

In terms of my Laminar, here's what I do:

1. I go down on the inboard sprogs (washout struts) and the outboard ones too. You have to be careful about this and only do as much as your experience, skills and balls can handle*. Go a little bit at a time—it's tricky. I never used to do this, but Gerolf taught me how and what the limits were.

Andre crossing goal on the last day of the 2001 World Meet.

2. Fly with ballast. The new gliders handle weight very well because they are stiffen Ballast increases your speed when gliding and hardly affects your climb rate. I am 74 to 75 kg (163 to 165 lbs) and I typically use 5 kg (11 lbs) of ballast (although I'd go up to 8 to 10 kg in certain conditions). All the top pilots use ballast except Beto who's flying a smaller glider. Gerolf and Manfred use it for sure. The benefit is you can fly at a higher wing loading without going to a smaller glider, which often will have a performance disadvantage.

3. Get the best airfoil possible. Manfred knows airfoils (on the Laminar) because he spent three years testing and changing them. Competition airfoils aren't necessarily those on production gliders.

4. Use thin cables and a profile (airfoil) speed bar (base tube). You have **to have** these items in order to keep up.

I believe there's still some things the factory pilots are doing on the Laminar that the rest of us don't know about. I think it makes a difference for Manfred and a few others.

I know you have some thoughts on the future of hang gliding. Do you want to mention that and any other last thought, Andre?

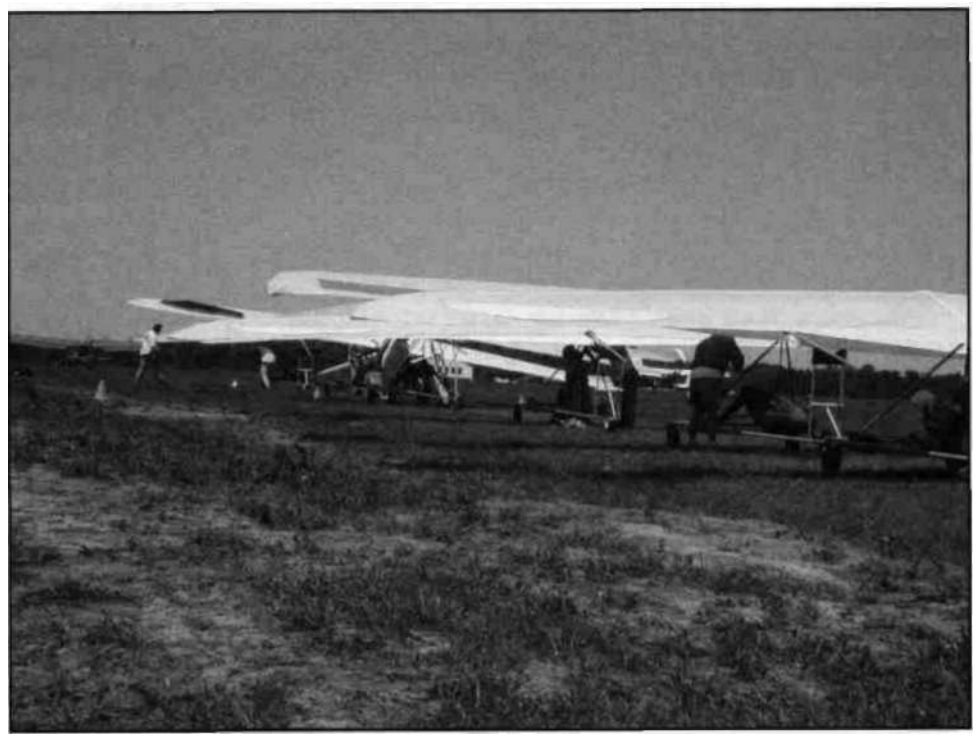
* Note: Lowering sprogs (washout struts) reduces pitch stability most definitely. We don't necessarily condone this action in this book. Consult your manufacturer if you have doubts or questions.

I'd like to first summarize my advice to average pilots in three points. First, if you really like hang gliding and want to do better, the will to get to the top is the most important thing. It is what will make you excel, even if you think you are not good. Second, try to compete as much as possible. You'll find the learning curve is incredible. And last, try to make friends with a better pilot than you. You'll learn much faster.

One good thing about hang gliding is you can do it at a much later age. I'm 36 and I'd be washed up in most other sports. But I can have 30 more years of great flying and develop all the time. We should do amazing things in 30 years. A good example is the Italian, Emilio Bricoli. In the 1998 Worlds I barely beat him and he was 52. It's great to have that image in my mind, 'cause it gives me a feeling I can go on forever.

However, I do look on hang gliding with sadness when I see it going down. In fact, I think the only chance to have hang gliding in 30 years is towing. The tow parks are actually growing fast. I also see a change if we can get into the Olympics. It's crazy that there is not one flying sport in the Olympics. We need to change this.

Believe me Andre we are working on it. I hope someday people realize like you and I do what a magic experience hang gliding is. Thank you for your time and I wish you and your team all the luck in the world.



Waiting in line to tow at the Florida Wallaby Open.

BETINHO SCHMITZ

Beto looks for developing clouds at Quest Air.

BETO'S TUTORIALS

Betinho Schmitz, know as "Beto" to his friends, is one of the popular figures on the international competition scene. Never mind his poster-boy looks—that just attracts the girls. It's his friendliness and attitude that make him approachable and a winner. He is serious about competition and his results show it. In my view he is most like Manfred and Guido in that he's a natural pilot. This term, while used a lot, might not be clear unless you understand the development of these pilots. Eventually they have the mental and physical qualities that allow them to learn very fast, to be very attuned to the three-dimensional orientation that flying requires and think in broad patterns (holistically) in an intuitive manner.

I caught up to Beto at the 2000 Wallaby Open (Florida). He was 32 at the time and casting around for a direction to go in order to continue his flying professionally.

Beto, would you please tell us where you are from and how you started flying?

I learned to fly in southern Brazil where I live. My father was an airplane pilot and in 1977 he was flying over some mountains and saw hang gliding. He landed at a nearby airport, got a car and drove to see it. He started hang gliding then. That got me interested in the sport, but I was only 9 at the time and too little. For five years I was looking, listening and helping on launch as well as setting up and breaking down the gliders. Then at 14 my father gave me a glider my size, a parachute and a harness. The glider was a UP Mosquito and he taught me to fly on it.

It was the 8th of February, 1982. That same year I entered my first competition, our Regionals and placed fourth. There were only UP gliders and La Mouette Atlases at the time.

The next year my father gave me his Comet while he bought a new Comet II. He had won the previous Regionals, but this year (1983) I won and he took second. After that he started giving me the new equipment and kept the second hand stuff for himself!

I really am thankful for my father to be so supportive throughout my flying experience. We flew together until 1995 when he died. He was flying a TRX 200 meters (660 ft) over takeoff going in circles and gradually descended into the trees. There was no damage to the glider and the autopsy showed he had a heart attack at 55 years old. It was sad to lose him, but it was also a good way for him to go—doing what he loved to do.

After the win in 1983,1 won the Regionals 9 years in a row—I lost to Andre Wolf in 1992. In 1983 I was second in one meet of our Nationals (we had three, meets)—after one year of flying. In '85 I was invited to Kossen (Austria) for the World Meet—I didn't make the cut. I went to the American Cup on the Brazilian team in '86 and the Pre-Worlds in Australia in '87. After that I competed only in Regionals because my father couldn't afford the expenses and I needed a job. I returned to national and international competition in 1992.

Beta ponders conditions at Algodonales. Note signs of his Red Bull sponsorship.

I wasn't in the Brazilian World Meet, but I was National Champion in 1994, '95 and '97. Andre beat me in '96 and I was second to Nene Rotor in '98. In the Andradas Open (Brazil) in '96 I took second against many of the world's best pilots. Also, I started paragliding that year and in 1997 I became Brazilian National Paragliding Champion. I won the Italian Open in '98 at Monte Cucco, then placed 4th in the British League and 7th in the Pre-Worlds. In the Worlds the next year I came in 4th. Overall, I think I'm gradually getting better.

Why do you think you keep improving?

I'm now making the right decisions to beat some very good pilots. I'm doing better than I expected at times. Earlier I didn't know how to control the right actions. Sometimes I did it right and sometimes I didn't. I didn't know why. So I sat down and tried to analyze my results. When I did it right, I asked "why?" When I did it wrong I asked the same question.

When things went wrong I realized I was stressing, tired or had negative emotions. I looked around and realized many times emotions had an influence on results. So I started reading books on the mental aspects. I read many books on neural linguistics—programming the brain to work as desired. It helped me stay with the right motivation and reach my goals successfully. Sometimes you want

things but you stray from the correct path to achieve them. I have learned to focus and apply myself to achieving my goals.

During the process when things go wrong—like I'm landing short or I leave a gaggle for no reason—I'm analyzing all the time. I'm evaluating what I'm doing and what others are doing. What does Manfred do, what are Guido or Tomas doing? Many times if I'm flying with them I analyze what they are doing and why. If I choose my own way, all the time I'm comparing to see if the thing I did was better or not than the alternative. Should I pull the VG more or less for example? Then I'm always trying to use the things that worked the best in the past situations that were similar to the present.

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Don't forget: We all have one or two special things inside that we can use that others don't have. You can't copy everything. Develop your own special skills.

For example, during the last World Meet (Monte Cucco) Guido went out every night, chasing girls, dancing and drinking and getting only a few hours sleep. He was very relaxed and flew great. Others can't operate that way. Guido and I always talk technique because we fly similarly and we are good friends.

Beto, I have often seen you out in front charging on alone. It seems that you have an abundance of confidence. How has that worked out for you?

Having confidence came with doing well so early, but it was necessary to control over-confidence for me. Sometimes before I would be way, way ahead of the pack. I always had an impulse to push ahead, go in front and cross the line first. It was more than I could control. Now I've learned to control it. I put on the brakes when necessary.

That control came with experience. I've learned more about meteorology, tactics, hang gliders, other equipment and so forth. Now I'm controlling all these multiple options better. I'm selecting the right moment to charge on ahead. I'm more in control and at the same time I'm always trying to learn more, absorb more and gain new experience. I am always observing, listening and learning so I have more information and I'm using it better.

Beto is off and running in the 2001 World Meet.

You know, there are many ways to learn quickly and reach your goals. For me it was to push hard. For others it may be to take the conservative approach, then get more aggressive with experience. I still take chances that may result in me landing short, but if I stop taking these risks, I stop growing. Of course, I'm taking fewer risks now because I know more. I'm pushing just as hard but the risk of not making goal is less.

What can you tell us about your mental process when you re in the air competing?

First, you have to take care of the basics. That means you develop your equipment, tactics and understanding of the conditions. They all play a part. For example, your glider should be the best possible with a clean harness and a good, useful instrument. All this combined is like a system with multiple screws to adjust. You must tweak on each one to get the whole system maximized. If you have more screws and know how to adjust them you can do better.

When it comes to the actual mental process, it's important to have a good model of the situation. Like what are the thermal shapes, what are the daily changes, what is the local wind flow? The more accurate and more clear the model, the better you'll be able to make the correct decisions.

A trick that I picked up from neural linguistics is to communicate with myself in a meaningful way. I write on my control bar certain important ideas that help me focus. What I write depends on what I want to focus on. I may write something to help me do a thing correctly or something to help me avoid mistakes. When I would push too hard earlier, I would write "Patience" or "Stay on top" or "Linger longer," etc. Now I mostly write "Always high, always ahead."

You know, Rich Pfeiffer would write on his bar too. Mostly I saw him write, "No pain, no gain!" Do you operate totally in the logical sense or more on feelings?

In competition I'm not always policing my thoughts or the process. I'm trying to go on feelings during the flight. I just try to get a sense of the thermals, the wind and general behavior of the air and what other competitors are doing to get a sense of their strategies, like do they push or wait, etc. What I start out with is a strategy and backup strategy, then I let it flow from there.

In competition I'm not always policing my thoughts or the process. I'm trying to go on feelings during the flight. What I start out with is a strategy and backup strategy, then I let it flow from there.

When something happens I have an initial impulse. I always try to follow this first impulse. That impulse is a subconscious thing but it comes from years of experience. If I have a second, third or fourth impulse it means I have to make a decision. Then I pause to concentrate and analyze to see if I have been in the situation before or I heard someone talk about it. But the best case is when I have only one impulse. In that case I can just let the glider fly—let it follow the strategy (Beto has a twinkle in his eyes on this last statement).

I've analyzed and know many of my personal impulses. I've found that some are based on past experiences, some are based on fear and some seem to be natural human reactions since many other pilots react similarly to the same situations. So hopefully my natural impulses choose the best reaction to the given situation.

I find that impulse often accompanies emotion—the more emotions, the more impulses. I now control my emotions better, so my impulses are more realistic and proper. They are fewer and more reliable. I'm still willing to follow my impulses because they are producing good results.

Don't get me wrong, I like the emotional flight. When I'm flying in a new place I often feel more emotions and thus get more impulses. These extraneous impulses are distracting and not necessarily reliable. I want my emotions to come before or after a flight—preferably after. Many times I have cried when I cross the finish line (and when I landed short). The completion of a task is such an emotional high that it's hard not to let loose. Hang Gliding is such joy that I'm willing

to let the emotions flow and immerse myself in the experience. I'm not the only one. I've seen Guido jump for joy and I've seen Manfred diving his glider and yelling, just having fun in the middle of a competition.

How important is it for you to get enjoyment out of competition?

Before hang gliding I competed in many other sports like judo, bicycle motor cross and swimming. I always like to compete to test myself. I've found that hang gliding competition is the most enjoyable. The reward to effort ratio is higher. The sense of accomplishment and the joy is a lesson for other aspects of life as well. I've learned that success comes from focus, dedication and hard work, and with success comes joy. That's a good plan for life, isn't it?

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The decision making process in hang gliding competition also carries over into life and business. I've learned that just the practice of making decisions gives you confidence even if you fail occasionally. It goes back and forth because I get ideas about decision making from life situations, which I use in competition as well. I'm still trying to get more experience by listening, practicing and trying new things—pushing to find how good I can get. My successes make me very happy and motivate me to keep improving.

My goals in life are to be happy, be healthy and win life's challenges. My hang gliding goals are to get to the top and still have fun doing it.

How important do you feel it is to set goals?

Very important. It's essential for living. I need to set many goals, because achieving a goal is the main joy of living. Achieving success is its own reward. Once I achieve one main goal, I always set another.

Let's talk a little about actual technique, Beto. How about discussing thermals with us?

In general, I don't think there is a great difference in basic skills among good pilots, but there's a difference in experience. I believe everyone needs to learn the many different types of thermals that occur due to different air conditions, different sites and different ground cover. Also, pressure systems, placement and size of hills, sun position and wind speed are all factors that affect thermals. With different thermals you should use slightly different techniques. There are different ways to initiate turns, different VG settings to use, different bank angles. Do you turn abruptly or gradually? Do you use a rolling or yawing control input? Are you correcting constantly? Do you have to track upwind a bit with each circle? Do you push out to the max or reserve some speed for the better shots? All these are parts of a total technique repertoire that top pilots and those who want to do best must have.

I believe those pilots with the most correct model of the atmosphere and each day's thermals will succeed best. The pilot who identifies the nature of the thermals most accurately and can select the best technique for that type of thermal will excel.

Pilots really must learn to be sensitive to air pressure (relative wind), their vario sound, feedback from the base tube and body accelerations. That sensitivity plus all the experience of all the thermals you have flown in will help you put

together the maximum climb rate. The pilot who can put all this together best will climb best and master the gaggles.

In thermals I concentrate on my vario sound. Meanwhile I'm looking at pilots near me in my thermal and also out in other thermals. I'm looking at clouds and routes. In other words, my focus is out, up and beyond while I'm feeling surges, listening to my vario and automatically controlling in the thermal. I'm constantly making adjustments in thermals. Where I live in the south of Brazil, it's the only place where thermals seem to be regular. In the rest of Brazil they are always moving so you always have to be adjusting. It's great training for sensitivity, focus and technique.

Sometimes your ability in thermals is better than at other times. I've climbed better than other competitors, but many times they have outclimbed me—especially Guido, Manfred and Nene (Rotor). Part of the secret is practicing at a site in the same conditions.

You know, I've heard many pilots after landing talk about how nice and smooth the thermals were, and how they could just let the glider climb on its own. Yet I was feeling surges to push out in then pull back in before the glider fell off. That dynamic flying, if done properly, will give you real climb gains. Perhaps these pilots just weren't being sensitive to the thermals' subtle effects.

Do you tend to stay with the gaggle like Andre and others?

I really like flying in gaggles with friends—competitors I consider friends. There's a certain energy that is traded when everyone is right on, going fast and communicating with their actions. I don't like flying alone, except when I'm in front. I like being in the lead gaggle, but I have the confidence to go alone too.

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In a comp I like to take off at the right moment, naturally. The right decision here puts me with the lead gaggle. When I take off depends on the start gate system, the scoring system and whether I am in front or back in the standings. If I'm in front I try to take less risk—I let others take off first to be 200,000% sure it's possible to climb out. Of course, the weather is the big factor here. If I'm back in the scoring I'm much more willing to take risks, of course.

Beto, let's talk a little bit about your equipment and your plans. You've been flying a La Mouette topless for the past several years. What was the reason of your choice [Ed. Note: Since the 2001 season Betinho has been flying a Moyes Litespeed] ?

For eight years I flew Airwave gliders—from the Magic IV to the Concept. But they didn't have a topless glider, so I looked around. I came to a Brazilian comp in '96 with the Concept and everybody had topless gliders. I tried a Laminar and liked it. But the dealer sold it for $6,000 and wouldn't give me a discount. I felt I could do a good job promoting the glider, and would have been happy with 5% or even 2% discount. It was like a question of honor so I switched again. The La Mouette distributor, Joao Moreno, invited me to fly a Topless and I won the '97 Nationals on it. I got congratulations and a discount!

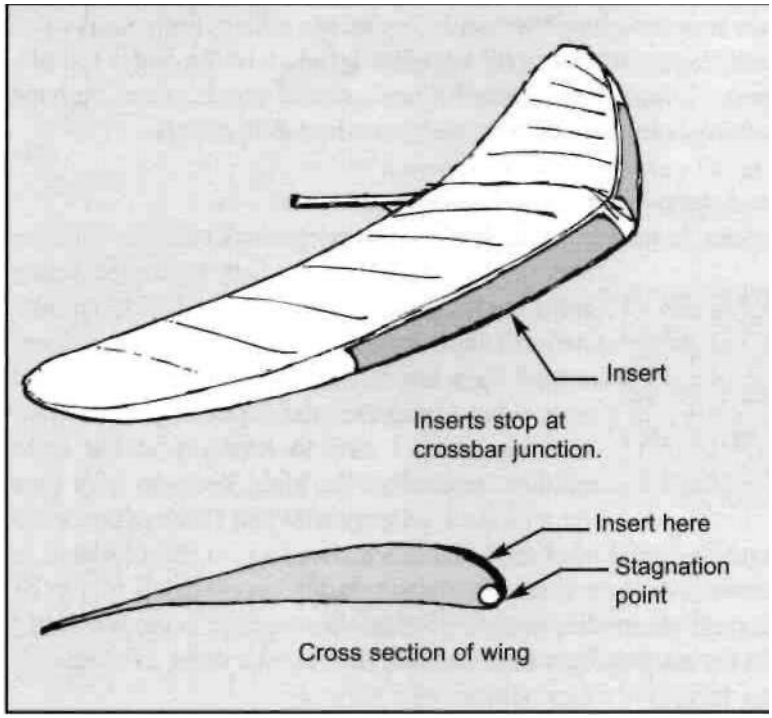
After that I decided to devote more time to the sport so I sold my business (car sales and repair shop) and made hang gliding my career. Gerard Thevenot (La

Mouette owner) gave me some support and I had a small sponsorship from Bad Boy Sportswear. I'm still looking for a bigger sponsor *[Ed. Note: We are happy to report that Beto landed a lucrative sponsorship from Red Bull energy drink. The happy feeling stems from the realization that sponsorship by such visible corporations as Red Bull is the key to the publicity and growth of hang gliding].*

To help develop the new topless, Gerard contracted some very good pilots—Oleg, then Guido. These people know why others fly well, why a glider flies well, and what to do to reach the top. They analyze gliders, do one-on-one tests, analyze photos, make many little changes and prototypes. They invest a lot of time in development.

I find now that the Topless climbs very well. I must adjust the VG from 30 to 40% on to outclimb the Laminar, but climbing is the Topless strong point. The topless matches my flying style and is a world class glider. A good example is Guido—he won the World Meet (1998) on one.

Figure 1 - Carbon Leading Edge Inserts



I believe you helped develop the carbon leading edge inserts that improve performance at high speeds. Is that correct?

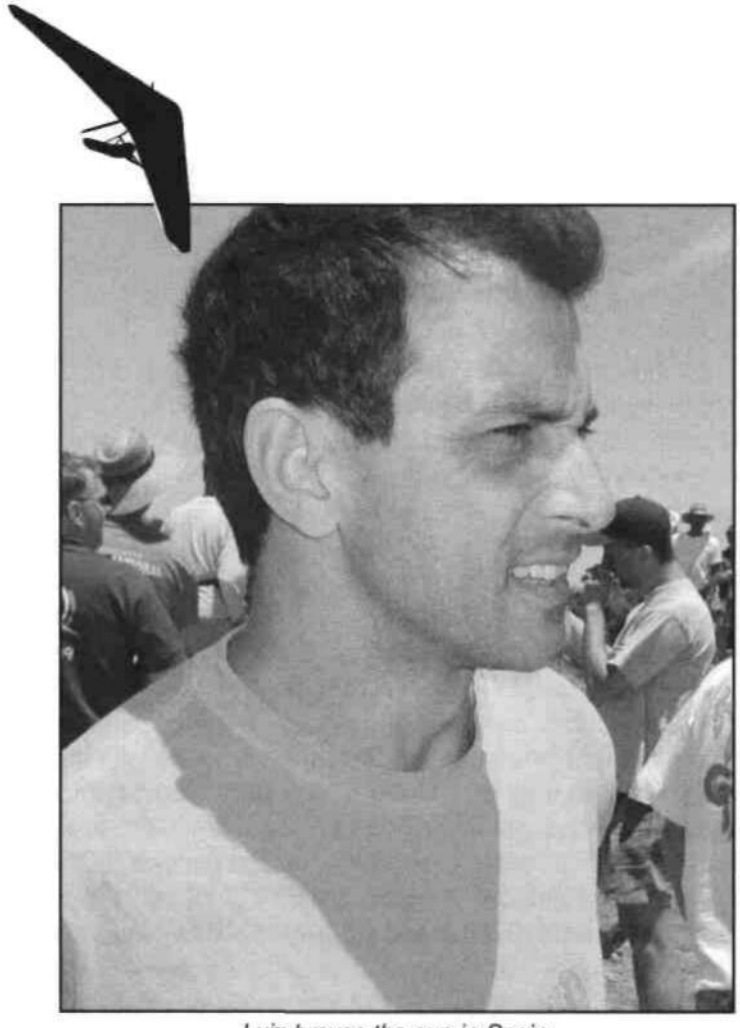
Yes. Other people tried larger inserts, but I took some pieces the La Mouette carbon supplier made and cut them to work better. Before they always made the handling stiffen My idea was to stop them at the crossbar so the outside leading edge can flex. Also, they stop at the stagnation point on the leading edge so they don't affect the lower surface (see figure 1). The way they work is to stop the pushing in of the sail between the battens at high speeds. This pushing in results in a great increase in drag and leads to instability. So the glider glides better at high speeds and is safer.

Let me ask you one more question: who do you think is the world's ***best pilot at*** *the present time?*

Now it's Manfred without a doubt. He does it all. He's the only pilot I can't figure out some of the things he does. He's always a little ahead and above. But he makes a great challenge or target for the rest of us.

Well, Beto, you are one of the pilots I'm putting money on to be World Champion, so keep working on it. We'll see you at the next World Meet in Brazil (2003) and beyond.

LUIZ NIEMEYER



Luiz braves the sun in Spain.

IN THE BREEZE WITH LUIZ

Luiz Niemeyer is another one of those Brazilian pilots who started young and dedicated many years to the sport. He was 14 when he started flying in 1977. Our interview took place at the 2001 World Meet in Spain and Luiz was just as enthused as ever. In fact, he is instrumental in bringing the 2003 World Meet to Brazil by presenting the bid and promoting the somewhat unique concept. We'll let Luiz tell you about it.

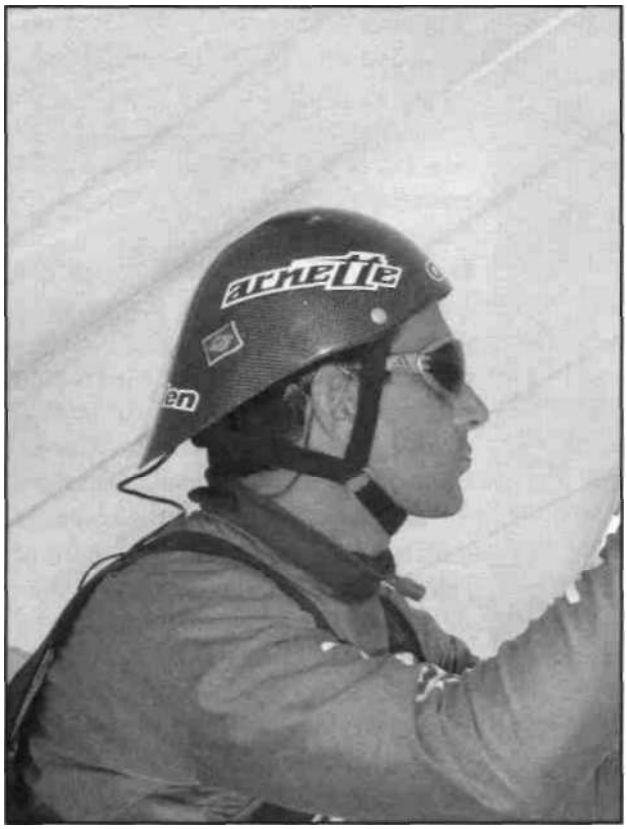
Luiz, would you please describe your early years and how you came to be one of Brazil's top pilots?

When I first saw hang gliding near my home city, Rio, it came into my life like a rocket. My mother didn't want me to start—she thought I was too young. I was relentless and she finally let me. But she put down three conditions: 1. I couldn't fly during the week when I was in school. 2.1 couldn't fly out of the area, and 3. I couldn't have an accident. On that last one, early on I cut my finger and was really afraid she'd make me quit.

She went to Brazil's top pilot at the time, Paul Geiser (he was two-time Brazilian champ and finished 9th in a world meet), and asked him to make me the best safe pilot possible. So I had a great teacher from the start. All I had in mind from that early time on was to be the best in the world. When I started flying with friends, they were flying for fun, but I was competing. I always wanted to be the highest, go the fastest, fly the furthest. I had a goal from the beginning.

I always thought hang gliding could be a top sport like tennis or bicycling, **for** example. Now all my efforts are going towards promoting the sport in the media. In my hometown, Rio, many people go up to launch and are astounded at the beauty of the sport. So I see it is possible to get media interest. I want to move the focus of the sport from the deserts to more urban areas. That's why the next World Meet will end up every day in Brasilia, Brazil's capital. We will start out at a site about 96 km (60 miles) from the city, use various turn points then end up at goal in the middle of the city. It has a huge central esplanade and park that is perfect for this. I expect total media coverage and thousands of spectators.

But getting back to my early flying, I used to talk my older brother Carlos into driving me up the mountain. He eventually got interested too and started in 1979. He got on the Brazilian team in 1981 and was Brazilian champion in '82 (I took 6th that year). *[Ed. Note: Carlos was on the winning 1999 Brazilian World Team].*



Luiz in competition racing gear.

Since I was in school I couldn't get away to all the meets so it was difficult for me to make the team selection. But Carlos was in university so he could go. Sometimes though, I would skip school and go flying with Carlos. I hope my mother doesn't read this—both of us will be in trouble!

That meet in '82 was my first cross-country meet, but my first meet was in Rio in 1979. I remember that Gerard Thevenot (France) won and the field included some of the great pilots of the time: Rich Grigsby (U.S.), Joe Greblo (U.S.), Tom Peghiny (U.S.) and Dean Kupchanko (Canada). In '82 I was on the American Cup team, which competed in England. That was the first time I used a **vario.** Before that all my flying was by feel and senses. I think it helped my flying tremendously for I learned to be ultra-sensitive to the air. I still tell new pilots to fly without a vario much of the time, especially when flying near the terrain like in Rio. Then you can learn the feel of thermals and use your position to the terrain to judge your success. I once had my vario die and did an 80 km (50 mile) task without instruments. I took second for the day.

In 1983 my brother went to the World Meet in Tegelberg (Germany) and brought me back a Sensor. I started doing very well then. There was an international meet in Rio, which I led until the last day. I got the first place jitters and lost to Steve Moyes and Dean Kupchanko. Steve said I lost not because they outflew me, but because I made mistakes.

In the '84 Nationals I blew a takeoff and went into the trees. I got out of the trees, launched again and won the day, and would have won the Nationals, but the rule said only one takeoff was allowed, so I got a zero. In '85 I was #1 on the Brazilian team and went to the World Meet in Kossen. I had ordered a new Sensor well ahead of time, but Trampeneau (Seedwings owner) didn't care and the glider never showed up in Austria. I had to fly a borrowed GTR (Moyes) and didn't do well because I wasn't used to it.

Then I had to work for a couple of years. I returned in '88 and became first on the team that year and the next. I was supposed to go to Fiesh (Swizerland) for the '89 Worlds, but I had landed another job and couldn't go. So I gave my place to Paulo Coelho and he used my glider to finish fourth (Robbie Whittall won).

Then I rarely competed. In 1991 I entered a comp and Pedro Matos said as a piece of advice not to get my hopes up because I had been away for two years and everything was different. Pilots were flying different gliders, using different techniques and going much faster. I said OK, I'll just go to have fun; I had no intentions of winning. On the first day, I saw the leaders blew past me. But I arrived at goal I was the only one! I finished that meet 2nd to Paulo by 5 points.

That year I took 2nd to Nene (Rotor) in the Nationals. But I continued to have job problems. I tried to make an agreement to give up a week of vacation to be able to go when I wanted, but it didn't work out. We have a system of three meets you have to be in to make the team and be champion. I could only go to ond or two, so I was off the team from '92 to '97. But then I changed jobs—I now work in CD mastering—and gained the freedom to compete when I want. I was on the successful 1999 World Team and now I'm in fourth position on the 2001 team in Spain.

Luiz prepared to take to the air.

Luiz, what do you think makes the Brazilian team and Brazilian pilots in general so good?

Well, first off, we have a country that is very interested in sporting activity. We aren't so much couch potatoes. So there are a lot of people interested in competition. Right now we easily have ten guys who could be on a world team. In Brazil we are now making an effort to help up and coming pilots by telling them everything we can.

In the nineties we had the example of two pilots—Beto and Andre who showed us that if you go to competitions and put in the time and effort you can get good results. We realized that you have to practice at competing to really get good. In the 1999 World Meet we knew that Beto and Andre could go for the individual win, but we decided as a team to fly as a group and win the team title. As you know, Andre took 2nd, Pedro Matos was 3rd, Beto was 4th, Nene Rotor 9th and I was 11th.

We did it with teamwork. We were on the radio helping each other all the time. Someone ahead would tell us how strong the thermals were and where we should go. Someone above would say something like: "Move a little to the left, I'm getting strong lift." Also we'd use incentive like "We're gonna win!" Even when we made a mistake we could help the team by saying what not to do. The entire team was giving good vibes on the radio.

One of the important things was we supported each other psychologically. In the Pre-Worlds we only had three pilots but we finished 3rd as a team. This gave us incentive and confidence. Now it's not the nature of Brazilians to work so well

together, but we wanted the team championship so badly we had meetings, talked about it and made a game plan. In the last National competition that year we all flew on the same radio channel and practiced, even though we were competing against each other. Pedrao (Pedro Matos) is the spark plug. He's always giving us incentive, saying "Let's go, let's go—never give up."

We had good ground support as well. Our crew let us know when and where the Austrians landed. One day in Italy, Manfred was flying with Andre and Pedrao and we made a story for Andre's girlfriend to act like she was going to get Andre as if he landed. The Austrian ground crew saw Andre's girlfriend leaving and announced that Andre had landed. We used all the tactics we could.

I saw the British teamwork in 1982 and realized they were the best. We decided to make the sacrifices necessary to win as a team. Everyone on the team was **happy to** work that way and proud to be part of the World Champion team. It seems that hang gliding is the only individual sp6rt where competitors help each other.

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Ultimately, I believe we are winning because we **are** motivated. We are fighting for first place and we motivate each other. First Beto and Andre motivated each other, then that inspired the rest of us. Manfred once said "All the top pilots have the same skill at thermaling, decision making and so on; what sets them apart is motivation. The best really want to win." I agree.

Do you think you can beat Manfred?

It will be very hard because he makes his living out of hang gliding by making his glider better. He has the best-tuned glider and tuning is everything. He can fly and tune, fly and tune. Manfred has natural ability plus he has development experience.

Another great pilot is Tomas (Suchanek). He's very cool and makes really good decisions. We Brazilians are never like that—we're more excitable! Tomas has something inside. In 2000 when he came back I could see he was a helluva good pilot *[Ed. Note: After winning his 3rd World Championship in 1995, Tomas quit for 5 years to compete in ultralights—winning the World Championship—and sailplanes].* It is hard to follow him. Tomas has an amazing ability to take the best line in the air.

Right now, Tomas is in a situation where he must show the ability to come back. Tomas realizes that people are watching him and the pressure is on. But now Manfred is better than ever and it isn't going to be easy to beat him, even for Tomas. Manfred is extremely confident, which helps make him untouchable.

You have had you own experiences getting out of competition then coming back. Could you tell us how you do this successfully?

I don't think there is any big secret—you just have to start flying in lots of comps. Once you have the basic skills, then you have to maintain your confidence. Some of us have natural skills and some have to work at it. In order to get good most of us have to practice. You can lose your edge without practice. For example, this year I went without flying for 6 months then went to Valadares with **a** new glider. I was in 2nd place in the meet then I had my worst accident. I had lowered my sprogs too low and ended up tumbling. I went over four times and came down under my chute. I dropped to 7th place. If I hadn't been away for six

months, I would have been more confident in myself and not tempted to push the glider safety limit so hard. So my lesson is: With more practice you will be safer and will know your limits better. Otherwise you will find your limits the hard way. If you're lucky like me you will survive.

If I want to keep competing I feel I have to fly nearly all the comps and free fly regularly. I believe that otherwise I'll put myself at risk. It's OK to compete without pushing and fly for fun on an occasional basis, but if you are going to push to win you must fly a lot to be safe. We always have the attitude that we've been there before, but we won't do it safely if we don't practice. It's a common problem with pilots to not recognize the limits of their bodies and abilities.

Here's an example: Pedrao, Phil Hagler, Paulo and I went for a flight in Rio and bet beers on who could stay up the longest. We were hugging in close to the trees to use the heat going up the face. All four of us scratched in close and went up. Another guy launched and tried to follow us, but ended up going into the trees. We later asked him why it happened and he said he saw us doing it and tried to copy us. But he didn't have the skills. You must develop your skills before you can do everything the top pilots do safely.

When I started flying, everyone was learning on their own. I was hooked on hang gliding like a drug. I never thought deeply about the risks, so I had no blocks. But now I understand it's important to understand the risks. I tell new pilots coming up that there are two ways to learn: by your own experience or by the experience of others. If by the first one, you must have great luck or you will be injured and won't learn fast. Sure, you have to expand your limits, but you should always get advice about what you want to do. In the beginning it's extremely important to analyze in order to learn safely and effectively.

***What do** you think makes a natural pilot?*

Some people have smooth control movements with good body mechanics. They aren't clumsy. Some have good mental abilities to think naturally without too much wavering back and forth. They make good and quick decisions almost instantly. They use the total picture approach. I think a natural pilot has both these physical and mental properties as well as enthusiasm, motivation, focus and confidence.

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When I first started flying I couldn't fly all the time, so I would practice flying movements in the swimming pool. I was doing flying exercises all the time and I think that helps program the automatic mind. Even before I started flying I was making model gliders with paper and paper clips. I learned a lot from that. Some people get so excited about their flights that they zone out after and don't analyze what they did right or wrong. I **think** you have to evaluate in order to improve.

Confidence is all important. My confidence was developed in the very beginning when we flew without varios and learned to stay up in very weak, light lift. It translates into today's conditions on the tough days when many pilots lose confidence. As long as you have the skills from practice you must have confidence or you can't excel. In 2000 I took part in 10 comps. I won 5, took 2nd in 2, then a 3rd and a 4th. I was very confident because I had all the skills and a glider, of which I said, "This is *the* glider." It was a Laminar MR 2000. I could fly on top of the lead gaggles and do anything. This was against the world's best. I took a

2nd at Wallaby (Florida) that year—Manfred won. Having top equipment is an important factor to maintaining confidence.

Some time ago Andre said, "Luiz, it looks like you fly so well until just before goal. At the end you seem to make mistakes." So I wrote on my base bar: C + D + C = V. That stands for Concentration plus Decisions plus Confidence equals Victory. It helped me focus all the way to goal. Another thing to write is: "Don't try it low." This is sort of a confidence thing too. Because if you see pilots high you can't go off chasing them. You have to slow down, get back up and catch them **later.**

When you lose confidence, how do you regain it?

You have to go back to a point where you are comfortable and sure you excel. For example, if I lose my confidence in my ability to climb with the best in thermals, I would go to my home site in Rio without a vario and try, try and try until I regain my skills and confidence. Like the soccer star Renaldo, when he had a knee problem, he had to practice and practice once he was healed in order to come back. The problem with hang gliding is we think we don't lose that much, but we do. We lose physical and mental sharpness if we lay off. There are three things that must be in top shape: the physical, mental and equipment aspects.

Luiz in full run at the 2001 World Meet.

How important do you consider the glider to be?

It's very important. **As I said,** my MR 2000 was great. Since 1997 I flew 10 different topless Laminars and this one was perfect. I had to put much less effort into it and it was climbing better than anything. The same glider from the factory can be very different.

*Beto told me he flew eight gliders of one design in competition **and** of the eight, he rated four excellent, three good and one mediocre.*

Yeah, gliders vary. My brother and I are the Brazilian distributors for the Laminar so we fly a lot of different ones. Sail making is everything. The sail I prefer is made by Bause Segel. The problem is, those of us who aren't factory pilots cannot play around with the sail. We can change parts and adjustments, but not details of the sail. Even if I went to the factory to get the best I couldn't do it because I would upset the factory production. Manfred on the other hand can do it.

Manfred is the best pilot far and away, but he also has the best glider. I asked him what makes his glider better and he didn't answer! Maybe he has little things in the sail or a profile that's not stock. I'm flying a stock glider and I can't beat his glide. But I still have confidence I can beat most others.

Gerolf has a great glider as well, but he doesn't beat Manfred because he wants

to win so much that he pushes too hard. That results in mistakes so he pushes harder and makes more mistakes. Today, if there's anyone who can beat Manfred it's Gerolf. If I were him I would push to be the best designer—he's proud, he's very good at that—and possibly it would help him become World Champion. When he pushes too hard he loses confidence. Manfred never pushes too hard.

Let's turn to specific techniques. Are you a good thermal pilot and how so?

Yes! At comps I'm always on top or on top of the gaggle longest. I have learned theory from books, but the practical stuff came from the old school where we always competed to be highest in every thermal. For me, every thermal is a competition.

I fly thermals intuitively. I try to be in the best part of a core and let my instincts guide me there. Remember, I trained without a vario so it's mostly all feeling. If I feel it's time to turn I turn. Every turn you make in a thermal you must be prepared to adjust and improve your climb. If I see 3 m/s (600 FPM) I'm still not satisfied and try to go up better. At Quest (Florida) I was in a thermal with others and it was light. I left and went directly into 3 m/s. The others didn't know why, but I saw birds going up like a rocket. I'm always looking, always paying attention and always ready to find better lift.

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To be a good climber you have to practice. I find when I'm not flying a lot or if I'm not doing comps I'm not as good as the top pilots in thermals. But if I'm practiced up I can stay with them. To be on the cutting edge you have to have all aspects of your game honed to perfection.

Here at Algodonales there is a real problem with crowding in the skies, especially on the weak days. How do you deal with it?

I try to be higher! When thermals are broken I feel apprehensive in crowds. It's hard to find the core and hard to turn when you need to. Some people are flying steeply and some are flying flat. One day I left the thermal and lost it. I landed. It's hard to cooperate when the lift is scattered. With 150 to 200 pilots, no matter what the conditions, we'll always have problems. I think world meets should be reduced in size to be safer. After all, we know only about ten pilots in the world have a chance of winning. The spectators can't even follow the leaders with so many pilots around.

With crowds, pilots will always go where a glider is turning. You are rarely ever alone making a decision based on the air conditions. I used to be very aggressive in the past in crowds, but I found it made me very tired to be always pushing and controlling. I found you have to relax and be patient to find a little part that gives you 5 meters more so you can break away. In a crowd you'll have more tension if you're aggressive and may lose sensitivity.

When I'm alone I may thermal with my VG up to 1/2 on, but in a crowd it's off. That's only common sense. Anyone using much VG in a crowd is crazy and dangerous to others. The other day Bob Baier said, "It was great to fly with you. We were flying like birds—one showing the other the best core." Cooperation in a thermal is better for everyone—everybody gets up better.

Do you have any advice for pilots learning to fly in gaggles (groups in one thermal)?

Sure, it's simple. Pilots new to gaggle flying should learn the techniques by

starting with a smaller group—two or three other pilots. They should maintain regular circles so they are predictable. They will gradually gain confidence if they avoid conflicts. If you get scared and flatten out it will cause more conflicts and a loss of confidence. Keep a regular bank angle equal to the other gliders at your level, that way everyone of the other pilots can predict where you will be and will maintain a regular track themselves. If even one pilot of a gaggle does something unpredictable or disrupts the circle, everyone on that level gets off track and it is less safe. Of course, if the cores are moving, pilots will move their circle, but all the pilots should be totally aware and move together.

You can watch the other pilots to see where they rise or sink in relation to you. Then make adjustments to your circle to move away from the sinking part and into the rising part of the circle. You do this by opening up or tightening up your circle at the appropriate places (see Figure 1). Do this changing smoothly, and the other pilots can follow your actions. That way everyone climbs faster together. Gaggle flying should not be combat, but cooperation. All the pilots in your gaggle are your friends helping you to go faster. If you conflict with them it can actually slow all of you down.

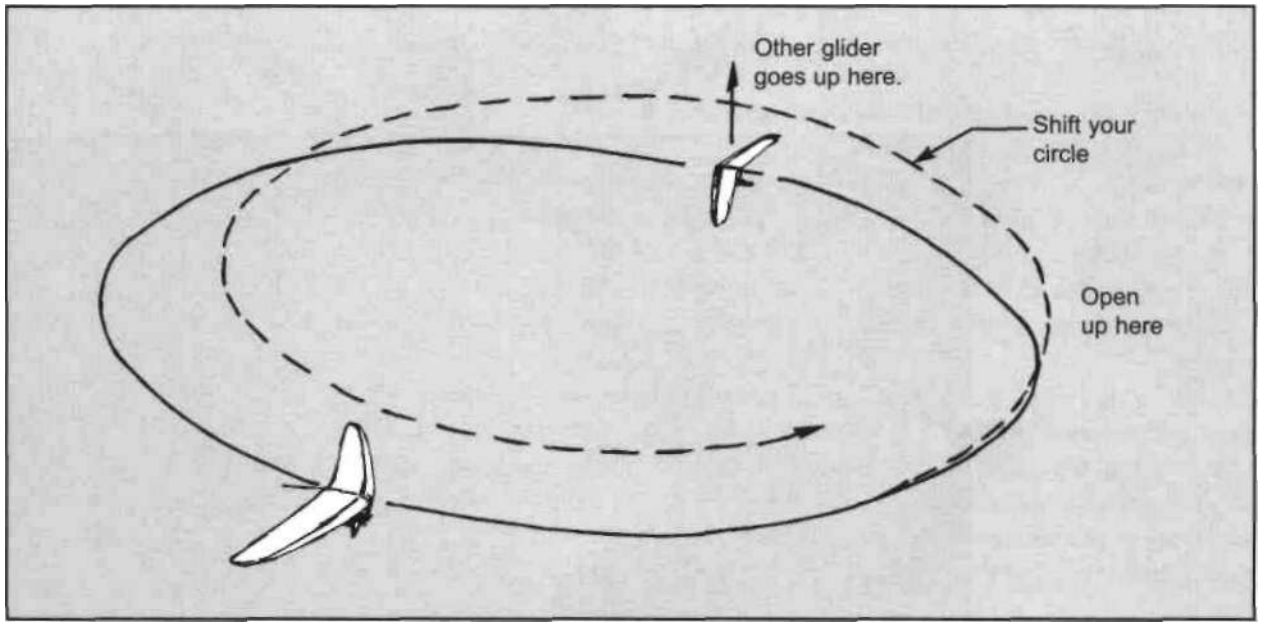


Figure 1 - Using Other Pilots to Detect Best Lift Area of Thermal

Those are words of wisdom, Luiz. What has competition done for you?

Some people fly just to stay in the air. I learned to fly to be one of the best. Competition helps the development of the sport and so all pilots benefit. We started comps in Brazil to help our development. Personally I found the confidence I developed in competition created confidence in every day living as well. It's a great lesson for life. Life is like an X-C flight. You never know for sure where the next lift is, you get high, you get low, but you try not to land. I'm 38 so more than half of my life has been spent in hang gliding. This is the answer to the question "How important is hang gliding to you?"

What do you see for the future of our sport?

Pilots can see that we need a renewal in hang gliding. We need to bring young people into the sport. The media wants to see young guys (or girls) in their 20s winning. I want to give the view to young people that they can do this and be a hero.

I work in sports publicity (not just hang gliding). I believe we have an opportunity to really promote hang gliding in this next world meet. It's near a big city—we land in the middle of it—for the first time. We have media publicity and sponsors ready to go. Then we can give pilots what they deserve: money, recognition, pleasure and fun. Near Brasilia the flying is wonderful, the city is pleasant and we will have a good show. I'd like to change the World Meet into a big show so we can move forward with the sport.

Thank you so much for sharing your views, Luiz. I wish you another 24 years of successful flying. Go out and enjoy the Andalusian skies.

In line for takeoff at the European Championships in Slovenia.

THE AUSTRIAN DYNASTY

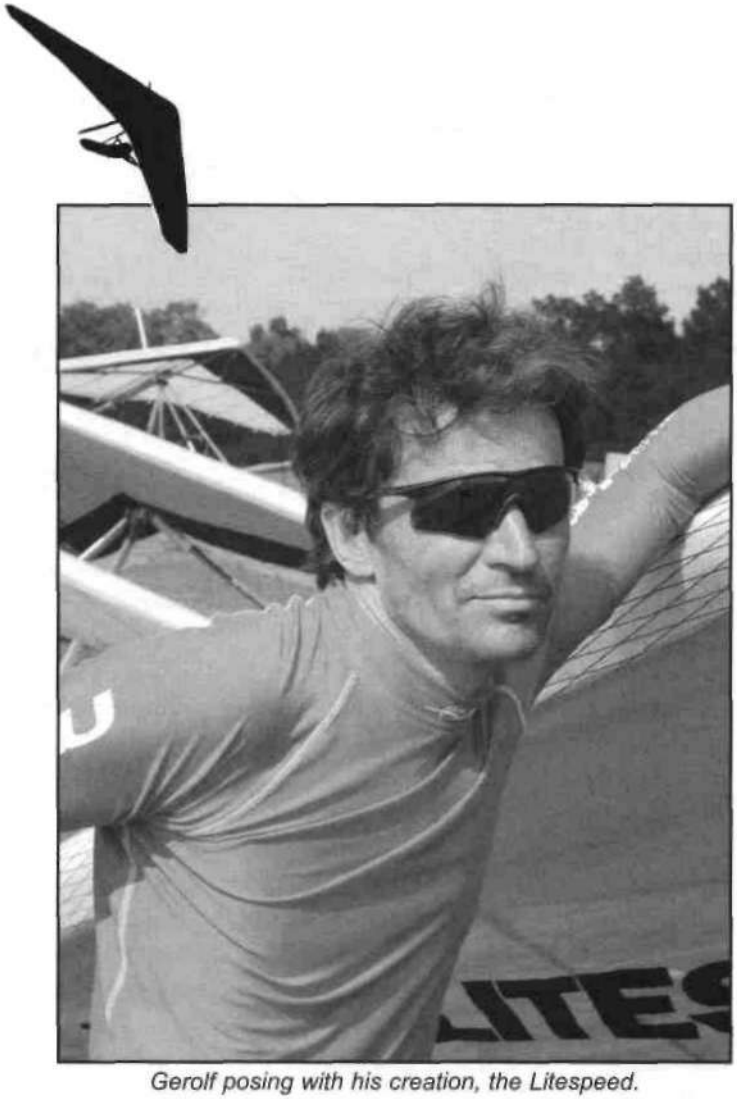
The Austrian team has once again risen to the top by virtue of their win in the 2001 World Meet and World Air Games in Algodonales, Spain. They handily beat the Brazilians and everyone else. This result is not a fluke, since they have several of the world's top pilots on their team. These include Manfred Ruhmer, Gerolf Heinrichs, Robert Reisinger, Josef Zweckmayr, Seppi Salvenmoser and Rupert Plattner. When they are all on, they are nearly invincible.

They lost to the Brazilians in Monte Cucco (1999), of course. Part of the reason is that they did not team fly. They were not on the radio together and were mostly flying as individuals. Perhaps this was a hard lesson, and in Spain they were noticeably more cohesive. Can this cooperation, can this dynasty last? At least for a while, given the prowess of their top pilots. But the Brazilians and others are determined, so the unfolding drama over the years will be interesting to watch.

The Austrians did not spring up overnight. Indeed, since the early 80's they have had some of the world's top pilots with the likes of Herbie Kuhr, Helmut Lorenzoni and Martin Jursa. But as we shall see in Gerolf s recounting of events it was Manfred's step to the next level that spurred them on and showed them all how to become champions.

We have selected Gerolf and Manfred as our interviewees, for reasons of convenience and space. They represent the Austrians well and give us the overall picture of a winning team.

GEROLF HEINRICHS



Gerolf posing with his creation, the Litespeed.

THE WORD OF GEROLF

Gerolf Heinrichs is a member of the legendary Austrian team. He is consistently one of the pilots favored to win any meet he enters. He brings a unique perspective to our discussion for he is a successful hang glider designer with a degree in aerospace engineering, a competitor in many sports and of course, a teammate of Manfred Runnier. In fact, Gerolf has much to say about Manfred, for not only did he acquire much of his insights from chasing Manfred over the years, but he has an unwavering urge to beat him. To be number one, you must defeat the man to beat.

Gerolf s analytical approach to all things hang gliding provides us with a wealth of information, some of it from a very unique perspective. So sit back and listen to the man with the steel-trap mind deliver the Word of Gerolf.

Gerolf, here we are at the Quest Air competition where you are doing very well. Obviously you didn't arrive at the top of the world all at once. Tell us a bit about your flying history.

Well, I was raised in Gratz, Austria and started flying in that area in 1987—a year after Manfred started. A friend said he was going to try hang gliding, so I said "Why not." I had participated in a lot of adventure sports up to that time like kayaking and wind surfing, but I realized that I had started too late in life to be a champion. In most sports you should start in your early teens, so even though I learned quickly, I didn't have the years of experience and youth. However, with

hang gliding I realized that you didn't have to be young and fearless and that since judgement is the main ingredient, you can become better when you are older up to a point (Gerolf is at the top of his game at the ripe old age of 41).

Did you get good in hang gliding quickly?

Like I said, I was a fast learner. Around Gratz, there are just small hills at the end of the Alps. Flying here taught me to excel in weak and tough conditions. But it didn't prepare me for big air. I had to wait to go to other areas in competition and pay my dues for a while.

I started competing in 1989—two years after I learned to fly. It was the Austrian Nationals and I learned a lot. It took me a while to understand that competition is a comparison of limits. When I did poorly I would get angry, until I realized that I was learning my own limits through comparison, and the ultimate limits of the sport. Since that time I've used the comparison opportunities to greatly elevate my own limits and those of the sport through technique and design.

I probably started competing too early in my development, because I would get very frustrated. But I finally realized that equipment was an important part of the equation, even when starting out. For example, look at Guido Gehrmann*. He started out on the best with his La Mouette Topless some years ago and he was able to keep up with the top pilots to see what they do. You don't have to understand everything, but you have to be there to learn fast. Another example is Paris (Williams)*. He was competing on an older design and doing OK, but not great until he got a modern glider and moved to the top gaggle.

Gerolf awaits his launch turn.

My first good glider was a Wega (pronounced Vega), made by a Polish guy living in Austria. Manfred was the top pilot flying this glider and he took second in the European Championships on one around 1991. In 1993 I entered my first international comp, flying an Airwave K4. At that time I was jumping from manufacturer to manufacturer. I didn't realize at the time that the manufacturers want commitment before they give a pilot the good stuff. All you get otherwise is stock equipment.

That year I won the Pre-Pre-World meet in Ager, Spain. Perhaps that's the first time people realized there's another Austrian contender other than Manfred. Soon after that Manfred went to Icaro and I followed. I realized that with Icaro I could have design input and end up with the best glider. Manfred was always one level better at that time, but we were sharing ideas. Many of my ideas got incorporated into the Icaro designs.

* See the interview with these young aces in other parts of this book.

I'd like to go into details about your design ideas later, Gerolf. How about giving us a rundown on your competition success.

OK. My first World Meet was in Ager, in 1995 where I took 6th (Tomas Suchanek won, barely edging out Manfred). Then in the next World Meet in Australia I again took 6th. I was in 2nd until the last day when I had a camera problem and lost 600 points—I would have ended up 2nd (Manfred took second place just behind Guido Gehrmann). That same year I took 6th in the Euros in Slovakia—again I blew it at the end.

Three major 6's sounds like a stigma to me. When did you break that jinx?

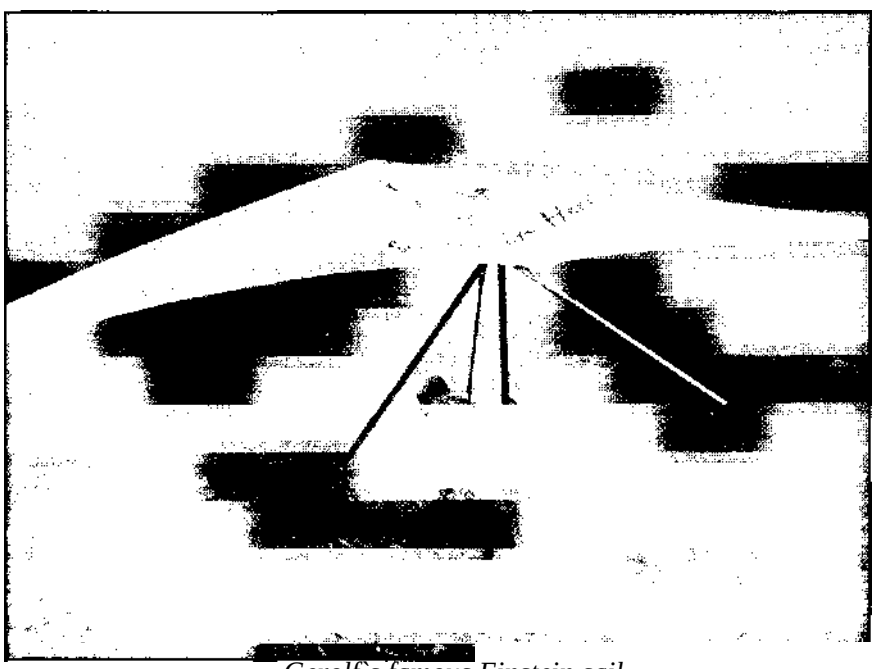
In the 1998 Pre-World Meet in Monte Cucco, Italy. I took home the cup. It was good to finally be a winner of a major international meet. That was my last one on an Icaro glider. You see, I ran into a problem. I flew too close to the sun by beating Manfred in three contests. He wasn't the problem, but Gianni (Icaro owner) would no longer give me the best prototypes. So I looked around for another place to work. I talked to Wills Wing and Thevenot (La Mouette) but Moyes was the first to give me a contract and definite guidelines. I started working in Australia and developed the Litespeed.

Unfortunately, it wasn't ready for the World Meet in '99.1 over-pushed the prototype—it was too radical with not enough washout. I didn't have any practice days there and the conditions resulted in mostly scratchy survival flying. I ended up 15th. It was a disappointment for my new glider, but I knew how to improve it.

In the Pre-World Meet in Algodonales, Spain I took second. We'll see how I progress from there.

It's interesting how you only focus on the big international meets, Gerolf. Surely you had to work to get to the top, how did that happen?

Well, Manfred was the first of the young Austrian pilots to acquire international comp knowledge and experience. The rest of us had to improve or quit. Martin Jursa, Herbie Kuhr and Helmut Lorenzoni all quit competing when Manfred came on the scene and kept beating them. Rupert Plattner is the only one of the older Austrian team who is still there.



Gerolf`s famous Einstein sail.

Manfred was teaching us by desperately not telling us anything. We had to figure it out. That was difficult because he was there only for seconds then he would leave us in his wake. As we got better we could stay with him longer and learn more. It was an accelerating process. Finally, we could follow him on the whole course, but still couldn't beat

him. I was the first to learn his tricks, with Rupert, Josef Zweckmayr and Robert Reisinger right behind. I now fly half the year away from the team (Gerolf spends his winters in Australia with Moyes) and this has helped me fly independently. Robert and Josef haven't yet broken away and tend to follow Manfred.

Early on I was perhaps too focused on equipment because I had bad equipment at first. So that's all I worked on. Then, when my equipment was competitive I realized I had to develop my skills to make my glider's capabilities pay off. It's no use having the best equipment if you can't use it to the fullest. For example, if an inexperienced pilot lowers his sprogs (dive sticks) he may end up flying faster unconsciously and charge through lift because he can't feel it. One of Manfred's assets is he can fly the most difficult gliders because he's the world's best test pilot. He's always trying new things. John Pendry used to be the same—he would shim his glider and no one could glide with him or handle his glider.

For me, learning how to trim gliders for performance and how to fly gliders trimmed to the max was important. I am grateful to Manfred that he let me fly his gliders so that I knew what to shoot for. I probably contributed some to Manfred **too,** but I'm most grateful for the education he gave me.

*What makes the Austrians as a team so formidable? I note that they have **won three** World Meets and four Europeans.*

Some years ago we all flew Icaro gliders. Everyone on the team benefited from the tuning secrets of Manfred and me. We could get them top gliders. Plus we were flying together in our home meets. I was the organizer of the Austrian League for ten years and tried to keep us cohesive. I'm not doing it now, and I think things are falling apart a bit. I was the team integrator. Manfred was not a teacher, he was more like the star while I was the team captain.

In Monte Cucco, it was the first time we were not flying as a team. I was on a Moyes and none of us were communicating by radio. We lost to the Brazilians. They had a good trick in Monte Cucco. They came to Manfred and me and asked us to tune their gliders. We didn't think they were as strong as they turned out **to** be, so we were glad to help. Never again! *[Ed note: At the end of the 2001 World **Meet** the Austrians were again world champs.]*

*Well, Gerolf, being the best doesn't just happen magically, let's start talking about **technique.** Would you focus your unique view on thermal skills for us?*

Sure. The top pilots like Manfred, Tomas, all the Austrians and others use the advanced technique I call spinning up. It was invented by Tomas and cultivated to the highest level by Manfred. Here's the method: A given thermal calls for a certain turning radius. You may want to turn tighter to get in the better lift towards the center of the core, but a steeper bank hurts your sink rate. So the trick is to fly with 1/4 to 1/3 VG near the stall balance of the inner wing. Then when getting tipped out of the thermal or needing to tighten up in a surge, you push out and high-side the glider (shift weight to the outside) a lot to stall the inside wing and get 1/4 of a spin which then settles back into coordinated flight. This method produces an exceptionally efficient climb, especially when the thermal isn't uniform or it is crowded.

The top pilots like Manfred, Tomas, all the Austrians and others use the advanced technique I call spinning up. It was invented by Tomas and cultivated to the highest level by Manfred.

In order to perform this properly and safely, you have to practice and have the right glider setup. You should practice away from other pilots and the terrain. The action is again, slow down, put in a yaw control to high-side your body and create a partial spin/stall in the turning direction. The result is a very efficient flat turn in the smallest radius possible. It feels like you are turning on a tip. You cannot continue such a flat turn, so the technique is only valuable when the thermal varies (but most thermals vary somewhat).

Naturally, you should not be flying so slowly in very strong thermals. That's a good way to tumble. The technique requires enough practice so you know every nuance of your glider or you will end up losing more than you gain because you'll fall off on a wing.

The best gliders for doing this are the curved tip gliders. They tend to be more forgiving of stalls in a turn. You also need to have a relatively flat profile in your tip battens so the stall recovery is quicker (that is less hysteresis, which is a difference in the airflow detachment and reattachment angle of attack. Most airfoils stall at a given angle of attack and reestablish smooth airflow at a lower angle of attack). A Wills Wing Fusion wouldn't be good for this technique, for it has a steep stall in a turn.

I first saw Larry Tudor using this technique in Brazil years ago. Since then I have tried to use it when my glider allowed. I find it to be work intensive.

Yeah. It's tiring, so you can't use it all day. You have to have some VG on and work. But you'll see pilots like Tomas and Manfred do it and come up on the inside of a gaggle. When it's not critical we all use an alternate technique, which is more conventional and relaxed. Basically we use a certain amount of VG, but not too much and work with yaw and pitch to bring the glider around rather than roll, which takes more effort. If a wing gets lifted, the trick is to give a hard yaw input that moves the lifted wing back and the other one forward, so the roll tendency is offset. It works when a glider is loose as well, but this technique is essential for high performance tuned gliders.

Top pilots aren't necessarily flying at the limits of their climb ability all day. Manfred, for example, will only climb with the rest of the pack until he gets in a bad place or nears final glide. Then he goes to 1/2 VG, works hard and outclimbs everyone around him. His glider is stiff and requires a lot of high-siding in that mode, but he has the experience, stamina and the skill to do it.

Top pilots aren't necessarily flying at the limits of their climb ability all day.

More and more, competition is becoming like a bicycle race. Every one of the good pilots stay together in a pack nearly the whole flight—they help each other along by spreading out and finding lift. Then near the end the race begins. We just finished a 92 mile (147 km) task and we all flew together until about the last thermal where Manfred outclimbed everyone and crossed goal first. So the first 3/4 of a task we see who can stay with the lead gaggle, then the last % we see who can finish hard.

Some good competitors don't get the point. They think they got unlucky at the end and lost the rest of the leaders. Actually, they were flying at the limit of their ability to stay up with the pack and couldn't gear up for the last hard finish. They also ask, "Why doesn't Manfred lead all the way if he's so good?" The answer is just like for cycling, no one can take all the risks all the way. Besides, Manfred flies with up to 10 kg (22 lbs) of ballast so he trades off climb for a killer glide.

Getting back to thermaling, can you give us more insights into your theory of lift optimization?

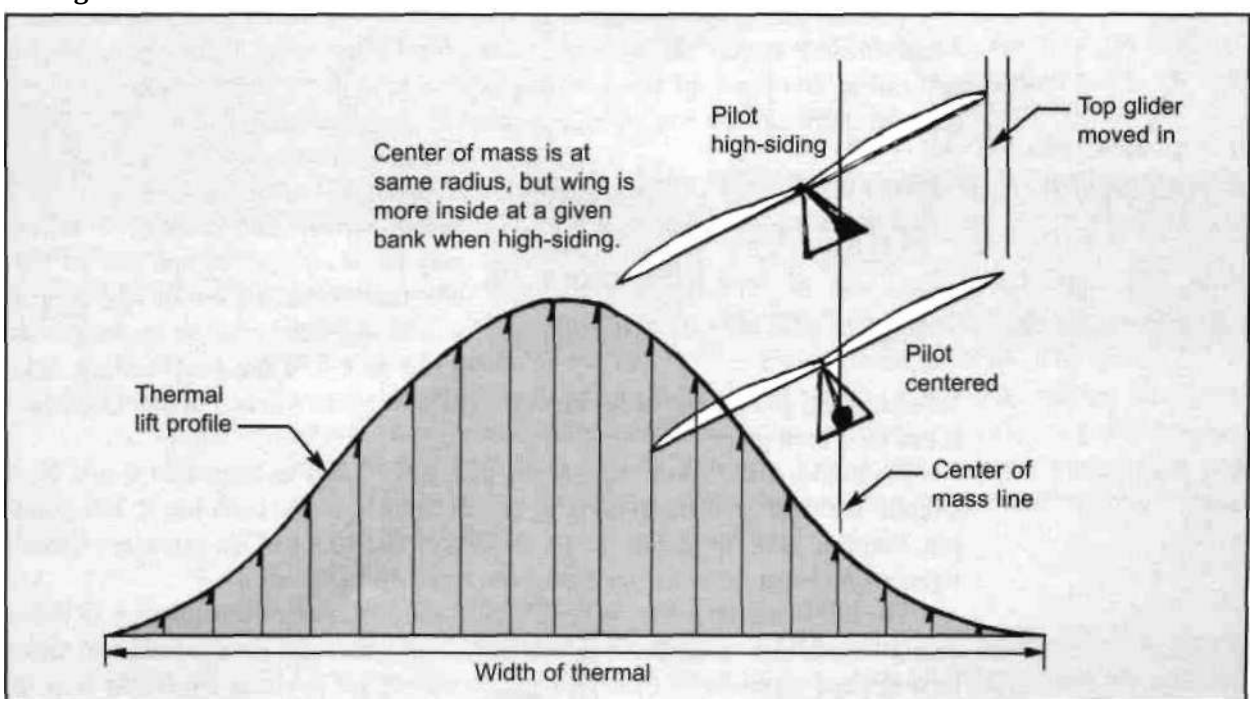
I'll start out saying you must be more aware to feel the thermal at all times. This awareness requires two things. First, your glider must be perfectly tuned to fly straight when level and to be equal in a left and right bank. Secondly, you should have light pitch at the right speed when in a thermal turn. If your glider is trimmed to fly nicely above stall when level, then it will probably be too fast when thermaling. You'll have to push out to go slow enough, which is tiring. Most likely you won't be going slow enough much of the time. If you are constantly holding the bar out (or in) you won't be as sensitive to the changes in the thermal. When you miss changes you miss chances to accelerate upward.

The other point, which I touched on earlier, is you should set the glider up to require a bit of high-siding in a normal thermal bank. I like less high-siding than others, but still it's important. With high-siding there is more mass toward the outside of the circle, so the wing can be more towards the center and thus has a smaller radius for a given bank angle (see figure 1).

Brett Hazlett and I came up with the result that the optimum circling radius is between 17 and 20 meters (56 and 66 ft), no matter what the glider polar or thermal lift profile. Any tighter than that and you begin to overload the wing and lose efficiency. But a 20 to 30 second time of one 360 is usually too big a circle. Some pilots think they climb better when they use a flat bank, but they are not aware of how big the circle gets with just a small flattening of bank.

Of course, every pilot gets low at times and has to work small and weak stuff before it gets better higher. Then you have to use the bank angle and circle size appropriate to the conditions. If the cores are many, but too small to turn in, maybe a big flat circle is best. Sometimes you have to experiment while using your experience to get a quick recognition of what technique to use. You improve your general thermaling greatly when you can master the small stuff. Tomas is best at working the very small cores. He knows that often you have to do the

Figure 1 - Climb Benefit of High-Siding



tightest turn you can just to get into it. Later you can open up as you climb and the lift gets wider.

I think I see Moyes boys (pilots on the Litespeed) banking a few degrees more than other gliders. That's because the Litespeed is set up to bank tightly like a paraglider. It helps to get into the interior of the core. On the Litespeed we've reduced the span and widened the tips so there is not as much speed differential from tip to tip and the pilot can slow more in the thermal.

This helps in a gaggle because you can sometimes cut inside the other pilots and stay in the core. Try to avoid going on the outside for you risk falling off the edge of the thermal. The worse situation is the start gaggle (the crowd in a thermal waiting for the start gate in a meet) because it's pilots of all levels and they tend to turn too flat. Often you can turn inside and get above them all.

It sounds like your thoughts are on competition, Gerolf, so let's move in that direction. What advice can you give to new competition pilots?

If a pilot is going to start competing, he or she should focus on learning at first. You'll learn more in one good competition than will in two seasons of flying at home. Even if you only learn how far you have to go, it's very valuable because you learn what to work on.

But eventually, if you continue with competition, you should focus on winning—that's the reward. I think champions are made up of three special skills. First, I think you have to want to win badly and do all the necessary preparations. You must sacrifice time, money and yes, even relationships occasionally. Examples of this dedication are Gerard Thevenot or Tomas. For years they were extremely devoted to competition matters. Now Manfred and I have a similar obsession. We put so much effort in working on our equipment that sometimes in the air we remember all the work and it makes us struggle even harder. This is where discipline comes into play. Pilots may only see us at a meet and think we aren't doing anything exceptional, but they miss all the effort put into preparation.

Second, there's the ability to stay calm and cool when the going is tough. Manfred and Tomas are the best examples of the cool, calm and collected demeanor. You can hear them on the radio talking in a normal voice or making jokes even though the conditions are going to hell all around them. In X-C flying, you are making decisions all the time. If fear takes over these decisions are based on fear, not strategy. This fear may be of a safety nature, fear of failure, fear of landing out or whatever. If you switch your mind to landing mode (how do I find the best landing field, for example), you are **out** of the race. Don't lose sight of safety, but don't lose your focus on winning.

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Manfred used to have more focus than I do. I had to learn this focus. Your overall intelligence or understanding means nothing if you can't use it. For example, Manfred is not a genius, but he can nearly use 100% of his experience, intelligence and judgement and so comes out smartest in the air.

The third special quality is the physical. Good competition pilots are in shape enough so fatigue doesn't get in the way. They don't get overly tired and know how to pace themselves. Clearly, the best way to get in shape for flying is to fly

a lot. Even if you aren't learning a lot, accumulating hours in free flying, you are at least conditioning yourself. So you become a better pilot because you are less fatigued and can make better judgements.

Most of us wish we could fly more, Gerolf. What can you tell us about X-C racing?

Like all good pilots, I have learned that to go faster it isn't enough to just fly at a faster speed. You have to choose the best line and feel the air. I used to desperately fly straight, fighting the air. You know, the shortest distance between two points. But when you do that you're not listening to the air. Now I realize you have to feel the subtle changes and react to the air. If a left wing gets lifted slightly on glide, turn in that direction.

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I often see pilots let their glider wander and get turned away from the lift, or they turn too late. Of course, you'll often see the lead gaggle wander, but they are responding to the lift or they are going toward little thermal signs like birds, cloud puffs or gliders. In general they are flying most efficiently to the best lift lines.

In order to feel the subtle effects of the air you must have your glider tuned to go perfectly straight, hands off. Even the slightest turn will destroy your sensitivity. Also, I like to have my glider tuned so I can use *V** VG and still control it. I often glide with VG^3A on because I can read and respond to the air better rather than crank it all the way on and get knocked around.

Gerolf chills out in front of the pre-launch lineup at Quest Air.

I've seen you go on long, killer glides with the lead gaggle. Are you using dolphin techniques (the principle of slowing down radically in lift and speeding up in sink)?

Well the dolphin technique is more useful for sailplanes, not hang gliders. Our energy retention isn't all that great. So we shouldn't push out too radically. Sure, you should amplify the load situation—if you feel increased G loading push out, decreased Gs, pull in. But your speed shouldn't vary as much as some people think. We typically glide between thermals at 60 to 65 km/h (37.5 to 40.6 mph), which is almost 20 km/h (12.5 mph) faster than still air best glide speed. I rarely do more than a 15% variation of speed, unlike some guys who slow down below best glide for lift. You may gain a little altitude, but you get way behind the pack by slowing too much. In fact, it's usually better to do less speed variations and more course variations.

Do you fly to clouds?

Of course, but I am more ground oriented than cloud oriented—that's probably a weakness—but then I do better than most on blue days. I use the standard

techniques like observing ground cover, shape of terrain and wind flow.

One thing I had to learn, especially later in the day, is to wait for the thermal to develop. I learned this by waiting for gaggles—I may have been higher but wanted to cross a tough area with a gaggle. I found that by waiting the gaggle catches up and then we all climb better, much higher. It often happens that you leave a weakening thermal and then the guys coming up below you top out much higher, soon after you left.

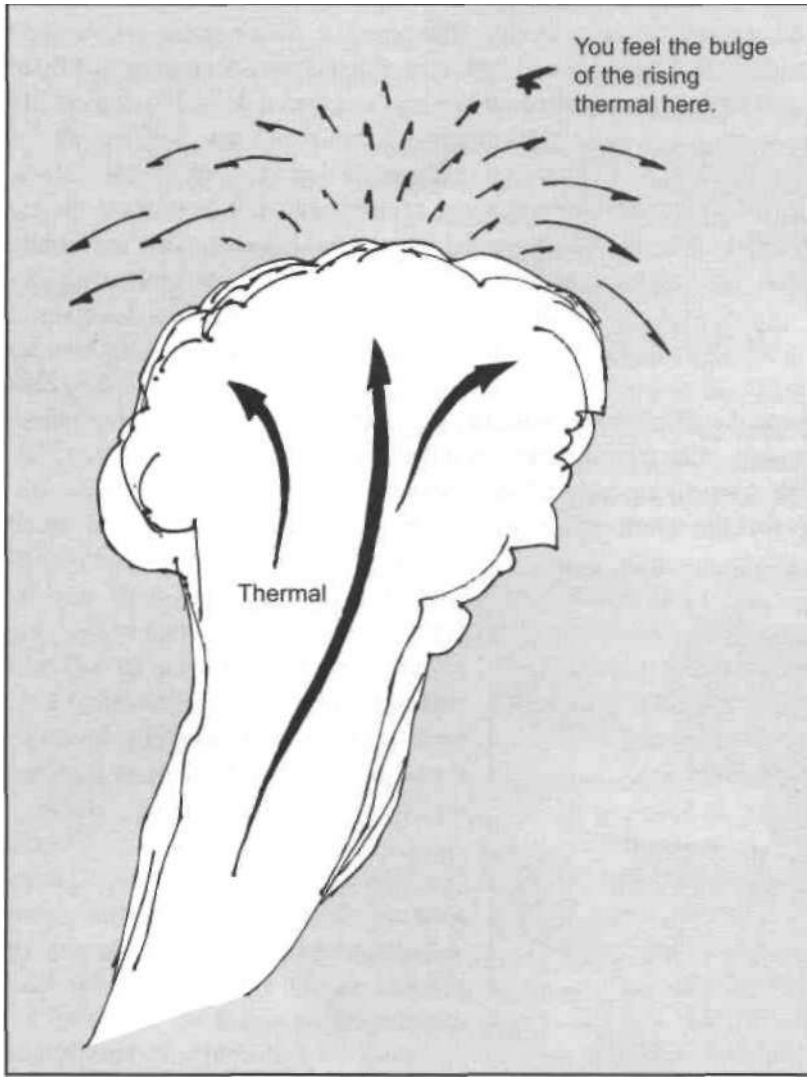

Figure 2 - Detecting Thermals Rising Below You

Other times, you may be in less sink and can detect a thermal coming. You have to learn to feel the thermal bulging as it comes (see figure 2). Especially late in the day or in tough sections, this sensitivity and being able to wait for developing thermals may mean the difference in going on or going down. In a tail wind, getting zero sink is as good as lift on a tough section.

At Hay (in Australia) they called a long 260 km (162 mi) task. It was overcalled and they didn't expect anyone to make it. They wanted to see what we could do. No one made goal, but Attila Bertok and I went 240 km (150 mi). We were in weak lift and I was ready to glide on. But Attila came on the radio and convinced me not to. We drifted in a .3 m/s (60 FPM) thermal for an hour! We flew an hour longer man everyone else since they went on ghde and landed when the thermal dropped to nearly zero. I am convinced that Attila is a born cross-country pilot and a master of the flatlands.

Tell us more about starting out in competition.

For one thing, comps can teach you how to fly X-C, but it's not necessarily true the other way around. In competition you can compare different decisions and get quick feedback about the correctness of your decisions. As I said, flying one comp will improve you more than two summers of flying. Sure, there are sometimes inconvenient gaggles, but the learning rewards more than make up for this drawback.

We shouldn't expect to be winners right away, but of course we can **all** improve. The first thing a competitor should do is understand the scoring system. For example, in a short task, the competitors will go early for the early bird bonus *[Ed. Note: a part of the Race program that gives pilots extra points for leaving*

early and taking the risks by leading}. On a long task it's too risky 'cause the fast train from the rear will catch you. When the gaggle catches you, you have to charge on ahead to maintain the same time on the course. This process usually decks you rather than puts you ahead.

You have to remember what kind of pilot you are. Are you a Manfred with pilots following you all around? The advantage in this case is there are pilots helping spot thermals, but it's hard to break away. If you're not a well-known pilot, it's often possible to go on your own—people won't be keying on you—and so get ahead. A lot of pilots are good enough to do this but are reluctant to go on their own. But this is what you should be practicing when flying at home in recreation. If you don't go alone you don't learn as much. Your decision making is simply: should I stay with the gaggle, or should I leave.

With the scoring system it is important to know what is worth fighting for and what isn't. Probably the reason why we see so much gaggle flying is the scoring system rewards beating other competitors, not covering distance. So pilots tend to stay with others and try to beat them at the end at goal for arrival points. The risk to reward is greatest when striking out on your own.

For the "beat them at the end" strategy, it's best to hold back some performance. In other words, you bluff. They don't think you can beat them and they often wait too long to turn on the afterburners. Generally, all the good pilots are checking each other out along the course for the final sprint, just like a bicycle race. You can affect the way you glide by how much ballast you carry, the amount of VG you use, your body angle, your arm position (out instead of tucked) and in other ways. The game actually starts every day in the briefing where a pilot might say, "Oh, I might not use full ballast because it looks mighty weak." Everyone is trying to outguess the others.

So it seems a well-rounded competition pilot must get experience flying with the gaggle and doing it alone.

For sure. There are essentially two general skills important in competition. They are technical skills and tactical skills. An example of technical skills is climbing well. You will learn this best by flying in a gaggle, for your will see the tricks and methods used by others as well as have a continuous comparison of you and your glider's climbing ability. This is a great way to improve your thermaling, but you learn no tactics to speak of. To learn tactics (decision-making) you have to go it alone. Some pilots make goal with the group without making a single serious decision. They find the flight easy, but they don't know why. If you're going with a group, the best number is 3 to 5 pilots so you can all help each other without getting distracted by too much input. But if you want to learn decision making, go alone.

There are essentially two general skills important in competition. They are technical skills and tactical skills. An example of technical skills is climbing well.

Many of us end up going alone because we get left behind by the gaggle by making a dumb move or missing a thermal.

Yeah, but in that case it's important not to panic. Don't be desperate when you're a little back and there's a long way to go, especially at the start gate. You can afford to be a minute behind the group you expect to be with at the start, for like in a bicycle race, you never see the good guys start out sprinting. Remember,

it's exhausting to always try to be on top in front for hours. I have learned to relax and save energy for the final section where it's most important.

Here's my strategy: When I get behind I change my style. My original approach was to not fly as conservatively as the others. For example, I would not make the last 3 to 5 circles and would glide on with the gaggle, only lower. But when you are lower you are in a different air mass and you may have completely different vertical air. The sucking of air at higher levels on glide is very important.

In this situation it's usually easier to close up the gap by doing your homework—that is, topping out the lift and trying to make up the gap on glide, not climb. That way you are using the tactic of watching the gaggle for the best glide line and location of lift, rather than the technique side of things where you try to climb better. Of course, this whole matter should be combined with how the day's thermals behave. If they are much stronger lower, it may not pay to top out. Also, if you get too far behind, you are on your own and should switch to your self-judgement mode.

On the other hand, if you are the highest in a group it's good to lead out for it builds confidence almost as much as flying alone. Manfred is so good at that. He is often the highest and is never afraid to go on. He has supreme confidence now. If you are afraid to lead, it's self-defeating. You lose confidence and ultimately do poorer. By not being confident you fly slower.

If you are afraid to lead, it's self-defeating. You lose confidence and ultimately do poorer. By not being confident you fly slower.

Leading when lower tends to be psychologically bad juju. It tends to make a pilot insecure, but if you find yourself in this position, just forget about the others and make your decisions as you would alone. Perhaps you'll find a great thermal first and end up with them, or perhaps they'll get ahead. But in the long run you will gain because you will be building confidence and decision skills.

We all learn about the speed-to-fly theory, but remember, the tactical factor is not yet built into this theory. Pilots who depend too much on their instruments can get hurt by this. They fly by the numbers, but miss the point that sometimes an impending change of conditions will require a totally different approach. That was the case in the story I told about the thermal with Attila. The theory says that lift had dwindled to nothing and that it was time to glide to the next one. But Attila's experience said this was the last one and the best tactic was to drift in zero.

You mentioned ballast earlier. Do you use ballast, and if so why?

Most of the top pilots are using ballast if they already aren't too fat. The amount depends on how strong the day is. Here's the strategy: By using ballast you trade off climb for glide speed. If you're good at climbing, then you can stay with the gaggle in the thermal, but outglide them because you are maintaining a speed closer to best glide through the air while they are pulled in more. This is especially true in a head wind or sink.

Think about this for a minute. If you outclimb everyone your advantage is only realized if you leave first, so you are taking more risk. On the other hand, if you outglide them, you end up reaching the next thermal 30 to 50 meters higher and can find the best core sooner and easier. Every gaggle occasionally gets into trouble, so it's better to have the advantage when everyone is low (by outgliding them) than when everyone is high (by outclimbing). Pilots can often block you from outclimbing them, but there's no way in hell they can stop you from

outgliding them.

Manfred is one of the best climbers there is, but he ballasts up so his climb is equal but his glide is exceptional. That way he can be higher than the rest when it gets weak and everyone spreads out. He just goes to the guy who is climbing the best and stays on top. Then even if everyone is on final glide he beats them.

The reason we didn't use ballast much on earlier gliders is they would wash out. The leading edges weren't stiff enough. Tommy (Suchanek) is still thinking the old way, but I think he is mistaken. We can actually load today's gliders more than is reasonable for takeoff and landing. They still remain energy efficient and so are good in thermals. However, nobody I know uses over 10 kg (22 lbs) of ballast for X-C racing.

Certainly it's easier to carry ballast in a tow meet than when launching on a high, hot, flat slope like at a couple of World Meets I have been to. What about that final glide you have referred to a couple times?

As you know, final glide is the last dive to goal. Many top pilots tend to leave too early on final glide. It's important to read the air to excel at this phase of competition. If conditions are flat or you are far away it's often better to wait in weaker lift before gliding, especially if there's sink expected. If you are closer—the final is steep—you must leave earlier for you cannot overtake anyone even if you hit a good thermal. One of the most essential things for a good finish is having a good last climb. So sometimes when you are behind you can capitalize on what pilots ahead are doing and go to the best lift.

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Of course, the air plays a big part in all this. For example, in the 2001 Quest Air meet I beat the lead gaggle to goal by two minutes by taking a better final glide line. I pulled out of the lead gaggle and flew a path I thought would work best. They got higher and went straight, but I had better air and won.

Manfred's tactic when he is ahead at the end is to take a weak thermal that may be dying so that the others coming behind don't get up in it. Another way to win at the end is to go on a long glide that the others are reluctant to do. This takes steely nerves and is risky. I have done this before and got low, but got a good thermal and won. But that tactic should be reserved only when you are near the end of the meet and not leading. Then you can pull out the stops and go for it. The worse that can happen is you fail to win but learn something. That's how I won the Pre-Worlds in Monte Cucco. I knew the area around the last turn point on the last day's task. I went on ahead of

Gerolf crosses goal in perfect form in Spain. Note his unzipped harness.

Manfred, found the resident thermal and won.

But all that's only half the picture. If you are in the lead for the day, it's wise to protect that lead. In that case I may stop for a weak thermal that the following pilots may miss or get lower down so they don't climb as much. But of course, I don't let them get away too far ahead. It's always good to get a little gap on the others so when a critical time comes you have a little edge like height to clear a crest, town or trees. *[Editor's Note: A situation like this came up in the 2001 World Meet in Spain. Nearly 30 pilots were gliding to a turn point past some foothills to the flats. The higher ones flew over a ridge and found a thermal on the other side. However, quite a few were too low and dropped below the top and had to land.]*

Long before final glide you should be planning for it. You should be thinking 10 to 20 km (6 to 12 miles) ahead. That's at least one or two thermals ahead.

Long before final glide you should be planning for it. You should be thinking 10 to 20 km (6 to 12 miles) ahead. That's at least one or two thermals ahead. Watch the conditions, the terrain, the signs in the air and the changes to help you plan your strategy. That way you are less surprised by the unexpected. This strategy planning is also a learning matter, so learn from your unsuccessful planning as much as your successes.

In general, I'd like to leave pilots with three mental aspects of being a good competitor. First, *don't get angry.* Don't get upset with the conditions, yourself, your luck or other pilots. That's just distracting. Focus on playing the hand you were dealt and play it until the very last card hits the table.

Second, *don't get excited* (elated). If everything you do pays off, avoid getting over-confident. Often after a day of great success, a little tough thing happens toward the end. You may get stuck for instance or pass through a long area of sink while your competitors are gliding great to the side of you. It's important to focus all the way and not expect that you will waltz into goal just because it's been easy so far. Hang gliding competition can be manic-depressive. Don't get too excited and don't get down.

The third point is to *avoid getting surprised.* That doesn't mean don't fly into unexpected sink, wind changes or lift, but rather, when the unexpected happens, be able to minimize the bad effects and capitalize on the good ones. Intellectual pilots often have a problem with this. When something doesn't fit the well-planned expected model they may not be able to adapt as quickly. An example is encountering a thermal over water. Don't think about it, just use it! Intuitive pilots don't have this problem—they go with the flow. If you think too much you can't focus and process all the inputs. If you feel you must analyze a new or challenging situation, do it later after the flight is over, or it may be over sooner than you want it to be.

Whew! That's a good chunk of information, Gerolf Before we end our discussion we need to cover some subjects dear to your heart. That's tuning and designing.

Yah! For me, tuning means tuning a glider for your needs. So forget the idea that there's one tuning for everyone. Just as you have to develop your own style of flying, you have to develop your own tuning style (like do you want to high-side? What pitch effects do you want?, etc.).

There are three aspects to tuning, like a three-legged stool. They are (1) handling, (2) performance, (3) safety. They are usually in opposition to one another. For example, by lowering the dive sticks you may get better handling or high-

speed performance, but you will compromise safety. With gliders tuned to the limits of safety, handling in the thermal may be better. But will you perform better knowing you have less safety margin? Remember our sport is 90% mental and if you aren't 100% confident your performance will suffer.

Nowadays, the sail tension of our gliders is mainly on the leading edge, not trailing edge. So they tend to handle great when set up properly. It's a myth that Manfred's glider is overtuned. Most people that fly his glider like it very much. They may not like the pitch, but it sits very well in thermals. It's very sweet and so are those of most of the top pilots. You know, even though Manfred is able to fly a glider that's very stiff, he will still fly better on one that isn't.

On my glider I tune it so not a lot of high-siding is required. I want a glider that sits in a turn without much input and is trimmed very slow at loose VG (but I can always pull in of course). I fly loose VG only in strong turbulence, broken lift or when going into small landing fields.

Gerolf happy again at goal.

When it comes to tuning, you should first get the pitch right. You do this with the dive sticks. With compensated dive sticks (automatic adjusting ones like on the Litespeed) you shouldn't have to do too much. Don't go overboard here. The idea is to have some reasonable pitch feel at all speeds. Myself, I don't want a zero pitch feel; I want to be able to concentrate on the air through a light grip. Perhaps the only time zero pitch feel is useful is when there is no needed thermal-that is, you are on final glide.

Then you should find out what bar position and trim speed works best for you. Bar position can be altered with different front and back cables. It depends on your geometry and your preferences. Small people may have a climb deficit, for example, if they can't push out enough due to short arms. As long as you are aware of the stall situation you can have the bar brought closer. Tomas prefers a bar position that is 8 cm (3 inches) further back than mine and I prefer mine 5 cm (2 inches) back from Steve Moyes, even though I'm taller than Steve. Remember, the glider must be comfortable for both climbing and gliding.

Trimming means the hands off speed. Many people have their glider trimmed too fast. They feel the bar push back when they slow lower than trim speed and think the glider is stalling. To check for this, take some flights and move your hang system one hole back on each flight until you get it right. I want my glider to trim slowly in straight flight. That's why I rarely fly straight without some VG pulled on. Here's a trick: if you find you need to trim between two holes, you can trim to the front one, then make the glider slower by flattening the last (outboard) 3 or 4 battens a bit. That will slow it up.

Next, you should tune for turns. Of course, the glider should fly straight, but you also want the desired turn initiation and proper balance in the turn. With the

Litespeed you can greatly effect the turn initiation by adjusting the inner eccentrics, which changes the dihedral balance of the glider. The tip wand adjuster is good for effecting how the glider sits in a thermal. This is also a good adjustment for getting a turn out of a glider.

One of the things I recommend is flatter battens at the tip. It doesn't make the glider any less safe (actually, it's generally safer) and often makes it more pleasant in thermals. You can also adjust batten tension and sail tension to get a variety of effects. Generally, all of these things are safe compared to lowering the dive sticks so every pilot that wants to get the most out of his or her glider should spend some time and try some small changes. One word of advice: write down in detail exactly what you do so you can always go back to the original if necessary.

Gerolf, I have been using the inboard eccentrics on the Litespeed to adjust for handling. I believe it's the first time in a flex-wing design that the pilot can truly alter the handling to suit his or her needs in an effective way.

Absolutely. Wills Wing invented the eccentric leading edge insert, but I went one step further and made it movable so you can change the glider's outboard dihedral (see figure 3).

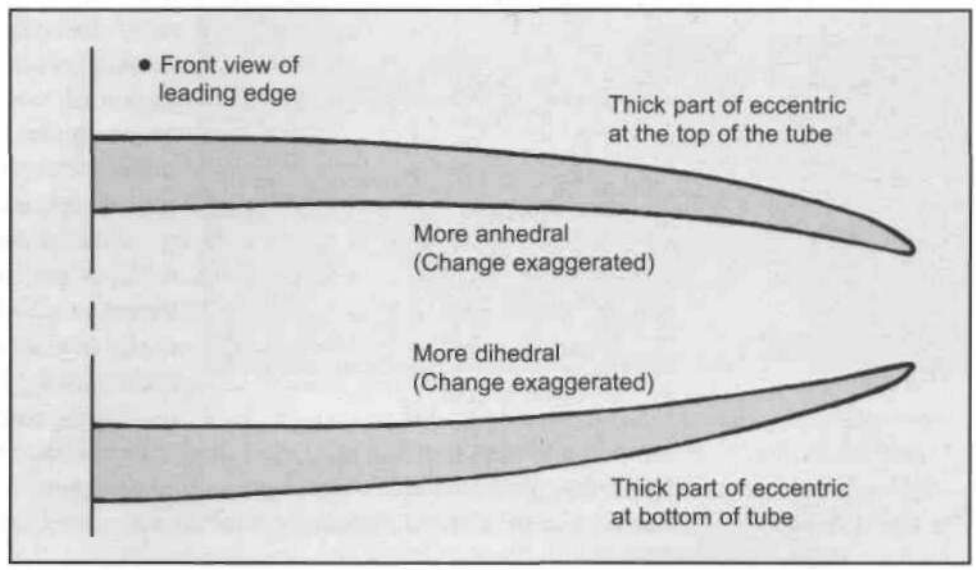


Figure 3 - Altering the Dihedral of a Glider with Tubing Eccentrics

That brings us to your many design contributions. I know you invented the Gerolf Connection—the rocker arm used on most current topless gliders' hang system. What other innovations have you brought us?

I changed the crossbar/leading edge junction system when I was at Icaro. Before, they would bend the crossbar. With my system there is no bend on the crossbar and it makes the leading edge want to bend outward beyond the crossbar so you have a virtually longer crossbar. It consists of a plate fixed to the leading edge rather than the crossbar (see figure 4). I think that's perhaps my most important contribution, but people don't know about it.

I also developed the better inboard dive stick (sprog) adjusting system with a cable to the crossbar. I believe the worst pitch situation is during low speed, especially with the VG loose. So our system kicks up the dive sticks with the VG off. With that trick we have nearly two times the required HGMA pitch stability

reading (Cmo).

In addition to that I have made the whole pitch system tortionally rigid. The leading edges are bigger, there's added bracing at the crossbar junction and the dive sticks are cable supported. The result is a more solid system so you can keep the sticks lower and still have better pitch stability. The old system used to deflect 25 cm (10 in) with a 20 kg (44 lb) load. The new system only deflects 6 cm (2.4 in) with the same load.

Another important thing I have done is change the airfoils. I started with what I learned with the Laminar while at Icaro and made some changes. I was the first to use flatter center section battens and flatter tips (keeping the midspan thick). The general theory is that thicker camber airfoils have a broader usable angle of attack range, but they stall at a lower angle of attack. Thus, you can't use them to their full advantage in the root area since that's the area that's at the highest angle of attack.

The spin-off of using flatter batten profiles (airfoils) in the root is that they are more pitch stable, so we can use less washout (wing twist) and fly more efficiently. That is, we are faster and have a better high speed glide.

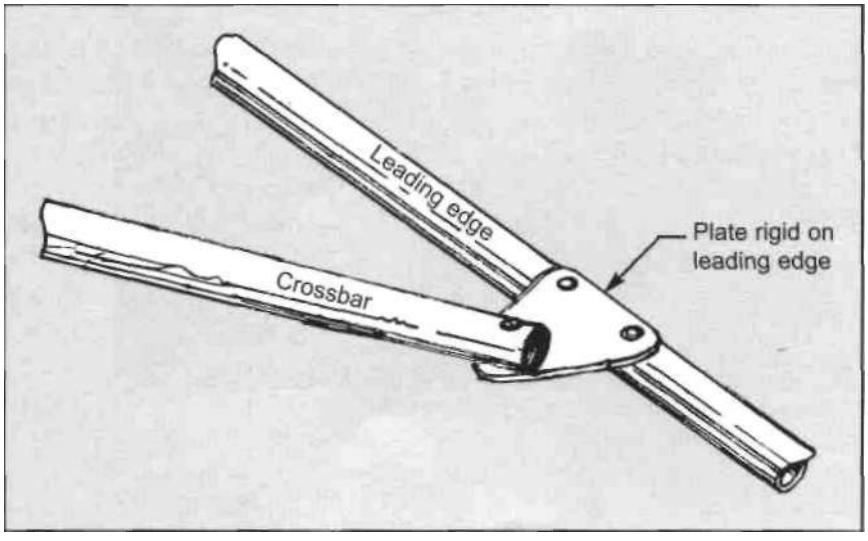
Big camber airfoils take longer to recover from a stall as well, so a flatter profile helps you maintain control in rough air. That's one of the main reasons I went to flatter airfoils at the tips as well. Remember, fhermals tend to be turbulent and our inside wing is kissing a stall when we are flying a slow thermal turn.

Big camber airfoils take longer to recover from a stall as well, so a flatter profile helps you maintain control in rough air.

My airfoil initially was about 4 cm (1.6 in) flatter at the root—a significant amount. My philosophy is that battens shouldn't be of the same airfoil family along the span. I keep battens 1 to 5 (from root to tip) fairly flat, then the midspan deeper, then the tips flattened just enough to control high-siding. Incidentally, Manfred went to this profile arrangement just before the '98 World Meet.

Also, around that time I realized that the faired uprights were not right. People were saying that a fineness ratio (thickness to width) of 2 or 3 to 1 was good, but I had books that compelled me to use 4 to 1. At Icaro we had the first carbon upright, which Robert Reisinger had made by himself. Then we had the first production ones. Tomas had the first faired base tube, but again, we had the first production ones.

Figure 4 - Leading Edge/Crossbar Junction Plate



Getting back to airfoils, Gerolf, can you compare yours with the competition?

Not only is my root airfoil flatter than before, but the high point is moved forward. The current Laminar airfoil is using the same layout as in the king-post days, but flatter. The high point is back. The Aeros gliders are most extreme with a high point furthest forward. The result is a longer stall recovery, which defeats the

purpose of using flatter airfoils. You know, sailplanes have laminar airfoils, which have poor stall recovery. We can't get laminar flow, so it makes sense to go the other way.

During the era of the first topless gliders, I saw many pilots scared to use the full potentials of their gliders. Since then we have improved the handling (less PIOs and easier initiation), the strength and the pitch stability. I have now seen pilots fly one level better.

When I came to Moyes the CSX was not too successful. So I set about designing a glider with the focus on marketability. I found by making a safer, easier-to-fly glider, it actually performed better as well, since performance is a marriage of pilot and machine. While our focus was on a saleable glider, the Laminar's focus was on performance at all costs. I found that to sell gliders you have to build pilot's confidence in all aspects. If a local hero crashes on landing in front of his buddies, they are going to blame the glider. A glider sells on performance, but deep down pilots must feel comfortable, have control, not get tired and so forth.

I think we had a fashion wave of big gliders some years ago, but now we're going the other way. When I tried designing a smaller glider I realized there was a big hole in the market. I wanted to try a smaller aspect ratio glider so high speed glide is enhanced, handling is enhanced and there is not so much speed differential in the tips during thermal turns. The performance benefits became a reality with the Litespeed. Because it is not so spanny, you can fly it at a relatively tighter VG.

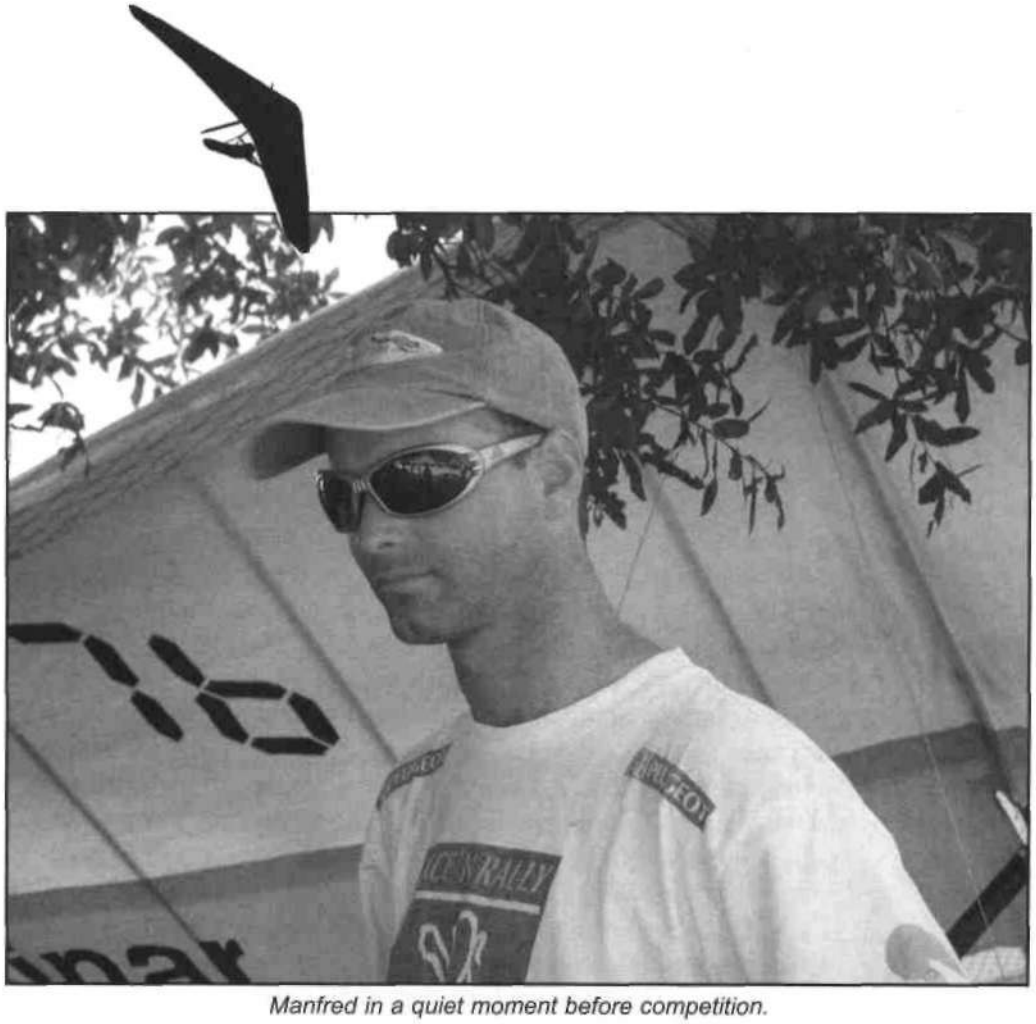
I like a more methodical approach with careful documentation. That prevents what happened to Oleg—he had a perfect glider, but didn't take notes on the setup and couldn't duplicate it. Most of my design work is done on the computer with a CAD program. It shortcuts the sailmaking and perfection process. The computer drives a plotter that can make millimeter adjustments to the patterns. This is important because the new Mylar sails (PX10 and others) don't stretch much, so wrinkles will be present unless your pattern is perfect. If you use templates (the old way) you have to change the template. I believe the future of sail development is with this system. So I see Moyes and Wills Wing being on the cutting edge of development because we have this integrated computerized system.

That brings us to a good closing point, Gerolf. But first would you care to peer into the future of design according to the Heinrichs crystal ball?

I see one product missing: that's a hybrid between rigid wing and flexies. Perhaps with a similar leading edge as the rigids, but being weight shifted. If we go to flaps, I only want to use it going up for fast speed. With the current crop of gliders, I don't think we need to land any slower.

Well, thanks for your time, your insights and your frank discussion. Hopefully now some of us can join you in that elusive lead gaggle.

MANFRED RUHMER



Manfred in a quiet moment before competition.

RUHMER'S TRUTHS

Our last interview is with Manfred Ruhmer. This is a fitting arrangement, because Manfred has gone on to win the World Championship three times and as of this writing, he reigns supreme. I first caught up with him in 1996 at the U.S. Nationals in Colorado—a meet he added to his list of wins. We spent several evenings covering all aspects of his flying experience and the tale was one of an up-and-coming pilot building his repertoire of knowledge and skill. But the story doesn't end there, for I re-interviewed him both in 1999 and 2001 at the Wallaby Open Meet. It is very interesting to compare his attitude, insights and confidence level at this later date to his earlier comments. The interviews appear chronologically below.

There are a number of top pilots on the world hang gliding scene, but two in particular seem to have become legendary in the last decade or so. Tomas Suchanek and Manfred Ruhmer are well known for their customary occupation of the winner's circle at international competitions. In fact, Tomas had few rivals for a while until Manfred came along. After that they seemed to trade first place at every other meet. Then, Tomas quit competing in hang gliding for nearly five years after he won his third World Championship in 1995. Now he's back to give Manfred a run for his money, but Manfred has upped the ante even more. As the drama unfolds, one thing is clear: these top pilots have some special abilities that leave the rest of us mystified. In the course of our presentation, we will see that while both Manfred and Tomas have reached a similar level of excellence, their approach is entirely different.

Manfred, you seem to have captured our attention all of a sudden only a couple years ago, but we know success doesn 't happen overnight. Can you tell us about your flying and competition background?

Well, my first exposure to flying was with models. I believe that experience helped me visualize the nature of the air. I first heard about hang gliding in 1978 when I was 13, but of course I had no car and no means to pursue it. Around 1982 or '83 a friend had an old Rogallo wing which he gave to me to try. I was not too successful, but finally in 1986 I began to take lessons near Micheldorf, which is by the Czech border in northern Austria. I learned to fly on the small hills that precede the Alps there, and I think my time there has helped my flying by making me excel in light conditions.

I find it interested, Manfred, that you learned to fly very near where Tomas learned in what appears to be similarly challenging circumstances. Perhaps we should all spend some years scratching around on low hills.

Manfred finished in first place at the 2002 Class 2 World Championships in Chelan, WA. Robin Hamilton from Great Britain (right) was second and Brian Porter from the USA (left) was third..

Actually, I didn't spend many years there, for I started competing after my first year of hang gliding. I learned to soar one weekend in autumn during my first competition. The next season I bought a high performance glider and competed more seriously.

It sounds like you did learn quickly after all. How were your results?

I finished 3rd in a Regional competition and there I experienced my first good cross-country flight. Later that same year, I won a small meet. Its significance for me was that I experienced my first win and realized that this was something I could get used to (Manfred grins).

My first international competition was the 1989 World Meet in Fiesch, Switzerland. I was there to observe and learn, but I ended up first on the Austrian team. It was very turbulent there, but I thought competition was always turbulent, so I just held on tightly and handled it!

That's what we call trial by fire. The turbulence in that meet was legendary and the winner, Robbie Whittall, tumbled in the midst of one flight.

Yes, he went on to win and he was considered one of the best pilots at the time. In 1990, at the European championships in Yugoslavia, I found I could climb with Robbie, so I realized I could be a top pilot. I took second in that meet. I got a job building gliders in Austria, and began to fly the competitions on a Wega.

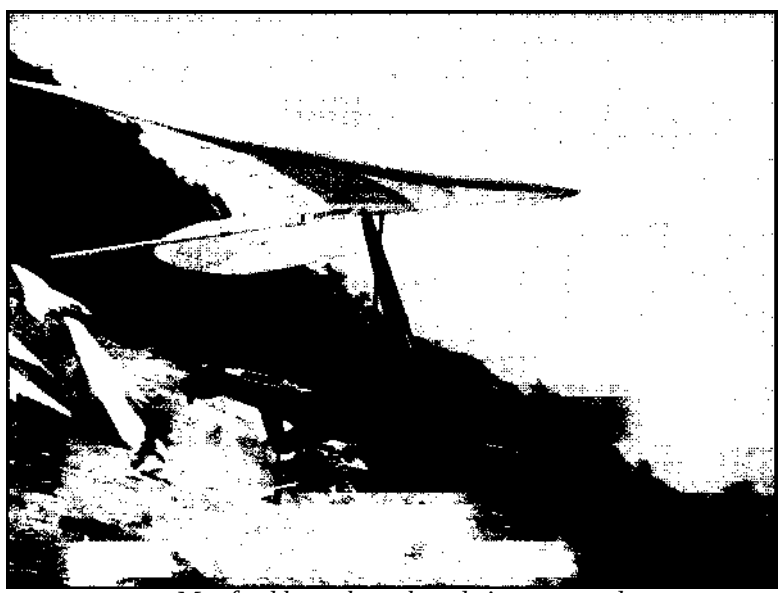
In the 1991 World Meet at Govenador Valadores, Brazil, I took 14th. I began very well, but in the middle of the meet I made some bad mistakes. I was not sure of myself and this lack of confidence affected my decision making.

It's comforting to know that even such a formidable pilot as yourself had to develop confidence like the rest of us. We'll talk more about this later, but first tell us more about your competition success.

In 1991 I became the Austrian champion for the first time and have repeated that four more times *[Ed. Note: as of 1996].* In '92 I took 4th at the European championships in Vaga, Norway. I was then flying a 142 Moyes XS. I chose the small size because Tomas was flying it. Later in the '92 pre-Worlds in the Owens Valley, California, I changed to the Icaro Brazil XS which was lighter. By the next year I began flying the 155 Brazil.

I took 11th in the Owens Pre-Worlds and 7th in the World Meet the following year. Then in '94 everything came together. In Australia I won the Bogong Cup, took 2nd in the Flatlands meet and tied for 1st in the Australian Nationals at Mt. Buffalo. Then I was first in the Pre-Worlds in Ager, Spain and 2nd in the Europeans at Laragne, France. I lost to Tomas in that meet by a few points.

Many of us know about your heartbreaking 2nd place finish at the 95 World Meet in Ager. We'll get your impressions of this event later when we deal with competition. For now, it is fair to say that you are clearly at the top of your game as evidenced by your win of the Europeans this year (1996) in Hungary. While we can see that you did progress gradually toward your high level of performance, it is also apparent that you did so at an amazingly fast pace.



Manfred launches already in race mode.

To get some clues as to how this is possible, let's look at your personal traits. Manfred, let's discuss physical attributes first. Some good pilots seem to have excellent eyesight for spotting signs of lift. How is yours?

My vision isn't perfect. I wear contact lenses and can spot birds and gliders when necessary. I do believe this ability is very important. In this area (Colorado, USA), acute vision is more important because altitudes and distances are so great. It is possible to reach a thermaling glider more than 10 km (6 miles) away. In Europe, such sharp vision is not quite as critical it seems, because we don't reach out as far.

I had previously had problems with dust on glasses, so for me wearing contacts is the best solution.

How do you get in shape for a competition or flying in general?

I don't do any regular exercises—I just fly as much as I can. I get perhaps 200 hours of airtime per year. Sometimes I don't fly for a week or more and may have

little problems with my body—the standard aches—at the beginning of a competition. However, as the competition goes on, it gets better and better. By the end of a week-long competition, I can fly for many hours and not get tired. For example, in this meet (the U.S. Nationals in Dinosaur, Colorado) I feel better now than during the first days. In strong conditions such as here, I get more tired, but I believe I can readily fly 6 hours. However, I prefer to be fast to goal and not fly so long.

Manfred smiles at this last sentiment. It is clear from our conversation that he believes the best exercise for flying is flying itself. It's also clear that his attitude that things will get better as a meet progresses is exactly the mental mindset that delineates a champion. Our conversation turned to the mental aspect of hang gliding excellence. I asked him about his thought process during competition and flying in general.

I am very patient. An example of this is the climbout after launch here in Dinosaur. I am willing to spend an hour or more if necessary getting high before getting the start photo *[Ed. Note: in those days all control of a pilot's start time and turn point achievement was through camera verification rather than GPS].* Of course, when it's time to leave a thermal I don't linger. **I** see **many** pilots take the patience thing too far on good days and they wait too long at the top of a thermal where the climb slows down.

/ see many pilots take the patience thing too far on good days and they wait too long at the top of a thermal where the climb slows down.

When I choose to leave a thermal or gaggle, I'm making logical decisions based on what I know of the area and what the day has shown me so far. I'm also constantly looking around for possibilities for a better climb, even when I'm climbing well. However, much of my thought process when making these decisions and especially when leaving a thermal and choosing a good path is not done consciously. I think my flying is 60 to 70% intuitive. Even when thermaling I'm sort of on automatic pilot; my body does the right controls to stay in the best lift while my attention can be devoted to watching for traffic and looking for signs of better lift or the best routes. I have the ability to absorb and process a lot of information, but it is often not in the fully conscious mind. I use what is necessary.

/ have been struck by the differences you and Tomas report about your thought processes during flight. He seems to be constantly making up-front logical decisions, while you are a more intuitive pilot. It is interesting that both types of approach can work to make a pilot excel. Over the years we have seen both approaches work with other pilots as well. Perhaps the common thread, however, is the ability to absorb and process a lot of information, whether consciously or not. Also, I expect confidence is an important factor no matter how a pilot comes ***to*** *make a decision.*

Sure it is. In the past I didn't have total confidence in my decision making as I do now. I have learned in hang gliding that we must make our decisions and stick with them for we have few chances to try other options. If we waiver, we often eliminate all options. For example, if we start heading to a place of likely thermal production and encounter strong sink on the way, if we turn back we will most likely lose all chance of finding lift. Of course, this process must be tempered with good sense—don't head off into a dismal stretch of poor thermal prospects just

because you are determined never to alter your decisions.

The point is to have confidence in your decisions and only alter them if it is clear that some other option is better. So often in our flying we don't have absolutely clear information as to what's happening up ahead. So again we have to make guesses based on all our observations and experience. And of course, the situation is constantly changing. For that reason, I don't like to fly with pilots in front of me. Others may like a gaggle to follow, but I find that other pilots affect my decisions adversely and often slow me down. The air and the lift are constantly changing, so pilots ahead do not necessarily show you the best routes. Of course, if I need a climb I'll go to a climbing glider, but very often I'll pass by a gaggle if I can go further along course to a place of likely thermal production.

At this point you seem to make few mistakes, Manfred. How do you manage that?

Certainly, I still make mistakes but they are fewer and fewer. The important thing (as much as avoiding mistakes) for learning to be a good pilot is to make decisions and stick to them. Then if you go down you can think about the mistake and when faced with nearly the same situation, you can make a better decision. If we never make mistakes we can never learn. A pilot afraid of making mistakes will also be afraid to make an independent decision. He or she will not learn and improve in that case.

I can remember many mistakes and not repeat them. If I could give a bit of advice to other pilots, I would say don't be afraid to make a mistake. If you go down, analyze the situation and remember it for next time. The bad thing is not making a mistake, but repeating it. Confidence is everything and confidence comes from awareness of the situation. There is no way to make 100% good cross-country decisions in our sport. That's the nature of hang gliding since we can't readily see the air. So mistakes will be made. We must have the conviction that we made the best decision based on the information at hand. If we land short we must add the experience to our store of knowledge and go out and try again. The next time we are in a similar situation, we take the last experience into account, but do not let it affect our confidence in our decision.

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Manfred, many pilots have noted your superior climbing ability. You seem to be able to climb through almost anyone in a thermal. In fact, Tomas Suchanek pointed out that you appear to have a natural climbing ability while he must constantly work to stay with you in climb. Can you tell us how you manage to thermal so well?

I will try, but perhaps I can't tell you all the details because I tend to thermal on automatic pilot so I am not aware of everything I do. When I am established in a thermal, I think I am constantly aware of changes in lift. I adjust both pitch and roll accordingly. In pitch control I may push out a bit to gain a little more in a surge of lift if I am not in danger of stalling. In roll control, I will bank steeper or flatter to change my circle as the thermal core moves or small shots of lift come through. Of course, when you are turning, a pitch control will also change our circle's size. So all these controls involve a combination of pitch, roll and yaw. I

think one of the secrets of maximum climbing is not resting in a steady climb, but making adjustments when possible. I am always looking to get a better climb.

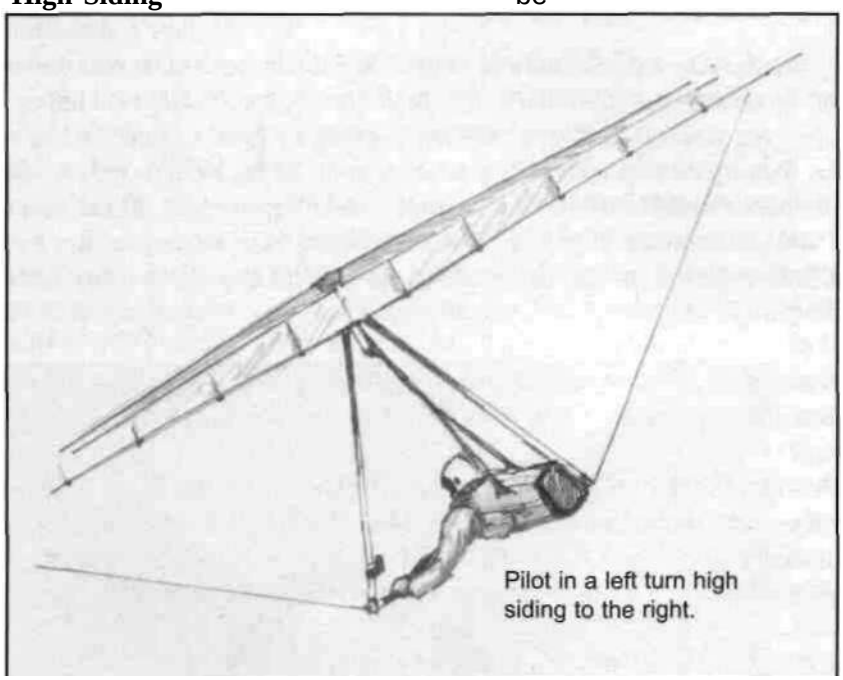
Some of us have seen you push out in a thermal and tighten up your circle to climb away from a pack. Is this a method you use often?

Yes, I use this method frequently, but it must be clear that if a thermal is totally smooth, there will be no surges of lift that can be used to create this improvement in climb. Larger thermals in desert areas like Spain are more likely to have variations that can be used in this way. Naturally, if traffic is too thick, it is difficult to turn and maneuver exactly like I want in order to make the most of the climb. On the other hand, it is often in the situation where too many pilots in the thermal block each other from using the best lift that I can get a jump on the other pilots by tightening in a surge of lift and climbing out while the rest are still interfering with each other. I find I am not as aggressive in crowded thermals as other competitors may be, but if I can see the chance to tighten up and get away, I'll take it.

All this control technique is aided by having really good glider handling that allows me to turn instantly. Also, curved tip gliders seem to avoid dropping a wing in a turn when you push out. This helps because you can make pitch controls without having to roll too much.

Another point to make about control in thermals is I believe you should be on the high side of your glider if you are going to be maxing out the climb. Sometimes I will add some VG to help me do this. By staying on the high side, my bank will be less for a given circle radius which is more efficient. *[Editor's Note: In order for a glider to be thermaled with the pilot's body displaced to the outside of the control bar's centerline or high-sided as illustrated in figure 1, **the** glider must have a tendency to roll into the turn. This tendency increases with more anhedral—downward angling of the wing—among other factors.]*

Figure 1 - High Siding



Do you have other tricks or ideas that help you excel at thermaling?

Sure, I am aware that many thermals have their own characteristics. This depends on the quality of the air and the area. Different wind conditions, temperatures and moisture in the air will affect the thermal nature. Different ground shapes, ground cover and orientation will also alter thermals. So every thermal I stop in I try to determine three things as soon as possible:

1. How big is the thermal?
2. How strong is the center?
3. Are the cores moving?

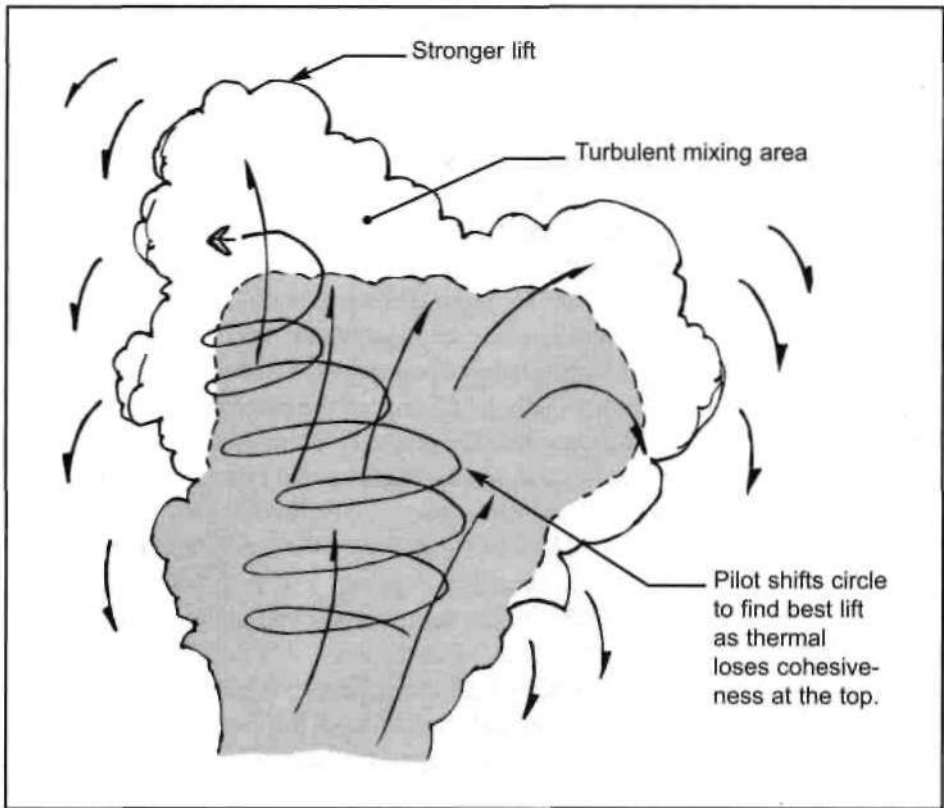


Figure 2 - Turbulent Thermal Top

The first two points help determine how much bank to use. I want to stay in the strongest part with the smallest radius circle and slowest speed possible. The third point lets me know if I need to be constantly moving the center of my circle.

For example, when I began to fly here (at the 1996 US Nationals in Colorado), I found there were more thermals with varied cores than I am used to. If I stayed in one place, I may not have the best core—500 meters or 1 km further along or to the side may be better. A search pattern that consists of widening a 360 before tightening up again may be helpful in this case.

In another situation, sometimes you reach the top of a thermal long before it has reached its maximum height. It can be turbulent and broken at this point (see figure 2). Here it's important to change your circle to find what section is going up best. I usually make a bigger circle, then tighten up when I find a better area. I may have to repeat this process a number of times until the thermal tops out. Often stronger lift can enter the thermal and accelerate it. If you are ready to change your circle position and are doing a little exploration, you can find this better shot and climb away from the other gliders.

Those are some ideas for us to ponder about how to climb well, Manfred, but we also know you are adept at finding thermals. Do you have any special tricks when angling for lift?

Well, mostly I use the classic signs: clouds, terrain, birds and other gliders. Clouds are especially important when you are high. When it is windy, the drift of the cloud shadows on the ground tells the wind direction at the cloud level. This greatly helps me know where to be in relation to the cloud to most likely find a thermal.

When lift is weaker or harder to find, I rely more on other gliders and birds. Sometimes another glider will be on top of a thermal and you'll be above him and find no lift. If you need a thermal at that point, you must wait for him to climb up to you. This is a difficult thing to do if you are racing, for it means this pilot will catch up to you or get ahead. But finding thermals is a matter of probabilities or chance, and you must take what you can get. I would only pass by such a well-marked thermal if I have plenty of altitude for exploring and I see definite signs of lift ahead.

I **try** to be aware of all possibilities and keep a sharp observation of all gliders in the area, especially if lift is weak. Also, I try to be sensitive to my drift so I can detect flows into a thermal. This will mostly show up as an external yaw input into my glider. We often hit thermals to the side so it is very important to be able to feel where the best area of lift is. If a pilot isn't sensitive to horizontal flows, he may feel a little lift and move on, thinking it is just a weak thermal. If he is able to feel glider inputs that say more lift is to the side, he may be rewarded with a healthy thermal.

When you're flying cross-country, are you mostly watching the terrain or the sky?

I use both. The higher I am, the more I use the sky; the lower, the more I use the ground. But choosing a cross-country route is a total plan which must involve decisions that take in the combination of the best looking cloud and terrain routes. For example, on today's task I didn't go straight on track over some reasonably good ground because there were clouds to the north that promised better lift. The pilots that went straight through the blue had more problems. I often observe that pilots don't always choose the best lines.

Very often in the sky there are lines of lift and lines of sink generally oriented parallel to the wind. These lines may be very weak—only slight differences in the lift and sink—but it is important to try to find and remain in the lift lines.

Very often in the sky there are lines of lift and lines of sink generally oriented parallel to the wind. These lines may be very weak—only slight differences in the lift and sink—but it is important to try to find and remain in the lift lines. This is partly a matter of exploration and partly observation. Watch other pilots gliding and watch your instruments for signs of buoyant air when you are gliding.

I think we all have glided alongside another pilot who has done much better or worse than us simply because he or she was on a slightly different line. Do you have any advice for flying in windy conditions such as we've been enjoying here?

First let me say that wind makes things more complicated. In high mountains in light winds, we get upslope breezes and things can be read pretty much like in the textbooks. However, as more wind comes, thermals become broken and more elusive, flows around multiple hills and slopes interact with one another and downdrafts have more velocity when they reach the ground. This last fact can mean that they trigger more thermals but the thermals will be smaller because they are set off more frequently.

Manfred landing at another goal in Spain.

We can extend this idea to finding thermals over hills. Normally we search the upslope areas for lift in higher winds. However, in stronger winds, the downdraft behind the hill

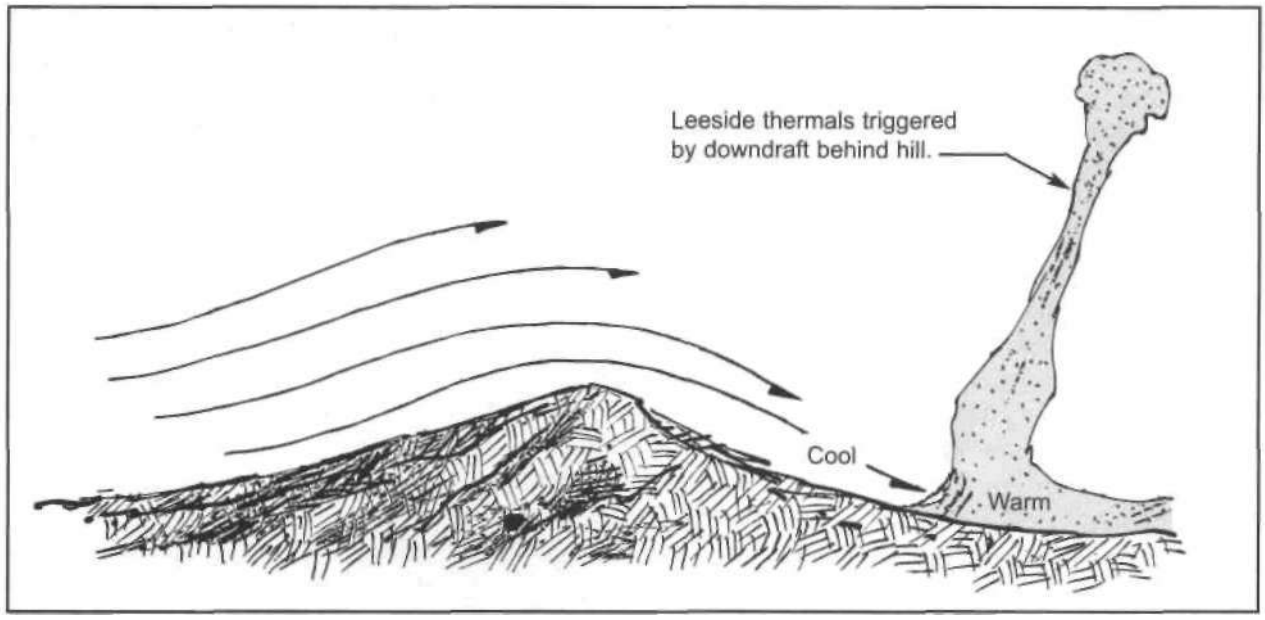


Figure 3 - Leeside Thermal

may trigger thermals (see figure 3). Also the area behind the hill may be sheltered somewhat from the wind so it may build up a stronger thermal until a downdraft dislodges it. It should be clear that winds in hilly or mountainous regions aren't steady, so the thermals will trigger in more different places and certain regular thermal producers will be less reliable. On the other hand, in desert conditions with a layer of very warm moving air, thermals often rise with only a small rise in the terrain. I look at all these factors when I fly in windy conditions.

Thermaling techniques should be a bit different in windy conditions. For example, the thermal drift and tilt means you must constantly be aware of staying with the core. Sometimes you have to commit and go with a thermal that is drifting fast after launch. Other times, you have to keep heading forward to avoid falling out the back of thermals. The methods I mentioned before—constantly adjusting circles, constantly monitoring your climb rate and paying attention to **lift** lines—all are important when trying to stay with lift and maximize your climb on windy days.

You make me eager to go fly in wind since you portray it as a fun challenge. Do you have any more words of wisdom concerning thermaling or cross-country flying?

/ try to learn about the nature of the thermals and the quality of the day as soon as possible. Of course, we can learn something by watching other pilots, but flying gives us the most information.

I would say that for me I try to learn about the nature of the thermals and the quality of the day as soon as possible. Of course, we can learn something by watching other pilots, but flying gives us the most information. Within two or three thermals, I try to have figured out how strong the day is, how big the thermals are, how high they go, how cohesive they are and what altitudes provide the best lift. Of course, I make a constant update as I continue flying, but the sooner I get this information catalogued, the better I am able to make useful decisions. I especially want to know what altitudes provide the fastest climbs and then I'll try to remain in that band if I am racing.

Another point I would make is that it is necessary to have a variometer that is fast enough and sensitive enough to show the changes in thermal texture. A good audio signal with an averager is the most important instrumentation a pilot can have. This allows us to watch the surroundings—I'm always looking for the best lift—and monitor our progress over time.

Finally, and perhaps most importantly of all, I would say pilots must simply learn to use their luck. This game we play is partially a matter of chance, but the best pilots know how to exploit their good fortune when it comes. There is skill involved with recognizing the presence of good luck (a lift line perhaps) and in using it to the max. This involves total awareness and the ability to dance with the air to exploit its energy. Not all pilots can do this, but most pilots can learn to do this.

Manfred, earlier you told me you prefer not to have pilots in front of you because they slow you down. However, I've seen both you and Tomas in competition wait until everyone else on the hill has launched. What is going on here?

Sometimes, we do this for fun—for the challenge. But the main point I was trying to make is that flying without other pilots around can be as fast or faster than flying with gaggles. But you must have confidence to be able to go for it alone and this is what I do have.

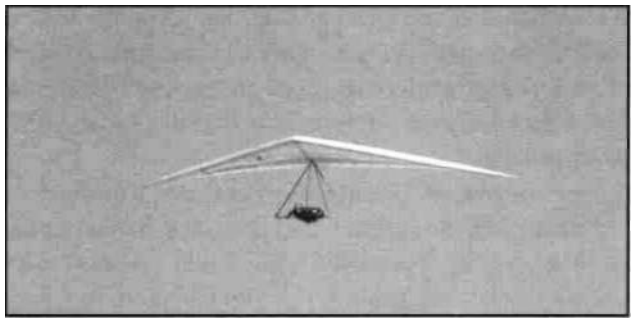
In Europe, with weaker conditions, I start later so I can go from gaggle to gaggle. The most important thing here is to have a really good climb rate to be able to climb to the top of the gaggles and glide on first. But once again, it's important not to get hooked on gaggles because they often contain conservative pilots who are afraid to strike out on their own, even if they are on top. This slows them down. I will sometimes avoid these gaggles. Usually the first gaggles you encounter if you launch late are slower ones and they are not necessarily using the best lift or the best lines. In flat lands, without definite thermal indicators, I find it is usually better to stay with a gaggle of good pilots.

It's important not to get hooked on gaggles because they often contain conservative pilots who are afraid to strike out on their own, even if they are on top. This slows them down.

To summarize gaggle flying, I would say it is necessary to look at all pilots ahead to see the big picture of what the lift is doing. If you are going to join the gaggle it is very important to know at which level they are flying. If they are not top competitors, I expect to leave them soon. In any case, when I get to the top or in front of a gaggle, I never wait. My quest is to go forward as efficiently as possible.

This is certainly an aggressive approach that can harbor no lack of confidence. We have seen you on launch, calmly studying the sky like a boat captain, seemingly oblivious of the stresses of competition. How do you gain such confidence?

My confidence comes as a consequence of my motivation to do well. When I do well I naturally have more confidence. When I do poorly, I don't dwell on the negatives. If I have a bad day, I am even more motivated and aggressive the next day. I realize that every pilot has problems on tasks at some point, so I look to make fewer mistakes and avoid repeating the ones I do make. Actually, I often find if I am doing very well for a time, I may be less aggressive, that is, more conservative, and this may slow me down. So my attitude is that a little adversity makes me a better pilot.



Manfred blazes to goal in perfect form.

How does flying against Tomas affect your confidence?

When Tomas is present in a meet, I am more motivated and fly better. When we are together in a World or European Championship, we push each other. I find I have to totally concentrate on every circle, every glide. When we are alone in a meet, it's possible that there is not so much difference between either of us and the rest of the pilots.

I consider Tomas to be the best all-around pilot, so I am motivated to beat him. He seems to be a bit more sure of his decisions and is better alone than I am, perhaps because he has been flying longer and has more experience. But when we are flying together, we seem to make the same decisions—what routes to take, when to leave a thermal, etc. This gives me confidence of course, and I sometimes trade leads with him in a flight. We are so similar in skills that even if we split up, we often end up together. Today for example, we took two completely different routes and ended up only 1/2 minute apart.

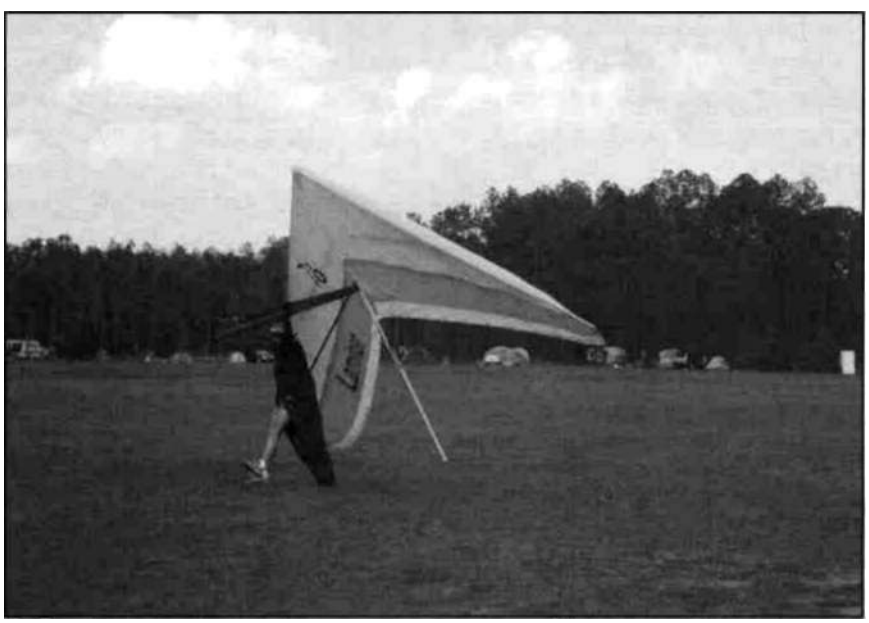
Does that happen often?

Well, we quite frequently find ourselves together, partially because we are watching each other and partially because we make very similar decisions. We even take photos of one another. Today we took a different line when Tomas tried to find lift on some hills to the north that wasn't there. I went more in the flat area and gained 400 to 500 meters on him. But we ended up close together at goal. It is never possible to forget Tomas is there.

Tomas said he tries to beat you by taking a different path—essentially escaping you. What is your strategy to beat him?

I try to take the start at the same time, stay with him and try to escape him just before goal. I think I can glide a little bit better than he can, so if I can make final glide with him, I can beat him. His flying and decision-making is so good that I can't let him get away too often. We are similar in skills, so if we fly alone, there's the element of chance involved. I prefer to stay with him and try to beat him at the end.

Manfred flares to a landing at Wallaby Goal.



Can you tell us what happened in the last World meet in Ager? From the results we see that you won 6 of 11 days while Tomas won 3. Yet one the next-to-last day you were tied. Finally, on the last day, you were with him just before goal and landed short.

The memory of that meet is very clear *{smiles).* I was lead-

ing by the fifth day, but on the sixth day, I landed way short because I had a moment of indecision. I was with Tomas and we were gliding in a head wind. I didn't think we had enough altitude to reach the next climb. We both turned back, then Tomas turned again and went on. I followed later, but was too low and went down. I lost 440 points to him that day.

After that I won two more days and Tomas and I ended up tied at 8382 points at the end of the tenth day. On the days I had won, I was able to control the situation by staying with Tomas and beating him on final glide. It was my plan to do the same on the last day. On the first part of the flight I was able to stay higher than him and I waited for him. Later, when conditions got weaker, we were with a gaggle that was going good and we were very close to one another. Just before goal, we were in a very weak thermal and I had 10 to 20 meters on Tomas. I also had wind information from goal and an Austrian pilot about 20 km back that indicated the wind was the opposite direction. It appeared that there was a convergence happening, which should cause buoyancy. I could see the goal line and a glider circling between me and the goal. So when the thermal we were in started to die, I went on glide and I was sure I had enough altitude. But I soon hit heavy sink and I got worried. When I reached the plateau that the goal was on, I encountered a little lift but I thought the air was getting better, so I continued on. I landed 70 to 80 meters short of goal. Tomas waited to get higher in the thermal then took a line more to the left and made it easily.

No doubt that was a devastating experience. How did that affect your attitude?

I was disappointed of course, but I became even more determined to win a **World** Championship.

I assume you're aiming for the next one in Australia. What is the process you use to learn more and improve?

I read sailplane and other flying books, especially the technical material. I also teach hang gliding and paragliding, which actually teaches me a lot because I have to be aware of how everything works. Mostly though, I learn from my experience and observations. Thinking about what has happened on a flight is the best way to learn and improve.

If you will let me change the subject, Manfred, I'd like to ask about your equipment. What do you use for an instrument and how is it set up?

I use an Aircotec Primus instrument and have for almost four years. I am very used to it so I like it best. The vario is very sensitive. Also it has a very good averager. I think airspeed is very important for speeds-to-fly. I haven't done a polar, but I use speeds-to-fly in my head.

I mount my instrument on the right with GPS next to it. Before I had my instruments on the basetube in front of me, but now I prefer my view downward to be unobstructed.

I like a good vario with not too much information because it distracts me from looking around. I mostly use the vario sound and like to have a fast audio output.

I mount my instrument on the right with GPS next to it. Before I had my instruments on the basetube in front of me, but now I prefer my view downward to be unobstructed. In thermals I mostly use the audio and only occasionally look at the vario to see my rate of climb.

Since the vario is on one side, do you have a preferred turn direction?

No, but sometimes a given glider will prefer to turn one way and sometimes I turn in the same direction in later thermals that I did in the first efficient climb. But it's important to be ambidextrous and thermal equally well in both directions.

What is your harness setup?

I fly a Pro Design harness *[Ed. Note: later Manfred changed to a Woody Valley]* that I have modified a bit. I want my feet area to be as small as possible. This harness has a good system for changing the body angle without a shoulder line. I tend to rock up in a thermal and down very close to the basetube when gliding at speed. I also stay down in a strong thermal for more control.

I use speed sleeves with my parachute on the side to minimize the drag of the pilot. Many people think it's only the glider that makes a performance difference, but I feel the harness and pilot drag factor is also very important.

I use speed sleeves with my parachute on the side to minimize the drag of the pilot. Many people think it's only the glider that makes a performance difference, but I feel the harness and pilot drag factor is also very important.

Also, a harness must be very comfortable to reduce the fatigue factor during longer flights. Speaking of fatigue, I am using an oxygen system with electronic metering delivery from Mountain High. This system helps prevent fatigue and mental problems during this high altitude flying.

Now, please tell us about your glider, Manfred.

I was flying the XS Brazil, which was excellent for thermaling and handling. It climbed great but its glide at speed was not so good. At the Icaro factory, we resolved to make a new glider with all the good traits of the Brazil, but with the addition of high-speed performance. The problem was the flexible leading edge. We made it stiffer, then added the inside ribs connecting the top and bottom surface. This served to control the bottom surface at higher speeds, which reduced drag.

We tried many different profiles on this glider, but ended up with the same one we had a couple years ago. The end result was the Laminar. This glider climbs very well, which is its best point. It also handles very easily and predictably so, anyone with a bit of experience can fly it and do well. Another point is its good glide. When you get a slow sink rate, it helps get a good max glide.

I think the Laminar gives me an advantage and since I've been flying it, I've moved to the top. Before the Laminar I had good results, but not as consistently. If I have a small performance edge, it's easier to "control" other pilots.

It is important for a pilot to be integrated with his glider. He must be comfortable and confident in his equipment to excel. When I was flying a smaller glider, I had to fly very precisely. This was good training, but now that I fly the larger Laminar 14 (14 square meters or 150 square feet) at a body weight of 75 kg (165 lbs), I have it easier. The smaller Laminar gives me better control, but with many hours on the big one I can control it easily in strong conditions.

Do you have any special setup on your glider?

Not here. This is a stock glider except for the faired basetube. In Ager I had smaller diameter upper rigging *[Ed. Note: at that time gliders still had kingposts]*, faired speed bar and tighter tips.

Who developed the Laminar?

Three people were involved mainly, the sail maker, Jayena, Franco Garcia, a former Italian Champion, and myself. The sail ideas were mostly mine while Franco and I developed the airfoil and did the test flying.

Manfred, what is your future in the sport?

I will fly in the next two World Championships for sure. My goal is to beat Tomas. I'm sure I will continue in hang gliding for more years after that, but who can tell? Right now, I am having so much fun, how can it get better?

Now we continue our exposure of Manfred Ruhmer's secrets with the new, improved Manfred. At this point he had indeed beaten Tomas and everyone else who strapped on a pair of wings. His different attitude was apparent. The interview is taking place at the Wallaby Open meet.

Manfred, first let's talk about psychological matters. Has your confidence level changed at all?

Jah, for sure. I have developed total confidence. I am now able to win and beat the others. The last time we talked I was not as confident as Tomas. He was totally confident and he would win. I just went to try to do well. Now I expect to win. I got sick of practicing just to take second! I believe no one can beat me now. I'm first most of the time and I am no longer happy being second.

Manfred Ruhmer is always happy at goal. Note the streamlining cape on his harness.

Confidence is everything in this game. In this meet Betinho (Schmitz) and Oleg (Bondarchuk) aren't as confident because we went on glide before the competition and they saw I outglided them. Oleg was clearly disappointed.

What can you tell us about these other pilots?

Oleg has been flying well for a long time. In '97 he was on top with his own glider. He is clearly one of the best. He will often go ahead on his own, even when he is leading in a meet. I don't think he lacks confidence. He doesn't talk so much about what he does—he lets his results speak!

Beto (Betinho) is really a good independent pilot and he knows that with more experience he'll be great. He could be World Champion and may be one of the best. He often goes on his own and climbs great. Right now the difference between him and me is that I'm outgliding him. It makes him risk more. *[Ed. Note: At the time of this interview Betinho was flying a La Mouette Topless. He* ***has*** *since changed to a Moyes Litespeed.]*

I should also mention my Austrian teammates, Gerolf (Heinrichs) and Robert (Reisinger). Gerolf has become more confident and is a world threat. Robert is becoming great and I think he will be a world champion. He is very confident.

[Ed. Note: Reisinger would have handily won the 2001 Pre-Europeans except for a missing GPS track log on the last day.]

Now Tomas doesn't have the best glider *[Ed. Note: Tomas was flying a Moyes CSX at the time}.* He has lost his motivation, but he already has won everything. If you want to always be on top you must constantly push to do better. It's part of my job to do well and I want to keep working at the same job.

I feel that I'm flying better now than three years ago. I make better decisions. The luck factor is getting smaller. To be a top pilot you have to keep the luck factor low. I'm making better decisions because I'm more experienced. It comes from all the competition. Everyone discusses the day's event and everybody learns more. In fact, I say any pilot who wants to get better should enter competition.

I used to be wishy-washy and maybe change a decision. Now I believe you should stay with a decision, even if it's bad. You'll learn more. As you learn your decisions will get better and you will then gain even more confidence. Nothing tried, nothing gained.

I always review a flight in my mind to see what I could do better. I can remember only a few flights where I've landed and said it was nearly perfect. All pilots make mistakes—I just try to make less. When I get low I get tense and push on my feet just like everybody else. But even when I'm low, I look for better lift at times. It's a risky approach.

What do you consider low, Manfred?

Well, that depends on the place. In flatlands, if you are at 600 m (2,000 feet) you are low. In mountains you can get much lower and still get up except when valley winds suppress the thermals. In flatlands you can rely on getting up from low only part of the time. You have to stay high and fly the sky.

Years ago I hated flatland flying. I was often on the ground! Now, I'm good at it. I've also become good on blue days. The secret is experience, which comes from practice. I know how to read the ground better. I like to fly with cumulus clouds though because it's easier to go faster. I have a good feeling for clouds and what's happening in the sky on various days.

Can you offer thermaling advice for learning pilots?

In regard to finding thermals, the best thing to do is to go out and try things. Even if you hit the ground you will learn. If you just go out when the conditions are good you won't learn as much. You should go also in bad (but safe) conditions to learn the tough stuff. You'll learn much more. You shouldn't always try to be the high pilot either. Practice going down and getting back up. It's much more valuable practice. When you are going down intentionally, try aerobatics or speed gliding to get more familiar with your glider, then try to climb again. This is great climbing practice.

Learn to observe and understand the conditions so you can predict where lift is and what changes will come. I am always looking around. I never look at my vario—I just use the sound and focus my attention on my surroundings. Thermaling skills are a combination of glider and pilot. There are many pilots good at thermaling now. It's not as easy to excel as it was 10 years ago. Sometimes you can out-thermal someone by finding a little bubble and escaping upwards, but you have to work harder.

When you beat people now, Manfred, do you do it with climb, glide, decision making or a combination of these?

I think it's a combination of glide and decision making. For example, in head wind flying people often hit lift and turn immediately. I usually keep going and try to find a better core upwind. Remember, you can always come back to the lift if you don't find it better upwind.

I'm always trying to do something better than what is happening immediately.

I'm always trying to do something better than what is happening immediately. This may be moving to find a better core or picking a better gliding line. The other pilots are only local points of information, they aren't giving the entire picture. Many times a gaggle is in lift because someone found it by chance. I ask myself if this is the likely place for the best thermal in the area.

I always try to do something better, but of course, sometimes you can't.

Why do you think you have such a good glide?

In general, the curved tip gliders seem to do better. It's a really clean, efficient design. Wills Wing finally got the Talon with curved tips and it glides much better than the Fusion. Oleg's glider (the Aeros Stealth) is the only one without curved tips that glides as efficiently *[Ed. Note: The Stealth tips have an upward curved molded insert].* The Moyes Litespeed is gliding well also.

We worked on our current glider (Laminar MR 2000) to perfect the airfoil along with changes in the lower surface to get a better glide. We support the sail with radiating reinforcement strips—which are most useful for marketing—and a trailing edge string, which helps stop the flutter. We also have more VG pull, thinner cables and better sprogs so they can be lower and still safe. We've lightened the leading edge without losing stiffness.

We have made the handling more forgiving by tightening the under surface, shortening the pigtail *[Ed. Note: The single cable at the rear end of the rear flying cables, which lets the keel move from side to side]* and shortening the crossbar hold down strap.

Over the years we have learned how important it is to control the under surface. Martin Jursa (former Austrian team pilot and aerodynamic engineer) was the first to recognize this. I took a paragliding instructor course with him in 1994 and we discussed using ribs like a paraglider. Since then we have been using these ribs and they have become standard in the industry. We have added more on our newer design. We have also altered the undersurface placement quite a bit to tighten it for optimum performance.

In the past we used to use smaller gliders with a high airfoil camber to get sink rate. That turned out to not be the best, because such airfoils are less stable in turbulent conditions. Now we use slightly bigger gliders 154 to155 square feet (14.3 to 14.4 sq. meters) and flatter airfoils. That seems to be a better compromise. *[Ed. Note: In the past couple of years the trend—spurred by Gerolf—seems to be to fly the new more efficient gliders at a higher wing loading.]*

My current glider—which is in production—seems to be the best compromise. It is my perfect glider. I like it best of all we've produced. I have it trimmed to the limit. It's trimmed to fly very slowly and the pitch is very light until the last bit of bar pull.

Do you alter your sprog settings?

Of course. They are infinitely adjustable with a screw fitting. In big competitions

I set them low; right on the limit, but still in the safe part of the range. I will not fly a glider that's dangerous in my perception as based on my experience. The real secret is to adjust the entire glider to get the maximum performance without compromising safety. It's not just one or two things, but many things like airfoil at each point along the wing, batten tension, tip tension, C.G. position, dihedral, sprogs, etc.

Many pilots think I fly a glider they can't fly, but I believe if they tried my glider, they could fly it safely. If I used a glider that was too stiff or in danger of tumbling I could not relax and focus on the things I need to in order to win. If competition pilots were flying unsafe gliders, we'd be having many more accidents than we do. Of course, a more experienced pilot can fly a more challenging glider, but it can't compromise safety.

Manfred at goal hoping he won the 2001 Worlds.

Let me ask you one more question, Manfred. What do you think of the rigid revolution? Why not try to become World Champion in that class?

I feel I lose some contact with the air with a rigid wing of the control bar type. You can't feel the wing lifting as much, which means you lose some ability to detect thermals from a distance. Every time I land when competing with rigids, I ask myself "Why should I fly them?" I like my glider better. It is much more convenient. You know, in very weak or very strong conditions I can climb with them. When it's very weak they can't turn as quickly to stay in the small lift. When it's strong and a high bank is required, they can't slow as much. They're not like sailplanes. I can glide with them as well. At faster speeds our polars come together because they have fixed twist all the way out and all that span just becomes drag.

The weight-shift rigid wings in which the pilot hangs by a strap are probably not as stable in pitch as a stock topless flex wing. They may have a problem in big air. For fun flying I think it's important to have good stability. I'm more interested in the rigids like the Utopia or Millenium. I like three-axis control because of my model and sailplane experience.

Where do you think we go from here, Manfred?

I think it is a mistake to think we have reached the end of our development. There's going to be new materials and new ideas. Look at the revolution created by the use of carbon and topless gliders. Look at the development of rigid wings. We have already borrowed from paragliders. Maybe the wing of the future will be **a** combination of flex wing, rigid wing and paragliding technology. Competition is the push that keeps us improving.

Thank you for all your insights, Manfred. I hope you continue to prosper and enjoy our great sport!

SUMMARY

Throughout these interviews there have been many ideas, insights, tricks and techniques revealed by our selected aces. Many of these tips are useful for our everyday flying, while some apply to competition racing. But all are important for developing flying excellence.

Our flying skills, judgement and decision making must be acquired over a period of time and we can't apply or even remember all the important points at once. Certainly, multiple readings of these interviews as our skills progress is the best way to use this material to our advantage. To help facilitate the process we offer this summary of the main ideas contained throughout the book. This summary can be used to spark your memory about what's important to practice or where to direct your focus to help overcome weak points. We have organized the list below generally in categories of mental aspects, thermaling, cross-country, competition and equipment.

MENTAL ASPECTS

1. The mental aspects of flying are extremely important for doing well. This matter applies to thermaling efficiently, finding thermals, choosing X-C routes and competition.
2. It is necessary to develop the ability to make as many decisions as possible in the intuitive or subconscious state. This holistic mode of thinking is able to deal with much more information at a faster rate than the linear, logical type of thinking.
3. There are methods to train for the intuitive type of thinking. The main secret for this process to take place is to relax.
4. Try to bring intuitive decisions into the conscious forebrain.
5. Read, study and apply what you learn.
6. Make observations to use in the air (study clouds).
7. Observe in the air to analyze later (what happened with each decision). Don't get overanalytical in the air or you may miss many other opportunities.
8. Patience is a virtue when used at the right time.
9. Taking risks such as using lee side thermals may pay off in the short term, but invariably leads to accidents and setbacks.
10. The reason we fly is for fun—maintain the right attitude to keep all your flying enjoyable.

THERMALING

1. Perfect your vision (with glasses or sunglasses).
2. Concentrate to maximize each thermal circle.
3. Learn to follow thermals through their changes and expect similar behavior from thermals on a given day at similar heights.
4. Use the variations in a thermal to improve your climb.

5. When lift is broken or moving, don't be afraid to explore to the side, but be ready to return to the area you left if no improvement is found.
6. Feel the air's inputs into your glider to help detect where lift is.
7. Practice climbing (don't just sit on top).
8. Practice in light conditions.
9. Form a correct model of different thermals.
10. Use an instrument that is very accurate and sensitive to report lift and airspeed.

CROSS-COUNTRY

1. Form a correct model of and observe air flows. Learn to predict these flows.
2. Try to figure out the nature of thermals on a given day as soon as possible to best use their lift.
3. Choose lift lines if possible when gliding. If you find yourself in a sink line, get out of it!
4. Constantly look around for signs and patterns indicating good lift and good routes.
5. Constantly try to anticipate changes and look ahead to the next possible thermals and potential routes.
6. Practice flying the best line and going to thermal generators (trikes aid this).
7. Practice gliding efficiently (speeds-to-fly).
8. Be sensitive to glider trajectory changes to locate thermals. Be sensitive to the air to feel the conditions and get the picture of what's happening.
9. Learn more about weather on the small and large scale. With longer X-C tasks we encounter more varied conditions in a flight.
10. In windy conditions, be especially sensitive to the location of lift in a thermal and its drift.

COMPETITION

1. Develop confidence in your decisions and have the fortitude to stick by them.
2. One of the skills that the very top pilots have is the ability to make decisions faster than the rest of us. This is probably due to their ability to absorb and process more information faster.
3. If you do end up making a mistake, resolve not to repeat it and use it to make you more determined and motivated to improve.
4. Don't get mired in slow gaggles. Develop enough confidence to fly your own route if the signs say that's the best way. Avoid the herd instinct.
5. Get lots of practice making your own decisions.
6. Set goals and practice triangles with upwind and crosswind legs.
7. Part of relaxing in competition is keeping a positive attitude. Don't get overly discouraged about a bad flight or overly excited over a good one.
8. Fly consistently and steadily. If you are overly aggressive it can lead to too many ups and downs or prevent you from relaxing.
9. If lift is needed badly, have the patience to wait for a climbing glider to reach you.
10. Learn to use your good luck to the utmost.
11. Don't try to wring every foot of lift out of a thermal on a good day.

EQUIPMENT

1. Fly a good performing glider, but most importantly, choose one with which you are comfortable and confident.

2. Try different gliders and designs before settling on one, to find which type suits your style.
3. Stick with one manufacturer, if possible, so you build a long-term relationship and receive preferential treatment based on your loyalty.
4. Be aware that different gliders of the same make, model and size can have different performance qualities due to small, subtle manufacturing differences.
5. Learn to tune your glider for your flying style and performance.
6. Don't compromise safety with tuning (lowering sprogs too much) or you won't be able to relax in the air and thus will be less sensitive.
7. Tune your glider to require high-siding if you want to achieve the best thermal efficiency.
8. Do not compromise handling too much or you will not be able to react properly to the air.
9. Keep your glider in relatively new condition if possible. Top pilots may change gliders several times a season.
10. Pay as much attention to drag reduction in your ancillary equipment—harness, helmet and instruments, etc—as you do your glider.