free flight • vol libre

2/04
Apr/May

Priorities

Phil Stade

A quick look at the Big Picture ...

The recent Annual General Meeting in Calgary was an opportunity to share information and ideas and to remind ourselves that SAC and all the member clubs are not "them", but rather "us". We share similar goals and challenges. The more substantial issues discussed in Calgary included SAC's finances, our safety and accident record, insurance costs and options, and methods of attracting and retaining members. SAC needs a steady and growing income to remain available to assist clubs by funding programs such as marketing and safety initiatives. These two areas are strongly related since few newcomers will want to join a group which may be getting prohibitively expensive and unsafe.

Who is SAC anyway ...?

SAC is a corporation of clubs and club affiliated members joined together:

- to promote soaring flight in Canada,
- to research soaring flight and soaring aircraft,
- to represent the interests of soaring pilots to government departments,
- to encourage soaring competitions,
- to be a central organization to record and distribute soaring information.

The mandate SAC accepted and the authority it has are the creation and extension of its member clubs. I have noted that individual clubs can and do choose to accept or reject that authority.

Insurance reality: we have it or we don't fly!

Soaring attracts individuals who value solitude, work alone, are wrapped up in their own thoughts and seek to go higher and farther than others. This mindset can make some of us unwilling to participate in such activities as effective spring checks. It can lead to individual pilots and entire clubs focussing only on their needs. Our Flight Training & Safety committee has been struggling with how to make our flying safer. Clearly, all the rules we can dream up won't create safer flying operations. That will only come from the acceptance, understanding and implementation of safe flying practices by all pilots.

The challenge ...

The cooperation of each SAC club is required since it is within clubs that the authority lies to demand change. Ensure that you and your fellow pilots participate in effective review and upgrading of flying knowledge and skills. Our record of accidents indicates that it is time for clubs to take the lead in this area. The FT&SC will soon be presenting a new safety initiative to support your club in its goal to fly safely. Please be prepared to participate. The opportunity to continue enjoying this sport may well depend on how seriously we take this challenge.

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DEPARTMENTS

Cover

Looking west across the Purcell Mountains just north of Invermere, BC. Photo was taken in June 2002 and shows the still subtantial snow levels for early summer that year.

photo: Tim Wood

Clubs — please check your contact information on the back page and send me corrections

Safety report for 2003

Dan Cook
Safety Officer, FT&S committee

THIS YEAR we experienced 17 accidents of which two involved fatalities and one serious injury, and five aircraft were destroyed. There was some major difficulty in gathering information as only three accidents were reported to SAC on the Flight Training & Safety committee's Accident Form. This may be a result of the Insurance Accident Claim form being similar in design to the FT&SC form and pilots think that it isn't necessary to inform both groups. Unfortunately, sharing of insurance information with the committee is not seamless and we are NOT getting the information from pilots or clubs. In addition, Transport Canada will not share information on accidents with non-governmental sources due to Privacy Act considerations. Unless the information is sent to the FT&SC through SAC we will be limited in our ability to do analysis and therefore have difficulty learning from our mistakes. Based on limited data, the following are the "highlights" of accidents in 2003.

- Fatal, serious injury, write-off LS-1C & PW-5. Mid-air collision occurred around circuit height over glider port. One pilot seriously injured, the other fatal.
- Fatal & write-off. Ventus. Glider missing in Rocky Mountains and presumed crashed.
- Write-off, L-33. Wing struck trees on final approach during off-field landing attempt.
- Write-off, L-23. A windstorm destroyed glider while it was tied down at the gliderport.
- Substantial damage. US-registered glider experienced a hard landing.
- Substantial damage, 2-33. Tow cable became tangled in the tail wheel and the glider was pulled into the air prematurely on launch.
- Substantial damage, L-19. Wind gust lifted the wing after normal touch down and the opposite wing tip contacted turf runway. Control regained after gust.
- Substantial damage, Grob Twin. After a low circuit, airbrakes were opened on final and the glider wing struck the top of a fence.
- Substantial damage, SZD Junior. Right wing contacted a bail of hay in an off-field landing attempt in adjoining field after a vehicle was observed blocking the runway.
- Substantial damage, L-23. On rollout after landing, the glider stuck a danger sign.
- Substantial damage, 7GGAA. Hard landing and propeller ground strike.
- Substantial damage, ASW-24. Glider was being towed by a ground vehicle when the wing tip dropped into a grassy ditch.
- Substantial damage, Grob-103. Crack in leading edge of wing was detected when glider was inspected. Overstress or impact related?
- Substantial damage, DG-300. The wing of another glider was moved during ground handling in the hangar and it struck the canopy of the DG.
- Minor damage, L-13. The glider was landed with improper use of spoilers and contacted tail first damaging the tail wheel assembly attachment.
- Minor damage, Russia Gear collapse on striking hard rut in landout field.
- Minor damage, Krosno. The glider was landed by the instructor after taking control. Directional control was not maintained on a soft field and the aircraft yawed 90°. The wing tip dropped and was slightly damaged when it made contact in the mud.

Analysis

There are no surprises in terms of what may have been the major factors in the cause of most of these accidents. Stall/spin (loss of controlled flight), mid-air collisions, and off-field landing attempts still lead the accident categories. Again, most accidents are made by experienced pilots. The number of recent accidents in the Rocky Mountains and other moun-

The
SOARING ASSOCIATION of CANADA

is a non-profit organization of enthusiasts who seek to foster and promote all phases of gliding and soaring on a national and international basis. The association is a member of the Aero Club of Canada (ACC), the Canadian national aero club representing Canada in the Fédération Aéronautique Internationale (FAI), the world sport aviation governing body composed of national aero clubs. The ACC delegates to SAC the supervision of FAI-related soaring activities such as competition sanctions, issuing FAI badges, record attempts, and the selection of Canadian team pilots for world soaring championships.

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Images may be sent as photo prints or as hi-resolution greyscale/colour .jpg or .tif files. Prints returned on request.

free flight also serves as a forum for opinion on soaring matters and will publish letters to the editor as space permits. Publication of ideas and opinion in *free flight* does not imply endorsement by SAC. Correspondents who wish formal action on their concerns should contact their Zone Director.

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tainous countries highlight that this type of flying has more risks, and special precautions and training is required. This is not to imply that the pilots ignored these requirements in these accidents. The FT&SC has identified that mountain flying is an area that the committee will address. However, a detailed knowledge of each of the accidents is needed to draw more specific conclusions. It is the responsibility of club CFIs and Safety Officers to identify these factors and apply mitigating strategies locally. More often than not there are club organizational and safety culture factors that contribute to the accident.

Beyond the actions of individual clubs, we wish to look more closely at human factors (HF). It is believed that HF play a significant role in many of these accidents. Of course, this includes aircraft design and the OSTIV *Sailplane Development Panel* is working on improving designs, but the older types of gliders will not be eliminated in the short term.

What can be done to mitigate the risks now? Many pilots who have had an accident are normally contentious! All pilots can make poor decisions though. There are some HF actions we can take as pilots. First, assume that you are an accident about to happen! This requires that we admit we are fallible. This will go a long way towards our attitude to professionalism and mitigation strategy. Next, learn as much as you can about HF and how this can affect your flying and judgement. Now use this professional approach towards planning, preparation, preflight, the flight, and postflight actions. I like to think of planning as, *"What is about to bite me today?"* Some examples are weather, weight and balance, terrain, etc. Preparation is an action that can be taken as part of risk reduction. These may include transponders for rugged terrain, first aid kits, survival gear, or simply a hat, food and water and a recent checkflight with an instructor. My attitude during a preflight is, *"There is a fault in the glider or my equipment that may kill me"*. Can I find it?

During the flight I now assume the worst will occur: I will have a takeoff emergency and I will mitigate it with the S.O.A.R. Pilot Decision Making technique and run through all possible options in the "O" of CISTRSC-O before launch. I will also have a mid-air collision; I mitigate it with my scanning technique and avoid preoccupation in the cockpit with GPS, etc. I *always* assume that I'll have to landout and prepare for the best landing situation. I also assume there will be some emergency when I make that landing: obstacles on the field, updraft, glider malfunction, etc. As these thoughts go through my mind, I still struggle with finding every shred of lift to continue the flight. But, at my pre-determined height, I commit to land. Lastly, post-flight is now the time to be used to review your decisions. Are there areas I could have improved my decision making and the range of options available for the next flight? Remember, we get tunnel vision under stress. You will likely only consider options you have already identified and practised in an emergency.

Flight Training & Safety committee plans

A theme over the last few years by the FT&SC has been to look at human factors, organizational factors and safety culture. We have implemented seminars and safety reviews (audits). Is your safety culture still generative versus authoritative? We also revamped some of our basic flight training by looking at other countries on the OSTIV Training and Safety Panel who have lower accident rates. Taking their lessons learned and feedback from our club CFIs, we modified our manuals and courses. The third area we are revisiting again for 2004 is human factors; in particular, why do we take risks? Based on our current accident statistics, HF may explain why some of our experienced pilots seem to be at higher risk. The FT&SC will be planning HF seminars to help look at these issues and visit clubs to discuss HF. We will continue the fight for safer flying by advancing all three areas or "pillars" as identified. Furthermore, OSTIV member countries have agreed that there appears to be a three-year cycle to safety information. After three years, pilots have forgotten some of the lessons learned and accidents appear to repeat themselves. Therefore, the committee will continue to review and reinforce the three pillars every three years, adding new material as available to a particular pillar.

What has to happen now is that you, the pilot, meet us somewhere half way. What are you going to do as your part to improving safety? Our biggest challenge ahead is that not everyone is getting the message! ❖

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Cross-country flight in the southern Alberta lee waves

Vaughan Allan, Cu Nim

AFTER EIGHT YEARS OF FLYING at Cu Nim's field at Black Diamond, I started flying from Claresholm in 1992. This location combined with the self-launching performance of my PIK-20E allowed me to fly year round and soar in wave on a regular basis. If you remember, back at about this time the glider world was abuzz with the 2000+ kilometre flights achieved by New Zealand pilots in the lee waves of the Southern Alps. With these flights as an example of what was possible, cross-country flights in southern Alberta lee wave seemed an obvious and natural thing to attempt.

In the years since, many Cowley camps have come and gone, a lot of Diamond altitude flights have been achieved, but no one was venturing out to explore along the wave. The only glider pilot I have ever encountered flying cross-country in the wave is the soaring veteran Dick Mamini who has been exploring the wave for over twenty-five years. However, the 2003 version of the Cowley fall wave camp was a refreshing change, with several pilots pursuing cross-country wave flights for the first time. My hope is that this article will help spur solid interest in the pursuit of cross-country wave flights in southern Alberta. I will refer to expected altitude losses and speeds, but as the vast majority of my wave flying experience has been in my PIK-20E, these parameters may not be directly transferable to you in your glider. Keep in mind that the PIK, a fine example of 35-year-old technology, has a high wing loading and relatively good high speed performance.

Flight planning I like to keep my weather briefing very simple. I look at little more than the public weather broadcast, the predicted winds aloft from the Nav Canada website, and the view of the sky out my west facing windows. What I look for are predictions of a Chinook weather pattern and winds aloft that are close to perpendicular to the main ridges and lots of wave clouds in the morning sky. Soarable lee wave development generally requires a stable airmass, a wind velocity in excess of 20 knots at ridge top height, and increasing wind speed as well as consistent wind direction with altitude[1]. Truly powerful lee waves tend to develop when the jet stream is located directly over southern Alberta and the weather patterns arrange themselves with a low pressure region to the north and a high pressure region located to the south. Under these conditions a powerful flow is pumped through the region and a classic wave day can be the result. The position of the low pressure to the north also means that frontal systems bring in adverse weather, usually approaching from the north.

I have often observed that the wave north of the Crowsnest Pass has more cloud, a greater tendency for closure of the wave windows, and an increased risk of complete wave shut down with an abrupt change in wind direction or airmass stability associated with frontal passage. Frontal systems moving into the area tend to be held up and delayed by the mountains. This can result in hours of wave flying in the lee of the Continental Divide long after the wave to the east of the front ranges has shut down. One caution I would offer is to be careful of days that are accompanied by wind warnings in the Crowsnest Pass and Lethbridge areas. On some of these days surface winds can gust to over 110 km/h and flying, while perhaps not impossible, will definitely be quite a handful under these conditions. In the past I have been asked about the best time of the year to plan a wave flight. The answer is a bit of a surprise; my three best months have been July, October and November, but every month of the year has produced good conditions for wave flights. All considered, I would recommend the fall or spring for good wave conditions, longer daylight hours and milder temperatures[3].

Maximum cruising speed Flying speeds during wave cross-country can be very fast, commonly putting the pilot into situations where there is ample lift to cruise at redline. During my flights I concern myself with two key airspeeds; rough air redline (V_{ra}) measured as an indicated airspeed, and the never exceed speed (V_{ne}) measured as a true airspeed and adjusted appropriately for altitude. In most situations I limit my cruising speed to the glider's V_{ra} — the airspeed below which any aerodynamic load imposed on the glider by turbulence or control movements is within design limits. By limiting the maximum cruising speed to the glider's V_{ra} a pilot can maintain a safety margin in case severe turbulence is encountered.

Twice in my wave flying history I have unexpectedly encountered severe clear air turbulence, in both cases I was flying at speeds below the rough air redline, as a result my glider and I emerged shaken but not damaged, but these experiences made a lasting impression on me. In some circumstances, where I have a high confidence that rotor turbulence will not be encountered I have pushed my cruising speed to the glider's V_{ne}. Unlike the V_{ra}, the V_{ne} is defined as a true airspeed at altitudes above 2000 metres (6562 feet). At high altitudes your glider's V_{ne} will occur at lower indicated airspeeds. The manuals on some gliders supply a chart showing the relationship between altitude and indicated airspeed V_{ne}. On some older gliders this information is not supplied, but obviously the same physical constrains will apply. If you want to avoid a situation where you could experience flutter or worse, then it's worth a few minutes to calculate an indicated airspeed V_{ne} for typical flight altitudes (it increases about 2% per 1000 feet. I found an excellent discussion of the topic posted by Ian Strachan, 2002/01/02 on *<rec.aviation.soaring>* under the thread, "V_{ne} at altitude".

Dissecting the wave Figure 1 below is my interpretation of the vertical structure of the southern Alberta lee wave. It's a west to east cross-section extending from Centre Peak on the Livingstone Range to Claresholm. The highlighted dashed line represents a wind streamline along the low altitude wave. This line is drawn from my wave flying experience and is a combination of hard data and interpretation. The dashed wind streamline traces a system of six wave peaks with a wavelength of about five kilometres. The additional wind streamlines, at both higher and lower altitudes, were constructed purely geometrically using computer software to project the shape of the low altitude waveform. Above 25,000 feet, the crests of the low altitude waves have largely amalgamated to form the broad culmination of the high altitude "long wave". The long wave has a wavelength of approximately 60 kilometres but relatively low amplitude. Superimposed on the long wave is a high frequency wave that acquires directly from the low altitude lee wave and has a similar five kilometre wavelength.

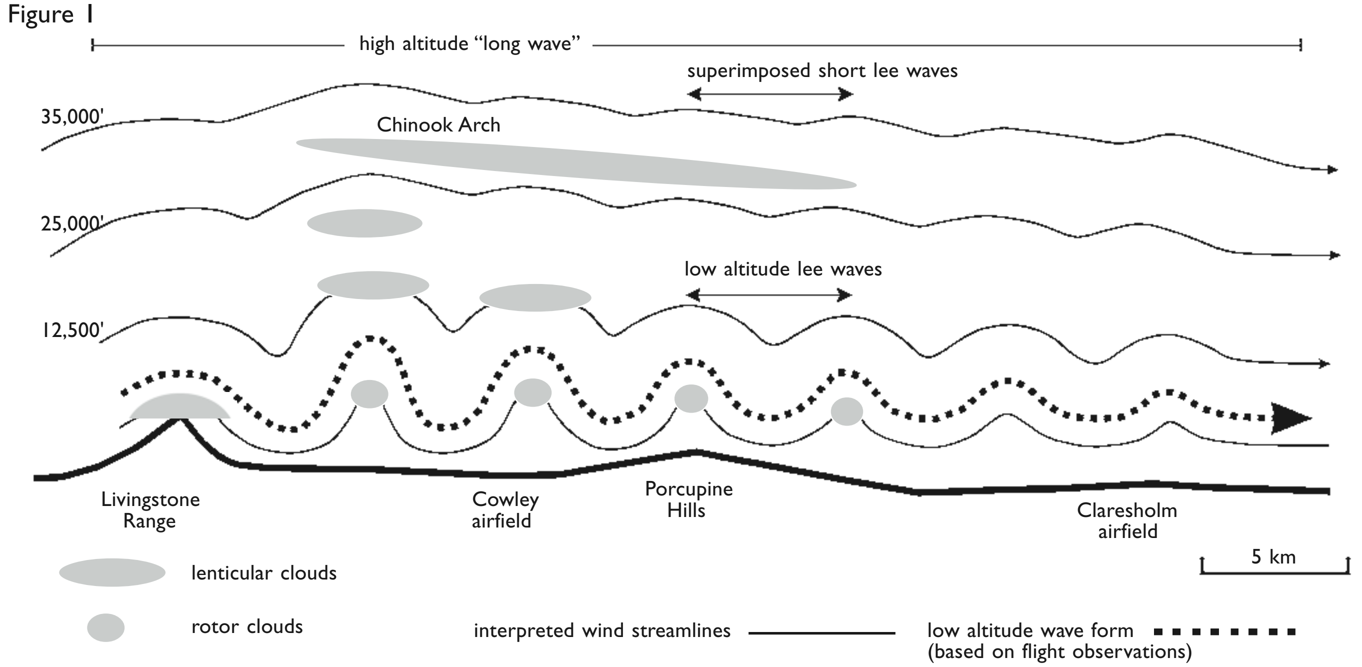
The model geometry fits well with observations of Chinook Arch clouds, including the presence of the superimposed higher frequency waves[2]. The leading edge of the arch lenticular cloud is usually smooth and continuous, with few breaks or sharp orientation changes. Pilots who have had an opportunity to fly along the leading edge of the Chinook Arch cloud have found consistent, moderate lift along its length[4]. In my personal wave flying experience I've never observed a Chinook Arch without an accompanying lee wave working at lower altitudes. The implication of the model is that the long wave is created by the underlying low altitude wave system. The presence of lee waves in the lower atmosphere takes up additional space, which props up a broad culmination in the wind streamlines above it and produces the Chinook Arch long wave. The total overall length of the underlying lee wave train controls the wavelength of the long wave. In the model, a 30 kilometre lee wave train has produced a 60 kilometre wave length in the Arch.

My contention of a direct link between the Chinook Arch "long wave" and low altitude lee waves is controversial and runs counter to some current theories. There is a single wind streamline projected in at lower altitudes on Figure 1, which also illustrates some interesting features. Below about 10,000 feet the predicted wind streamline shows a sharp angular change in the core of the wave crests. The laminar airflow, which is so characteristic of the wave, is unable to flow around this sharp angle and it breaks down into a chaotic, turbulent rotating flow. This is of course, the position of the rotor. Another interesting feature predicted by the model is the potential for clear air turbulence in the wave troughs at higher altitudes. The mechanism at work would be analogous to the formation of the rotors. The wind streamlines in the troughs are bent through a tight angle in the 18-25,000 foot range. I have limited flying experience in this region of the wave and have never personally encountered this feature in nature.

Figure 2 is my attempt to represent the distribution of the major wave crests on a "typical, good wave day". I've tried to be as factual as possible with my observations (my basic policy was if I haven't flown in it, I didn't put it on the map). The low altitude wave is best described as a complicated interference pattern of lee waves produced by every ridge and significant mountain peak of the Rocky Mountains. The wave systems in the lee of the front ranges from north to south are the Highwood, Livingstone and Border. One range into the Rocky Mountains is the lee wave produced by the Continental Divide, the High Rock and Flathead systems. The optimal wind direction for a wave day is approximately 250° at ridge top height. Soarable wave conditions are still present even when the winds are as much as 45° off optimal. The wave that develops on days when the wind direction diverges considerably from optimal is often restricted to small pods of lift in the lee of the best ridges, like the Livingstone Range at Centre Peak. Wind shear has a considerable impact on lee wave development. When there is a substantial change in wind direction with altitude the resultant lee wave has an odd, oblique orientation to the ridges. On these days, the wave axis can be as much as 20–30° divergent from the ridge lines, allowing you to fly along the wave axis and actually intersect the wave generating ridge.

As a simple model of wave geometry, the primary, secondary, tertiary wave designations have proved very

Figure 1



robust. It is a useful tool to communicate the relationship of areas of lift with the wave generating ridges. But, in nature, such elegant simplicity seldom tells the whole story. The waveforms that can develop often go beyond what the simple primary or secondary labels can adequately describe. Some of the common wave geometries that can be produced are shown in Figure 2. The lesson here is to read the clouds, build a mental picture of the wave, and not be confined to simplistic models.

The wavelength of the lee wave is highly variable. Looking at a situation I am most familiar with, the number of wave crests between Claresholm airfield and the front ranges, I have observed as many as seven and as few as two, with a rough average of four. All of these waves can yield strong lift to high altitudes, with lift strength decreasing in the higher order waves.

Wave also has a daily cycle. Lee wave lift is often strongest and wavelength the shortest in the early morning and evening hours. During the middle, warmer hours of the day, the wavelength tends to be longer and the lift weaker. This phenomenon causes the commonly observed eastward migration of the Chinook Arch cloud as the day warms[3]. Many promising cross-country flights have ended because of this midday weakening of the lift that can sometimes lead to a total collapse of the wave system. This effect is obviously least pronounced on winter wave days. The most frustrating aspect of this daily cycle is that after a promising day has ended early, forcing you to abandon your flight, the evening sky comes back to life with wave clouds promising the return of soarable conditions at about the time you are putting your glider away.

Wave generating ridges To gain further understanding of the pattern of wave development, it's useful to stand back and take a big picture look at the wave generating ridges of the Rocky Mountains, Figure 3. Ridges that are good wave generators have several common qualities: a sharp and abrupt lee slope, significant height and good continuity. Negative factors which reduce lee wave potential are changes in the orientation of the ridge, major mountain passes, low discontinuous ridgelines, and the presence of high topography immediately downwind. The best wave generating ridges are highlighted in Figure 3. The four ridges that have consistently yielded the best wave conditions are the Livingstone Range around Centre Peak, the Highwood Range between the Highwood and Sheep rivers, the Flathead range south of Crowsnest Pass to Mt. Haig and the High Rock Range between Mist Mountain and Crowsnest Mountain. All these ridges have the classic shape of good wave generators.

Ridge orientation There are four places where the mountain ridges undergo a substantial orientation change: Chief Mountain on the international border, Castle River south of the Crowsnest Pass, Tornado Mountain northwest of the Oldman Gap and the Highwood River gap. At these four locations the orientation of the ridges change by 20–30° and the impact on lee wave development is substantial.

Mountain passes The presence of a large mountain pass is by definition a substantial break in the continuity of the ridges and has an expected negative effect on the lee wave. There are three major passes in the area: the Highwood River gap, the Oldman Gap, and the Crowsnest Pass. Of these, the Crowsnest Pass is by far the largest and most important to the soaring pilot. I have never encountered good wave soaring conditions in the lee of the Crowsnest Pass when flying in the Livingstone and Border waves.

Ridge height and continuity The third factor, height and continuity of the ridge is important in two areas: the Livingstone Range from north of the Oldman Gap to Chain Lakes, and the north end of the Border Range starting south of the Crowsnest Pass to about the Waterton gas plant. In the first area, the Livingstone Range north of the Gap, the ridge is lower and lacks good continuity. This results in a generally weaker, broken up lee wave along this stretch. This is an area for slower more cautious flying, but crossing on good wave days is fairly straightforward. The second area, along the Border Range south of the Crowsnest Pass, has the poorest ridge development of the entire southern front ranges. The Livingstone Range starting at Centre Peak plunges rapidly into the subsurface, and south of Highway 3 is replaced by a series of low hills with almost no wave generation potential.

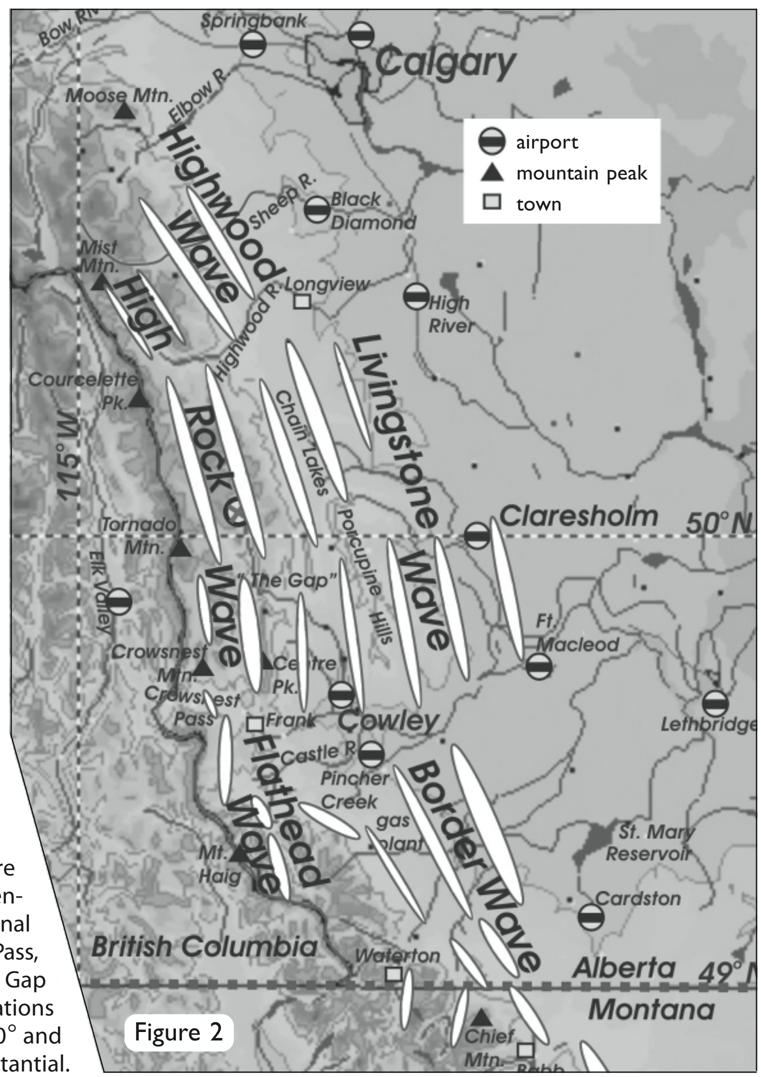


Figure 2

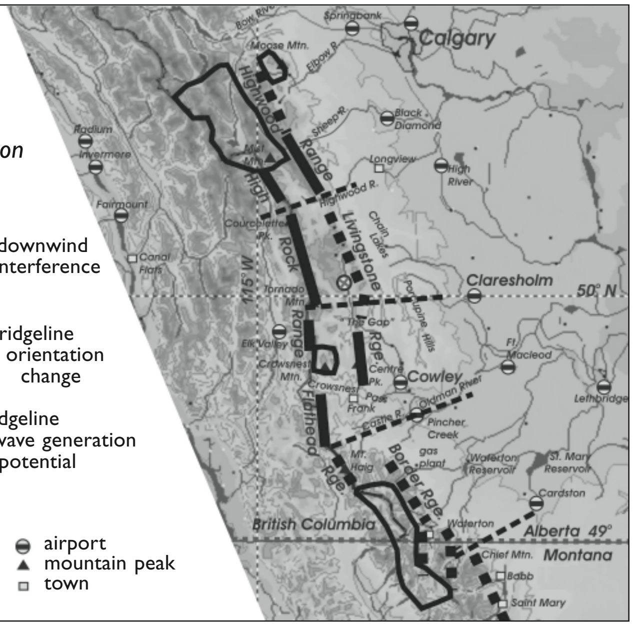


Figure 3

Structural controls on wave generation

Downwind terrain interference The presence of high terrain immediately downwind of a ridge can disrupt the formation of lee waves. The ridge itself may still have all the qualities of a good wave generator but if the downwind valley is extremely narrow there will be little room for lee waves to develop. This factor is primarily a concern for the High Rock and Flathead ranges on the Continental Divide. As seen in Figure 3 there are three areas along the Continental Divide where high downwind terrain impacts lee wave development: the south end of the Flathead Range at Mt. Haig and the High Rock Range in the Crowsnest Mountain area as well as north of Mist Mountain in the Kananaskis Country area southwest of Calgary.

Wave flying technique I haven't found lift strength to be the most important factor in controlling speed or distance in wave cross-country flying. Even modest lift in the 3–5 knot range will allow most fibreglass sailplanes to maintain altitude while cruising at speeds ranging from 80 to over 120 knots. The most significant factors are the continuity, consistency, and predictability of lift.

My cross-country wave soaring technique relies heavily on reading wave clouds to build a model of the geometry and strength of the wave systems. Low altitude wave clouds are generally very good indicators of the location and relative strength of lift. On most wave days the rotor will be marked with clouds that vary from scrappy strings to solid walls and provide an accurate outline of wave development. The airmass on a typical wave day is dry which results in a high cloudbase, and rotor, lenticular, and cap clouds that rapidly dissolve on the downwind, back side of the wave. As a result, clouds are honest markers of the wave system. The dry air also means there will be relatively few days when the wave window, the space between the wave crests, will tend to fill with cloud. Closing wave windows will tend to form first in areas of weak wave development (hence lower vertical airspeeds), such as the Crowsnest Pass or Mist Mountain areas.

Once you have "tuned your eye" to the appearance of the rotor clouds you can use them to gain information not only on wave location but also the relative strength of the lift. The larger, more solid clouds form in the most turbulent, strongest rotors and will be associated with the areas of best wave lift. Lenticulars, if present, tend to be restricted to higher altitudes and are generally not of much use to a pilot flying lower. The only exception is when lenticulars form as a cap, directly on top of a built-up mass of rotor clouds. In this case the lenticulars will form at altitudes of 12–16,000 feet and mark an area of especially strong lee wave development.

A surprising amount of information can also be gleaned from the cap clouds that sometimes form on the wave generating ridges. The most favourable cap clouds have the classic appearance of streamlined cloud pouring over the ridge crest and down the lee slope to dissolve in a ragged line tight to the ridge. This type of cap cloud indicates that the airmass is very stable and the air flow is conforming to the lee slope of the ridge, an important quality for wave generation. These "streamlined" cap clouds are always associated with good wave conditions. As the instability of the airmass increases, the cap clouds take on the appearance of cumulus clouds that blanket the ridges. In more extreme instability, snow flurries develop in the mountains. The combination of snow and cumulus create a hoary wall that obscures the wave generating ridges. When this type of cap cloud is present the airmass is often too unstable to form good wave or sometimes any wave at all. I've been airborne on several occasions when cumulus cap clouds with snow flurries gradually evolved on the front ranges and can attest to the almost complete collapse of the lee wave system.

Transitioning across waves The complex nature of the wave system means that soaring pilots will often want to move between the primary, secondary and sometimes higher order waves to find the best lift.

Downwind transitions seldom present a problem; with a strong tailwind, ground speeds can easily be as high as 160 knots. My altitude losses to move one wavelength downwind have averaged about 1700 feet, with a maximum on very strong days of 3500. Pushing upwind is more of a challenge. On strong wave days the soaring pilot can face a 50 knot headwind, 12 knots of sink and be flying straight at a mountain. Under these conditions you definitely need to be confident in your reading of the wave system. There will be days that a safe upwind transition can only be had by starting from altitudes well above 12,500. My average height loss for an upwind transition of one wave is about 2500 feet, but on strong days I have lost more than 6000. Typical ground speeds I have achieved during an upwind transition averaged about 72 knots.

You can minimize altitude losses by planning your transition in an area of weaker wave development. This is accomplished by making your up or downwind transition in clear areas, around the ends of well developed rotor clouds. This way you can avoid the areas of strongest sink. Once the transition is complete and again established in the upside of the wave, you can then shift laterally back to the area of best lift. I came across a good article on this aspect of wave flying entitled, *Speed-To-Fly in Upwind Wave Jumps*, by Ian Trotter, Sailplane & Gliding, June/July 1995. In the article, Ian examines the application of speed-to-fly theory to the problem of upwind wave jumps. Ian examines a typical wave situation where an upwind jump will involve flying into strong headwinds through sink to reach lift. Taking his basic conclusions and applying them to typical southern Alberta conditions would yield an optimal speed-to-fly for an upwind jump being about equal to your glider's rough air redline. This agrees fairly well with my own practical flying experience, however I tend to be a little less aggressive, choosing to fly 10–20 knots below rough air redline on most occasions.

Downwind wave jumps, assisted by a strong tailwind, can be flown at much slower airspeeds — I tend to fly at 70–90 knots. On wave days that have extensive rotor cloud formation, but an open wave window, a downwind transition can be made with relative ease directly over top of adjacent rotor clouds. It is, however, my firm policy never to try an upwind or across wind transition over top of solid cloud; the combination of headwind and sink can reduce your glide ratio relative to the stationary wave clouds to as little as 4 to 1. This makes judging your flight path over top of clouds a challenge which can be a recipe for disaster. Descending into turbulence-filled rotor cloud with no blind flying instruments will seldom have a happy ending. Always be sure you have an escape route clear of clouds.

A topic somewhat related to flying speeds is control of your cruising altitude. This altitude band is dictated by several conflicting factors; having safe landing fields in reach may push you to higher altitudes, but there will always be a need to stay below an upper limit that could be imposed by oxygen, low temperatures, or controlled airspace. My personal cruising altitude band is typically 9–11,000 feet on the low end to as much as 14–18,000 on the high end. Preventing your glider from climbing above your altitude band can be surprisingly difficult on strong wave days. Some degree of altitude control is provided by varying airspeed — flying fast when high and in strong lift, slowing down when low and in weak lift. Applying this technique on strong wave days can see you flying at near redline speeds and still climbing out of your altitude band. In this situation the best course of action is to move upwind, out of the area of strongest lift. This may involve as much as a 90° turn toward the back side of the upwind wave. This action is vastly preferable to attempting to use your spoilers at high speed or turning downwind into areas of potential rotor turbulence. On the best wave days you will have to continuously weave in and out of lift in an effort to control your cruising altitude.

"Chicken out" altitude A more elegant term might be "decision point" altitude, but I like to think in terms of at what altitude do I chicken out, change course to the east, and fly toward more benign terrain with safe landing sites. Wave cross-country flying definitely works best with the "get high – stay high" model, but you do need to plan ahead for the inevitable day when things don't work out. One cannot set a fixed altitude for all conditions, pilots and aircraft. That said, I like to generally set my chicken out altitude at about 7–8000 feet when flying in front range wave and about 9–10,000 when in the Continental Divide wave. This reduces the chance of falling out the bottom of the wave but leaves enough height to retreat downwind to higher order waves or safe landing sites.

Let me emphasize one point: do not try to recover from a low and in-sink situation by flying either along or at a shallow angle to the wave axis, which is oriented roughly parallel to the ridges. Once you have decided that you are too low for comfort and cannot contact lift, the best course of action is to turn downwind, perpendicular to the wave system. I emphasize this point because inexperienced pilots flying locally at Cowley, on getting into strong sink, often fly straight back to the airfield — this results in them flying a course at an angle to the wave axis, with a longer time spent in strong sink, and the result is the "duty landout" by the Blanik at the Hutterite farm four miles to the northwest of the airfield. What is the probability of landing out on a wave cross-country flight? My own personal experience has been about one of every twelve flights requires an engine start to prevent an off-field landing. If I had showed a little more restraint on some obviously marginal days, I could have avoided almost half of my engine saves.

Blue wave conditions I cannot claim great success in flying wave in blue conditions. The degree of difficulty is much higher when no clouds are present to guide you through the wave systems. One aspect that becomes critical in blue wave conditions is orienting yourself relative to the wave generating ridges by reference to ground features. This will help you track along the waves and stay in the best lift. In blue wave conditions your attention has shifted from looking at the sky and reading the clouds to watching the trend of your vario and looking at the ground. If your flight path results in a trend of steadily increasing sink, I find it works best to always make your initial correction into the wind. This compensates for the tendency of the high winds aloft to drift you downwind, out the back of the wave. It is also best to try an upwind correction first because even a small amount of time spent flying downwind will cover large distances that will be difficult to regain later if you decide to reverse course. I have found that it pays to keep a good lookout for any scraps of rotor as even the slightest wisp can reveal the location of the wave and speed you on your way.

A tour of the wave systems of southern Alberta

High Rock and Flathead waves The High Rock wave system extends about 90 kilometres from Mist Mountain in the north to the Crowsnest Pass in the south. A typical wave day will see the development of two waves, with the secondary lying just west of the front ranges. The northern termination of the High Rock wave is on the southern side of the Highwood Pass at Mist Mountain. In this area the sudden appearance of the Misty Range produces a very narrow and high valley with little room for a lee wave to develop. Without the powerful sink in the lee of the High Rock Range, it is common for cloud to extend across the valley and close off the wave window in the Mist Mountain area. The large continuous lee wave ends at this point and I have not ventured to the north into Kananaskis Country but there appears to be opportunities for soaring smaller isolated waves and ridges.

The southern end of the High Rock wave system is at the Crowsnest Pass, but often the wave starts to weaken just north of the Pass at Crowsnest Mountain. Crowsnest Mountain, close on the downwind side of the High Rock Range, can disrupt the formation of lee wave through this area. The best option is to either fly directly over top of Crowsnest Mountain or just upwind of it. This path may not yield good lift but will limit the amount of sink encountered. Two other features along the High Rock Range worthy of mention are the orientation changes in the ridge at Tornado Mountain and Courcelette Peak. Through both of these areas the wave may have a small discontinuity in it that will require the pilot to read the wave clouds and realign the flight path with a new lift trend. I have accessed the High Rock wave system by three paths, through the Crowsnest Pass, the Oldman Gap and the Highwood River gap. The best option has been the Oldman Gap route. Through this area there is 18,000 feet of VFR airspace available, allowing the soaring pilot to get a good high start making an easier upwind transition. The Crowsnest Pass along the Continental Divide is narrow and flanked by good wave generating ridges on either side. These features result in a relatively easy crossing and on some days there is even wave lift developed in the middle of the pass.

The Flathead Range to the south yields a run in powerful wave lift that is lamentably short — only 30 kilometres long. In overall appearance the Flathead Range reminds me of a slightly larger version of the Livingstone Range at Centre Peak. This wave is well positioned for the pilot to top up on altitude and take advantage of the 18,000 feet available for VFR flight south to the international border. I have only seen a primary wave developed in the lee of the Flathead Range, although there appears to be room for a secondary wave. Starting just north of Mt. Haig the terrain downwind of the Flathead Range rapidly builds up and the open valley space required for good lee wave development isn't present. There is also an orientation change in the ridge along the Castle River lineament, these two elements combine to rapidly end the good wave lift. This point marks the southern limit of my Continental Divide wave flying experience.

There are two obvious routes into the Flathead wave, one from the north across the Crowsnest Pass out of the High Rock wave and from the south out of the Border wave. I have found both to be successful with the southern route being somewhat more difficult. The distance upwind from the last good lift in the north end of the Border wave can make this transition a challenging one.

Highwood, Livingstone and Border waves The Highwood wave system runs from the Elbow River southwest of Moose Mountain, to the Highwood River gap, about 30 kilometres in total length. Figure 2 illustrates the position of the primary and secondary waves that I have used on soaring flights. Two factors, airspace restrictions of the Calgary TCA combined with the presence of Moose Mountain, have combined to make the Elbow River the northern limit of my progress in this wave. Moose Mountain at 7995 feet is the highest peak in the southern Alberta foothills, and its position downwind of the front ranges has a considerable negative influence on the lee wave, shifting the wave to the east towards the Springbank and Calgary International airports.

The Highwood wave is at its best between the Sheep and Highwood Rivers, producing strong consistent lift and fast cross-country speeds. The Highwood River gap marks the southern end of the Highwood Range and the northern end of the Livingstone Range. The gap is relatively narrow, flanked by wave generating ridges on either side and is also the position of a slight orientation change in the ridge line. Crossing this gap has presented difficulty on some flights, but is very dependent on the quality of the wave day.

The northern end of the Livingstone Range between the Highwood River and Oldman River gaps is a weak section of the front range wave. Along this 65 kilometre stretch, the ridge has lower relief and is somewhat discontinuous. I have run into problems through this section of the wave on numerous flights and been shot down several times. This section of the Livingstone wave is a good barometer for the type of soaring day you are facing. If the wave works well through here you are in for a good day; if not, it is going to be a struggle. As a result of its central position, it is important to be able to use this section of the wave to achieve the longer distance flights. I have used lift in the primary, secondary and tertiary waves through this area and have observed but not soared in higher order waves to the east.

The boundary with the southern Livingstone wave is in the Oldman Gap area. There is a pronounced change in the ridge line orientation north of the Gap which is commonly expressed in the offset position of the wave crest on either side. Crossing through this area will require reading the wave clouds and repositioning your flight track along a new lift trend. The southern Livingstone wave is most familiar to Cowley pilots. This 30 kilometre section of wave from the Oldman Gap to the Crowsnest Pass is the premier lee wave in Canada. Launching from Claresholm, 53 kilometres northeast of Cowley, means I often work the tertiary or quaternary Livingstone waves to get away at the start of a flight. Even these higher order waves can yield strong lift to high altitudes. The primary and secondary waves can serve up lift as strong as 25 knots, which is almost too much of a good thing. I've often been reduced to weaving in and out of the lift in an effort to prevent the glider from gaining too much altitude. The Livingstone wave in the Cowley area is also notable for its consistency and persistence, even with weather changes such as the passage of fronts, this is always one of the first areas to develop and the last to die.

It is quite amazing how fast things can change. The best section of the front range wave, Cowley, is juxtaposed with the worst section, the area in the lee of the Crowsnest Pass. This 25 kilometre stretch from Highway 3 to the Waterton gas plant has nothing going for it; it is in the lee of a large mountain pass, an almost nonexistent ridge, and a sharp change in ridgeline orientation. My history in crossing this area has seen an average altitude loss of about 1100 feet, with a maximum loss of 3500 feet. Curiously, my best record through this area was an altitude gain of 300 feet. This was achieved by working scattered bits of wave lift that were probably higher order waves of the Flathead system. With the new south extension to the Livingstone Block, a Crowsnest Pass crossing is easier to achieve. When leaving the Livingstone wave headed south, you need to allow for the wind drift created by high winds aloft, and aim upwind of the wave clouds in the north end of the Border system. I've learned to be cautious attempting to cross the Crowsnest Pass area.

The final section of the front range wave system is the Border wave. The Border wave extends 60 kilometres from the Waterton gas plant down to the border. I have used the primary and secondary waves along this section for cross-country flights. The scenery in this corner of Alberta is spectacular, the transition from open plains to front range mountains is very abrupt. The Border Range just seems to leap out of the ground with virtually no foothills present to smooth the contrast. The Border wave generally has less cloud development than waves to the north of the Crowsnest Pass. This may be due to it being further removed from the influence of low ⇨ **p22**

Probing for the smoking gun

Stan Hall, from *Sailplane Builder*

the Ivans/Engen Nimbus-4DB accident

dihedral-induced roll rate, seized ailerons and wing inertia seen as major factors

JULY 13, 1999 WAS A SAD DAY FOR SOARING when Bill Ivans and Donald Engen lost their lives in their 26.5m span Nimbus 4DM motor sailplane, which broke up in flight at Minden, Nevada and crashed. You may have read about this tragedy in George Thelen's safety column in the February 2003 issue of *SOARING*. Ivans was a widely known, world-class competition pilot with over 3300 glider hours in his logbook. Back-seater Engen was a retired Navy admiral and former director of the National Air & Space Museum as well as a retired government executive. He had 7000 hours PiC in naval aircraft and was an active glider pilot. It would be hard to find a more experienced crew and it is thus difficult to imagine how an accident like this could happen.

I consider it vital to the science of soaring that we examine this accident further for the lessons it carries for both pilots and sailplane designers. Simply reporting that the accident happened isn't enough. We need to know *why* it happened. There are facts begging to be revealed or theorized upon so that accidents like this can be eliminated or at least minimized. We need to do the math. We owe it to ourselves, to our sport, to aeronautical science.

In the 45-page National Transportation and Safety Board (NTSB) accident investigation report, witnesses state the 4DM was "circling tightly" in a thermal at about 10,000 feet when it dropped off into a spiral dive, which quickly developed into a two turn spin. The pilot recovered in what looked like a nearly vertical, high-speed dive. On the way out of the dive the wing, bending upward to an estimated 45 degrees, failed in four places, committing the remainder of the aircraft and its luckless crew to their ultimate fate. The NTSB spent most of those 45 pages describing the wreckage and estimating the probable forces that led to the breakup. Unfortunately, it offers no judgement as to *why* those forces developed in the first place for it concludes with, "... the probable cause of this accident was the pilot's excessive use of the elevator control during recovery from an inadvertently entered spin and/or spiral dive during which the glider exceeded the maximum permitted speed, which resulted in the overload failure of the wings at loadings beyond the structure's ultimate design loads." Read that as "Pilot Error".

Pilot Error, that common and too familiar refrain to pilots everywhere, a judgement carrying the stunning finality of a judge's gavel. That's it. Next case. Bailiff, haul the prisoner away! Judge, hold on a sec. There's more to be said about this accident, let me try to convince you that the case is not closed. Sure, it is likely the pilot came back too hard on the stick considering the speed involved. But I think one can legitimately ask if there was something inherent in the design of the sailplane that led its occupants into a situation from which there was no escape. My thesis is, there was.

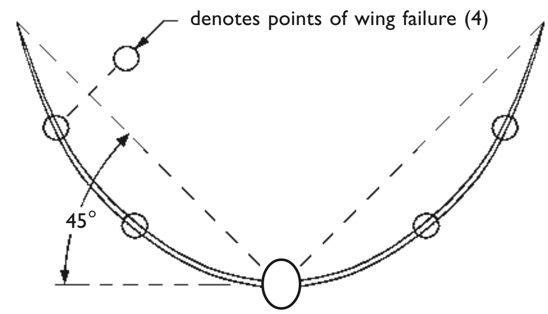
First, like many if not most production aircraft, the Nimbus 4DM is not without an accident history. The NTSB report states there have been several crashes. One was a non-injury, long landing accident in France. Another 4DM crashed in Spain during takeoff, resulting in two fatalities. A third crashed in Germany because the horizontal stabilizer was improperly installed which led to injuring the two-man crew. A fourth was the Ivans/Engen crash, and a fifth happened later in Spain where the aircraft broke up in flight under circumstances suspiciously similar to those involving Ivans/Engen. The pilot bailed out successfully. The accident is being investigated by the Spanish authorities. It is, of course unfair as well as inaccurate to claim these accidents have any bearing on the Ivans/Engen accident. However, a common thread that relates them is they all had that 26.5m wing, a span unprecedented at the time (a more recent long-winger is the new 30.8m span, 70:1 *Eta* described in the August 2003 issue of *SOARING*.

What about the 4DM's wing?
At a span of 26.5m, which is but spitting distance shorter than the wing on a DC-10, the 4DM will bend to an astonishing 45° or more at high g loading. The scale drawing provided here shows what an 26.5m wing, bent up 45° might look like.

According to the NTSB report Schempp-Hirth, manufacturers of the 4DM, measured a bend of 46.5° at an 8g loading. Since deflection is proportional to load the normal flight bend is about 6° in straight flight. In any case, a bent wing means a bent aileron hinge line. Ailerons don't like to move if their hinge lines aren't straight. Even at 1g and 6° the ailerons couldn't help be a little stiff. Imagine how stiff they might be when the wing is bent 45°! Bill Ivans faced that problem. How did he solve it? Maybe he didn't because maybe be couldn't.

The dihedral effect of the bent wing
Dihedral tends to roll any aircraft when rudder is applied, the amount depending largely on how much dihedral is involved and, of course, how much rudder is applied. Back in aviation's infancy in 1934, NACA engineers Wieck, Soule and Gough did extensive flight testing in aircraft of the period to examine the effects of dihedral on aircraft stability and control. They reported, "The roll that could be generated by the rudder at 9° dihedral was so great that the rudder had to be handled with discretion".

This early lesson has been rediscovered 70 or so years later in the light of the Ivans/Engen accident. Bill's son had flown the 4DM and reported extreme sensitivity of the rudder, which produced high rolling moments. A pilot, he said, had to take care not to put in too much rudder because of this undesirable characteristic. And this was the case with the wing bent up to its normal, 1g angle. Imagine the rolling moment with the rudder



Approximate shape of 26.5m wing bent upwards 45°.

hard over at a dihedral of 45°! Maybe, because Bill couldn't muscle in the ailerons, stomping on top rudder may be what got the spin stopped. We'll never know.

In any case, other Nimbus-4 pilots interviewed by the NTSB stated that the aircraft is an extremely high performance glider used for long distance flights and competition soaring. It is not designed for aerobatics or extreme weather conditions. Schempp-Hirth advises that "to avoid undesired rolling moments, once the bank is established the ailerons must be deflected to get a symmetric lift distribution (which) means stick deflected against the bank". They don't tell you how to make the ailerons go when the wings are bent up around your ears. Also, at the high angles of attack implicit in high bending, the boundary layer out at the ailerons, combined with the fact that sailplane ailerons are typically very narrow, suggests if they could be moved at all they might likely be working in mostly dead air.

The wing wasn't likely to be bent up much at the start but a spiral dive is a wicked maneuver. The wing did bend, a lot, as the spiral matured, which brings me to inertia.

The inertia of long wings
We recall learning about inertia from our high school physics, a property of a mass where in order to make it move, you must first apply a force to it, and once moving, another force to stop it. Like everything that moves, wings have inertia and respond to the same law. To make the aircraft roll or yaw the pilot has to first overcome the wing's inertia, using the controls to apply the required force. Then, to stop the motion he has to apply an opposing force. Elementary.

A measure of how easy or hard it is to provide the required forces can be seen by the Moment of Inertia being developed around the craft's cg. The moment of inertia is found by multiplying the mass of the wing by how far its cg is from the plane's cg, squared. Since the cg of a long wing is farther away from the aircraft's cg than a short one, long wings have a higher moment of inertia. And, long wings are usually heavier than short ones. Thus, the cg of a long wing which is, say, twice as far out as on a short one will have a moment of inertia four times that of the short one just due to the difference in location. Since the long wing is also, say, twice as heavy, that moment of inertia needs to be multiplied by two, making the net inertial moment eight times that of the short wing. That's a heap. If you are accustomed to flying a "short" winged sailplane and crawl into a long-winger you may be in for a surprise.

Bill Ivans had a bit over 100 hours in his 4DM. But according to other more experienced 4DM pilots, it takes more than 100 hours to master the machine. Bill was a very competent pilot but sometimes even competent pilots can be caught by surprise. The rough air being reported that day may have done just that; it unexpectedly rolled the aircraft, which because it was already spiralling, quickly fell off into a spiral dive. And then gravitational acceleration stepped in and joined with the aircraft's unique inertial properties. Together they presented the crew an essentially untenable situation. The result was a set of forces which Bill may not have had the strength to counter with the ailerons — because the aileron hinge line was so badly bent. Putting in top rudder as an alternative must have provided the needed force to stop the spiral.

The dive brakes
In common with other sailplanes, the 4DM carries spoilers on the upper surface of the wing. These devices also act as dive brakes. In my view, supported by the NTSB report, raising these surfaces contributed to the breakup. I think more pilots need to appreciate the fact that spoilers or brakes, when deployed, cause wing lift to be shifted outboard, consequently increasing the bending moments at the root as well as those over the outboard sections. To appreciate how strong this effect can be may be seen by observing Schempp-Hirth's measurements on the 4DM: at 1g and 177 mi/h the root bending moment increased by a factor of 5 over what it was at stalling speed. One might postulate that the moments farther outboard saw the same level of increase. That's what the diagram shows; the wing broke over those outboard sections at the points indicated.

The aircraft flight manual (AFM) notes that "while airbrakes may be extended up to V_{ne} they should only be used at such high speeds in emergency or if the maximum permitted speeds are *being exceeded inadvertently*." (my italics) What the AFM didn't say of course was, "if you exceed the maximum permitted speed and open the brakes be prepared to have the wings come off."

In studying the wreckage the NTSB investigators came to the opinion that at some point prior to breakup the spoilers were deployed. Had Bill recalled the perils of opening the brakes at high speed he might not have used them. But maybe he did; he may have had no choice considering how little altitude he may have had left to work with. Observe that the situation started to unravel for him at around 10,000 feet msl. The crash site was on the order of 5000 feet msl. It doesn't take long to use up 5000 feet, especially in a ship as slippery as the Nimbus-4DM and, according to witnesses, pointed nearly straight down.

My own take on the accident
Having studied the NTSB report in detail and having a bit of experience in designing, building and flying sailplanes and aircraft (the latter professionally) brings out the daredevil in me, to the point where I have the audacity to second-guess the chronology of the accident because there are some dots that need connecting.

Try this scenario on for size. The crew was circling tightly in rough air when a gust steepened the bank of that incredibly long, flexible wing. Maybe Don Engen was at the controls at the time, his relative lack of experience in the 4DM preventing him from responding instantly to the situation. The roll forced the machine to slip toward the lower wing, thus setting up circumstances favourable to a spiral dive. Two characteristics of the spiral dive are, one, the speed builds up dramatically and quickly. The rate of build-up can be stunning, particularly if the aircraft is as clean as the 4DM. Two, the g loads build up quickly since the aircraft is spiralling around an axis remote from the aircraft. This causes centrifugal forces to develop which can make it difficult if not impossible for the crew to bail out.

The spiral dive is a fearsome maneuver. In an earlier time it was called the Death Spiral, for good reason; it killed a lot of people. The maneuver is made even more fearsome in ships having very long wings because of their inherent high moments of inertia in roll and yaw, which tend to keep the wings rotating, once started.

The scenario proceeds: Bill came on line the instant he recognized what was happening and applied controls to stop the spinning. Since after about one turn, which developed in a heartbeat, the wings bent up so far he couldn't move the ailerons. In response, he then applied top rudder and forward stick and with this action managed to stop the rotation after another turn. Typical of a spin recovery the vehicle came out with the nose well down. Witnesses estimate it at 45°. Bill's forward stick aggravated the dive, which went to essentially straight down, the speed building dramatically as a consequence. Realizing he was losing altitude at a prodigious rate and approaching redline or better, he popped the brakes (or maybe they popped themselves) in hopes of slowing the machine down. At the same time he came back hard on the stick (too hard, say the NTSB investigators) because there was nothing else he could do; he was running out of altitude. These two actions may have sealed the crew's fate for the loads on the wings, already perilously high by now, failed.

So much for second guessing

In concluding this foray into conjecture, in my view there was something inherent in the 4DM's design that led to its breaking up. I can now connect the dots they lead me to conclude the smoking gun was the aircraft's incredibly high performance. In spite of my having no experience as a pilot of long-wingers like the 4DM (I have lots in short wingers) I would think when you're tooling around at 60:1, after about 100 hours PiC you might be lulled into a sense of invincibility. You are in command, the machine will do whatever you ask of it, it has in the past. A sailplane isn't invincible, it just obeys the laws of physics. The 4DM reaches its incredible L/D in straight and level flight. The problem is, in the vernacular, it don't turn too good. And in thermalling it has to be able to do that. Shouldn't it be possible to design a sailplane which doesn't demand the pilot choose between high L/D and turning performance?

Now there is little the manufacturer can do about all this with the possible exception of stiffening up those wings, making them lighter and making them strong enough to permit spoiler/brake openings at higher speeds than presently stated in the rules. The authors of these rules might consider revisiting them with an eye toward increasing the maximum required design load factors as well as the diving speed V_d for sailplanes having ultrahigh performance. While waiting for that to happen, designers of new machines might consider the installation of a jettisonable drogue chute in the tail as standard equipment. This method is commonly used in testing military aircraft and, in fact, has been used on at least one sailplane I know of. If the Ivans/Engen 4DM had been so equipped Bill might have been able to slow the sailplane without having to deploy the spoilers.

What might the future hold?

The solution to the "inertia problem" of long wings might be, in the future, to make them shorter. Now, you and I know this isn't going to happen; it's simply not in the tradition of soaring. Because low span loading (weight/span^2) lies at the heart of L/D performance, they don't get shorter, they get longer. The Nimbus 4 and the *Eta* may simply be harbingers of the twenty-first century's sailplanes.

It is not beyond the realm of possibility that for designs beyond Nimbus and *Eta* we can enlist the help of our friends in computer geekdom to lend a hand. (The Discovery Channel told me the other night the pilot of an aircraft carrier fighter doesn't have control of his airplane during the first 12 seconds of launch, a computer does. He just grabs hold of something solid and hangs on until the computer disconnects at 12 seconds, after which he takes over.) Should we not suggest our designers close ranks with those esteemed and learned cyberwonks to work together to solve our unique problems? Anyone for Fly-by-Wire? How about abandoning ailerons in favour of a more effective method for starting and stopping roll? How about integrating airspeed, turn radius, g loads and other factors involved in thermal flying into an instrument that warns the pilot he is treading on thin ice — or like our carrier fighters, takes over control when the ice gets too thin?

While the technology for improving both the performance and safety of sailplanes is at hand I'm fully aware of the difficulties involved in trying to design a machine that protects the pilot against himself. But we have to keep trying.

Instructors, check pilots and operating manual authors

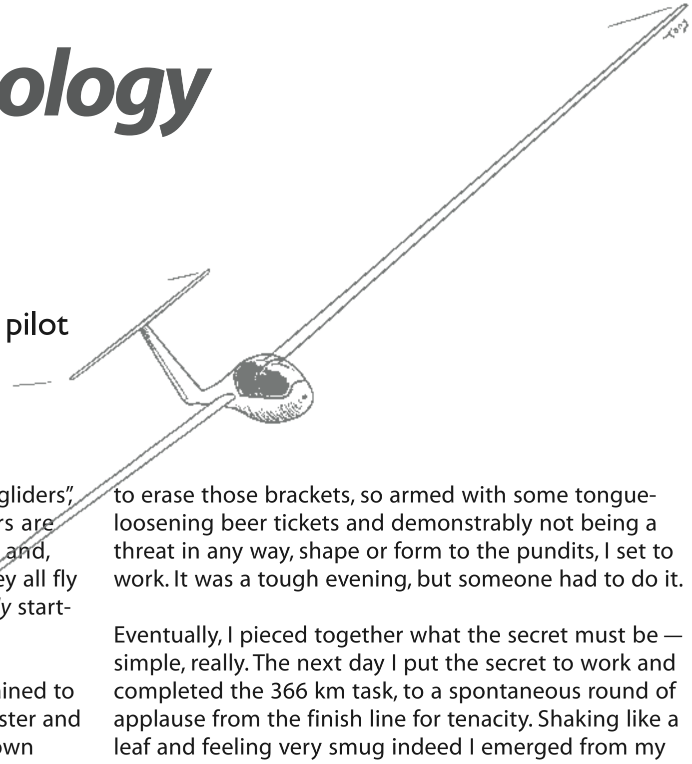
Right now, to borrow a snippet from the classics, if I were King I would decree that instructors and check pilots avail themselves more often of the persuasive powers of the two-by-four in their instructing and checking. I would insist that instructors act on that old bromide, "if the student hasn't learned, the instructor hasn't taught".

If I were king, I would demand the manufacturer make a stronger effort in his AFMs to advise what his vehicle can and can't do. I would insist he apply more emphasis on how the pilot might enjoy his sailplane — and still get home for dinner afterwards. I would require that the the vital features of his product be described in bigger, bolder, redder block letters, and use lots of exclamation points. In short, I would insist he communicate better the limits and special precautions to his customers even if in the process employed is the literary equivalent of the instructor's two-by-four. Had he done so on the 4DM perhaps I wouldn't have had cause to write this piece, and you wouldn't have had reason to read it. ❖

Stan Hall is a reknowned designer of homebuilt gliders in the USA, and has written widely on the subject for decades. The NTSB accident report summary is at <http://www.ntsb.gov/ntsb/brief.asp?ev_id=20001212X19310&key=1>. Complete document is accident number LAX99MA251.

Competition psychology

Chris Davison, from *Sailplane & Gliding*



the quest to discover what makes a racing pilot

RACING HAS MANY MEANINGS. There are "racing gliders", "racing days", and "racing pilots". Racing gliders are white and shiny, racing days are blue and fluffy and, while it is less easy to categorize racing pilots, they all fly faster and land out less than I do, and that is *really* starting to annoy me.

I am also getting annoyed that no one ever explained to me how I can become one. The secret of flying faster and so becoming a racing pilot is, I'm sure, handed down from pundit to novice behind rows of shiny LS-8 trailers all over the country. Secret meetings conducted in low whispering tones — "but remember, keep it to yourself and, whatever you do, don't tell Davison". I have loitered with intent behind most of the LS-8 trailers in the UK and discovered absolutely nothing.

I first came across the term "racing" at a regional contest a few years ago. I had been delighted to actually complete a task, only to discover a bar full of sour-faced pilots moaning about being 5 km/h slower than the winner, who in turn had a grin like an *Eta* on finals. I had no idea that there was a class of pilots for whom "getting back and having a cold beer" was not the pinnacle of achievement but just a basic statement of the obvious: racing pilots.

I had hung around LS-8 trailers long enough without the slightest sign of an indiscreet pundit; I had to find another route to further my quest, so I entered a Nationals. In my search to discover the secret of being a racing pilot I sought and received lots of advice: "it's your first nationals, so fly within yourself" — "it's your first nationals, so you'll need to push yourself hard" — "start the task early to maximize the flying window" — "start late to follow the other gliders"… fly fast, fly slow, press on, hold back, stay high, fly low … You name it, I'd been told it, and then someone else had contradicted it.

The good news is that hindsight brings far more clarity than advice — so after the first few days of the competition I knew exactly where I was going wrong:

I was landing in fields.

Progress was being made, however; each landing was further away than the last and I was getting to the field far more quickly. By Wednesday, I had formulated the brilliant plan of following a better pilot, only to discover that all the better pilots also had bigger gliders and did not turn into jelly at 1500 feet. But the plan (almost) worked and I (nearly) made it home. I decided that an intensive session of questioning was required if I were to erase those brackets, so armed with some tongue-loosening beer tickets and demonstrably not being a threat in any way, shape or form to the pundits, I set to work. It was a tough evening, but someone had to do it.

Eventually, I pieced together what the secret must be — simple, really. The next day I put the secret to work and completed the 366 km task, to a spontaneous round of applause from the finish line for tenacity. Shaking like a leaf and feeling very smug indeed I emerged from my little glider to be presented with an ice-cold beer. At last the secret was mine; I was a racing pilot. Or not.

Friday was the "day of days" and a 505 km task was set. My race-proven secret for flying faster would be applied again. The first leg, a mere 165 km from Lasham to Leominster, went without a hitch, I was keeping up with other gliders, even racing. Next, the 122 km to Buckingham and a huge cloudstreet. The best flying of my life, bar none: 62 km dolphining without turning once, catching the gliders ahead, rejecting 4 knot climbs and being rewarded by 7 knots on the averager! The conditions were fantastic and I was in racing heaven. What could possibly go wrong?

Then, slowly but surely, my secret started to fail me. The conditions began to change — but my flying didn't. I rejected 4 knots and found only 2. I got lower but pressed on further down track, rejecting weak lift as I went. Too late, I realized that I needed to stop racing and start flying, but by that time I was picking a field. I watched as a stream of gliders passed overhead, dumping water, climbing slowly away but most of all, flying. I cannot overstate how low I felt sitting in that field waiting for my crew to arrive. From the best to the worst day of my gliding life, in less than an hour. The next day, physically and mentally exhausted, I quit the competition and went home to take up golf.

On reflection, it was not the secret that had failed, only my attempts to use it. A mixture of dehydration (the hottest week since records began), the internal stress of a poor start to the week and the false elation that my days of landing out were over had blinded me to the obvious: *racing pilots race in racing conditions* or, at least, the successful ones do. Racing days in the UK are subject to terms and conditions, and you fail to read the small print at your peril.

So what is the secret I discovered and does flying faster make you a racing pilot? First let me share some of the myths I have dispelled in searching for the secret: ⇨ **p26**

a 2020 km O&R

the record flight that wasn't

Wolfgang Thiele, Rideau Valley Soaring

WHILE WORKING IN SAUDI ARABIA, I developed the habit of taking my leave in France for gliding holidays there. Most of my gliding was done at Fayence, sixty kilometres north of the Côte d'Azure. In 1996 I saw in the German sport aviation magazine *Aerokurier* a write-up about the wave wizard, Klaus Ohlmann. On contacting him, I found him very approachable and willing to introduce this flatlander to high-performance wave flying. His glider operation, "Quo Vadis International", is located in Serres, fifty kilometres west of the city of Gap in the French Alps. Klaus teaches performance wave flying by dual instruction and also by shepherding a group of solo gliders. But in my case, having lost my medical, I exclusively fly with him and so far we have accumulated almost 400 hours together, 109 hours last year alone. I have experienced with him the full range of elation (and its opposite!) available in mountain soaring. My nickname for Klaus is "Panther" because he has those physical and mental attributes, except that he is very people-friendly and a natural leader.

Last fall he insisted that I come to Argentina to experience a "bigger dimension" of wave flying. So, last November I went to San Martin des los Andes to fly with him in the mountain range known as the Cordillera des los Andes. I arrived in Buenos Aires from New York after a nonstop 10.5 hour flight. In Buenos Aires I did not observe any signs of the reported problems on the ground; my overall experience with the people and the country was very favourable. I recommend Argentina as a holiday destination (quality for little money).

"Lanin", the 11,800 foot volcano 50 kilometres NNW from San Martin des los Andes, is so large that it always has a reliable wave.

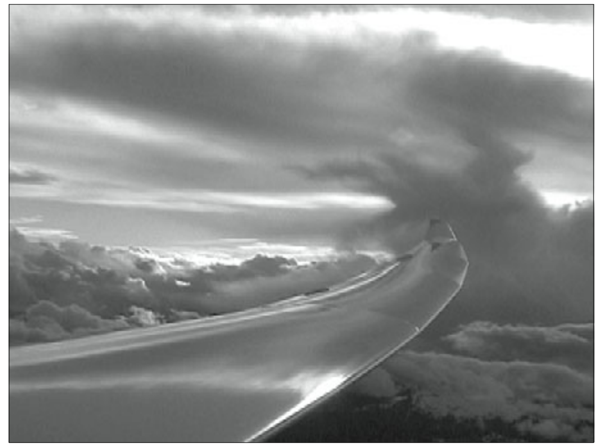
Travelling by long distance bus took 20.5 hours to reach my destination of San Martin des los Andes. Modern double-decker Mercedes buses have fully reclining captain chairs, hot meals, snacks and drinks, and travelling a distance of 1650 km cost only $50 Canadian! Our base at the Chapelco airport is 23 kilometres northeast of the town of San Martin (15,000 feet elevation) in Patagonia at 40 degrees south latitude, very close to Argentina/Chile border.

I had my introduction to the vistas and vastness of the Patagonian landscape with two flights at "regular soaring hours" (between early afternoon and dusk, approximately 1300 to 2030). Then, on 14 November, Klaus had everybody (the pilots of two ASH-25M two-seaters plus two solo machines, a Ventus 2CM and ASH-26M, and him and I in the Nimbus 4DM) get up at 4:30 am, to be at the airfield at 5:30 for launch at daybreak, about 6:00.

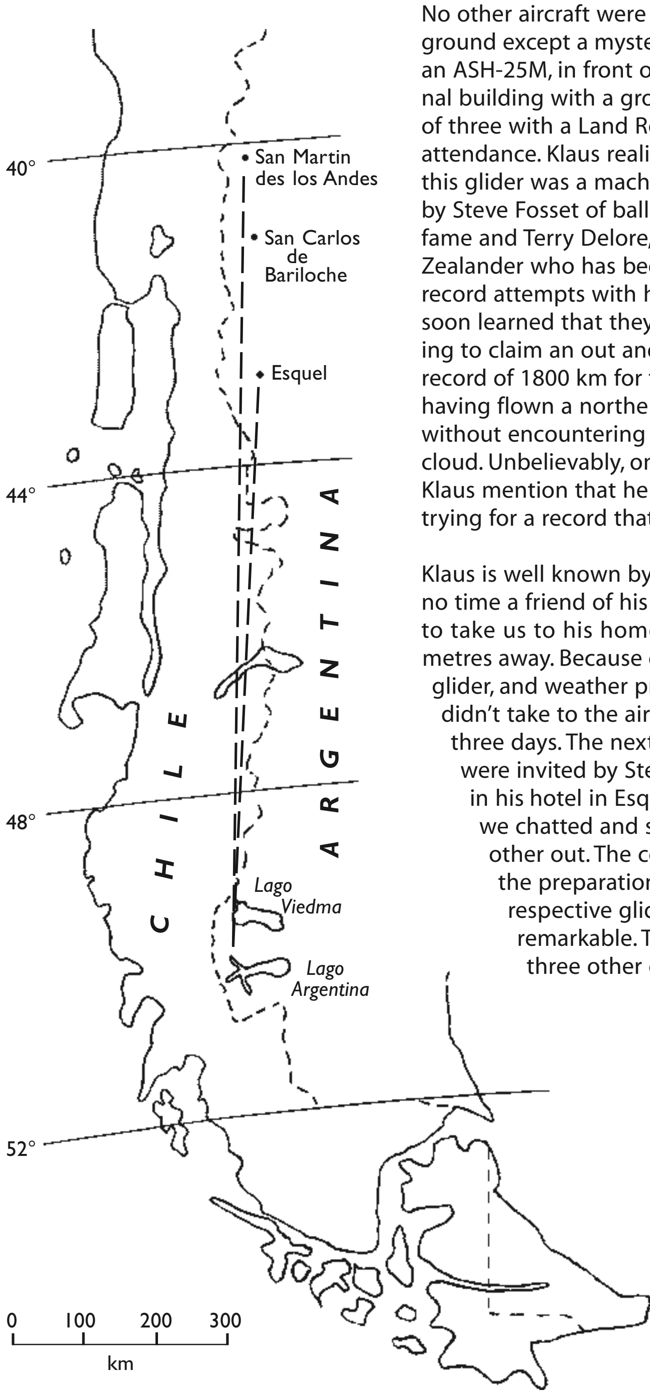
After having towed the Nimbus 4DM to the starting point and the car having left to pick up the next glider, Klaus realized that he had left his flying boots in the car. So after fetching the boots we ended up in last place for take-off instead of first. After launch, we marked our departure and stormed south in 100–130 km/h winds at altitudes from 4500 to 6000 metres. After 6.5 hours we had flown 1010 kilometres to our turnpoint between Lago Viedma and Lago Argentino at 50 degree latitude; it all seemed so effortless. The flying time left to return home to Chapelco airport, 23 kilometres north of San Martin, was now a little less than eight hours.

After soaring 500 kilometres of the return leg we had to slow down considerably and it became clear that our morning delay might prevent completion of the task. The open spaces between clouds were diminishing and orientation becoming more difficult, since we flew above the clouds whenever possible.

The major air traffic control centre at San Carlos de Bariloche was ahead of us at this point in time instead of behind us. It was 1900 hours and we were at 5000 m, when Bariloche controllers "suggested" we land at nearby Esquel airport. Since the visiting glider pilots consider themselves guests in Argentina, they treat such suggestions as orders. So we spiralled down from 5000 m in a relatively small opening, requiring rapid maneuvering to remain out of cloud. We also exchanged the ease of laminar flying with rotor-rodeoing down to a landing on a paved runway at Esquel.



Wolf, and two soaring scenes near San Martin.



No other aircraft were on the ground except a mystery glider, an ASH-25M, in front of the terminal building with a ground crew of three with a Land Rover in attendance. Klaus realized that this glider was a machine flown by Steve Fosset of ballooning fame and Terry Delore, the New Zealander who has been flying record attempts with him. We soon learned that they were going to claim an out and return record of 1800 km for that day, having flown a northerly course without encountering much cloud. Unbelievably, only now did Klaus mention that he had been trying for a record that day also.

Klaus is well known by now, so in no time a friend of his showed up to take us to his home 44 kilometres away. Because of human, glider, and weather problems, we didn't take to the air again for three days. The next day we were invited by Steve for tea in his hotel in Esquel, where we chatted and sniffed each other out. The contrast in the preparation of our respective gliders was remarkable. Terry and three other experienced pilot/technicians maintained their glider race-ready while our glider was flown "as-is" and out of necessity received only oxygen maintenance. Still, Klaus outclimbs and outglides the competition most of the time in long distance wave flying.

Ironically, the most memorable flight was the 300 kilometres from Esquel back home to Chapelco to complete our failed 2020 task. Two hours after take off at 14:30 we had not gained any distance towards home. Even though we had strong winds on steep sloping ranges we were unable to outclimb the ridge high enough to get into wave. We had to get away from this unproductive area so we flew over an even less promising plateau with a circular mogul pattern. Height losses became precipitous and in no time at all we were in survival mode. With the "help" of a seriously compromised total energy system on our varios we rapidly ended up too low to use the engine safely! We had to reach the next crashlandable shallow valley depression; and fortunately we did. The situation had been really serious for a few minutes.

Lower down, we managed to find bits of lift, tip-toeing towards a landable road and landing strip. Soon we had gained enough height to gladly abandon the super-cautious flying and search for lift. It took "Kilo Oscar" not long to find a powerful thermal-rotor combination, which we battled our way up to enter wave for an anti-climactic fast flight home to Chapelco.

Since our flight, Klaus Ohlmann surpassed this attempt with out and return flights of 2356 km on 23 November and 2621 km on 11 December 2003. ❖

Checklist for a sport ☑

Andy Gough & Steve Newfield, SOSA

QUESTIONS, QUESTIONS, questions – who cares to answer?

Questions about insurance

- Are insurance rates just another fee increase, or is the increase a symptom of something else?
- Are high insurance rates the result of greedy insurance companies? If this were the case, would not the competition step in to offer a better rate?
- Doesn't the fact that we have only one company that will even consider doing business with us point to some other cause?
- Could it be our abysmal claims record?
- Do we make a lot of noise about safety and a safety culture with few results and improvements?
- Do we understand the average glider pilot with less than 20 hours per season and long periods of no flying activity is always flying in a high risk situation?
- Do we understand that in the majority of accident statistics the following are factors?
  - Low recent time, total time, and experience.
  - Low time at the site being flown.
  - Low time in the aircraft or type being flown.
  - Little experience in the situation being flown.
- Do we accept our poor safety record is the cause of our insurance dilemma?
- Do we understand it is not them — it is us?

Questions about safety measures

- Do we understand that the greatest contributor to our poor safety record is a deficit in currency and familiarity, in turn, a sign of low flying activity?
- Are we willing to consider the possibility that low flying activity is a symptom of how we operate?
- Are we prepared to acknowledge that our operations don't promote activity and consequently don't promote safety?
- Are we prepared to accept the root cause of our low activity is poor organization and management at the club level?
- Do our clubs' safety committees chronicle and collect data and demonstrate great knowledge about who, where, and when?
- Do they apply this knowledge to the task of determining the root cause?
- Do we excuse poor performance because we are choosing to rely on ad hoc volunteerism?
- In defense of our dismal performance, do we hear people make the statement "we are an amateur organization"?
- Is an ad hoc approach to safety acceptable?
- When senior pilots just tell us to fly more safely, does that make it happen?
- Do private owners think they are a special case and deserve special treatment as they are not part of the problem? Do they just expect club pilots to fly safer?
- Do club pilots just expect pilots with private gliders to fly safer?
- Do our solutions to safety problems consist mainly of extending the time and number of flights before solo or to implement more procedures and paperwork?
- Do we understand that safety is something we must practise and not something we can learn and retain, that safety is a hands-on activity that needs to be practised on a regular schedule?

Was this your last checkout ... ?

- Was there a lot of paperwork-checking and a reliance on aggregate numbers?
- Were you required to do some cursory checkflights or flights with no particular purpose in mind?
- Suppose you only flew a total of five hours the previous year but have a total time exceeding 150 hours, and it has been nine months since your last flight. Would anybody notice and probe further into your proficiency?
- Were you expected to demonstrate a certain level of proficiency and currency in a reasonable time span before resuming flying privileges at the level you flew in a preceding period?
- Were you able to fly enough to be proficient?
- Do you know or does anyone convey to you what is considered an appropriate level of activity in a particular time span to maintain your proficiency?
- If you are an instructor, do you believe your experience level is sufficient to give you the confidence to make judgements on a person's flying ability and suitability to exercise the privileges you grant, or do you rely on mere aggregate numbers?
- Can you look a "paper-qualified" pilot in the eye and tell him that his recent experience and proficiency demonstrated are not up to the standard?

- Do we understand that pilots who are not familiar with the situation they are flying in and are not current in the equipment they are flying are potential accident victims?

How is safety affected by operational organization?

- Will preventing those without the requisite skills from getting into the skies and falling back out of them again with a bump and an insurance claim solve the safety problem?
- Will it exacerbate the problem, because people are not apt to stay in an activity where they are constantly returned to a previous level?
- Do we understand that providing the opportunity for everyone to fly an adequate amount of time is not just desirable but essential to safety?
- Will we consider that our operations may not promote activity and consequently do not promote safety?
- Will we consider low activity is a symptom of how we operate, and that the cause of our low activity is poor organization and management at the club level?
- Do we understand who is responsible for safety and the effective management of our resources?
- Do we understand it is not them, it is us?

Questions for SAC executives

- Does the SAC Board have a vision to communicate for the future of soaring in Canada?
- Does the SAC Board have a plan of action, objectives, and a means of measuring them? Will the SAC Board communicate to members those objectives?
- Does the SAC Board believe it has any obligations in setting and communicating objectives to the membership? If not, will the SAC Board communicate to members what it believes its function is?
- Has the SAC Board communicated to the members what it believes we should be doing to overcome the problems of declining numbers?
- Will the SAC Board communicate to the members what it believes we should be doing to overcome the problems of declining safety and increasing costs?
- Should the SAC Board allow itself to be influenced by interest groups in the membership or rather concentrate on issues that contribute the greatest benefit to growing and sustaining the membership of SAC?

Questions for club executives

- Does the executive have a vision to communicate for the future of its club to the membership?
- Does the executive have a plan and objectives to meet such a vision and have a means of measuring their progress and success?
- Do we understand that activity is the key to a flourishing club environment and the key to safe flying?
- Do we understand how destructive a lack of activity is to our clubs?
- Do we understand that an influx of new members is every club's most important resource and realize their influence of new members on flying activity?
- Do we understand that weather is not the sole influence on flying activity and that new members have a reason to fly in any flyable conditions and therefore promote flying activity?
- Do we understand that without new members our flying activity will drop to only on the good days.
- Do we understand the loss of an inactive long-time member is far less a problem than the failure to recruit and keep new members?
- Do we understand we are not doing well in keeping new members, and that the majority of new members leave because of poor management?
- Do we understand that putting long time members' needs ahead of new members' needs eventually impacts all members negatively?
- Do we understand we are able to positively influence flying costs through better management?
- Do we understand that keeping the costs of belonging high and the costs of flying club gliders low promotes activity, and that doing the opposite not only cuts down activity but also affects safety?
- Do we understand the above can be achieved if we apply the appropriate organizational structure?
- Are we prepared to accept that failure to reach an appropriate level of activity is the result of our lack of attention to club organization and management?
- Do we understand that one rule for all is fair but not always practical for all members?
- Do we understand that different people have different priorities on their time?
- Do we understand we need to satisfy individual demands but also need those demands to be matched with an equalizing obligation?
- Do we understand that there can be more than one way to fill this obligation?
- Do we understand the need to communicate and set achievable objectives, and that progress towards them needs to be measured and the results acted upon?
- Do we understand that activity without results is meaningless?
- Do we understand that people are willing to help as long as they can see their efforts have not been squandered?
- Do we understand the cause of our poor safety record and our falling memberships is our low activity and that the cause of our low activity is poor organization and management at the club level?
- Do we understand it is not them, it is us?

a credo for sport executives

Our job in gliding is to plant trees under whose shade we shall never sit.

Questions for club members

- Do we understand that the next hundred members SAC loses represents 10% fewer members to pay the bills but the bills are not shrinking?
- Do we understand that the organization and management of our clubs affects our flying fun and pleasure?
- Do we know how much work goes into keeping our clubs running and whether it actually gets accomplished, and
- Do we understand the consequences of this work not being accomplished?
- Do we understand that too little flying affects safety?
- Would a higher fee structure with less personal commitment represent more flying to us, or a lower fee structure with more of a time commitment?
- Would a flexible membership period (by day, week , or month) have more value, understanding that the convenience of flexibility translates to a higher cost?
- Would a fleet that matches all levels of experience and need represent a reason to spend more time at the club?
- Would a seven day a week operation be a benefit to us and our fellow club members?
- Do we understand to achieve any or all of the above we need as club members to contribute to the operation of the club?
- Do we understand that there can be more than one way to fill an obligation?
- Are we prepared to accept that different people have different priorities on their time and that one rule for all, though just, is not always practical for all people?
- Do we believe we need to satisfy individual demands but also need those demands to be filled with a balancing obligation?
- Do we understand by not contributing we are forcing higher fees on the whole soaring community and we create the conditions that lead to poor operational performance?
- Do we understand that poor operational performance leads to low activity, a root cause of our poor safety record and our falling membership?
- Are we prepared to pay the price of poor organization and management?
- Do we understand that *we* are our club management?
- Do we understand our problems stem not from them, but from us?

Questions for cross-country and contest pilots

- Do we understand that cross-country and contest pilots represent a very small percentage of the members of a worldwide community of about 120,000 glider pilots?
- Do we understand that most people do not join a gliding club with the express purpose of competing in contests and flying cross-country?
- Do we understand that we depend on the much larger group of club pilots to keep our sport alive?
- Do we understand that if the clubs do not solo and progress new pilots we will not be able to sustain our ranks, let alone have it grow?
- Do we understand that nurturing new cross-country pilots starts at the beginning of their flying experience and not after their licence, and that we as an experienced group have the most potential to influence this process, and
- Do we understand that new members represent more than convenient helpers to retrieve and rig our ships?
- Do we understand that to be able to host a national contest with 50 entrants we will need, at a minimum, to double our national membership?
- Do we understand that countries with a far smaller population than the greater Toronto area have more soaring members than SAC?
- Do we understand we have a problem that originates with us, not them?

Is it possible to build a solution from the bottom up?

- Can we improve our safety record principally by each and every one of us flying more and becoming more proficient, and keep costs to a level that will allow a wide group of people to afford the amount of flying needed to keep them proficient?
- Will clubs accept that cheap flying in a safe and well-managed environment is the *only* solution to declining activity, safety and membership?
- Can we improve our efficiency to the point where we can service the needs of our existing members *as well as* the new members we need for our organization to grow?
- Can clubs examine their activities and make hard choices that benefit the growth of the club and tailor their operations to satisfy a wider variety of needs?
- Will club executives focus on the need to grow and sustain not only their clubs but SAC as a whole, but understand there must be a measurable and accountable way of checking progress?
- Will club executives insist that they get lots of help, but understand that the incentive for those who help out is to be assured that their efforts are not squandered meaninglessly?
- Will clubs understand that it is unrealistic to assume they can service all members with the same type of membership?
- Will clubs understand there needs to be a number of ways in which a member can contribute to allow the widest section of those interested to participate in our sport?
- Can we understand that success lies with us inside our organization?
- Can we understand that success is achievable if we focus on the goal of growing and sustaining the membership and not on our own self-interests? ❖

Soaring to Pemberton

Ken Armstrong

MY STALWART FLYING COMPANION, James Ord, had helped so much with my motorglider operations, I decided to thrill him with a round trip flight from Victoria to Pemberton to check out the legendary soaring conditions there. Previously, we had only sampled the convection and wave in the lesser hills of southern Vancouver Island and we felt it was time to see if soaring advocates were exaggerating about Pemberton.

We left Victoria airport by mid-morning and set course for directly over Vancouver International at 4500 feet and then were cleared to 8500. Once out of controlled airspace, we allowed the thermals and ridge lift to determine our cruising altitude. Our first hint of the lifting power these larger mountains provide occurred as we passed just downwind of Garibaldi Mountain's peak. A strong southwesterly flow still possessed plenty of upward inertia and we quickly gained a thousand feet. We didn't linger as Pemberton was our destination so we tucked the nose down and continued to indicate over 115 knots as we slid down the updraft towards our previous cruising altitude. This was interrupted by even more lift over the Whistler ski area. While it was difficult to determine the exact source of the updrafts, we played hunt and seek for a few minutes in and out of the sporadic lift. Two thousand feet later we could only shake our heads as to the hidden secrets of vertical currents and once again tucked our nose down to seek Pemberton.

The Diamond Xtreme motorglider power was reduced to high idle as our descent rate was minimized by light ridge lift along our track to the opening of the valley notch leading into the airport. Once the GPS and map references indicated we were within easy gliding distance of our new operating area, we cooled the engine at idle, shut down, feathered and closed the cowl flap to keep temperatures up. While we didn't find any convective help at altitude, the mixture of winds in the Pemberton area create a lot of convergence and maintained us aloft for a considerable period. We noted other gliders launching to about 2000 feet; however, they were all returning to earth shortly thereafter. Our intent was to glide to touchdown but the cavorting gliders made it prudent to start up the engine for landing.

After a chat with Rudy, the owner of the Pemberton Soaring Centre, we headed west towards Ipsoot Mountain and the Pemberton Icefield. Minutes before a glider had been towed over to Golf Cart Ridge and seemed to be working decent lift — we followed. Whether it was convergence or convection or perhaps both with some ridge lift on the upwind side, we were quickly hoisted to 7000 feet. We lingered and ran back and forth along the two mile humpbacked hill for 20 minutes or so before setting off west to conquer the big hills. Five minutes later we were back to regain all of the altitude we had lost. We headed east to try the west facing cliffs for ridge lift. That was a mistake and the engine was called back from hibernation so we could get back to the Box Cart and quickly lofted back to altitude. This time we used five minutes of engine power to get over to Ipsoot's southern ridge line were we found abundant, consistent lift. With engine and propeller secured we dashed back and forth along the ridgeline sacrificing higher altitudes for speed. We noted the lift was strongest near the southwest corner (no surprise there) and were able to climb 500 feet above the ridge and noted the lift only dropped off slightly as we soared downwind over the steeply climbing glacier. With plenty of altitude we continued northeast anticipating an end to the up-draft but it was strong enough to overcome our 250 ft/min sink rate and keep us well above the snow. While I couldn't explain to Jim why we were climbing faster than the slope of the ice field, we accepted the thrill for more than an hour.

It was even more enthralling as we noticed that none of the relatively high performance gliders were able to break through the 7000 foot barrier and had all surrendered and returned to the airfield. Chalk one up for the additional capabilities of the motorglider. In short order, we were up to 10,000 feet and could see the sun preparing to set over the western peaks. Time to start the downwind and downhill glide to Pemberton. With so much potential energy stored, we darted across to other valley areas to research them for future flights in a shallow descent in deference to Jim's ear clearing.

All airport tie downs were in use and thankfully Rudy found some buried lugs on his property to secure the bird. As darkness approached we hosted a round for the helpful crew and met two of the instructors, Jim from Australia and Allen from England. They would figure prominently in our activities next day. When the fridge supplies were exhausted and this low time glider pilot had learned oodles more information on the local area, we retreated to the local hotel accommodation where we had first hand experiences of the BC Northern rail line schedules through the night. Recommendation number one would be to stay at one of the local bed and breakfasts in the future — or camp out.

The next day broke clear and sunny and after a most enjoyable breakfast we toured the local area somewhat to get a lay of the land and to look for a campsite for future visits. Jim and I got separated for a brief time and he snuck off with Allen in the Blanik for a pure glider flight. I had trouble berating him over his defection — he was gloating and oohing and awing so much.

When it came time to depart near mid-day, we only needed to climb a few thousand feet and turn the corner southbound towards Whistler to reap the benefits of the wind which had now switched to westerly. Our southerly track maximized the crosswind and ridge lift such that we could climb at 100 knots rather than our typical 75. All this with the engine at high idle. The trip home was quick as it was "downhill" from the beginning in the steady lift….

After securing the bird, I quickly realized that while I had been lucky and successful in finding so much lift on the Island, there were far more exciting adventures and exceptional scenery awaiting on the mainland. This summer is slated for Pemberton. Maybe I won't have to travel as far as Cowley for soul-gratifying soaring. ❖

club news

† Leonard Douglas

We lost another like-minded soul in the week of 19 January. Leonard was a coach, a mentor, an instructor, for all the right reasons ... a love of flight, a willingness to share and pass on his, and a desire to ensure that all students received the best instruction possible. And he had lots of experience, from navigating Europe during WWll, to jets through the Cold War. He finished his last RCAF tour in the back seat of a CF-100.

After his son died in a gliding training flight in Europe, Leonard decided to take up gliding with Base Borden Soaring Group in the late 70s, became an instructor, and taught until Transport Canada clipped his wings shortly after I joined BBSG in 1992. His goal, which he achieved as far as I'm concerned, was to make sure that none of his students died as a result of a training incident. He opened his home to me and others over the years that I flew with the club during our summer flying weeks ... some wicked parties too!

He also taught accounting for many years in Barrie at Sheridan College and volunteered untold hours for their food bank. Oh! ... almost forgot ... he donated in addition to time, an endowment, the proceeds of which would provide sufficient funds for an annual flying scholarship for a local Air Cadet Squadron in Barrie. A pilot, a teacher, a gentleman.

Alan Mills

... Alberta lee waves from page 11

pressure areas tracking west to east over northern or central Alberta. Lack of cloud can be a limiting factor in using the Border wave, making the system more difficult to read.

The nature of the front range ridges through this area is also unique. The ridgeline is cut by a series of deeply incised transverse drainages which break up the lee slope and somewhat compromise its wave generation potential. The resulting wave is often fractured into a series of smaller segments that can require frequent reorienting of the flight path to find the highest energy pathway.

Starting at the Waterton Park gate and continuing south of the international border in Montana the front ranges undergo a series of stepwise jumps to the east. These steps are easy to follow when you are heading south, with a substantial tailwind component helping you along, but there is a surprise waiting when you turn back north. The trip north will require you to push into a quartering headwind and on marginal days this can be a struggle to make progress.

Tips for the initial wave cross-country flight

So, you've just launched from Cowley on a wave day, and have decided to try your hand at stepping out along the wave and covering some kilometres. Once established in lift and climbing I would recommend you study the strength, continuity and predictability of the wave. Conditions in the lee of the Livingstone Range at Cowley will typically be as good as it gets. If you have had difficulty locating lift and climbing away in this area it is not going to be better anywhere else. Move around in the wave, sample the primary and secondary, and gain some confidence in using the rotors as indicators of wave position and strength. Test your ability to transition up and downwind through the system. Lastly, use the typically excellent visibility to judge the health of the wave in adjacent areas. You can commonly see in excess of 150 kilometres, allowing you to read the wave clouds along a considerable length of the front ranges. This will allow you to visually interpret the conditions along the Livingstone, Border and High Rock ranges. Once you have figured out how the wave is working, you can then extend out and sample other areas marked by good rotor cloud development.

An appropriate initial goal might be cruising up the Livingstone wave system west of Chain Lakes to the Highwood River gap[5]. A second option is to head south along the Border wave system to Waterton. Choosing the second option will require crossing the area in the lee of the Crowsnest Pass and the northern end of the Border Range, an area of notoriously poor wave. With the Livingstone Block open, a more adventurous third option is to climb up to about 20,000 in the Livingstone wave and fly west into the High Rock wave system in the lee of Tornado Mountain. From a high initial altitude you could cruise out, investigate the lift in the High Rock wave and still have ample altitude to return to the Livingstone wave if conditions are not to your liking. Once established in the High Rock wave you have an excellent opportunity for some fast flying along its 90 kilometre extent. The south end of the High Rock wave near Crowsnest Mountain is also one of the best places to transition into the Flathead wave and on south to Waterton in the Border wave. This route will obviously take you deeper into the mountains and an appropriately higher "chicken out" altitude will have to be employed.

I hope this article will be of some help in removing the mystery surrounding wave cross-country flying in southern Alberta. I would encourage pilots to get out there and try soaring along the wave; I am sure you will find it an exciting and challenging complement to the pursuit of altitude Diamonds at the Cowley camps. ❖

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1 Tom Bradbury, *Meteorology and Flight*, pages 74-75.
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3 Ursula Wiese, *Stalking the Mountain Wave, edition 1*, "A Lee Wave Cloud Climatology for Pincher Creek, AB", Peter Lester.
4 Ursula Wiese, *Stalking the Mountain Wave, edition 1*, pp 130-132, "Alcor Flies at Claresholm", edition 2, pp 21-31, Tony Burton.
5 Vaughan Allan, *1000 kilometres in Rockies Wave,* free flight 5/01, pp 6-9.

Photo by Adam Dalziel, a Canadian towpilot at Omarama. On a training flight in an ASH-25 with Doug Hamilton shortly after arriving in New Zealand, Adam was being treated to a run to Mount Cook on a typical southwest wave day. Approaching Glentanner along the Pukaki wave line, a cloud cell rapidly growing in front of them added meaning to the term "wave" by tipping and spilling onto its lee side.

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safety & training

The instructor's guide to safety

Safety functions on three levels. The first, and most important level is the flight itself. As the instructor, you are responsible for the safe conduct of the flight. Everything else is a distant second, including the lesson. It won't matter one bit that you have just given the world's best lesson if you allow the flight to end in an accident. For student training flights, check flights of all sorts, intro or familiarization flights, or any other flight in which you are the Pilot-in-Command, you and you alone are responsible for the safety of the flight.

The second level of safety is the flying operation. Here too, as the instructor you have a measure of responsibility to monitor the overall safety of the operation. As duty instructor, it is difficult to not only organize and teach, but to keep an eye out for changes in wind and weather conditions. But it should be done to the best of your ability. If you have any doubt about marginal conditions, the person to confer with is your friendly towpilot. The two of you will often agree on a course of action that you would have been reluctant to take as individuals. A decision to shut down or even change runways can be unpopular at times, and it helps immensely if someone else is on your side.

The third and broadest level of safety occurs at the club level, and is referred to as the "safety culture" of the club. It is the overall attitude and code of behaviour of the club members as a whole. As an instructor, you have a greater opportunity to influence the safety culture of the club than you did as a student or licensed pilot. But, since you are now seen as a role model, this opportunity comes with an obligation to lead by example. Which is why safety should permeate everything that we do as instructors. It should form the core of the attitudes that we pass along to our students.

Terry Southwood

Two winch accidents revisited

Two past winch accidents offer insights into pilot and glider performance, and can be looked at to find out the most probable reasons for the unfortunate accidents. In this way we can learn from them and so hope to avoid getting into the same or a similar situation ourselves, when flying either on a winch or by aerotow.

The first accident was to a Standard Austria, a V-tailed single seater, many of which were built. The type is known as being very likely to drop a wing at the stall as well as to be slow to recover from a spin. From ground observations and the position of the crash site, the accident was most probably a case of too vigorous a pull-up into the full climb at a slow airspeed, exacerbated by a tailwind. Very early in the launch, the left wing stalled, the glider flicked and the pilot was unable to recover. The glider then fell to the runway nose first and partially inverted less than 100 metres from the launch point. Speed was inadequate, possibly made worse by a tailwind gust as the glider started to climb. The glider structure or design features afforded no protection to the pilot.

The second accident occurred to an Open Cirrus, a type also known for its poor handling on winch launches under certain conditions, especially when slow.The accident was most likely caused when the pilot shifted backwards on the initial high acceleration on the ground. His rearward weight now added to the nose-up moment provided by the winch cable but, having shifted backwards in the seat, he was probably unable to make a nose-down push on the stick as the glider slowly rolled over as it climbed steeply. He too was unable to recover.

These are believed to be the closest explanations for these two fatal accidents. We need to consider what can we do to prevent a recurrence.

At recent OSTIV Safety and Training Panel meetings the members discussed the problems of winching, particularly with a tailwind component. We spoke about the sensations a pilot experiences when rotating into the full climb. If the pilot has been used to rotating into the climb, then it becomes fixed into the subconscious that as height is gained the nose should be rotated into the full climb attitude. Therefore, as the glider initially climbs, the normal action becomes one of deliberately rotating the glider into the full climb. This is done relative to the height as seen peripherally and perhaps with reference to the altimeter. This then is what he will expect to be doing as he climbs, even with a tailwind or with too low a speed. Under these conditions, the subconscious reaction is to apply more up elevator in order to see the normal climb response.

We should also remember that with a tailwind, ground speed will be higher than the airspeed, and the pilot's peripheral vision can fool him into thinking the airspeed is adequate — this is a key point. Unless the pilot has been strictly trained to watch the airspeed and be aware of the problem of climbing through a tailwind component (airspeed decreases of course as the wind gradient is penetrated upwards), the pilot is setting himself up for the very situation that is critical to avoid.

This is the "too slow airspeed" case as the pilot applies more loading to the wings in order to get the perceived normal climb rate. We should remember that at this critical point in the launch the angle of attack is high, particularly if the airspeed is marginal and the load on the wings is being increased. With a vigorous pull on the stick, the angle of attack is likely to quickly reach the critical value.

If the pilot is in the habit of being vigorous with the transition into the full climb, he is susceptible to getting into real trouble in a glider like the Austria, from which it is very unlikely to be recoverable in time once one wing begins to fully stall. This all goes to suggest that a pilot who has been used to rotating into the full climb attitude is therefore getting set up for the tailwind (and a too-slow airspeed) problem.

If, on the other hand, the pilot is used *not* to deliberately rotate, then he will not be expecting the glider to respond as no input is being provided to positively rotate the nose upward. As the glider climbs through the tailwind gradient, the pilot should then become aware that something is not right because it will not be rotating on its own as usual since the airspeed is inadequate — the pilot should become aware that the ASI is reading low — and that this is a real reading! As a result, he will not likely add to the problem of reaching a high angle of attack by pulling back more. Winch training in some countries like the UK is now strictly to allow the glider to assume the climb attitude *on its own* until a height of at least 100 m or 300 feet has been reached, then the pilot may control the climb normally.

Because most of us launch by aerotow we may think that this problem does not concern us. Not so! I have seen pilots decide that in the circumstances of a developing tailwind, they elect to takeoff downwind because it takes so long to change ends, and that it will be okay. Think very carefully about it. The airspeed decreases as the wind gradient is climbed through. Yes, it bears repeating! clearing the fence and hay bales at the end of the runway becomes more of a question — who has approached them on a hot day and wondered if you would clear them? Now think of the tailwind adding to your problems.

Loss of directional control is another problem on the ground with the tailwind; I have seen a pilot lose control, leave the runway, and punch into a car that was parked too close! Funny, it was the contest manager's car and he had just berated us that morning for parking our cars too close!

As instructors, we need to keep vigilant. An example from a winching operation might be to remind pilots if we see them rotating too rapidly. Take the pilot up for a launch and arrange with the winch operator for a cable break simulation by cutting the throttle as soon as he sees the glider leave the ground. The pilot will be waiting for the break and will not rotate rapidly! Repeat this, and again say you are arranging for a break at the same height, but don't ask the winch operator to do so! The pilot will surely not pull back even as he rotates into the full climb, as is his habit, and the final launch height will be as good as before! A good object lesson. The same principles can be used to give checks and reminders to all pilots. It just depends on the instructor's imagination to devise the flight and checks to be a good lesson.

We should add an observation that, as many pilots get more comfortable with winch launching (complacency?), there is a tendency to become increasingly more aggressive at maximizing climb performance. The result is smaller margins of safety, flying very close to the stall angle of attack when in the rotation. Add any of the factors mentioned here, and there is no safety margin. We need to keep that angle of attack below the critical value, especially if flying slowly as we rotate into the full climb.

Whether winch or aerotow launched, when we come back to the club after an hour or three and there is a strong wind, we will find ourselves flying the downwind at a higher than normal ground speed. Because we are lower to the ground than we have been for the whole flight, we receive stronger than usual peripheral vision information that tells our brains that we are flying too slowly! Actually our ground speed is high because of the tailwind, but our airspeed is what matters, and we don't want this to get too low, especially as we are about to embark on one of the most critical parts of the flight. We may be tired, a sore butt is adding to our distractions, but we need to make our base and final turns with good speed and in well-coordinated flight. Think about it, the ASI is what tells us the airspeed, not our peripheral vision, so once again monitor the ASI and keep that angle of attack below the critical value!

The question of cushions comes up again from time to time. Energy absorbing foam (EAF) cushions are the best to use under the pilot, with maybe a thinner layer against the back as well. However, a more urgent consideration is that the cushions used to space shorter pilots ahead of the backrest should be made of high-density foam. This foam does feel firmer to sit on and cannot be deformed significantly under load. That the pilot must not be able to move back in the seat by pushing on the rudder pedals is a no-brainer of course, and we all need to pay attention to this. Hence a hard foam rubber cushion is best behind the pilot. If the pilot needs to be raised in the seat, use the high density foam here too. Adding a layer of EAF makes the cushion very comfortable. Submarining under the seat harness is another problem made worse by use of soft, squashable cushions. Avoiding them in the first place can save a lot of heartache later.

Ian Oldaker, chairman
Flight Training & Safety

Competition Director's Report 2003 Nationals

Here are a few observations about last year's Nationals:

Scoring We had an efficient scoring system which allowed competitors to enter their own flight into three available computers. Once competitors had entered their data, they could almost immediately see their scores on another computer reserved for that purpose.

While this system seemed almost ideal in concept, we did run into some difficulties. Downtime on systems and other computer glitches caused grief among competitors and organizers on a number of occasions. I guess it is almost impossible to set up a completely fool-proof system.

There were a number of difficulties because competitors had to enter their own data at the end of each flight. At that point of the day, the average competitor is very tired and partially brain dead because of the rigours of the flight. Now we ask them wrestle with a not always cooperative computer system and the results are not always pretty. There are still many computer-challenged pilots and it may be a bit too much to ask them to perform this task, especially at the end of a tough day of flying.

I would recommend that in the future, organizers have a couple of people do the data entry task on behalf of the pilots.

Tasking Because of the very marginal conditions on most days, we ran into a number of difficulties. The first one was, as always, that we gave up on the task a little too early. When, by 2:30, it looked like the sniffer could not stay up (he did anyway after a lengthy struggle at 1000 feet) we cancelled the task, especially given a 75 minute launch duration. Later, the sniffer plus a couple of other pilots, went around a minimum distance course, showing that a competition day would have been possible after all. This, in hindsight, would have meant that we could have declared champions in all three classes.

We maintained the unwritten rule that we would not go on task unless cloudbase was at least 1000 metres above ground and visibility was acceptable. I think this is a wise practice, however, the general rule should be that if sustainable lift is found above 2500 feet (and again with acceptable visibility) the fleet should be launched but the start of the task delayed until the 3250 can be consistently achieved. Because these are unwritten rules, it might be useful to provide some written guidelines along these lines to the Competition Manager within the "official" rules.

Towards the end of the contest, becoming desperate, we waited much longer and this resulted in getting at least one additional contest day. Some contestants started the task at 4:30 and yet were able to exceed the minimum scoring distance. I think this kind of decision-making is the most difficult part of being a Competition Director. One problem is that he often has to rely on the Task committee and they sometimes have biases that come to play in these situations. Ideally, the committee would not have competitors on it, but I think that is not realistic.

Class structure This year we again had very small Standard and 15m classes with five and six competitors, respectively. This is not a lot of fun for organizers or competitors. In view of the virtual performance equality between those two classes, I would recommend that we very seriously consider combining them for future competitions. Rankings for internationals do not appear to be a problem any more since we have quite a limited number of pilots who want to go to them anyway. We could just rate pilots using the current formulae and then ask them (in order of their ranking) to choose which class they want to fly in.

Rule infractions We had a couple of pilots make major mistakes in navigating, particularly near the start (ie. missing the start zone by accident). Technically, they should have received no points. However, at subsequent jury meetings about this, it was decided (I believe correctly) that much lesser penalties should apply, particularly since these incidents were completely accidental and did not result in any real advantage to the pilots. Part of the reasoning was that we need to be lenient because we have a small pool of competitors anyway and to really annoy them to the point of having them go home would serve no useful purpose for anyone. I would recommend that we build a little bit more leniency into the penalty structure, to allow for these kinds of situations.

Entrants I think it is no fun to have a low number of competitors. We need to do more to attract more competitors and build the pool of interested pilots. Ulli Werneburg has already reported via the SAC Roundtable on a very useful discussion which took place on one of the rest days about ways and means of attracting more young competitors. I think, from a strictly Nationals perspective, organizers should be strongly encouraged to waive entry fees for pilots under 25 years of age (perhaps 30 would be even better). We need to have more young blood in competitions or else we will soon have no more meaningful Nationals.

Flight recorders I think we should become even more lenient in the use of non-IGC approved flight recorders. Again, this could be an encouragement for some pilots to participate.

Ken Brewin, CD

competition psychology from page 15

Myth #1 Just follow the gaggle
A brilliant idea so long as you can: (a) find the gaggle in the first place, (b) join them before they swarm off to the next thermal, and (c) fly a glider with enough performance to stick with them. Playing catch-up in a small glider does not work. Trust me.

Myth #2 Fly faster between the thermals
Flying faster in a Club class glider just makes you come down more quickly and so you need to spend more time thermaling, which slows you down again. Flying fast in isolation of having a good climb ahead is a really effective way to add another field to your collection.

Myth #3 Rejecting sub-standard lift increases your chances of landing out
No, it doesn't: it reduces them. Why? Because there are simply only so many hours in the day with good conditions and if you don't maximize the good conditions you will be forced to use the poorer conditions later in the day. Rejecting a single 4 knot climb to take 6 knot gives the same benefit as a final 2 knot climb over zero sink ... and how many tasks have you failed for the want of a final 2 knot climb?

The single thing I changed was taking the risk to reject weaker lift because if I didn't I knew with certainty I would run out of day. The single error I made on that day was not spotting that the stronger lift ahead was not there any more.

Myth #4 Racing pilots like strong thermals
Wrong, if you've ever tried to follow one you will know that racing pilots *hate* all thermals and spend as little time as possible in them. Going round and round in small circles clocks up significantly fewer kilometres than flying in straight lines, so you are slowing down, not speeding up. The thing about strong thermals that racing pilots do like is that they need to spend less time circling in the damn things.

But does flying faster, by itself, make you a racing pilot? Racing, it seems to me, is a mindset — an absolute certainty that there *is* good lift ahead and you *will* get to it. Your focus is on how you maximize it, not how you find it. All the secrets in the world will not make you a racing pilot unless you can clear your mind of the fear of landing out because you *know* there are multiple sources of lift ahead and you *know* you can find and use the best ones. If you can free your mind of that constraint, either through experience or blind optimism, you will make a great racing pilot.

I, for one, am not quite there. So while my secret may not make me a racing pilot just yet, it does give me something new to try this season… and should mean a lot less time loitering behind LS-8 trailers! ❖

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K6E, #4050, C-GTXP, build 1966, approx 950h, O2, Cambridge vario, Security chute, handheld GPS and radio, polyurethane finish, enclosed metal trailer, $12,500 obo, *<uww@sbcglobal.net>*, 408-732-9289.

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ASW-20C, C-GEXR, #20706, 1984, 360h, excellent cond, Komet trailer, L-NAV, GPS-NAV, LCD display, Sage CVA Vario, Dittel FSG-60M, Winter ASI, Kollsman altimeter, digital clock, blue tinted canopy, tow-out gear, O2, wing/canopy covers, chute. Never damaged or modified, always stored in trailer in hangar. $63,000. Ulli Werneburg, (613) 826-6606, *<wernebmz@magma.ca>*.

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Chairchute 150. Manu. July 89. Last repack 92. Owned since new by Swan Valley Soaring. Matt Chislett, *<mbc@autobahn.mb.ca>*, (204) 254-3767.

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