2/94
Apr/May

free flight · vol libre

LIAISON

The first words of this column will be to acknowledge the contribution of Al Sunley who, at the last AGM, stepped down after three years as president and many more as Alberta zone director. Al was at the helm of our association during some of the most difficult years of the last decade and he did have to thermal around some severe difficulties. Should you see Al around the field in Edmonton, please stop and say thank you for his diligent contribution.

In the event you might be interested in what the almost new kid on the board has in mind, let me say that I want to focus the action of SAC, its board of directors, and committees on two objectives that could be called S&R. While it is not Search & Rescue that I am talking about, I am referring to SAFETY & RECRUITING.

Let's talk SAFETY first. Our track record of the last five years has been inconsistent and 1993 was absolutely catastrophic. Hull claims accounted for 127% of hull premiums. Other than the human sufferings associated with such a record, there are some rather disturbing consequences both long term and short term. First of all, our premiums are increasing 6–2/3% in 1994. Secondly, or insurance committee does not have much of a position to negotiate from. Insurers are not flocking to our door to beg for our business, to say the least. Lastly this situation does not fare well in any negotiations we may have with Transport Canada in view of regulating our sport ourselves.

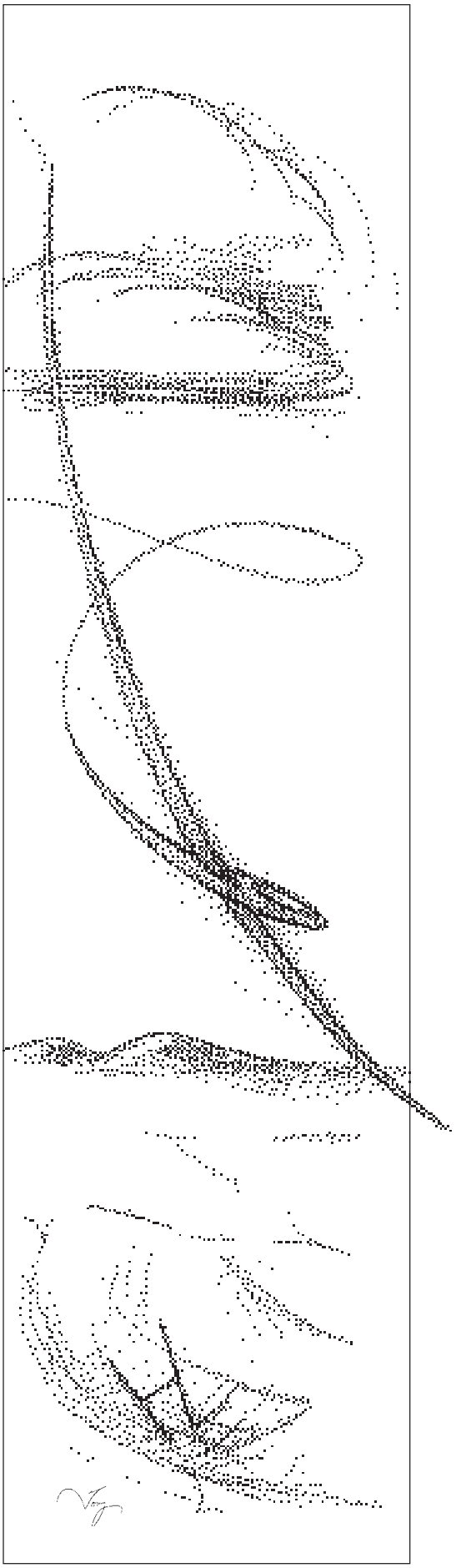
RECRUITING is the other urgent task on hand. Our membership has declined over the last two years. We have been able, through the efforts of Jim McCollum, Joan McCagg and Al Sunley, to maintain our services through cost reductions. We have probably reached the end of this avenue. If we want to increase services, training, and I believe we have to, we need to spread the cost over many more people. Since SAC cannot recruit on its own, I am pleading with every club in the land to start on an aggressive recruiting program for this year. We now have in stock a series of post-card size micro–posters that are ideal for posting everywhere. A bunch is on its way to your club now FREE. Use them well.

J'ignore si la chronique du président n'a jamais été écrite dans la langue de Molière, mais je compte le faire aussi souvent que possible. De plus cette chronique ne sera pas une traduction de la version anglaise. J'aurais l'impression d'insulter votre intelligence en le faisant puisque l'immense majorité d'entre vous lisez l'anglais. De plus, nos amis anglophones qui comprennent notre langue y trouveront aussi leur compte.

Si vous avez lu mon rapport 1993 en tant que directeur de la zone Québec, vous savez mon sentiment sur la performance des clubs québécois au sujet de la sécurité. Nous devons nous attaquer à ce fléau en priorité. Le comité Entraînement & Sécurité est non seulement à votre disposition mais de plus a comme objectif de provoquer la création de comité de sécurité dans tous les clubs. C'est un service gratuit que vous vaut votre adhésion à L'ACVV. À vous de jouer.

Peu de temps avant d'écrire ces lignes, un accord de principe est intervenu entre les membres d'Appalachian et de Champlain pour consolider ces deux organisations. J'ai tout lieu de croire que la même chose pourrait arriver entre Sportair et Outardes. On peut être peiné de voir deux clubs disparaître. Mais dans les faits, on doit se réjouir de voir que deux clubs encore plus viables et dynamiques émergeront.

Pierre Pépin, president



free flight • vol libre

Trademark pending Marque de commerce en instance

2/94 Apr/May

The journal of the Soaring Association of Canada
Le journal de l'Association Canadienne de Vol à Voile

ISSN 0827 – 2557

Cover *"Under the Steeples".* Yankee–3 rests in a pasture at the foot of this section of the mountains on the east side of the Columbia River valley near Cranbrook, BC. The Steeples top out at 9300 feet and are one of the most dramatic rock faces on the cross–country 'highway' between Golden and the US border. On this day an east wind and its associated subsidence shot down Joe Gegenbauer on his task.
photo: Joe Gegenbauer

Accident and Health Insurance outside Canada

a policy tailored to glider pilots

Doug Eaton
member, SAC Insurance committee

Those who were at the AGM in Montreal already know that the company underwriting the Travel Insurance Plan we arranged for last year decided not to renew any of the policies, nor accept any new applications, as a result of the low number of members who took out coverage.

Your Insurance committee and the broker have been successful in arranging for another company to offer our members coverage which includes protection while flying our gliders outside Canada, both for pleasure and in competitions. The plan, written by John Ingle Insurance, is a full–featured accident and health plan, which may be custom tailored to our travel needs by offering a choice of an unlimited number of either 4 day or 30 day maximum duration trips during the year, and then additional days may be added for specific trips which will be longer than the basic plan selected.

The coverage begins the day you leave Canada, not the day you begin flying. The following table summarizes briefly the benefits included in the package:

Benefit	*limits*
excess hospital/medical	unlimited
extended health care:	
– prescription drugs	unlimited
– X–ray & lab	unlimited
– local ambulance	unlimited
– private duty nursing	$10,000
– wheelchair/braces	unlimited
emergency air ambulance	unlimited
emergency return home	unlimited
repatriation	$5,000
professional fees	50 visits
accidental death & dismemberment	$10,000
baggage[1]	$500
trip cancellation, interruption or delay[1]	$500
meal & accommodation costs	$1,500
transportation of relative	$2,000
vehicle return	$2,000
dental accident	$2,000

[1] additional baggage insurance and trip cancellation are available up to a maximum of $5,000.

Our group rate annual premiums for the plan are:

4 Day Annual Plan		*30 day Annual Plan*	
64 years & under	$45	64 years & under	$81
65 years & over	$67	65 years & over	$225

Once you have purchased two adult coverages in a family, all children are covered automatically.

Applications have to be sent to the insurance company, *not* to the broker. We are sending a supply of applications to each club, so *ask your club secretary or treasurer for the forms.* Additional days can be arranged for by phone in an emergency, but it is better to send in the "extra days application" ahead of time. In case you cannot obtain an application form for any reason, call John Ingle Insurance at 1–800–387–4770, tell them you are with the Soaring Association, and they will help you.

As you are all aware, no Provincial Health Care Plan comes even close to covering fully the cost of emergency health care outside Canada, and no regular travel plans cover flying other than as a fare paying passenger on a scheduled passenger flight. Even at the highest rate above, *the premium is less than 10% of one day's stay in an American hospital,* with no additional treatment.

We do not want to lose this plan because members delayed signing up until the last minute, so we urge any of you who contemplate flying outside Canada, or travelling without some other form of travel insurance, to participate in this plan. •

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 a Canadian team for the biennial World soaring championships.

free flight is the official journal of SAC.

Material published in ***free flight*** is contributed by individuals or clubs for the enjoyment of Canadian soaring enthusiasts. The accuracy of the material is the responsibility of the contributor. No payment is offered for submitted material. All individuals and clubs are invited to contribute articles, reports, club activities, and photos of soaring interest. A 3.5" disk copy of text in any common word processing format is welcome (Macintosh preferred, DOS ok in ASCII). All material is subject to editing to the space requirements and the quality standards of the magazine.

Prints in B&W or colour are acceptable. No slides please. Negatives can be used if accompanied by a print.

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 SAC Zone Director whose name and address is given in the magazine.

The contents of ***free flight*** may be reprinted; however, SAC requests that both the magazine and the author be given acknowledgement.

For change of address and subscriptions to non–SAC members ($20 per year, US$22 in USA, and US$28 overseas), please contact the National Office, address below.

President Pierre Pépin
Vice President Harald Tilgner
Executive Secretary Joan McCagg
Corporate Treasurer Jim McCollum
Corporate Secretary Joan McCagg

SAC National Office
Suite 306, 1355 Bank Street
Ottawa, ON K1H 8K7
(613) 739-1063 Fax (613) 739-1826

Deadline for contributions:

5 January, March
May, July
September, November

L'ASSOCIATION CANADIENNE DE VOL A VOILE

est une organisation à but non lucratif formée de personnes enthousiastes cherchant à développer et à promouvoir le vol à voile sous toutes ses formes sur une base nationale et internationale. L'association est membre de l'Aéro Club du Canada (ACC) représentant le Canada au sein de la Fédération Aéronautique Internationale (FAI), administration formée des aéro clubs nationaux responsables des sports aériens à l'échelle mondiale. Selon les normes de la FAI, l'ACC a délégué à l'Association Canadienne de Vol à Voile la supervision des activités de vol à voile telles que tentatives de records, sanctions des compétitions, délivrance des brevets de la FAI etc. ainsi que la sélection d'une équipe nationale pour les championnats mondiaux biennaux de vol à voile.

vol libre est le journal officiel de l'ACVV.

Les articles publiés dans ***vol libre*** sont des contri-butions dues à la gracieuseté d'individus ou de groupes enthousiastes du vol à voile. Le contenu des articles soumis est la responsabilité exclusive de leurs auteurs. Aucune compensation financière n'est offerte pour la fourniture d'un article. Chacun est invité à participer à la réalisation de la revue, soit par reportages, échanges d'opinions, activités dans le club, etc. Le texte peut être soumis sur disquette de format 3.5" sous n'importe quel format de traitement de texte bien que l'éditeur préfère le format Macintosh (DOS est acceptable). Les articles seront publiés selon l'espace disponible. Les textes et les photos seront soumis à la rédaction et, dépendant de leur intérêt, seront insérés dans la revue.

Les épreuves de photos en noir et blanc ou couleur sont acceptables. Les négatifs sont utilisables si accompagnés d'épreuves. Nous ne pouvons malheureusement pas utiliser de diapositives.

L'exactitude des articles publiés est la responsabilité des auteurs et ne saurait en aucun cas engager celle de la revue ***vol libre***, ni celle de l'ACVV ni refléter leurs idées. Toute personne désirant faire des représentations sur un sujet précis auprès de l'ACVV devra s'adresser au directeur régional de l'ACVV dont le nom apparait dans la revue.

Les articles de ***vol libre*** peuvent être reproduits librement, mais la mention du nom de la revue et de l'auteur serait grandement appréciée.

Pour changements d'adresse et abonnements aux non membres de l'ACVV ($20 par an, EU$22 dans les Etats Unis, et EU$28 outre–mer) veuillez contacter le bureau national à l'adresse qui apparait au bas de la page à gauche.

EDITOR
Tony Burton
Box 1916 Claresholm, Alberta T0L 0T0
tel & fax: (403) 625-4563

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letters & opinions

MORE ON THE TOST BRAKE MOD

This brake improvement modification was originally submitted to Sailplane Builder *by Peter Myers who got the modification from Karl Striedieck in 1980.*

My interest in brakes started out of necessity in the spring of 1980. I was posted to Germany for three years and bought a factory new ASW–20 there which has a Tost brake drum. The first couple of attempted flights were terrifying. Both times the towplane hesitated on takeoff and the tows were aborted at low speed. The towplane stopped easily whereas the –20 with full braking just rolled on and on, once almost into the tail of the towplane, the other into runway lights.

With the brakes adjusted to the max, the only time you actually got any brake effect was when the glider was nearly stopped!

I changed the drum brake by filing the cam which converts the brake into a "self–energizing" type. This means that when the brake is applied the initial braking force plus the rotation of the wheel supplies the needed braking force rather than simple pilot brute strength to force the shoes against the drum.

Boy, does it work well. With very light pressure on the brake handle one can easily modulate the braking effort from light to skidding–on–concrete! The beauty of this type of mod is I have not seen a mechanical brake that can't be changed over.

Peter Myers, Bluenose Soaring

Note that there is a typo in the instructions which appear in the 5/93 issue. In step 3, file away about 40% *of the cam, not 1/4 as stated. editor*

STICK IN THE MIDDLE MEMORIES

This is a belated comment to the *Stick in the Middle* Hangar Flying item by Tom Knauff in *free flight* 6/93. It's surprising the things that come to light on the second reading of any book or magazine!

The elegantly simple procedure for letting the aircraft leave the ground when it's ready is something that everyone knows but is not always employed or even taught. It would have helped my takeoffs on many occasions in the past, particularly when trying a new glider type for the first time.

The extrapolation of this technique to the DC–10 end of the scale was interesting and brought back memories. During 1943, while working for Fairey Aviation in Manchester, England on both the *Halifax* and *Barracuda* production lines, I enjoyed the role of flight test engineer and can remember the take–off routine quite well. Despite the disparate size of these taildragger types, they both responded to neutral control column and a few degrees of up elevator trim. The only difference between them was the fact that the trim was wound in at take–off speed in the *Halifax*.

What I do not know is the response bearing full fuel, armament, ammunition, and bomb loads, but I suspect the same treatment would be successful. If there is anyone in our circulation who flew in No 4 Halifax Bomber Group out of Yorkshire, perhaps he would be interested in confirming this, or otherwise.

Don Wood

FLYING PROCEDURES AT COWLEY

A couple of recent articles in *free flight* have prompted me to write this letter on behalf of Alberta Soaring Council which has the responsibility for running the Cowley camps. I would like to make it very clear — the purpose of this letter is not meant to criticize or comment on the flying of the people writing the articles. As a former newsletter editor I know how tough it is to obtain material, so I certainly don't want to do anything to discourage people from writing about their experiences at this fantastic soaring site.

The concern I have is the perception that may arise that flying procedures at Cowley have become lax and may contribute to a less than safe flying environment. Our goal for pilots flying at Cowley is to enjoy this site to the fullest but always with the need for safety uppermost and a recognition of the pilot's own limits based on their level of experience at Cowley.

Please note the distinction pertaining to the experience *at Cowley.* It may be a subtle distinction, but flying in a region like Cowley requires a great deal of local knowledge to become capable of enjoying all that Cowley has to offer. For most of us — even Albertans — it is difficult to get to Cowley as often as we should to really understand what it's all about. The result is we hear about what others who have been flying at Cowley for many years are doing and we try the same thing without that extensive background. My pleas to pilots coming to Cowley is one of restraint. Please, enjoy all that Cowley has to offer — but enjoy the banquet in small bites.

Secondly, I would like to remind pilots that we have to comply with the Air Navigation Orders at all times — whether at Cowley or not. ANO Series II, No.9, the Oxygen Equipment Order, states in part in Section 5: "No person shall fly an aircraft (a) for more than 30 minutes at a cabin pressure altitude between 10,000 and 13,000 feet above mean sea level, or (b) at a cabin pressure altitude above 13,000 feet above mean sea level, unless each flight crew member on duty is continuously wearing an oxygen mask supplying oxygen".

continued on page 16

CUMULUS SPREAD OUT

The ruin of many a good day

Tom Bradbury
from SAILPLANE & GLIDING

THE EXASPERATING FEATURE of most spread out days is that they share many fair weather indicators, so it can be hard to distinguish between good and bad days.

Cases of spread out Spread out is due mainly to excessive moisture in the atmosphere but it is strongly influenced by the development of an inversion. The problem is caused by very slow evaporation of older masses of cloud.

- In a dry atmosphere thermals carry moisture up from low level to form clouds. When the thermal ends evaporation into the surrounding dry air disperses the cloud and cooling makes the sink stronger. Thus scattered cumulus are often separated by areas of strong sink in clear air.
- If the air aloft is already moist it takes much longer for evaporation to dissolve the decaying patches of cloud. The sky begins to fill up with bits of cloud at many levels. Sink is weaker under an overcast of spread out stratocu but this is offset by a lack of sunshine to set off fresh thermals.

An early warning It is often a bad sign if cumulus start to form soon after the sun has risen. It means that the air is so moist that little heat is needed to form cloud which almost always has a low base. Tall cu with a low cloudbase often precedes spread out.

Figure 1 shows a temperature sounding on a day of extensive spread out. The tephigram shows some factors which nearly always produce a spread out layer soon after convection starts:

- A marked inversion (this day at 832 mb, nearly 5300 msl). Above this level the temperature rose some 6.5° in just over 700 feet.

- The separation between dew point and air temperature was less than 2°C nearly all the way from 2000 to 5300 feet and was only 0.7° at the base of the inversion.

- The condensation level (marked CL) was low, near 955 mb or about 1500 feet. This suggests a cloud depth of some 3800 feet. Anything more than 2000 feet depth of cloud favours persistent spread out. An inversion at 7000–8000 feet with a big depth of cloud under it tends to give so much spread out that cross–country flying is nearly impossible. On this occasion very little surface heating was needed to start convection. The extra energy from release of latent heat is shown by the shaded area. The larger this shaded area the more energy is available for forming cloud. If the shaded area grows wider with height the early morning cu tend to shoot up like rockets until they hit the inversion. The first clouds may not have the energy to go so far; these tend to slow down and become tilted over if there is a stronger wind aloft.

Figure 2 shows a sounding made at the same time to illustrate the difference which often occurs over a distance of 300 or 400 miles.

- The air was much drier, the separation between air temperature and dew point was at least 10°C between 1000 and 5000 feet.

- The inversion (which was just below 5000 feet asl) was much less marked; the temperature only rose 1° in the next 900 feet. Much more heat was needed to start convection and the condensation level was much higher than in Figure 1.

Since the air was drier at the surface the condensation level was much higher, being nearly 4000 feet asl. Much heat was needed before any thermals reached this level so cumulus formed much later. The depth of cloud was much smaller too. The small shaded area above CL on Figure 2 shows very little extra energy was released by condensation.

Critical factors These two soundings show up the difference between widely scattered cu and a total spread out. Scattered cu exist in a dry atmosphere with more than 5°C separation between air temperature and dew point under a weak inversion. Spread out is likely with a very marked inversion, 2° or less separation between dew point and air temperature with a cloud depth of at least 2000 feet. The inversion is important because it concentrates all the lifted moisture at much the same level just under the inversion. If the inversion is destroyed the moisture is spread out over greater depth and a complete layer of cloud takes longer to form.

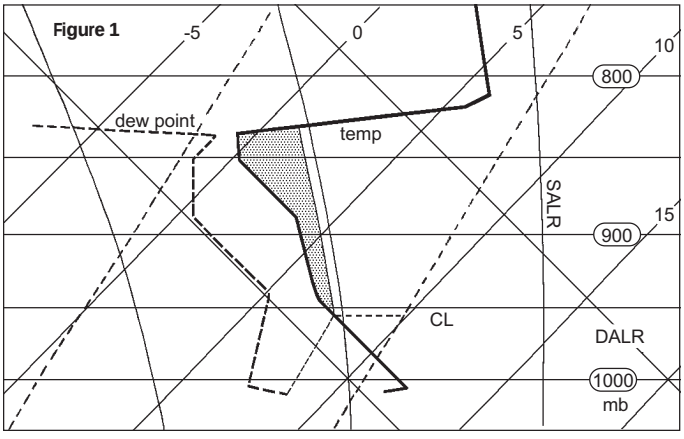
The development of spread out Figure 3 illustrates a typical sequence of events from early morning to midday. Time runs from left to right. Letters mark stages of development.

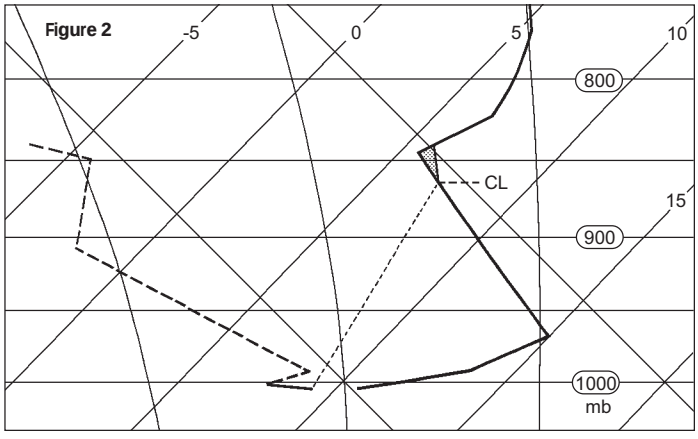
A shows lots of scruffy bits of cu which form soon after sunrise. This early appearance shows little heat is needed to start convection and suggests the air is too moist, thus giving a low cloudbase.

B shows columns of cu rocketing up in the moist unstable air. These have not yet enough energy to reach the inversion so they slow down and become tilted over by the wind.

C At this stage the cu have become stronger and their ascent pushes up some of the moist air aloft. This results in lenticular cloud caps called pileus. They are smooth because they are not part of a bubbly cumulus; they are rather like bow waves ahead of a blunt nosed barge. The pileus tend to stay in the moist zone and the cumulus may build through them. Pileus are a reliable sign of spread out later on but they do not appear on every occasion.

D shows the cumulus big enough to carry moisture up to the inversion where it spread out horizontally.





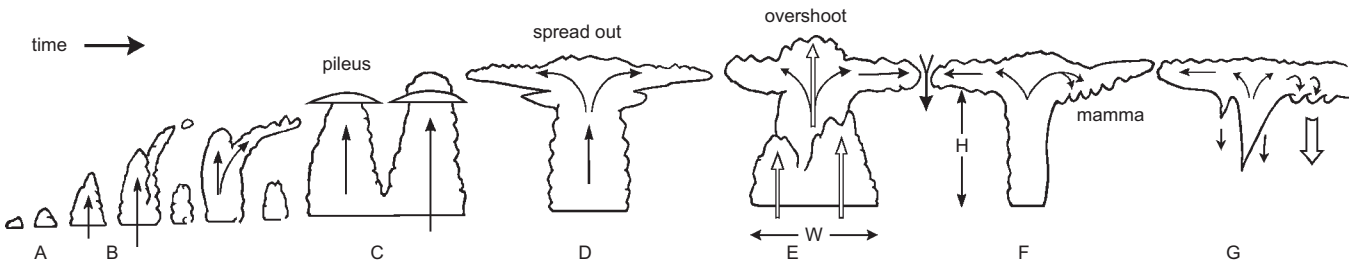


Figure 3

E shows a cu top overshooting the inversion and pushing a dome into the warmer and usually very dry air aloft. At this stage there is usually lots of lift under the cloud and climbs can be made which bring you out into clear air above the inversion. The lift of such a cu which has its width "W" equal or greater than its height "H" is usually at least 15 minutes and may be longer if there is a steady feed of new thermals into the cloudbase.

F shows the column of cumulus narrowing. The chimney carrying moisture upwards is no longer supported by buttresses of younger cells as at E. At this stage the overshooting top probably starts to collapse. The descending air sinks down and appears on the underside of the cloud sheet like a set of upside–down cumuli. These are termed mammatus clouds. Mammatus is an indication of the collapse of powerful cu which have overshot the inversion and are now falling back. Mamma usually have a short life; they change their shape and size rapidly. Thunderstorms often produce an area of mamma on the inactive side. It is often a good idea to avoid the region underneath mammatus cloud as the sink can come down a long way beneath them.

G shows the final stage when the cumulus chimney has thinned out and begun to decay rapidly. There is often an anxious period when flying to a narrowing chimney like F, wondering if it will last long enough to get you further or if this vital stepping stone is suffering from terminal starvation and is about to dwindle into a useless inverted cone of dead air.

Spread out and fronts
Official charts usually drop a front when it has become too weak to produce rain and the associated cloud band becomes narrow. These systems are said to be "frontolyzed" (frontolysis is the process of frontal decay). They may be inactive as regards most kinds of weather but they still have the capacity to produce a band of spread out.

One can sometimes estimate where they may be by drawing a line extending the official front out towards the ridge or high covering the task area. These old fronts are often too narrow to be picked up by early morning soundings which are 300 km apart. Lulled into a false sense of security by the two or three soundings which show dry air, one can easily agree to a route which crosses the old (and temporarily invisible) frontal zone. Although the day dawns clear the development of cumulus soon results in a belt of stratocu forming along the previously invisible line of the old front. This development tends to happen after the task has been set and before any satellite picture is available to show what is happening. It does not always need an old front; a weak trough may trigger off a wide band of spread out.

Going round or pushing through?
An active cloud edge offers the chance of a fairly fast diversion round the spread out; unfortunately it does not often go far enough though it may take you to a rift which heads in the direction you want to go. The active edge is often a good place to take a climb under one of the stronger cu.

Lift under the gloom The soundings on spread out days are almost always very unstable beneath the inversion and need little extra heat to set off more thermals. These are apt to be much weaker than those formed under a sunny sky. The weakness is sometimes compensated for by the thermals being larger and much smoother. Sink does not entirely vanish but is often much less than between scattered cumulus. As a result one can go quite long distances under an unwelcoming sky. On such days it can be extremely encouraging to hear another pilot ahead announcing good lift. (It is almost the only reason to leave the radio on at weekends when nine out of ten calls are just idle chatter.)

Even feeble scraps of tired looking cu seem to offer lift under the cloud sheet. Under a sunny sky such scraps nearly always mean the thermal has expired but under a strato cu sheet any feature is worth exploring; sometimes they mark an essential bit of lift. Darker patches in the overcast may also reveal where weak lift has gone up into the cloud sheet to form a deeper cu with a top penetrating the inversion.

If you have a choice in the matter it is seldom worth pushing out under a solid grey sheet of cloud unless you can see some brighter patches ahead. Hazy days make life even more difficult since the bright and dark patches cannot be distinguished soon enough to pick a good track.

Using satellite pictures from the previous day
On many days the satellite pictures shown on TV the previous day give warning of spread out to come. Northwesterly winds give us most of our good cross–country days but these winds have often had a long sea track round the perimeter of an Atlantic high. The sea is often warm enough to produce lots of cu which spread out under the anticyclonic inversion. The afternoon pictures may show if the cover is well broken or almost continuous.

A continuous sheet of cloud off Ireland or the west coast of Scotland often indicates cu spread out over England the next day when the wind is northwesterly. The cloud sheet may disperse over the cold land during the night but it will usually form again a few hours after cu have developed.

On days when the air is moving slowly from the west an area of spread out over Ireland during the afternoon gives warning that the same may occur over England the next day. (Since moisture is a major reason for spread out Ireland seems to suffer from it even more than England.) For Europeans the arrival of spread out over England is a warning of problems for them the next day. However, a long land track often dries up the air enough to break up a stratocu sheet. The North Sea coasts from the Low Countries round to Denmark suffer from stratocu at least as much as the UK but the cloud sheet usually breaks up over Eastern Europe.

Shelter effect The stratocu sheet often breaks up on crossing high ground if the cloud top is not more than 2000 feet above the hills. Once it breaks the sun warms the air enough to maintain good breaks on the lee side. Thus areas downwind of the Highlands of Scotland, the Pennines and the Welsh mountains can have good soaring when places near the Cheshire Gap and windward coastal areas remain almost overcast all day. The wind direction can be critical; if the wind veers bringing the flow down the North Sea the east coast areas and especially East Anglia lose almost all their sunshine.

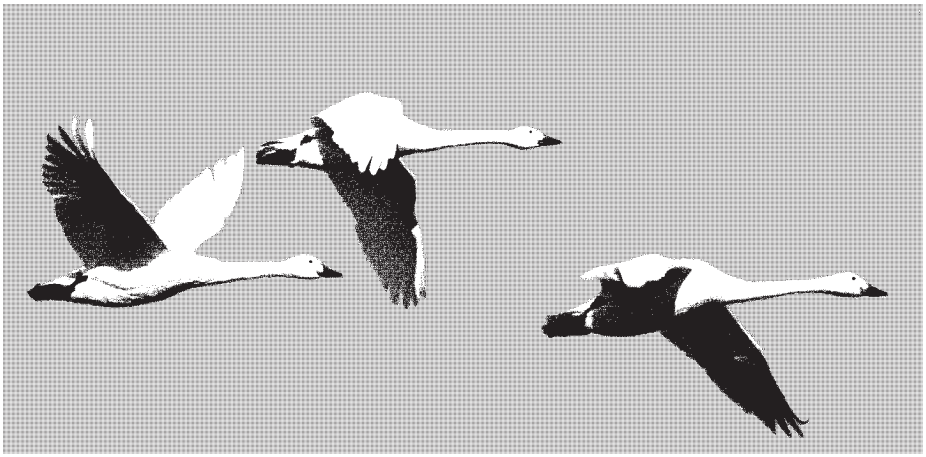
Diurnal changes When there is strong convection maintaining the cloud sheet overland there is often a region of descending air just off shore. As a result the Irish Sea and adjacent coasts become almost cloud free during the afternoon; so does much of the English Channel. I have never discovered how to predict this, nor been able to exploit it.

The four o'clock slot Even though the stratocumulus sheet cuts out much of the sun's energy the cloudbase does seem to rise through the day. A stage is reached when the base of cu goes up to the main stratocu layer and then good breaks develop. The process is aided by an approaching ridge bringing the base of the inversion down and making the cloud thinner. This often seems to happen about four o'clock. The latter part of the day then becomes good enough for short cross–countries. However, for this to happen it is usually necessary for the contest director to have scrubbed that day's task. •

BIRD FLIGHT

How the masters do it

Colin Pennycuick from SOARING



GLIDER PILOTS ARE THE ONLY AVIATORS who can fly with birds, as opposed to colliding with them, or sucking them in jet engines. Even to us, birds seem to fly so slowly that it is difficult to keep them in sight. This is partly a direct result of smaller size, and partly due to their special design requirements. The bird is a motorglider. It has to be able to take off and climb, as well as soar. It has no separate propeller, but gets both lift and thrust by flapping the whole wing. The wing has to be big enough to support and propel the bird, with the modest power output available from the light muscles. Even big birds therefore have wing loadings far below those of gliders. This is why they can glide so much slower than gliders, and are so good at turning in very small circles. Once in Africa I was outclimbed by an eagle squeezed into a tiny core, while I flew around the outside in an ASK–14. The humiliating thing was that I had my engine on, and he didn't.

Gliding performance

One should not be fooled by experiences like this into thinking that there is anything special about birds' gliding performance. Birds like vultures and storks fly like feathered bricks. I first realized this when I got behind an African lappet–faced vulture flying fast (45 knots) between thermals, and found I could stay with it. I was flying a Slingsby T31 at the time, an antique open cockpit two–seater with a maze of struts and screaming wires. I might have been doing 1 in 10, but that would be an optimistic estimate.

Later, when I got my hands on an ASK–14 motorglider, I found it was a good deal more difficult to stay with vultures between thermals, although I could still sometimes do it by flying the –14 right on the edge of the stall, holding the stick fully back and keeping the wings level with the rudder. I used to get a sore left arm doing this, because I had to hold the spring loaded spoilers all the way out as well, otherwise the vulture would soon drop out of sight below. Such ghastly performance is not so surprising when you consider that these big African vultures have aspect ratios around eight, and a thin, strongly cambered wing section, like a hang glider. Their best glide ratio is somewhere in the range 12–15, but their best glide speed is far too low for a glider to match. The combination of a low gliding speed with a wretched glide ratio results in gliders and vultures having much the same minimum sink. In big, smooth thermals, everybody goes up together at much the same rate. The birds come into their own in the rough, narrow cores, and the gliders leave the birds far behind in the straight glides.

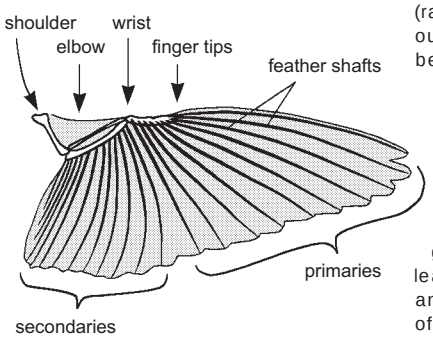
Bird construction

Unlike bats, whose wings consist of a flexible membrane stretched on a frame, somewhat like a hang glider, birds have cantilever wings, but they are constructed in a complicated way (Figure 1). The main spar has two joints, at the elbow and wrist. These are hinge joints, free to move in only one plane, so that they can transmit both torsional and bending loads (like the human elbow but unlike our wrist). The outer tip of a bird's finger bones comes only half way along the wing, or less, depending on the bird. Outboard of that, and over the posterior part of the inner wing, the bending and torsional loads are carried by the shafts of the flight feathers, whose bases are strapped to the bones by ligaments. The "primary" flight feathers, nine or ten in number, are attached to the hand bones, while the "secondaries" which are variable in number, attach to the rear side of the forearm bone (ulna). The flight feather shaft is a hollow box spar made of keratin, which collects a share of the bending and torsional load, and transmits it to one of the bones. Feather keratin is a protein, basically the same as human fingernail, although somewhat differently organized at the molecular level. It is about as strong as bone, but three times as flexible.

The outer part of a bird's wing (the part where the feather shafts provide the strength) distorts dramatically under load. A bird's wing only works right when it is bent and twisted into the proper shape by aerodynamic loads.

The primary feathers of soaring birds like vultures and pelicans are "emarginated," which means that the vanes get abruptly narrower at some point along their length. When the wing is fully spread, as it is when circling in thermals, the narrow parts of the feathers near the tips separate from each other, opening up a series of four to seven slots around the wing tip (Figure 2). The lift axis of a primary feather is behind the torsional axis of the feather shaft, so lift causes the feather to bend upwards, and also to twist in the nose–down sense. Each of the separated feathers bends and twists independently. The front one bends the most, with its tip curved sharply up, while the last one only bends a little bit, the net result being a cascade of small, thin aerofoils, each one sitting in the downwash from the one in front of it. The nose–down twisting in response to load makes the array as a whole absolutely stall proof. The arrangement of slots allegedly moves the wing tip vortex out a little bit, so making the wing behave as

Figure 1



A bird has an upper arm (humerus) and forearm (radius and ulna) which correspond directly to ours, but the finger bones are reduced in number and fused together. Bending and torsional loads are carried by the shafts of the primary and secondary flight feathers. Each feather shaft has a vane on each side. The aft or inner vane of each feather slides under the front vane of the feather behind or inside it. The bases of the flight feathers are covered by layers of covert feathers which get progressively smaller towards the wing leading edge. The angle between the shoulder and wrist is bridged by a feather covered fold of skin called the patagium.

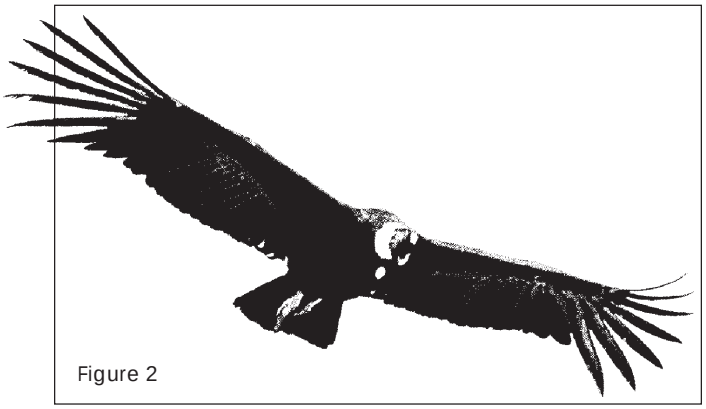


Figure 2

The primaries of typical land soaring birds like this Andean con-dor suddenly get narrower at some point along their length. When the wing is fully spread, the narrower parts are separate to form a cascade of small airfoils around the

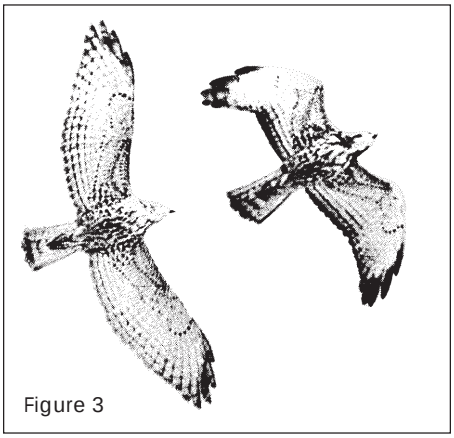


Figure 3

An immature broad–winged hawk. Left: the wings are fully spread for flight at minimum speed. Right: wings flexed at elbow and wrist. The flight feathers slide over each other reducing wing span and area together. Sweeping the outboard portion of the wing back also has the effect of trimming the bird to a higher speed.

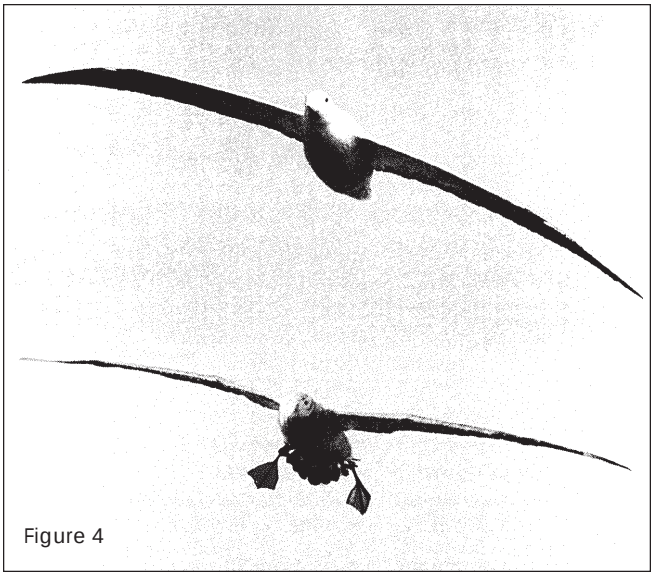


Figure 4

Above, a wandering albatross with its undercarriage tucked up under the flank feathers and the tail furled — it's the "lead sled" of the bird world. Below with everything hanging out, the alba-tross uses its webbed feet to augment its meager tail area. The feet also make very effective air brakes.

though its span were a little greater than it actually is. The resulting reduction of induced drag may not be much, but every bit helps if your aspect ratio is around eight. These slotted tips are *de rigeur* in land soaring birds like vultures and storks, birds which require rather broad wings to be able to take off from flat ground and climb steeply over obstacles. Taking off from the sea is often easier than from the land since birds can launch from the crest of a wave if it is windy, and get an unlimited take-off run if it is calm. Birds which soar over the sea have pointed, unslotted wingtips and higher aspect ratios than those which soar over land (gulls, terns, albatrosses, etc).

When the elbow and wrist joints are flexed the wing planform takes on a characteristic cranked shape, reducing the wing span (Figure 3). Neighbouring feathers overlap more than when the wing is fully spread, so the wing area is reduced too, and the wing tip slots, if any, close up. The centre of pressure moves aft, so trimming the bird nose–down and increasing its speed. Speed is controlled not by the tail, but by cranking the wings. The faster the bird goes, the more it reduces its span. As the speed increases, the profile drag would normally increase, while the induced drag would decrease, but the bird can trade off one against the other. By reducing its wing span and area together, it reduces its profile drag at the expense of a smaller increase in induced drag, and also keeps its lift coefficient nearly constant over quite a wide speed range. The effect is to flatten the polar and widen the speed range over which the gliding performance is acceptable. Shortening the wing span is a much more effective way of reducing wing area than reducing the chord (with Fowler flaps for example). Some genius should invent elbow and wrist joints for a glider spar, and provide some way for wing panels to slide over one another, like feathers.

Flaps, brakes and undercarriage

If a cat gets a pigeon's tail, the pigeon can still fly, although it may be a little wobbly, and is apt to tumble in a heap when it lands. Not only is the tail not used for speed control, birds do not depend on it for stability either, although it is used for fine control in both pitch and yaw. The tail is a fan of feathers which are constructed much like the flight feathers of the wings. It can be spread or furled, deflected up or down, and rotated in the rolling plane. In some birds like kites, terns and frigate birds, the tail is long and forked when furled, so that when it is spread, it turns into a slotted flap behind the inboard part of the wing (Figure 4). Such birds are noted for agility in slow flight. A smaller tail keeps the drag down for efficient cruising, but causes problems for landing. Many water birds augment their tail area in slow flight by spreading their big webbed feet on either side of the tail. Webbed feet also make highly effective airbrakes (Figure 4). Some African vultures have small webs between their toes, no doubt for this reason.

Birds are much more adaptable than bats, because the legs are not part of the wing structure, and can be adapted independently for walking, swimming, or both. Very few animals can walk, swim and fly, like gulls for example. Long–legged birds like storks trail their legs below the tail in flight, with the toes furled and pointed. Birds with shorter legs retract the feet forwards under the flank feathers by flexing the ankle joints, which is cleaner aerodynamically.

Soaring over the sea

There are two main ways in which birds soar over the sea; in thermals, and in slope lift along the windward sides of waves. Thermals? Yes indeed. If you want to see small, evenly scattered cumulus clouds stretching to the horizon in all directions, all day every day, and all night too, then take a ship trip down the middle of the Atlantic. That is the standard weather in the broad tradewind zones, which cover most of the tropics on either side of the equatorial "doldrums". It works around the clock, because the instability is not caused by the sun heating the surface, but depends on the air being convected equatorwards by the tradewinds, over progressively warmer water. The cloudbase is only about 2000 feet, and the thermal strength is not much, but it's good enough for frigate birds. These practical creatures are usually seen near land, mugging other seabirds, but they are also quite capable of catching their own food, notably by snatching flying fish as they skim over the surface in the hope of evading predators lurking below.

Unlike ducks, albatrosses, pelicans, gulls or just about any other water birds, frigate birds are never ever seen bobbing about on the surface of the water. This is because their feathers are not waterproof. If they fall in, or are pushed, they quickly get waterlogged, and drown.

Note two other observations: frigate birds fly very slowly, and recoveries of ringed birds show that they disperse over thousands of miles of open ocean — much too far to fly in a day. My conclusion is that they are adapted just to stay up in weak, narrow thermals under tradewind cumuli, and furthermore that they fly day and night for weeks or months on end. Some glider pilots have been suspected of nodding off in thermals, but frigate birds presumably do it on purpose.

Albatrosses also have long, pointed wings, but they have much chunkier bodies than frigate birds. Their wing loadings are higher, in relation to their size. The Wandering Alba-

tross has the largest wing span of any extant flying bird at three metres (ten feet), an aspect ratio around 16, and a best L/D of about 24 (Figure 4). Albatrosses are the lead sleds of the bird world, at home in the windy wastes of the Southern Ocean, where they soar in the slope lift on the windward faces of the long ocean swells. An albatross will never fly directly upwind or downwind. If it wants to go in one of those directions, it will tack along the face of a swell at wave top height, building up speed, then pull up steeply and glide up or downwind to another wave, get into the slope lift again and start another crosswind tack.

These pullups have reinforced the idea the albatross uses "dynamic soaring", a method whose claim to fame is that it was the first method of soaring to be discussed in a scientific journal (by Lord Rayleigh no less, in 1883). The idea is that by pulling up against the wind, you rise through layers of progressively stronger wind, and so maintain or increase your airspeed while gliding upwards at a steep angle. No doubt albatross do indeed get some energy out of the wind gradient in this way, but some elementary calculation shows that in typical conditions the strength of the wind gradient would be enough for them to maintain their airspeed up to about three metres above the surface, whereas they actually pull up to about fifteen metres between tacks. The energy for the pullups comes mainly from excess kinetic energy obtained by skimming along waves in the slope lift, not from the wind gradient. Albatross are so good at slope soaring that they can even do it in zero wind. On the rare occasion when the wind drops to zero over the Southern Ocean, the swells keep rolling along, and the albatross get their slope lift as usual, along the moving slopes.

Cross–country soaring

The modern glider pilot, used to slippery fibreglass wings, might suppose that cross–country flight is not really possible with a best glide of 15:1, however good the climb in tiny thermals. However, birds have another advantage, which even motorglider pilots do not share. They are not afraid of getting low over rocks or trees. If you have no nerves, and just keep pressing on, it is surprising how far you get. White storks, for example, set off from Germany and Poland at the end of every summer, and after thermalling doggedly for a few weeks, some of them fetch up in South Africa. An invisible line through Germany divides the Wessie storks, who go round via Gibraltar, from the Ossie storks, who go via Istanbul and Suez. Nobody takes the direct route, because that would involve crossing the Mediterranean, which is not one of those places where thermals grow. Cranes also migrate to Africa, from breeding grounds in Sweden and Finland, using thermals when the weather is good, but they change to flapping when the going gets too slow, and they do cross the Mediterranean, usually at night.

New World geography is better organized for soaring migration. If you want to take a picture of several thousand turkey vultures all at once, go to Panama City in October, put a long lens on your camera, and point it at the sky. Together with various kinds of hawks, incredible numbers of turkey vultures funnel down to the isthmus from all over North America, on their way to balmy Peru. Whether they live in the Old or the New World, these long distance soarers are big birds, or at least medium–sized ones. Plenty of small songbirds also cross the Mediterranean and the Sahara on their annual migrations (in one hop, many people think), but they do not bother circling in thermals. For them it is steady flap–flap for three days and nights, without landing, feeding, drinking or (presumably) sleeping.

Why would a small bird perform such a masochistic feat, while bigger ones relax in thermals? The answer is time. We all know that even the best glider, flown by a champion on a booming day, can barely keep up with a geriatric Cessna, while on non–booming days, it is not unknown for gliders to be unable to make any progress at all. Powered flight burns up fuel, but it gets you there quicker. If you have to arrive somewhere on time, there is no choice. The problem for small birds is that they burn up fuel anyway, because their metabolic rate is high, relative to the amount of fuel they can carry. A stork can stretch its sandwiches while it plods across the Sahara in thermals, but a warbler would starve if it tried to do that. It is obliged to keep moving.

Swifts

That said, the soaring bird that glider pilots most often see over Northern Europe in the summer is a small one, the swift. Those scimitar–winged black specks whizzing about just below cloudbase are swifts (not swallows), and although their motion looks random, they always seem to be right in the middle of the strongest core. Sea breeze fronts, you may remember, were first observed over eastern England by the radar echoes of the swifts concentrated in them. The swifts are not doing it just for fun. They hang about in thermals because that is the best way to find their favourite food, aphids.

Aphids are not exactly soarers in the sense of flying round in circles watching their variometers, but they do have some simple behaviour which maximizes the chance that they will get sucked off the ground by, and concentrated in, thermals. They rely on this for their dispersal, hence the mess on the leading edge of your wings after a few hours' soaring on a summer's day.

As you get ready to empty your ballast tanks, the swifts are filling theirs with fuel, but where do they land for the night? Many birdwatchers have wondered about that, and eventually reached the amazing conclusion that they don't land. If the thermals are still going at nightfall, the swifts fade into the sunset, upwards. They stay airborne through the summer nights, relying on their long narrow wings to keep the fuel consumption down.

Swifts' nests, in holes in cliffs and buildings, are actually the only places where they have ever been seen to land. They go to Africa for the winter, but apparently never land there. When they come back to their nests in the spring, their claws are very long and sharp, because they do not get worn down when the swifts are away from the nest. Film makers have a problem with swifts, because they can never get the one really obligatory shot. No pilot has been able to hold a plane steady enough for the cameraman to catch a pair of swifts in the act. Now there is a challenge.

Birds and gliders

Birds of prey and vultures will join gliders in thermals, and sometimes in other places. The African griffon vulture does formation flying displays in the vicinity of their nesting colonies, and if you fly slowly enough, you can collect quite a crowd of them, tagging happily along behind the glider. Storks and pelicans are wary of gliders, probably because certain kinds of eagles are liable to knock them out of the sky if they get the chance. I, too, learned to be wary of certain species, especially the African tawny eagle. If I flew below one of these maniacal creatures in the ASK–14, it would most likely pull in its wings and come down at me like a missile. Sometimes the eagle would realize that this "stork" was getting much too big, and pull up alongside for a close look, but other times I had some near misses. One went inches over the cockpit from straight ahead, and another hit the wing head on, which did not damage the ASK–14, but killed the eagle. I was afraid one would come through the canopy, or knock the tailplane off, so I learned to fly above them or beside them, but never to join a thermal below one of them.

The biggest eagle in East Africa is the martial eagle, a huge solitary creature, not often seen. One day I was thermalling with the canopy removed (to make a clear view for an optical instrument which I had installed in the cockpit), when a martial eagle joined the thermal below me, and worked its way up to join me. I had been neglectful with the oil can, and one of the hinges was squeaking on the port aileron. This fascinated the eagle, which held formation just above the wing, peering at the source of the squeak. Then it moved over the cockpit and flew six feet above my head, unprotected as it was by the usual plexiglass. It was not difficult to guess what was passing through the eagle's evil little mind, but luckily it did not try it. I continued thermalling, enjoying the best view any ornithologist has ever had of a martial eagle in flight.

Finding lift

Eagles and vultures are extremely good at finding the best cores. Low down, they may be able to gauge their rate of climb by watching the ground, but I found in Africa that they were still just as good at it when the cloudbase was 7000 feet or more above the ground. Do birds have variometers? Nobody knows for sure, but their eardrums, like ours, have air on both sides, and the inside is much like a variometer bottle, connected to the outside via a narrow tube. Ear popping is a nuisance to us, but the system could be adapted as a variometer, and probably is in soaring birds.

Vultures are grateful to other vultures (or gliders) for showing them thermals, but they are basically individualists, and go their own way when they have enough height. They look for dust devils and cumulus clouds, follow cloud streets, and never get caught out in dead blue patches. Storks are something else. They search for thermals by forming into a flock, sweeping the sky like a dragnet. When some part of the flock happens to fly into lift, the storks on either side converge on it, and soon everybody is wound into the core, each stork

continued on page 17

Bluenose soars on the North Mountain ridge

George Graham

TO SAY THAT BLUENOSE SOARING HIT the ridges with panache would be overstating of our ridge soaring flight tests of 1993. But with the south winds of November huffing and puffing, a cluster of hardy BSC souls trekked into Annapolis Valley with high hopes, modestly determined to at least join the flocks of feathered gliders strutting their stuff on the North Mountain ridge. North Mountain is a long straight 500 to 800 foot ridge on the northwest coast of Nova Scotia separating Annapolis Valley from the Bay of Fundy. For those of you who have been gliding a while, there was a good map and write–up on the area in *free flight* 2/85.

Modesty vanished and visions of Gold distances danced in our heads by the time we drove the winch onto a pasture kindly afforded to us by Mr. Darrell Gould (Mrs. Gould later afforded us the most tasty muffins). We unhooked the trailer containing C–FRCE, one of the club's K8s, and opened the trailer doors of C–GUIL, the Open Cirrus crewed by Dick Vine and Phil Backman.

A friendly met man at the nearby Base Greenwood had promised a somewhat unusual combination of fair sky combined with winds of 20 to 25 knots from the south, and we hurried to put the gliders together and set up the winch. Sure enough, as soon as the cable buzzed out, the winds that had previously waved the tree tops at the top of the ridge came down to ruffle the hair of uncapped heads.

Only Dick Vine had flown the ridge, but since he wanted to spirit the Cirrus aloft, it fell to yours truly to take the first K8 flight, not because I was the best pilot, or even the oldest, but, well ... because I had negotiated the use of the field.

With the aid of strengthening winds, and only the light K8 to deal with, the winch had no trouble making glider and nervous occupant reach for the sky. Instead, I pitied the winch driver as the 25 knot winds aloft made a narrow throttle window between good speed and Vne. I ended up kiting higher than I needed against a nearly stationary drum before I pulled off, then headed for the ridge nearby. I had more altitude than needed because of the zero sink that floated me back to the ridge. The mildness of the average lift and sink surprised me too, despite the well formed ridge and the strong winds (the spikes were something else!), but then I was almost 500 feet above the ridge.

At this point, knowing that I was learning on the fly, I headed for two red–tailed hawks that banked and hovered like seasoned veterans. Once I took up station beside them, I quickly learned amazing lessons and facts about ridge flying, at least as far as flying this ridge in south winds is concerned, where such winds tend to drag along a lot of unstable air rejected by the Bermuda High. (Or rejected by just about *any* high or low. Not for naught is Nova Scotia considered the atmospheric exhaust pipe of North America.)

Amazing lesson #1 If you're hooked on watching instruments, ignore the vario and watch the altimeter. In both my flight experiences, the air proved so rough that even with the vario set to slow and low, it went into manic–depressive mode: gleefully yelling 10 knots up one second and groaning 10 knots down the next.

Amazing lesson #2 Forget the instruments and enjoy the scenery. The ridge will rise to meet you, or fall away from you, as you sashay about, and you'll soon find the comfort zone.

Speaking of the view, that brings me to my first Amazing Fact: From up in the comfort zone, the view down a ridge itself is most inspiring, even magnificent, like looking down the finely–blued gun barrel of a classic shotgun, only this time the scale is that of looking down a miles–long barrel wedging off into the distant blue haze. And speaking of touristing, there's

Amazing lesson #3 Although the band of best lift might be narrow, the band of useful lift or zero sink lets you wander. If you want to sight–see out over the valley, go for it. A corollary: don't feel you have to contour fly the ridge with any great precision. Steady as she goes gets you across smaller gaps (up to three kilometres wide or so) with little loss of height.

Amazing lesson #4 Give a reasonably strong wind a ridge to play with and it will make a wave of itself, even if its roiling with unstable air. Although the wind died for a moment, allowing me to land and hand the glider over to Doug Devine, soon afterwards the wind freshened. Stuart Baker took up C–FVKA, the Ka6, and soon he, Doug in the K8, and Dick in the Cirrus were rising past 3000 feet, well above the 800 feet high ridge. Dick took the Cirrus down to Canning, about 60 km away, using the smooth wave lift rather than the turbulent mechanical lift coming directly off the ridge.

After briefings, most of the glider pilots got to play with this "new" kind of soaring. In the wave conditions, some pilots had their first experience in sink rates that changed with vertical rather than with horizontal position. This caused one stimulating circuit, at least it stimulated our feathered audience gracing the power lines to dive for cover. The day ended with smiles (some shaky) all around. However, as the field had begun to melt, a couple of cars got stuck in the field, so we decided to find drier pastures for our next foray.

Early Saturday on the next weekend found us invading the farm of Michael Pyle, which is nestled against the pretty town of Canning. Between two of his cultivated fields lay a farm road 2500 feet long, and that eight foot wide road had to be our airstrip: the fields on either side had been pounded into brown porridge by five days of rain.

The wind was much stronger and quite gusty this time out, and we had to wait until a heavy shower passed before we could rig the K8. We launched Dick first, since this time we were two kilometres away from the ridge, and we figured his extra experience might be needed. We watched, concerned as he faded in and out of sight in the wisps. But with the strong tailwind, and more zero sink, Dick hardly lost 200 feet before he contacted lift and turned parallel to the ridge. He then promptly went out of sight behind the clouds.

He reappeared quite a bit lower and behind the ridge. Dick reported that the wind was blowing over 45 knots at his altitude, and said it took Vne speeds on the venerable K8 to get back to the 'up' elevator. With the cloud deck only 400 feet higher than the ridge, Dick had to get off the elevator early, and compressed into such a narrow height band, reported a punishing ride. He disappeared off to the east, then returned to disappear off to the west before finally returning to let someone else sally forth.

Yours truly got into the rocking glider, and a minute later, got rocketed up to 1200 feet, from whence I unintentionally stall–turned before high–tailing it back through the turbulent air towards the beckoning ridge. I found out what Dick had been talking about as the combination of bouncy air and mechanical tumult made for a character building ride.

Amazing lesson #5 Ridge flying is rougher than anyone lets on. It's particularly indecent when you're compressed between the top of the ridge and a low shelf of cloud. At this point in the flight I realized why the many eagles and hawks (we had earlier seen six bald eagles in one elm tree) had been happy to hook their talons firmly around their perches. Wondering if I should find a comfortable spot, I nosed down to avoid the cloud, headed east, and soon found myself over the local look off (that's a viewpoint to you non–Maritimers). On the trip west, while sorting out the lift by watching the ridge rise and fall, I observed Amazing Fact #2.

Near even modest population centres, fabulously rich people build extravagant abodes on ridge tops. Talk about mansions on the hill! Some of the ones I looked down on were over 200 feet long and double–storied for that full length (one constructed only one room wide to give every room that top–of–the–world view). I never knew that kind of moola existed in humble Nova Scotia.

Political soaring hint #1. Since wealthy people have connections, it's probably unwise ridge soaring politics to whisper past a bedroom window at close range, eyeball to eyeball with the rich and cranky occupants picking around the window ledge for their underwear.

Now where was I? Oh yes, the turbulence made me thresh the controls to full deflection to stay right side up. After a half–hour of free aerobatics, I headed for home, again buoyed by turbulence that averaged out as zero sink. Landing meant diving into winds so strong that we had to put away the K8 before we could put the Cirrus together. Phil went up for the ride of his life, beating up and down the ridge (now we know why they use that phrase) before coming back in ahead of the advancing rain, saying that he should have carried water ballast. Winter got serious on Christmas Eve, and deep snow ended our ridge flying investigation of 1993.

We at Bluenose Soaring consider ourselves as much a research and development group as a soaring operation. Raised on rather calm Atlantic–edge thermals, we certainly developed a healthy respect for people that pound down ridges through such pummelling turbulence, their HUD sights focused on Diamond distance. But now we want more, in fact we're programming in Gold distance coordinates ourselves. In conclusion, we indeed benefited from the experience, even if the lessons, facts, and hints related above probably do not add much to the world–wide compendium of ridge flying knowledge.

But we can report that, in otherwise unreasonable soaring weather, it's a lot of fun. Because of this, we even predict a resurgence of ridge flying, led — would you believe — by the new "World class" gliders. Think of their size, their lightness, their L/D. They're just waiting to be experienced by us and discovered by our hang glider friends. That cute little performer, the PW–5, can probably be trailered by a car with a 1.3 litre engine, be assembled by two people, and launched off the top of a ridge with said car, or via bungee cord tightened by an ATV ... old may be new again, and twice as much fun. •

1993 ACCIDENT/ INCIDENT REPORTS & ANALYSIS

Learn from the mistakes of others; you won't live long enough to make them all yourself!

George Eckschmiedt
member Flight Training & Safety Committee

First of all, I would like to express my sincere thanks to SAC for bestowing on me the 1992 Hank Janzen award. I will cherish the plaque I received for the rest of my life.

The format of this report follows all the previous years' reports. I have not received much negative feedback (any feedback?) so I think it should be acceptable. The 1993 soaring season is finished and once again I spent my Christmas break in evaluating the Canadian accident reports for the sixth year in a row. Doing the analysis was somewhat more difficult than in the previous years. In the middle of November I joined Canada's official 11% (estimated 20%) of the population, and looking for a new job took up most of my time and all of my mind. Coupled with this, looking at all our accidents produced an anxiety level under which I would not choose to fly. Lucky it's wintertime, eh?

An unusually large number of reports (58) were evaluated in 1993. In the 1992 report, I predicted that we should have received at least 15 more incident reports. I was not too far off. Well into 1993 I received more information on about ten incidents, the one suspected damage accident and the two non–reported non–flying accidents from 1992. Even if late, I am glad they were sent, because they change significantly the overall information about the accident/incident status of soaring and gliding in Canada. Therefore, in the Events listing, the first ten incidents reported to SAC are from 1992, and in the Coding Sheet data the 1992 numbers were updated in an attempt to show the data as accurately as possible. (Meant double the work, though.)

The most important fact of this year is that we did not have any fatal accidents! Thank God for that, as many of the accidents could easily have resulted more grieving families. Even the serious injuries have maintained the average of the previous years.

The data for this report was obtained, as the saying goes, by hook or crook — any possible means. Joan, (bless her heart) diligently sends copies of some correspondence with the insurer as they pass on to SAC the one–line description of the original event, but not much else. In *free flight,* Tony lists some of the events from wherever Tony gets his information, and from the reports submitted to SAC. All information from the various sources were cross–checked for whatever more data could be extracted from each to try to get it as complete as possible.

It has to be repeated time and time again; the Flight Training & Safety committee is very concerned, and we are trying to do anything possible to improve the safety picture. That is the reason this report is prepared. This report has no intention of being related to the SAC insurance scheme, or for that matter any other. The FT&SC is working independently for this report (believe me, very independently — I do it), but we intend to make use of any information we can get.

I would like to thank the Safety Officers who sent me personal notes along with the reports. I feel honored and flattered by their action and I hope that the reports are acted upon in their clubs and that copies of the reports are also going to the Association office. On the facing page is a list of the known events in 1993 in Canada.

ANALYSIS

As before, many clubs reported their experiences diligently. York Soaring was one of them. Their Safety Officer, Peter William Foster has done an excellent job of analyzing their events and reporting them. Many thanks to him. Some magnificently detailed reports were received from Bluenose, Rideau Valley, AVV Champlain, Central Ontario Soaring, and my own VSA. I sincerely hope that the clubs go over these reports for their own analysis of what to and what not to do. On the other hand, one of the highest claimants, SOSA did not bother to send one single report. Perhaps this club considers itself above every one else; but then why the insurance claims?

The initial reports on the insurance indicated that the claims are high this year. When the number of events reported are considered, we are making the same type of mistakes all over again. But this year we have broken more parts than any of the previous years.

As in previous years, the events were grouped to highlight certain common characteristics. In 1993 we had 30 (16 in 1992) aviation type accidents and four (7 in 1992) in which no flying activity was involved! This report contains 21 (4 in 1992) aviation incidents, of which ten belong to 1992. (That makes it 11 in '93 and 14 in '92.) The incident reports are about the same, but boy–oh–boy, the accidents! For an overall picture and for the sake of simplification, I have chosen to look at the late reported events of 1992 and the 1993 events together. (The yearly data was updated though.) For many of the events, seldom has the immortal words of Eric Newsome been more applicable than this year, "People are substituting convenience for safety."

Most of the non–flying accidents with insurance claims are the most preventable ones, but they reflect on the soaring community. Most are just dumb, careless mistakes. I have sympathy for the pilot whose tire came off the trailer, myself having had a trailering accident, but I wonder what else happened to make that tire come off? Perhaps driving too fast, or not checking the tires before the trip?

In another case, while the glider was pushed backwards to its final tie down position the elevator struck a dirt mound. The elevator was not locked in the upright position. The damage was about $1000, not counting the revenue lost while the glider was out of service. I have seen this circumstance countless times, and I understand the reluctance to tie the elevator back after each landing. I forgot it myself many times. It takes just too much fiddling to tie the harness around the stick, then it falls down, so it is a bother – until you damage the elevator or stretch the cables. The solution is quite simple, make the task self–evident and easy to do. Install in the cockpit a short bungey cord with a hook on its end. The sole purpose of this cord is to lock the elevator up. I mentioned this in our club and the response was predictable, "What's wrong with the seat belt for this job?" Nothing, but the presence of this bungey cord is a psychological tool, a reminder to tie the elevator up. It works. I wish I could take credit for this idea, but I cannot, I saw it on a couple of Blaniks in Munich last September.

Of the 52 flying events in 1993 and part of 1992, 33 were landing related. Of these, I can estimate only six which may be considered legitimate off–field landings as part of a cross–country flight. I estimate it since the conditions were not reported. The other 27 flights were intended to be local flights. Out of these, 12 flights did not make their own runway and six of these resulted in damaged gliders. The other landing accidents point very clearly to a major fault, which I have been harping on for years: inadequate preparation for landing and unskilled use of the glide path control devices (see *free flight* 5/93 and 6/93). In at least six of the above 12 flights evidence was provided to derive the faulty dive brake use concept. (The dive brakes are the most mis–used controls of the glider and the flap is the least known control. Think about it.)

We concentrate on badge and competition flying, or flying for its own sake, and do not pay enough attention to the inevitable landing. Every flight must have some kind of start: winch, car tow, engine, aerotow, and this is the beginning of the flight so we try to teach them well. The flight itself is always different, so we emphasize its different aspects. But the end of the flight is always supposed to be the same: a perfect gentle union with the ground. So what do we do? We don't pay too much attention to it. Look at the data. If the airlines landed the way we do, they would be out of business a long time ago. Our winged bus drivers flying gliders are doing a better job of glider landings because

TABLE OF EVENTS

Pilot age	Description	Flying hours
	Aviation accidents not reported to SAC	
NR	Canopy on Blanik came open on a stop-and-turn.	NR
NR	Wind gust in Citabria side window damaged greenhouse & windshield.	NR
NR	Strong sink on final, could not clear trees. Landed on trees. Total loss.	NR
NR	Off–field landing in dirt field.	NR
NR	Landed in barley field and groundlooped.	NR
NR	Crashed on landing in field.	NR
NR	Landed on gas well cut line. Extensive damage.*	NR
NR	On landing roll out, towplane right wheel brake locked, flipped over.	NR
NR	Hard landing – lost control.	NR
NR	Off–field hard landing.	NR
NR	Off–field landing and ground loop.	NR
	* Well reported in *free flight*, but no accident report received.	
	Aviation accidents reported to SAC	
28	Unauthorized & untrained aerobatics in club glider. Suspect damage.	250
40	Undershoot into freshly plowed field; inappropriate dive brake use.	70
35	Hard landing, teaching landing before student can fly.	97
38	Inappropriate takeoff technique, glider groundlooped, hit another one	685
40	Taxiing to glider line-up, unable to stop. Hit parked glider.	>800
63	Lost canopy just after take off.	186
45	Towplane stalled on final turn, hit car. Aircraft demolished.	400
65	Ground looped on landing in strong turbulence and crosswind.	500
51	Severe sink on final, glider hit fence then another glider on takeoff line.	475
49	Undershoot, glider struck utility pole and came to rest in a small tree.	NR
70	Glider landed 200 feet short, in the river; dive brakes fully open.	NR
31	Unable to return to airport, left field picking too late, hit ground hard.	130
25	Glider landed in wheat field and groundlooped due to strong crosswind.	14
NR	Towplane ran out of fuel, creating difficult landing task for glider.	NR
31	Glider released, landed at the end of runway and groundlooped.	69
60	Flared at 10 feet and stalled. Bent fuselage longerons.	330
27	Hard landing, incorrect use of spoilers.	18
20	Forgot to lower landing gear. Did not apply SWAFTS.	180
27	Spin-in, crashed into trees on mountain.	27
63	Forgot to extend the wheel when landing on hardtop.	NR
	Non flying accidents not reported to SAC	
NA	Damaged elevator while pushing glider backwards. Not secured upward.	NA
NA	Rain infiltrated wing.	NA
	Non flying accidents reported to SAC	
NA	Canopy on ground driven over by car.	NA
NA	Tire came off rim, trailer flipped on its side.	NA
NA	Towed glider's wingtip hit parked Cessna's wing.	NA
NA	Windstorm blew glider trailer away. Trailers not tied down.	NA
	Aviation incidents reported to SAC	
25	Unable to return to airport. Poor landing field chosen.	60
NR	Circling at 300 feet on base leg at strange airport. Collision path.	NR
40	Misjudged conditions for final glide, unnecessary outlanding.	150
30	Homebuilt modified, spin developed to flat spin.	80
67	Student developed PIO, instructor failed to take control.	85
37	Near collision with towed glider on downwind.	650
35	Undershot runway, heavy landing. Did not notice wind change.	60
17	Unsafe choice of landing following tug failure.	15
17	Stall with wingdrop on final. Distracted by interfering traffic.	15
38	Crosswind on tow, CG tow hook, glider groundlooped.	680
55	Glider undershot, clipped trees at end of runway.	44
55	Gear–up landing; did not understand warning sound.	95
73	Glider assembled incorrectly, flew and got away with it.	600
65	Commenced a winch launch with dive brakes fully open.	89
74	On initiating slipping turn, canopy opened.	600
44	Ground taxiing initiated groundloop.	515
48	Elevator not secured, disconnected on ground after two flights.	800
NA	Ignored accepted procedures. Launch started w/o glider connected.	NA
63	Did not lock wheel down, collapsed on touch down.	NR
40	Heavy sink, unable to return to airport. Landed on sandbar.	NR
58	Took off with tailwheel still in glider. Fell clear on lift off.	>800

NR: not reported NA: not applicable

they have a different mind set about landing than the other mortals, but they cannot be very smug either. I have seen some of them driving the glider down the runway as if it was a high speed tank!

Sometimes I think it would be better to teach landings initially without dive brakes as in the early days, and when the student becomes reasonably proficient, then allow experimentation with the dive brakes. Would our instructors be in trouble?

We are not improving our canopy handling either. My last year's suggestion of labelling canopies with their cost obviously did not work. Some revealing reports were submitted to the insurance: "canopy came open on a stop and turn. Blanik L–13", and "sudden gust of wind through side window caused damage to greenhouse and windshield. Citabria". Very understandable. One canopy was driven over, one was not locked before takeoff, and one opened in a side slip. The first two have to be ignored since they do not make sense as described and cannot be analyzed, but the others invite comments. I chose to refrain from using adjectives about the driven–over canopy accident. Use your own.

The pilot of the report about the unlocked canopy lost on takeoff has my empathy as my own event, the last of the incidents, was under similar circumstances. He was "irritated" because of the heat and for being bumped on the flight line; I was "annoyed" because of the extra work I had to do for which I did not plan. I know that it is often impossible to avoid life's irritations and annoyances, but I also learned that under negative emotional circumstances we tend to make more mistakes. The lesson to be learned is that if one is upset for any reason, get out of the airplane.

Mechanical difficulties are showing up again. Still with the canopies, in one report the canopy locking device seems to have been worn and the canopy opened on the initiation of a sideslip. This is not a unique event as it happened once with a Blanik. Since then our club rule is to close the side windows when the glider is to be slipped. This action also verifies and brings to our consciousness the possibility of canopy opening.

I remember the K8 canopy locking mechanism which is easy to knock open inadvertently, whether it is worn or not. On the other hand, why bother with an intentional slipping turn at 3500 feet just to come down? With the barn doors employed as dive brakes on the K8, slipping is seldom needed.

While on the subject of the K8 (and K7), it is possible to install the horizontal stabilizer to the fuselage incorrectly. The metal eyes on the stabilizer can miss the horizontal pins on the fuselage, resulting in only a single bolt holding the two together. It can pass positive control checks by an uninitiated checker! The glider actually flew in this condition and only an astute observer noted the seemingly excess lateral motion of the stabilizer. Now if the pilot had attempted a high speed run the result could have been tragic.

Continuing with stabilizers, the elevator locking device on the Jantar is a sliding tube in which there is a hole. When the elevator is connected and locked, a small ball can be felt and seen in this hole. The glider was assembled and two flights were made. After the second landing the elevator fell loose during ground handling! Obviously it was not locked during assembly. Had it come loose in the air, we could have had another fatality to investigate. The above two events are frightening. Three pilots got away with flying incorrectly assembled gliders which could have cost them their lives. They should celebrate a second birthday on the anniversary of these events. The lesson to be learned from the above two events is the classic one – confirm everything by visual observation and if distracted in a routine, re–do it from the start.

About 50–60 years ago there were gliders that got into a flat spin, but these days it is very unusual. We had Monerai reported to be modified and the resulting C of G shift caused it to flatten out in a spin practise. Only by undoing the seat belts could the pilot shift the CG forward enough to recover. Many mistakes were made to reach that stage, on the other hand the pilot displayed tremendous presence of mind and a cool head to recover. V–tailed sailplanes have a history of different spin characteristics, which I cannot explore now. Ask some Austria pilots. This pilot should also celebrate a second birthday.

PEOPLE ARE SUBSTITUTING CONVENIENCE FOR SAFETY

Taxiing with a glider towards any obstruction is poor practise. In one club some of the privileged instructors are allowed to do it, regardless. I suppose it is a good feeling to end up with the glider exactly on the spot where one wants to, but a mistake can be costly. It was. You guessed it, another glider was hit. The damage to the other glider was minor, but I hope it was a major one to the ego! Next time you see a glider taxiing towards something, please say, there goes a pilot who substitutes convenience for safety!

Landing gear troubles and mistakes continue to hound us. One 100 hour pilot did not know what the buzzing sound meant when he opened the dive brakes for landing, as he proceeded to land gear–up. It was the first flight of the year and the first in that glider! Some gliders have a difficult system to affirm that the gear is indeed locked down. The alligator got the same pilot twice with one of these machines. I heard the sound of fibreglass grinding on hard runway surface and it is sickening.

We even wrote off a towplane as a result of landing gear failure. The other towplane loss was the result of a stall on final. The report was written in French, so I did not get much out of it (next time try Hungarian or pidgin–German). Then we had the annual "running out of fuel" event. No report of what happened to the tug, but it certainly placed the glider in an awkward position. It landed at the end of the runway, ground looped and the damage was about $14,000. Shall we visually check the fuel level, or do we keep relying on unreliable gauges?

A couple of near collisions with towplane–glider combinations were reported, one in the east and one in the west, although the latter one only verbally. I am certain this situation arises much more frequently, but is seldom reported.

I have witnessed more than one myself. The situation warrants serious review of towing practises. I observed many times the towpilot routinely towing the glider in the landing pattern or close to it. The towpilot could be having his 25th tow for the day and may not be as observant as on the first tow. Or, as it is done in some locations, the towpilot being a glider pilot himself tows through the known lift areas to shorten the tow duration. Certainly, he wants to improve the efficiency of the tow; that is his aim. But it happened to me too, when I was scratching at 900 feet and the turkey comes straight at me! He had his mind set to achieve only his own goal and the heck with everything else.

Some towpilots take pleasure out of diving turns when the glider releases; a great occasion for a collision if they do not verify that it is safe to do so. Often each towpilot flies in a different direction on climb–out and firmly believes that his is the only correct way to tow. Whatever they believe is their business, but while on climb to altitude they should conscientiously stay away from all paths used by first the landing and next by the soaring gliders at the same hight or lower than they are. Of course, once at altitude we all want to release in lift (and please find it), but not before, and especially not because of a near collision.

Towpilots are doing a difficult and thankless service for our sport and at times we allow them to exceed their endurance and impose tasks on them that we think they can handle, but which often turns out otherwise. Clubs, handle this one with care, but handle it.

Talk about touchy subjects, more and more clubs are experiencing a situation which is a sacred cow, but it has to be brought to light – pilot conversion from Air Cadet training. One club reported several circumstances in which the accelerated, rote method of training has resulted in incidents and accidents. It's good to have a backup supply of pilots, but I have also experienced that a pilot fully trained to "licence standard" by the Cadets will require about 10–15 dual flights before they can be allowed solo in the Blanik. It always comes as a surprise to them. There were exceptions of course, but few. This may not be a safety concern now, but it could become one. It would be interesting to see an accident/incident report like this from the Cadets.

The takeoff characteristics of the good old ASW–20 struck again, at least twice. Also I have seen a couple of our own 20s touch wingtip to ground on takeoff, but they got away with it on the smooth grass. My mind's eye already saw balls of fibreglass on the runway. For the life of me, I cannot understand why the owners don't form a users club to find a solution to the 20s takeoff handling. I like to try out different gliders, but if you have a 20, you are safe from me!

CODING SHEETS

The completion of the coding sheets has improved from the previous years. Thank you all who cared enough.

The object of the coding sheet is to identify the factors in the event. Items that could have caused the event, the reason, the result, the damaged component, or anything that was directly involved. Simply, only the FACTORS.

The coding sheets are processed by first examining the reported codes. If they make sense, an X is placed at the corresponding place in this analysis. If the aircraft is written off, an X is placed for the major components loss. Then every report, even if it is only a one liner from the insurer, is mentally recreated and examined for possible factors. A painful process, visualizing all the mistakes and damages of our friends and their equipment.

Some reports were excellently described and I hope the clubs make good use of them. Some would make excellent reading in *free flight*, leaving little for assumptions, but I have to leave it to the authors to submit them to Tony. On others, some assumptions had to be made, or simply were lending themselves for assumptions.

CODING SHEET SUMMARY

		93	92	91	90	89	88
Number of events		45	37	37	40	47	27
Flying events		41	30	-	-	-	-
1	*TYPE OF EVENT*						
1.1	Heavy landing	10	4	6	5	5	6
1.2	Undershoot	8	6	2	6	18	5
1.3	Overshoot	3	1	0	1	1	1
1.4	Groundloop	8	6	5	4	4	3
1.5	Collision (ground)	7	0	0	0	4	2
1.6	Collision (air)	0	0	0	0	0	0
1.7	Stall	2	0	0	2	0	0
1.8	Spin	4	3	1	2	0	0
1.9	Structural failure	1	1	3	2	1	1
1.10	Blown/Flip over	0	0	0	3	2	0
1.11	Gear up landing	3	0	2	0	2	0
1.12	Gear collapse	1	1	0	1	1	1
1.13	Takeoff	4	6	5	4	2	0
1.14	Other	11	13	16	15	14	8
2	*AIRCRAFT DAMAGE*						
2.1	None	11	15	14	13	17	13
2.2	Minor	13	6	17	10	13	2
2.3	Substantial	16	13	3	9	11	9
2.4	Write–off	5	3	2	5	4	2
3	*PERSONNEL INJURY*						
3.1	None	40	33	29	24	43	22
3.2	Minor	4	1	0	4	1	2
3.3	Serious	1	1	0	0	3	2
3.4	Fatality	0	2	1	4	0	1
4	*AIRFRAME FAILURE OR DAMAGE*						
a	In–flight failure	1	5	5	-	-	-
b	Damage at accident	27	14	14	-	-	-
c	Handling damage	6	7	7	-	-	-
4.1	Flight controls	4	2	2	3	2	1
4.2	Elevator	8	4	4	5	3	3
4.3	Rudder	5	5	3	6	2	2
4.4	Ailerons	5	3	2	5	1	0
4.5	Flaps	3	1	3	2	1	0
4.6	Wings	17	8	5	10	6	4
4.7	Spoilers/Divebrakes	4	0	1	1	2	0
4.8	Undercarriage	12	4	5	6	1	4
4.9	Canopy/doors	10	5	6	6	7	5
4.10	Fuselage	23	9	7	5	13	8
4.11	Release	0	1	2	-	-	-
4.12	Instruments	0	3	0	1	-	-
5	*TOWING*						
5.1	Premature release	2	2	3	0	0	0
5.2	Rope/Cable break	0	0	0	0	0	1
5.3	Winch/Tug failed	2	1	0	0	2	0
5.4	Rope/Cable snagged	0	1	1	0	2	1
5.5	Divebrake opened	0	1	0	1	4	2
5.6	Towplane ground upset	0	0	1	0	0	1
5.7	Run out of fuel	1	0	1	2	-	-
5.8	Taxiing mishap	1	3	0	2	-	-
6	*PILOT FACTORS*						
6.1	Misused controls	6	8	4	3	9	2
6.2	Misused spoilers	5	3	1	2	1	1
6.3	Misused flaps	1	0	1	1	2	0
6.4	Misjudged distance	6	3	6	4	8	2
6.5	Misjudged speed	3	3	2	2	1	2
6.6	Misjudged altitude	11	4	4	10	13	4
6.7	Misjudged conditions	11	9	7	8	10	4
6.8	No wind compensation	4	4	5	3	8	3
6.9	Did not see object	2	3	3	2	4	5
6.10	Did not keep speed	1	4	1	2	1	0
6.11	Overstressed A/C	1	2	1	1	0	0
6.12	Exceeded experience	2	5	4	3	4	1
6.13	Reckless flying	2	2	2	4	1	0
6.14	Insufficient training	3	4	1	2	5	2
6.15	Physical impairment	0	0	1	0	0	1
6.16	Wrong decision	12	6	5	11	16	11
6.17	Instructor failed	3	3	3	0	0	3
6.18	Other & complacency	19	4	7	9	4	2
7.	WEATHER						
7.1	Low ceiling	0	0	0	0	0	1
7.2	Rain	1	0	0	0	0	1
7.3	Hail	0	0	1	3	0	0
7.4	Crosswind	5	2	2	3	1	1
7.5	Severe turbulence	3	0	1	0	0	3
7.6	Wind gradient	3	1	1	0	1	1
7.7	Wind shift	0	1	1	0	0	0
7.8	Thunderstorm	1	0	0	1	0	0
7.9	Severe sink	3	0	1	1	0	2
7.10	Line squall	0	1	1	3	0	0
7.11	Lightning	0	0	0	0	0	0
7.12	Poor visibility	2	2	0	1	0	1
7.13	Clear (if factor)	0	0	-	-	-	-
7.14	Weather not a factor	27	30	29	-	-	-

Reported flying hrs	93	92	91	90	89	88
distribution:						
0-100 hours	9	8	7	7	10	1
101-300 hours	5	4	7	5	11	4
301-800 hours	9	3	6	5	7	6
801-above	2	1	4	3	2	5
Hours reported in flying events:	25of 41 61%	16of 30 53%	24of 30 80%	20of 31 64%	-	-
Reported pilot age distribution:						
16 - 25	2	3	4	3	7	1
26 - 49	14	9	9	9	7	0
50 - 59	4	2	6	1	6	8
60 - up	9	2	3	3	9	1
Age reported in flying events	29of 41 71%	16of 30 53%	22of 30 73%	16of 31 52%	-	-

As can be seen, six years of data is available simultaneously. I would hope that the readers themselves will make some comparisons, as the numbers are self–evident. Any apparent inconsistencies between the totals and the number of events may be that some events may have had more than one factor or that I have had reasons to include an extra factor. (I spent the whole of New Year's day, which turned out to be a wet and dark and miserable day and I also had the flu, trying to balance the entries.)

The emphasis on judgement training by the FT&SC is well warranted. The "misjudged" sections show up in the largest numbers. Complacency is also a form of misjudgement. In spite of all our best efforts, we have done very poorly in 1993.

Heavy landings, undershoots and groundloops still dominate. I suppose they always will. Groundloops, which are always indicative of excess energy during landing, are also increasing. The only mitigating circumstance would be when the groundloop was initiated to avoid more severe damage, such as could have been when the glider had to land at the end of the runway following the towplane running out of fuel.

In–flight mechanical failures are still worrisome. Although only one was reported and it was a minor event, we could have had at least two very bad in–flight failures (K8 and the Jantar). Thanks again for reporting them and let them be a lesson for all. Parts of the older gliders and also their owners are wearing out and the failure of seemingly minor items can have catastrophic results.

SUMMARY AND CONCLUSION

	93	92	91	90	89	88
Aviation accidents						
not reported to SAC	11	10	4	7	4	1
reported to SAC	19	6	11	12	17	14
Non–flying accidents						
not reported to SAC	0	5	5	7	3	0
reported to SAC	4	2	2	3	5	2
Incidents reported	11	14	15	11	18	10
Total reports	45	37	37	40	47	27
Aviation accidents	31	16	15	19	21	15
Aviation accidents (%)	69	43	41	48	45	56

The numbers speak. With the exception of 1989, the annual accident rate was similar. Then came 1993. Perhaps we flew more, perhaps we have more members? I doubt it. Is it that the 26-49 year old pilots with either low or high time suffered the events? The existing sample does not allow us to draw that conclusion. If all the events were reported and all requested data were available, we could provide reasonably accurate information. The 11 non–reported accidents could contain many of the clues.

In the 1992 report, in order to offer a solution for reducing accidents, I described a concept of continuous improvement. Obviously it did no good. I have little hope of having any success in getting more ideas. Regardless, as long as the instructors allow progress beyond the skills of the students, we will keep on having accidents. As long as we emphasize performance flying without the proper skill–sets, such as field selection and landings, and do not identify its associated extra risks, we will keep on having accidents.

I wish you all a safer 1994 season. •

AFTER THE CRASH

the Hope Mountain accident from the pilot's perspective

Christine Gaunt, Vancouver Soaring Association

"You must have been so scared!" This was the first response elicited from people when they learned that I had spent a cool October night 3100 feet up the side of a mountain. The fact that I destroyed a $35,000 Grob to get to that point wasn't their first concern, although it certainly was mine. Other friends have wondered what went through my mind that night.

The first thought was simple, absolute astonishment. It was hard to comprehend that at one moment I was soaring through the air in the clear sunlight and several seconds later I was crash-ing through 100 foot high fir trees with the pungent smell of broken pine and burning fibreglass about me. Then came the eerie silence broken by the everyday chatter of pilots on the radio who now seemed a whole world away to me. I just couldn't believe that what I saw was true. I was sit-ting in my undamaged cockpit on a slope of about 40° with one wing up and one wing down the slope. The wings were pocked with dents and gashes, each wing held in place by two trees, one on each side of the wing. Turning my head to the left, I could just see the rudder and tail boom bent at a grotesque angle. And still I could hear people on the radio calling in, oblivious to my current predicament.

I realized at some point that I was unhurt, although I hadn't ruled out some slow internal bleeding. A worse thought hit me after that — I would have to call the glider club ground station and tell them that I had crashed. That was actually one of the hardest things I've ever had to do. All of you perfectionists out there will understand how humiliating it is to admit that you can't always maintain the ideal that you would like to. So I did the dirty deed, and an onslaught of voices hailed me over the radio. I was sure that a flurry of activity would be starting on the ground, but from where I sat the world was very still and very quiet. I had more than enough solitude to enable me to go over and over again in my mind what it was that caused the crash. I spent a long time at this but met with limited success. My thoughts were broken by a tow-plane trying to locate me (although they couldn't see me) and later a helicopter (which did, barely). I sat in the cockpit for two hours as I was concerned that the glider might dislodge and slide further down the mountain if I tried to exit.

Meanwhile, the ground crew was busy making a care package for me among other things, as they didn't know if I would be spending the night on the mountain (I had gone down at 5 pm). As it turned out, I did. Somewhere around 6:30 a helicopter came to lower the package to me. Unfortunately this meant that I had to jettison the canopy (which I could not get back on) to get out as there was a five foot drop to the left and I didn't want to dislodge the glider by getting out that way. After a few attempts, I got the package off the line. I then hauled both the pack-age and my chute 50 feet up the slope where I found a semi–flat place to lay down. (In case anyone is wondering, parachutes are not the most comfortable things to sleep on.) I greatly appreciated everything which was sent up to me which included a sleeping bag, water, food, hot soup, a portable radio, a flashlight and warm clothing (I was wearing shorts and a T–shirt).

I crawled into the sleeping bag, put on the clothes and started to eat. I felt quite upset at this point as I was tired and overwhelmed. I also thought about bears while I was eating and hoped that they wouldn't normally find food at this elevation. I managed to get to sleep around 9:30. I knew that the helicopter from Search & Rescue had arrived around 8 pm, but it had been dark since 7 and they didn't attempt to retrieve me. I slept until midnight when I awoke to sounds like cats fighting. This made me wonder if there were any mountain lions in the vicinity which bothered me a while. I decided not to worry about it though — I would take care of the situation if it presented itself. But being woken up got me thinking of the accident again and I laid awake for an hour or so pondering it. I finally managed to get to sleep again until about 6:30.

The Search & Rescue helicopter was in the air just before 7 the next morning and my extrac-tion from the mountain side was relatively painless, except for being dragged up the side of a dead pine tree. This produced the worst injuries that I had received during the whole fiasco (two to three inch scratches on my leg and neck). I was deposited safely back at Hope airport and shortly after got to go home. All and all I was very fortunate that everything which could have gone right in this instance did. I know of others who have not been so lucky. •

LETTERS & OPINIONS

from page 5

We must all acknowledge that flying at higher altitudes has significant risks and must be approached with respect. The symptoms of hypoxia — including confusion, tunnel vision, impaired judgement, euphoria and incoordi-nation — have been experienced by more than one pilot at Cowley. Simply having oxygen "on–board" is not helpful if the tank is empty, if the valve is not opened, the connections have not been tested, and, importantly, if the published safety orders are not respected.

We don't want to turn Cowley into something with so many do's and don'ts that it takes all the enjoyment away from our great sport. But Cowley is different and does put more de-mands on our flying skills as well as our knowl-edge of the appropriate regulations. We only ask that pilots at Cowley come prepared with a realistic self–assessment of their own capa-bilities as well as a knowledge of the appro-priate regulations and procedures. As one of Canada's premier soaring sites it's too valu-able to lose. We all (not just Alberta pilots) have a responsibility to ensure we don't jeop-ardize our access to this great site.

Marty Slater,
president, Alberta Soaring Council

SCORING RULES OUT OF HAND

I am always amazed at the "lawyering" that goes on at National contests when it comes to reaching the fringes of existing scoring based results. Since I, a long time ago, have given up on flying in the current competition environment as I'm sure many others have done too, I would like to touch on some points with which I have problems.

Having been involved in competitive bicycling, I come from a sports environment where the winner is the one who crosses the line first and, I'm sure, that is the case with most com-petitive sports. Not so with soaring, where, over the years more and more rules of excep-tion have dominated scoring results based on such things as:

- number of finishers
- starting time
- distance achieved
- time achieved
- aircraft type (wingspan, flaps, etc)
- all–up weight

I'm sure I could go one and list more items, such as is the pilot high or low time, male or female, a member of FAI or not, has prostitis or menopause, etc. etc. etc. ad nauseam!

I don't mind flying against another bunch of competitors if the purpose leads to establish-ing the best overall pilot, not only as the fast-est or furthest, but also the best navigator (without use of GPS or Loran), the best dis-player of airmanship and a good sport all around. The sport is presently obsessed by speed alone.

What I object to is that as soon as we have established that a specific task will be flown, all kinds of whereases and wherewithalls, in-clusions and exclusions etc. start coming into play. The principle of "keep it simple, stupid!"

is being completely disregarded and replaced by the creation of another bunch of rules by elitist experts whose sole purpose is to computerize the complexities of scoring and then end up defending the (previously) agreed rules before the other group of elitists who feel that by challenging the rules, they may find a weakness in the other elite group so as to gain winning points for a flight that did not meet the original requirement in the first place, ie. a closed speed circuit where the greater speed over the greater distance wins.

To argue that greater distance can ever win over a lesser but completed task, is contrary to the intent of the flight. Either you score on distance when the task is for distance or the score is made on the basis of speed for a closed circuit speed task, to start mixing the two leaves a situation of "lawyering" as we witness with great regularity on our competition scene.

If we do want to weight scoring results, then it must be on the basis of the task's intention. To illustrate, I have prepared points for the task results illustrated on page 21 of *free flight* 1/94. I have given separate scores for distance, speed, and introduced a new distance points factor by adding or subtracting one point per kilometre for distance over or under the average distance flown on the task (to allow for the soaring conditions of the day, not forgetting that every pilot has the same opportunity at a "kick at the can" when it comes to the "luck factor").

	Dist (km)	dist pts	speed (km/h)	spd pts	diff fm davg	total pts
CJ	161.3	812	80.7	1000	2.5	1815
MZ	153.3	771	76.6	950	-5.5	1716
A1	198.6	1000	0.0	0	39.8	1040
2W	183.1	922	0.0	0	24.3	946
PM	97.6	491	48.8	605	-61.2	1031

average distance flown (d_{avg}) = 158.8 km

The above scores show the results as they should be, in keeping with the principle of greater points gained by completed versus uncompleted tasks.

Nothing shows this more clearly than the score achieved by "PM" who completed the task and received a greater reward for finishing over "2W" who flew a much longer distance but did not finish. It can be argued that "2W" gambled and lost, and that's part of the pilot's responsibility for his actions. "A1" did receive some advantage from the maximum distance he flew, but only because of his great variation over the average distance achieved.

No matter how one slices the salami, in any sport there are those who gamble and lose, so it is in soaring as well and the responsibility lies purely and simply with the pilot.

If we must progress, let's do it by keeping the original intent for the competitive side of our sport in mind and not "gum it up" by adding more and more fine print to the point where guys like me prefer to fly on our own terms and yet produce some pretty fancy results — all to the benefit of soaring achievements in this part of the world.

John Bisscheroux
Montreal Soaring Council

BIRD FLIGHT

continued from page 10

adjusting its circle by watching its neighbours. Between thermals, a stork flock just keeps going in the direction it wants to go, regardless of the appearance of the sky.

One day over the Serengeti plains, I was following a flock of storks in the ASK–14, as they plodded exasperatingly across an obvious dead patch, steadily losing height. Eventually I lost patience, turned 90 degrees and moved across to a growing cumulus cloud, half a mile from their original track. No sooner was I centered under it when the storks, who were also watching me, came streaming in and wound into the core below me. I got to cloudbase first, pulled the spoilers, and continued circling, waiting to see what the storks would do. The whole flock spiralled up the middle of my circle, and disappeared into cloud. I saw storks do this on several occasions, and sometimes I found them again, skimming along in and out of cloudbase. I suspect that they always break off the climb as soon as they lose sight of the ground, but I never did find out for certain whether they sometimes make serious cloud climbs. They do not have gyros, but possibly they could stay the right way up by using their magnetic sense, like a Bohli compass, and maintain contact with each other by calling.

How big can a bird be?

If you scale a bird up, the power required to fly increases more steeply than that available from the muscles. Bigger birds do not have relatively bigger muscles, so the bigger the bird, the less power it has to spare. There is an upper limit to the body mass, above which flight by muscle power is not possible at all. Various kinds of vultures, storks, cranes, pelicans and albatrosses, which get into the 10–12 kilograms range, show obvious signs of struggling in flapping flight.

The Andean condor and its nearly extinct cousin the California condor, are similar in appearance to the African vultures, but even bigger. Actually they are more closely related to storks than the Old World vultures, but have "converged", as zoologists say, on the same body plan. Condors use the slope lift along the cliffs in places like the Paracas Peninsula in Peru to scavenge along the beaches for such tidbits as seal afterbirths. If startled, they are capable of taking off from the beach, but would only do that in an emergency. They much prefer to use their wings and claws to scramble up the cliff face, until high enough to launch into the slope lift, then work their way back up to the top. Above the cliffs proper are steep slopes of loose sand, and along those the condors soar, in and out of the gullies, round the corner from the windward face as far as they dare into the horrendous turbulence where the wind is blowing along the cliff. Sometimes they get it wrong and splat into the hillside in a shower of sand. I climbed a slope where I saw this happen and found it was covered with huge, three–toed dinosaur–like footprints, all leading uphill and ending in a scrape mark where the condor had launched itself off again. Condors apparently do not breed on the coastal cliffs, but come down there to forage, from their nests high in the Andes, which involves thermalling 100 kilometres or so across the coastal desert.

The mystery of whooper swans

All very big birds soar — except for swans. A big male whooper swan can weigh up to 13.5 kilograms, which is on or near the record for any kind of bird that can still fly. Whoopers apparently do not soar, and what is more, they have a regular migration route, breeding in Iceland, and wintering in Scotland and Ireland. One of the most intriguing of all anecdotes about bird flight came from an airline pilot in December 1967, who was off the Hebrides at 27,000 feet, when he saw a flock of whoopers, which were subsequently tracked by radar as they descended to the coast of Northern Ireland. Oxygen is not so much of a problem as it might seem, as bird lungs work in a different way from ours, and are much better at extracting oxygen from thin air — but how did the swans get up there? Whooper swans do not have what you would call a lively takeoff and climb performance, especially when loaded up with fuel for migration. They make detours around trees and are always crashing into power wires. Wave perhaps? No bird (not even a condor) has been seen wave soaring high above terrain, but on the other hand there is plenty of wave about in that part of the world, especially in spring and autumn.

Try to imagine the swan's problem, as it would appear to a glider pilot. You contact wave after a somewhat marginal takeoff in your overloaded, underpowered motorglider. Then, making the best of your 20:1 glide ratio, you claw your way to 27,000 feet over the Highlands. Problem solved. All you have to do now is start up the engine, and off you go to — Iceland? That is nearly 900 kilometres away! I did it once in a Cessna 182, and I had to refuel in the Faroes. All I can tell you is that hundreds of whoopers make the return trip safely every year, and they are not usually seen in Shetland or the Faroes at migration time, so they presumably fly directly across the open Atlantic. I do not know how they do it. I am inclined to think that they must know something that we don't — but what could it possibly be? •

Colin Pennycuick learned to fly with the Oxford University Air Squadron in 1952, and took up gliding in 1958. He began research work on bird flight at about the same time, and has continued and combined both activities ever since. He built a tilting wind tunnel at Bristol in the 1960s and trained pigeons to fly in it, then spent the1968–73 in Kenya and Tanzania, where he developed the use of a Schleicher ASK–14 motorglider as a platform for observing soaring birds. He also acquired a Piper Super–Cruiser, in which he travelled widely in East Africa. He flew this aircraft back to England in 1973, and later used it in a study of migrating cranes in southern Sweden. As Maytag Professor of Ornithology at the University of Miami from 1983–92, he used a DG–400 to observe soaring birds in Florida and elsewhere in the USA. Last year he returned to Bristol. His book, "Bird Flight Performance" (Oxford University Press, 1989) covers both soaring and flapping flight, and is the definitive text on the subject.

FAI badges

Walter Weir 24 Holliday Drive
Whitby, ON L1P 1E6 (905) 668-9976 H

The following Badges and Badge legs were recorded in the Canadian Soaring Register during the period 1 January to 17 March 1994.

GOLD ALTITUDE

	Mike Cook	Rocky Mtn	4450 m	K5	Cowley, AB
	Martin Lacasse	Gatineau	4100 m	Jantar Std	Sugarbush, VT
	Bryan Swansburg	–	3400 m	Grob 102	Minden, NV
	James Bucknall	Gatineau	4660 m	ASW–20B	Sugarbush, VT

SILVER DISTANCE

	Mark Newcombe	SOSA	63 km	1–26	Rockton, ON

SILVER ALTITUDE

	Bryan Swansburg	–	3400 m	Grob 102	Minden, NV
	Robert Montreuil	Rideau	1200 m	1–34	Seminole Lake, FL

SILVER DURATION

	Karoly Zsebok	London	5:01	Skylark 2	Embro, ON
	Robert Montreuil	Rideau	5:16	1–34	Seminole Lake, FL

C BADGE

2412	Karoly Zsebok	London	5:01	Skylark 2	Embro, ON
2413	Alain Demers	Quebec	1:22	Blanik L13	St Raymond, PQ
2414	Marc-Francois Bernier	Quebec	1:43	1–26	St Raymond, PQ
2415	Simon Fleury	Quebec	1:18	Blanik L13	St Raymond, PQ
2416	Joseph Ford	Quebec	1:55	Blanik L13	St Raymond, PQ
2417	Mike Cook	Rocky Mtn	gold height – did not apply for C		
2418	Bryan Swansburg	–	gold/silver height – did not apply for C		
2419	Kateri Belanger	Champlain	1:19	1–26	St Dominique, PQ
2420	Robert Montreuil	Rideau	5:16	1–34	Seminole Lake, FL

FAI records

Dave Hennigar 404 Moray Street
Winnipeg, MB R3J 3A5 (204) 837-1585 H

The following records are being claimed:

400 km triangle speed – Open (not FAI), citizens, 119.7 km/h, 25 Jan 94, Charles Yeates, Lak–12, VH–XQR. Flown from Waikerie, Australia with turnpoints of Pinnaroo silo and Cullullcraine road junction. Surpasses previous citizens record of 111.8 km/h by Walter Weir in 1990.

200 km triangle speed – Open (not FAI), citizens, 116.3 km/h, 21 Feb 94, Charles Yeates, Lak–12, VH–XQR. Flown from Waikerie, Australia with turnpoints of Alawoona silo and Yamba roadhouse. The current *territorial* record is 110.6 km/h set by John Firth in 1984.

Charles says: During my nine week visit to Australia the weather was useable enough to give me 177 hours of flying in a new Lak–12. This 20.5m sailplane is built in Latvia and can carry 190 litres of ballast (418 lbs), giving it a best L/D of 48:1 at 115 km/h. It looks like an ASW–17 brought up to date and the handling qualities are very nice. The price is perhaps the best item — I estimate that the landed price in Canada, taxes paid and with a computer/GPS and trailer added here would be about $41,000. While not a competitor for a Nimbus 4, it has great performance for the price! The 200 km flight took place under the first good cu I had seen in three weeks which averaged 6–7 knots with bases at 7800–8500 ft agl! The weather here quickly turns the Oz experience into the Dream Time.

More goodies for Charlie

The SAC Board of Directors selected "Simply Flying to Never–Never Land" *as the best story to appear in free flight in 1993 by a Canadian author. He was awarded a certificate which was presented at the SAC Awards Banquet.*

Coming Events

6 Apr **Toronto Glider Pilot Ground School**, spring session, Weds evenings 7-10 pm for 8 weeks. Contact the school at (416) 395-3160 for registration info, or Ulf Boehlau (905) 884-3166.

4-8 Jul **"Un-Nationals" Novice Soaring Contest**, with realistic handicapping for lower performance sailplanes. Pendleton, ON hosted by GGC. Contacts: R Officer (613) 824-1174, G Lockhard (613) 692-3622.

5-14 Jul **Canadian National Soaring Competition**, SOSA. Contest manager will be Ed Hollestelle, (519) 461-1464 (H), (519) 455-3316 (W).

25-29 Jul **MSC Soaring Contest** for sport & club sailplanes. Contact Gilles Séguin (514) 377-5737.

27-28 Aug **Tillsonburg Air Show**, airport just north of Tillsonburg, ON on Hwy 19. Over 100 exhibitors, aircraft, balloons, classic cars, trucks. Shuttle bus service, RV parking. Contact (519) 842-9805.

50th ANNIVERSARY COMMITTEE

At the SAC AGM held on 6 March, a committee was formed to handle all aspects of the upcoming 50th anniversary of SAC. This committee will liaise with the Board of Directors. SAC members are asked to send their ideas, etc. to either of the following:

Chairman: Ed Hollestelle Jr
152 Bonaventure
London, ON N5V 4S7
(519) 451-6282

member: Paul Moggach
3333 Mainsail Crescent
Mississauga, ON L5L 1H3
(905) 607-4109

Trading Post

SINGLE SEAT

1–26C, C–FRSD, 1965, no damage, 2200h, condition 7/10 inside & out, always hangared. $7000. CVVQ c/o Claude Rousseau (418) 875-4395.

1–26C, C–GNYB, 1260h, basic instruments, no trailer. $6000 obo. MSC club ship. Call O. Maranta (613) 678-5197.

Tern, 1971 wood homebuilt, 30:1 performance, comes with encl metal trailer, chute, and radio. $5000 OBO. Chris Gadsby (403) 283-2411.

Ka6CR, C–FURK, 1070h, fuselage refinished in 1993 incl new canopy. O2, Becker radio, Winter barograph, Security chute, encl metal trailer. Very clean aircraft, well maintained. $10,000. Call Jerry Vesely (403) 625-3155 work, 625-3871 home.

Ka6CR-PE,C–GJUA, #6310 954h. Better L/D than CR with the pendulum style elevator. Standard instruments, 2 varios (one with audio), 8 day clock, G–meter, encl wood trailer. $9200 obo. Call Joseph (519) 354-4206 (Chatham, ON)

HP11A, new instruments, O2, Security 150 chute, 720 chan radio, new Schreder trailer. $12,500. Horst Dahlem, (306) 955-0179.

HP11A, C–FUKB, 518 h, standard instruments, CB radio, open trailer available. Highest performance for your $, has done gold and diamond flights. For quick sale as is, the first person with a reasonable offer will be flying this spring – after spring with fresh inspection, $10,900. Bob Patterson (905) 457-5238, 9 to 9.

Monerai, C–GRHG, less than 30 hours, standard instruments, radio, tinted canopy, new encl alum trailer. Easy to fly, good XC beginner ship. $4500. Mark Brown, Winnipeg (204) 895-2929.

RS–15, C–GPKH, estate sale – trailer, instruments, chute. Contact Ed Hollestelle (519) 455-3316 (B), or Chris Eaves (519) 452-1240 (B)

RS–15, C–GPHZ, only 485h, one of the finest looking RS–15s flying in Canada. Won the 1993 Nationals Open class (handicapped). Winter audio vario and basic instruments, Niagara chute, ballast capable, Schreder trailer. Will deliver anywhere in Canada. Great bang–for–the–buck with 38:1 performance. Whole lot (except delivery) $15,500. Dave Mercer (403) 594-0199.

Astir CS, C-FIUR, formerly N-127SS, 545 h, never damaged, excellent condition, Ball vario with audio netto/cruise, 720 chan hand-held radio, aluminum enclosed trailer. Marc Gallanter (416) 848-7900 or (613) 224-3255 any time.

Glasflügel Mosquito, 15m like new self–launching sailplane, 883 h, Rotax 501 engine, Terra radio, Cambridge, disc brakes, Pfeiffer trailer. Harry Miltner (509) 925-6214.

Learning how to fly a glider can take 20 hours.

Learning when *not* to fly it can take a lifetime.

TWO PLACE

2–22E, G–FYPC, very good condition, annual May '93, no trailer. Excellent trainer, asking $8000 obo. COSA, c/o Bob Leger (416) 668-5111.

2–22E, C–FACC, 1965, good condition. $4500. Covered trailer (needs work), $500 with glider only. Call Steve Patton, (604) 536-2819.

2–33, C–GXGX, 4100h, no damage, condition 7.5/10 inside & out, May '94 annual, always hangared. $14,000. Claude Rousseau (418) 875-4395.

2-33A, C-FARD, 1974, 1850h, no damage, very good condition inside and out, always hangared, new fabric and paint, yellow with orange trim, open trailer, asking $14,000. Roland Trudel (514) 835-3775

TOWPLANE

L–19, 2000h TTSN, remanufactured in 1975, always hangared, clean, 8/10 condition inside & out, no damage, mogas STC, Continental 0-470-II-B, 700h SMOH by Continental (good cylinders). Sale includes a stripped, run–out 0-470-II (running in aircraft when removed). $55,000. CVVQ c/o Claude Rousseau (418) 875-4395.

Murphy REBEL kit, only $17,850. This rugged, roomy, metal 3 seat STOL can be your next towplane. Use a Lycoming 0-320 or Subaru 160 hp engine and you can get better than factory performance with the cost advantage of doing your own maintenance. Also a great personal sportplane. Thrifty operation (3 gal/hr, 97 mph, 1000 ft/min on 80 hp! For info or demo flight call Bob Patterson (905) 457-5238, 9am to 9pm, 22 Baronwood Court, Brampton, ON L6V 3H6.

free flight non–commercial advertising

- Personal sailplane and sailplane equipment ads are free for SAC members, $10 per insertion for non–members.
- Ad will run twice. If ad is to continue, notify editor for each additional two issues. Notify editor when item is sold.
- Normal maximum length is 6 lines. Ads are subject to editing if space is limited.
- Send ad to editor, NOT to National Office.

MISCELLANEOUS

Rico Vario, with netto, like new, $350. Carol King (514) 672-9220 (H), (514) 289-4154 (B).

Wanted - Radair 10s radios in working cond or for parts. Pierre Bertrand (514) 421-6373 (collect ok).

Parachutes, three Cu Nim club military chutes, $250 each. Dave Fowlow (403) 289-9477 (H).

Wanted – Parachute, thinback style. Also will trade electronic Ball vario for a mechanical vario. Mike Cook (604) 427-5471.

Wanted – Standard Class sailplane to fly at the 1994 Nationals. Experienced BC pilot willing to beg, borrow, or even rent a suitable ship as the distance prohibits bringing my own. Required from 2-15 July. Call Nick Pfeiffer (604) 850-9345.

MAGAZINES

SOARING — the journal of the Soaring Society of America. International subscriptions $US35 second class. Box E, Hobbs, NM 88241 (505) 392-1177.

SOARING PILOT — bimonthly soaring news, views, and safety features from Knauff & Grove Publishers. New large format. $US20, add $8 for first class/foreign postage. Box 1145, Frederick, MD 21702-0145 USA.

NEW ZEALAND GLIDING KIWI — the official publication for the 1995 World Gliding Championships at Omarama and the bi–monthly journal of the N.Z. Gliding Association. Editor, John Roake. $US25/year. N.Z. Gliding Kiwi, Private Bag, Tauranga, N.Z.

SAILPLANE & GLIDING — the only authoritative British magazine devoted entirely to gliding. 52 pp, bi-monthly, and plenty of colour. Cdn. agent: T.R. Beasley, Box 169, L'Orignal, ON K0B 1K0 or to BGA, Kimberley House, Vaughan Way, Leicester, LE1 4SG, England. £15.50 per annum (US$30) or US$40 air.

AUSTRALIAN GLIDING — the journal of the Gliding Federation of Australia. Published monthly. $A40.50 surface mail, $A55 airmail per annum. Payable on an Australian bank, international money order, Visa, Mastercard. (No US$ personal checks.) Box 1650, GPO, Adelaide, South Australia 5001.

SUPPLIERS

REPAIRS & MAINT.

Sunaero Aviation. Glider repairs in fibreglass, wood, & metal. Jerry Vesely, Box 1928, Claresholm, AB T0L 0T0 (403) 625-3155 (B), 625-2281 (F).

XU Aviation Ltd. Repairs in wood, metal and composites. C. Eaves (519) 452-1240 (B), 268-8973 (H).

INSTRUMENTS & OTHER STUFF

Variometers, winglets, mylar seals — all products designed and built this side of the Atlantic! Peter Masak, Performance Engineering, Inc. tel (713) 431-1795; fax (713) 431-2228.

Variometer / Calculator. Versatile pressure transducer and microprocessor based vario and final glide calculator. Canadian designed and produced. Skytronics, 45 Carmichael Court, Kanata ON K2K 1K1. (613) 820-3751 or 592-0657.

Firmal Electronics. Cambridge variometers, L Nav and S Nav now both available with Global Positioning System (GPS) option. You need never be lost again! Write for list or phone John Firth, 542 Coronation Avenue, Ottawa K1G 0M4 (613) 731-6997.

MZ Supplies. CONFOR foam, Becker radios, most German soaring instruments. 1450 Goth Ave, Gloucester, ON K1T 1E4 tel/fax (613) 523-2581.

SAILPLANE DEALERS

Lark. Single, two place, motorglider and parts, Flite–Lite Inc. (gliders), (305) 472-5863, fax 473-1234.

Schempp-Hirth. Nimbus, Janus, Ventus, Discus. Al Schreiter, 3298 Lonefeather Cres, Mississauga, ON L4Y 3G5 (416) 625-0400 (H), 597-1999 (B).

Schleicher. ASK-21, 23, ASW-22, 24, ASH-25. Ulli Werneburg, 1450 Goth Avenue, Gloucester, ON K1T 1E4 (613) 523-2581.

Schweizer parts. Walter Chmela, (416) 221-3888 (B), 223-6487 (H), #203, 4750 Yonge Street, Willowdale ON M2N 5M6.

Solaire Canada. Ed Hollestelle (519) 455-3316 tel & fax. SZD–55–1, Krosno, PW–5, trailers, GPS, and other sailplane stuff.

PROVINCIAL ASSOCIATIONS

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Halifax, NS B3K 4A9
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President: Gordon Waugh

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Toronto, ON M5S 1C8
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Winnipeg, MB R3N 0B1
(204) 489-6734 B
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SOARING ASSOCIATION OF SASKATCHEWAN
78 Schneider Crescent
Regina, SK S4R 7R5
(306) 545-6856
President: Gary Bozek

ALBERTA SOARING COUNCIL
Box 1916
Claresholm, AB T0L 0T0
(403) 481-3866
President: Marty Slater

BC SOARING SOCIETY
Box 91562
West Vancouver, BC
V6G 1T2
(604) 669-9415
President: Dave Parsey

ATLANIC ZONE

BLUENOSE SOARING CLUB
Ron Van Houten
17 John Brenton Drive
Dartmouth, NS B2X 2V5
(902) 434-1032

QUEBEC ZONE

AERO–CLUB DES OUTARDES
Jean Richard
876 Bergeron
Ste-Thérèse, PQ J7E 4W8
(514) 430-0367

AERO CLUB SPORTAIR LANAUDIERE
Gaetan Trudel
131 Perron
St-Basile-le-Grand, PQ J3N 1H5
(514) 653-1945

CLUB DE VOL A VOILE APPALACHIAN
David Lord
2910 Robert
RR 1, Lennoxville, PQ J1M 2A2
(819) 566-6529

ASSOCIATION DE VOL A VOILE CHAMPLAIN
Claude Gosselin
30 des Orties
La Prairie, PQ J5R 5J3
(514) 444-3450

CLUB DE VOL A VOILE DE QUEBEC
Jean-Guy Helie
85 Route de la Jacques-Cartier
Ste-Catherine, PQ G0A 3M0
(418) 875-2005

MONTREAL SOARING COUNCIL
Box 1082
St. Laurent, PQ H4L 4W6

CLUB DE VOL A VOILE MONT VALIN
3434 Ch. Ste Famille
Chicoutimi, PQ G7H 5B1

ONTARIO ZONE

AIR SAILING CLUB
Richard Longhurst
100, 1446 Don Mills Road
Don Mills, ON M3B 3N6
(416) 391-3100 ext 250 (W)

ARTHUR GLIDING CLUB
10 Courtwood Place
North York, ON M2K 1Z9

BASE BORDEN SOARING
c/o OC Rec. Platoon, CFSPER
CFB Borden, ON L0M 1C0

BEAVER VALLEY SOARING
Box 394
Thornbury, ON N0H 2P0

BONNECHERE SOARING
Box 1081
Deep River, ON K0J 1P0

CENTRAL ONTARIO SOARING ASSOCIATION
Bob Leger (416) 668-5111
866 Hyland Street
Whitby, ON L1N 6S1

ERIN SOARING SOCIETY
Box 36060, 9025 Torbram Rd
Bramalea, ON L6S 6A3

GATINEAU GLIDING CLUB
Rick Officer (613) 824-1174
1085 St. Jovite Ridge
Orleans, ON K1C 1Y6

GUELPH GLIDING & SOARING ASSOCIATION
G. Ritchie (519) 763-7150
259 Cole Road
Guelph, ON N1G 3K1

KAWARTHA SOARING CLUB INC,
Box 168
Omemee, ON K0L 2W0

LONDON SOARING SOCIETY
Brian Keron
RR 2, Thamesford, ON N0M 2M0
(519) 285-2379

RIDEAU GLIDING CLUB
Box 307
Kingston, ON K7L 4W2

RIDEAU VALLEY SOARING SCHOOL
Bruce McGlashan
885 Springland Drive
Ottawa, ON K1V 6L1
(613) 738-0064

SOSA GLIDING CLUB
Ben Lockridge
1169 Tecumseh Park Drive
Mississauga, ON L5H 2W3
(416) 271-3097

TORONTO SOARING CLUB
Stephen Foster
10 Blyth Street
Richmond Hill, ON L4E 2X7
(416) 773-4147

WINDSOR GLIDING CLUB
Box 2172
Walkerville, ON N8Y 4R8

YORK SOARING ASSN
10 Courtwood Place
North York, ON M2K 1Z9

PRAIRIE ZONE

GRAVELBOURG GLIDING & SOARING CLUB
Henri Lizée, Box 596
Gravelbourg, SK S0H 1Y0
(306) 648-2744

PRINCE ALBERT GLIDING & SOARING CLUB
219 Scissons Court
Saskatoon, SK S7S 1B7

REGINA GLIDING & SOARING CLUB
Shane Crerar
Box 4093
Regina, SK S4P 3W5
(306) 584-1232

SASKATOON SOARING CLUB
Box 7943
Saskatoon, SK S7K 4R6

WINNIPEG GLIDING CLUB
Susan or Mike Maskell
489 Lodge Avenue
Winnipeg, MB R3J 0S5
(204) 837-8128

SWAN VALLEY SOARING ASSN
Sam Namaka, Box 1827
Swan River, MB R0L 1Z0
(204) 734-4677

WESTMAN SOARING CLUB
Box 1294
Brandon, MB R7A 6N2

ALBERTA ZONE

COLD LAKE SOARING CLUB
Box 2108
Medley, AB T0A 2M0

CU NIM GLIDING CLUB
Keith Hay
7 Scenic Glen Gate NW
Calgary, AB T3L 1K5
(403) 239-5179

EDMONTON SOARING CLUB
Box 472
Edmonton, AB T5J 2K1

GRANDE PRAIRIE SOARING SOCIETY
Walter Mueller
10317 - 82 Avenue
Grande Prairie, AB T8W 2A6
(403) 539-6991

PACIFIC ZONE

ALBERNI VALLEY SOARING ASSN
Doug Moore,
Site 310, C6, RR3
Port Alberni, BC V9Y 7L7
(604) 723-9385

ASTRA
9280 - 168 Street
Surrey, BC V4N 3G3
(604) 589-4552

BULKLEY VALLEY SOARING
Ted Schmidt Box 474
Smithers, BC V0J 2N0
(604) 847-3585

VANCOUVER SOARING ASSN
Membership Secretary
Box 3251
Vancouver, BC V6B 3X9
(604) 521-5501

SAC SUPPLIES FOR CERTIFICATES AND BADGES

1	FAI 'A' badge, silver plate pin	$ 5.00
2	FAI 'B' badge, silver plate pin	$ 5.00
3	SAC BRONZE badge pin *(available from your club)*	$ 6.00
4	FAI 'C' badge, cloth, 3" dia.	$ 4.50
5	FAI SILVER badge, cloth 3" dia.	$ 4.50
6	FAI GOLD badge, cloth 3" dia.	$ 4.50
	Items 7–12 ordered through FAI awards chairman	
7	FAI 'C' badge, silver plate pin	$ 5.00
8	FAI SILVER badge, pin	$39.00
9	FAI GOLD badge, gold plate pin	$35.00
	Items 10, 11 not stocked – external purchase approval given	
10	FAI GOLD badge 10k or 14k pin	
11	FAI DIAMOND badge, 10k or 14k pin and diamonds	
12	FAI Gliding Certificate (record of badge achievements)	$10.00
	Processing fee for each FAI application form submitted	**$10.00**
13	FAI badge application form *(also stocked by club)*	n/c
14	Official Observer application form *(also stocked by club)*	n/c
15	SAC Flight Trophies application form *(also stocked by club)*	n/c
16	FAI Records application form	n/c
17	SAC Flight Declaration form *(also stocked by club)* per sheet	$ 0.15
18	SAC guide "Badge and Records Procedures", ed. 6	$ 5.00
19	**FAI Sporting Code, Section 3, Gliders, 1992**	**$ 7.00**
	available from and payable to Aeroclub of Canada	

Please enclose payment with order; price includes postage. GST not required. Ontario residents, add 8% sales tax. Items 1–6 and 13–18 available from SAC National Office. Check with your club first if you are looking for forms.

ARTICLES ACVV POUR CERTIFICATS ET INSIGNES

Insigne FAI 'A', plaqué argent	
Insigne FAI 'B', plaqué argent	
Insigne ACVV BRONZE *(disponible au club)*	
Insigne FAI 'C', écusson de tissu	
Insigne FAI ARGENT, écusson de tissu	
Insigne FAI OR, écusson de tissu	
Les articles 7–12 sont disponibles au président des prix de la FAI	
Insigne FAI 'C', plaqué argent	
Insigne FAI ARGENT	
Insigne FAI OR, plaqué or	
Les articles 10, 11 ne sont pas en stock – permis d'achat externe	
Insigne FAI OR, 10k ou 14k	
Insigne FAI DIAMAND, 10k ou 14k et diamands	
Certificat FAI de vol à voile (receuil des insignes)	
Frais de services pour chaque formulaire de demande soumis	
Formulaire de demande pour insignes *(disponible au club)*	
Formulaire de demande pour observateur officiel *(disponible au club)*	
Formulaire de demande pour trophées de vol de l'ACCV	
Formulaire de demande pour records FAI	
Formulaire de déclaration de vol de l'ACCV	
ACVV guide des procédures pour FAI certificats et insignes (éd.6)	
FAI Code Sportif, Planeurs, 1992	
disponible de et payable à l'Aéroclub du Canada	

Votre paiement dévrait accompagner la commande. La livraison est incluse dans le prix. TPS n'est pas requise. Les résidents de l'Ontario sont priés d'ajouter la taxe de 8%. Les articles 1–6 et 13-18 sont disponibles au bureau national de l'ACVV.

SAC National Office, 306 – 1355 Bank Street, Ottawa, ON K1H 8K7 tel (613) 739-1063 • fax (613) 739-1826
Aeroclub of/du Canada, 306 – 1355 Bank Street, Ottawa, ON K1H 8K7 tel (613) 739-1368 • fax (613) 739-1826