free flight • vol libre

4/88
Aug-Sep

POTPOURRI

The Canadian Soaring Championships will be over by the time this issue is out. At this stage, there are 30 entries but with only one from other than Ontario and Quebec and four from the United States. What should be done to ensure a more representative cross-section of our top pilots are able to attend the Nationals to make these championships a truly national gathering? The policy of our Association is that no SAC funds are used to support competitions, either national or international, which leaves the competitors to pay their own way supported by gifts from members and corporations. In the past, we were able to get government funds for sport competition travel, and some provinces have funds for such purposes. Federal funds have not been available for six years. What to do?

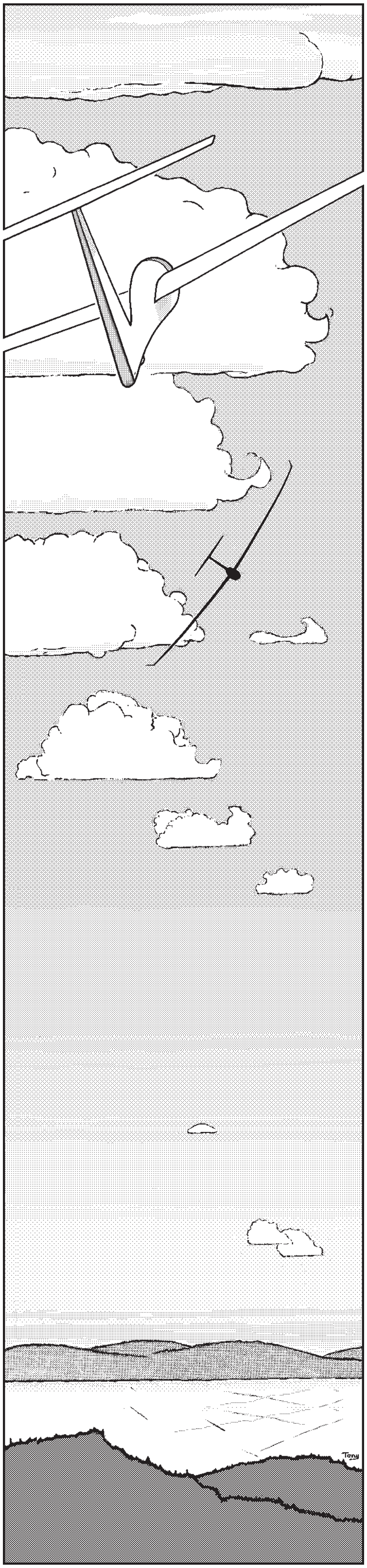
We have been successful in convincing the federal government to give us financial support for administrative purposes in 1988 even though our numbers do not support Sport Canada's criteria for such funds. There is reason to believe we may continue to get these monies in the future though we should not pretend astonishment if they are not forthcoming. It seems not prudent to push our luck and ask for reconsideration of funds for sport travel whilst the waxing and waning of policy is in vogue. In the meantime, considerable effort is being given by members of the competition groups to gain more corporate funding, and no doubt a more vigorous campaign will be launched to increase support from our generous members.

Our Association lost a very active gliding pioneer and long-time friend on the 26th of June. Hank Janzen lost his life in a most unfortunate towplane accident when the Cessna 150 towplane of the Rideau Gliding Club, which was being flight tested by Hank, lost elevator control causing an uncontrolled and fatal descent. He was one of the founding members of the Queen's University Gliding Club formed in 1946, later known as the Rideau Gliding Club, and served as its CFI for 33 years from its inception. He was the acknowledged leader of this club which had the enviable safety record of no accidents until this year. He must have had the record for attendance of SAC AGMs, which he never missed from their beginning. In his other life, he was the longest serving professor in the Queen's University Physics faculty. He was a reserved gentleman with a quiet sense of humour and a set of very high values, amongst which were perfection in maintenance of equipment, flying procedures, and safety, which he advocated and taught all his life. His friends were legion and he will be missed with fond, fond memories by all who were privileged to know him.

The standard of returns the SAC office has received this year from clubs for insurance and membership has been superior and is a credit to those who are responsible for these mundane but necessary details. This is also reflected in the response which the clubs give when extra information is needed. At the end of June, membership stood at over 1000, which is approximately 50 over last year. A revised Incident/Accident Report Form has been sent to all clubs and you are urged to use the new forms and continue the habits of last year by encouraging the submission of Incident reports for all incidents. Support safety by sending in these reports, no matter how minor, to enable the Training and Safety committee to profit from your observations.

Fly safely and enjoy our too short summer.

Gordon Bruce



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

DEPARTMENTS

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Cover

Three Ka6E classics pose with Mt. Hope, BC as backdrop. Pilots (left to right) are Lothar Schaubs, Georg Mathias, and Walter Kunster.
Photo by Walter Kunster

A PILGRIMAGE TO THE HOLY MOUNTAIN

Tony Burton

Ursula and I spent almost a month in Germany in April and May, and had the opportunity to visit some gliding sites and "werks", partly as a result of our promise to track down technical data on the Grunau Baby for Cu Nim's CFI, Dave Fowlow. Dave bought the Baby from Bruno Schrein in Medicine Hat and intends to restore it to "original condition" so far as it's possible. This Grunau Baby has an interesting history, being one of three gliders found stored in Germany and brought to Canada right after WWII as war prizes. *(I would like to hear from anyone who can tell me more of the facts surrounding this historical event.)* The Baby was one of the first gliders built by Alexander Schleicher very early in his business in the mid-30s. It was originally designed for Hanna Reitsch, the tiny and very excellent flyer who was to become one of Germany's best testpilots and the only woman in WWII to earn the Iron Cross for her exploits.

Anyway, on 20 April we headed southeast from Ursula's hometown of Neheim to the Rhön hills, the village of Poppenhausen and the Schleicher factory, and the famous Wasserkuppe. We arrived at the factory just before closing time and were met by the head designer, Gerhard Waibel. We had met Gerhard in 1981 at the world contest at Paderborn and had interviewed him for free flight. Gerhard, a very personable man, greeted us like we were old friends and spent two hours chatting with us while showing us around the quiet factory filled with every example of Schleicher sailplane in various stages of completion.

We explained that the main purpose of our visit was to get as much Grunau Baby information as possible. This would have to wait until the next day, but in the meantime, after our tour, we followed Gerhard up to the restaurant at the top of the Wasserkuppe about 10 km away for some "Kaffee" before he had to head home. The top is at about 950 m and there was still some snow in the ditches from a storm the previous week, and this day's weather was cloudy and cool so there was no activity in evidence. Let me tell you about German coffee — it is $1.50 a cup and you don't get seconds; however, the brew is at least three times stronger than you will ever drink in Canada, so I suppose it balances out. It's served with a very thick condensed cream that sinks to the bottom of the cup when you pour it, and it STAYS there until vigorously stirred.

Early next morning, we were in Waibel's office where we talked about soaring in southern Alberta, and he was impressed with the photos of the Chinook Arch we showed him. We got a further tour of other assembly operations, and watched a carbon spar being laid up for the new ASW-24. Almost anything can be on the floor depending on orders, and we saw the ASW-20, -24, -23, ASK-21, and the ASH-25 super two-seater going together. They also still weld the metal components and fuselage of the ASK-13, which is now built under licence by a small company, JUBI, operating at the giant Oerlinghausen glider field *(see story in last issue).*

On average, about eight to ten sailplanes per month go out the door, but any particular one takes at least two months of work to complete, although the 25 metre ASH-25 is more complicated and takes longer. Gerhard described the design features which make the ASW-24 unique. It's their first sailplane designed from scratch to take into account the specific characteristics of glass, carbon, and Kevlar in aerodynamic, structural, strength, and safety features. The cockpit sidewalls are unusual in that they are fairly straight beams (giving improved cockpit integrity and crash protection for the pilot) located *inside and higher* than the canopy frame, which dips low on each side for better visibility downwards. He commented that it was unfortunate but a fact of life that one is never sure how a new aircraft structure will react in a crash, so that improvements in crashworthiness for a model arises from the information gained from serious accidents.

Following the grand tour, Ursula was led down into the Schleicher dungeon where all the drawings of old gliders were stacked up on ten foot high racks of shelves, and some rummaging around produced an armload of cracked and dilapitated rolls. A lot of the Grunau drawings were not on transparent paper and so could not be copied except by an expensive photocopying procedure at the next large town, but all three of us spent twenty minutes unrolling and feeding what we could into a blueprint machine. Gerhard then gave Ursula the address of a man in Witzenhausen (near Göttingen) who was the chief repairer and "type-inspector" of Grunaus in Germany. We left Schleichers at noon for the Wasserkuppe once more, very impressed with the absolutely first class treatment we got from Gerhard, who we're sure had real business to conduct besides making a couple of Canadians feel welcome!

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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 which represents 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.

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Opinions

COMPETITION CONFLICTS

I recently received a letter from the 1988 National Soaring Competition organizers soliciting more entrants for the 1988 Nationals. At the time this letter was sent out, there were a total of 22 registered contestants in all three classes. When one considers that the pre-requisites to fly in the Canadian Nationals are quite minimal, it's very disappointing to see such a poor turnout, particularly when the contest is being held in the east. The eastern contests are normally well attended. We are probably one of the few countries that don't have to turn entrants away from a national contest.

One of the points made in this letter was that there was only one entrant from outside Ontario or Quebec. As I write this letter at the Cowley Summer Camp, I can look around and see at least five or six pilots who normally attend Nationals on a somewhat regular basis. In fact, the reason I did not go to the Nationals this year is because the Cowley Summer Camp and the Nationals are being held at the same time (the camp has always been held in the last week of July to the August long weekend). Of the pilots noted above, I know that at least three of them are not at the Nationals for the same reason. When I returned my Nationals registration form to the organizing committee early in the spring, I made note of this conflict and indicated I would not be attending because of it.

If you are wondering why someone would choose to fly at Cowley rather than fly at the Nationals, all I can say is come and fly here and your question will be answered. The 1986 Nationals at York Soaring also conflicted with Cowley and I've heard (unofficially) that the Nationals next year at SOSA are also in conflict. I hope that it's not too late to modify the scheduled date for 1989.

However, I'm sure that this conflict results in only a minimal reduction in total attendance at the Nationals. If there is not a significant increase in registrations above the 22 mentioned, there are no doubt numerous other reasons in addition to the Cowley conflict. In any event, the current examination of the Canadian contest system by Bruce Finlay should shed some light on them. Of the four Nationals I have flown in, only one had more than 40 contestants (York '86). If the present trend continues we will have, in effect, returned by default to the old system of Eastern and Western Regionals, a system I understand was not favoured by most pilots.

I realize that there is a rather limited window in which Nationals can be scheduled. Considering the time and effort required to organize and run one of these contests, I'm sure that all the volunteers involved would like to see that their efforts are worthwhile. As one small step to improve attendance, I would like to suggest that consideration be given to scheduling the Nationals such that a conflict with other major Canadian flying events doesn't exist. Then at least I'll be able to use up all my annual vacation in a logical manner (soaring), and it will give other contest pilots the opportunity to come and enjoy the most spectacular soaring site in the country, especially if it's just following or before a Western competition.

Good luck to everyone involved with the 1988 Nationals and hopefully I'll see you at SOSA next year??

Kevin Bennett, "X1"
Cu Nim

Kevin does not mention that he also serves as the Cowley Summer Camp Safety 0fficer, and some of the other potential entrants are actively involved in other organizational aspects of this largest soaring event in Canada, which is internationally known and attended.

The SAC aerobatics Coach, Manfred Radius, was on hand at Cowley to give senior Alberta club instructors a pre-aerobatics course in "unusual attitudes" which will be passed on to club post-solo students, and is a very valuable addition in coordination training and skills upgrading for any pilot — but it particularly shows new pilots that there is a lot more to be learned about flying a sailplane safely after solo. I highly recommend it.

Eastern pilots should speak with Manfred about his soaring adventures at Cowley when they have the opportunity.

I would like to be at the '89 Nats but as I'm also heavily involved with running Cowley, that has to be my first priority too. In the Canadian competition environment, where it is difficult enough, given our very extended geography, for pilots to make the decision to use up a lot of vacation time and extra gas to travel across the country to a contest, it doesn't make sense to introduce additional disincentives to competing.

Tony Burton, "EE"

TRYING POST IN ALBERTA

Tony Burton and **Dick Mamini**
Cu Nim

The Alberta Provincial Contest, held over the 1 July long weekend at Black Diamond, experimented with the "Pilot Option Speed Task" rules with some success and with the interest and support of most of the 19 pilots entered. The basic premise and philosophy of this type of contest is to elicit and exercise the widest range of soaring skills by the individual pilot.

The POST rules were kept as simple as possible by contest director, Terry Southwood, for the first try. They were:

- After the opening of the start gate, the pilots were to fly as fast and as far as possible around any turnpoints (listed at the start of the contest) within the time period set by the contest director prior to launch. The maximum distance flown earned 600 points and the maximum speed, 400 points. A penalty of eight points per minute was applied to late finishers to the maximum of their earned speed points.

- Flight distance was the total of one or more triangles, each triangle closing on the home airfield, and/or a single out-and-return. The pilot could declare a finish for speed points after the completion of any triangle, and was obliged to finish after the completion of an out-and-return. Both distance and speed was adjusted by the sailplane handicap factor. (Note — this restriction of all triangles closing on the airfield was a "house rule" occasioned by the often much better soaring conditions out to the east of Black Diamond which might not be reachable by the lower performance ships.)

- The start gate opened 20 minutes after last launch, with start consisting of photographing a ground signal (specific orientation of two glider trailers) at an unlimited height from a 180 degree sector behind the pilot's first leg. This rule improved safety by reducing the concentration of sailplanes near the start point. (Note — as a result of the unlimited height start, some pilots felt that a longer time should be allowed for the late launchers to climb to a "fair" height. I feel this can be a variable call by the contest director depending on the total launch time estimated and the cloudbase forecast.)

- All turnpoint photo sectors were 90 degrees centered on the courseline back to the home airfield, or if at the home airfield, back towards the previous turnpoint. This rule provided full pilot discretion for further flight options without a lot of "just-in-case" photos to cover a wide selection of possible subsequent turnpoints.

- The "normal" scoring formulas applied to minimize the computer program modifications required by George Dunbar (more on this subject will be mentioned later).

The weather was "interesting", with the first day being the only one that could be considered normal. The second day featured a change of airmass during the launch which significantly affected soaring and ultimately caused a no-contest day, and the last day featured rapid overdevelopment during the launch which killed the lift and produced an almost immediate no-contest day. However, because only two towplanes were available, it took two hours to get the start open — and on the last two days the conditions were such that as little as a 10 - 15 minute earlier opening of the start could have allowed enough pilots to get away to produce a score. The first two days gave wave to those pilots who looked for it as part of their flight strategy.

Day 1 began with a discussion of the rules, and a 2-1/2 hour time limit was called. Cloudbase climbed to about 8500 feet agl by the time the start opened. Dick Mamini won the day in speed and distance in his ASW-12 with 280 km and 117 km/h. Here he gives his story.

• • •

How sweet it is! One month after getting Romeo Mike flying again (after being grounded in both official languages since the 1980 contest in Claresholm) we have had some success not only with the bureaucrats but also with all those young hot shots in their very good ships. The level of competition is much higher today than it was in 1980, and the performance of sailplanes like the Ventus, especially when loaded with water, is unbelievably good.

When this POST type of competition was announced, my initial reaction was that it was going to be something like the old Sports class rules combined with a "Cat's Cradle". However, POST strongly encourages the pilots to land at the home field to gain maximum points and this, of course, cuts down on expensive retrieves and the wear and tear on crews and farmers' fields. This is a great improvement over the Cat's Cradle which encouraged maximum distance only and the almost inevitable retrieve at sunset in the downwind corner of the contest area.

The horserace start minimizes the volunteer requirement for the organizers and introduces a whole new tactical approach to starting which is challenging for the pilots. I also think it adds an element of interest for the spectators as there will be a large number of finishers (hopefully) right around the day's time limit. What is missing is the ability to compare your performance with other pilots around a fixed task. Perhaps a few "standard" races can be flown in a contest also, but all-in-all I like these rules better than the Sports class rules that were tried the last few years.

Now for flight comments: I was launched early enough to be at cloudbase with several other sailplanes about five minutes before the start. I should have stayed there, but I thought that I could gain a greater advantage by moving to a newly forming wisp just north of the start gate. This turned out to be a mirage and I lost 1500 to 2000 feet thrashing around trying to get back to where I had been. At this point the start was announced so I headed out anyway looking up at those high starters and commenting on my intelligence and heritage.

I had already decided to run across the prevailing westerlies which looked like they might produce some wave, so I headed south across a big hole for Longview. Most of the others were heading southeast in the direction of High River, but I saw one other going my way. I thought it was JM (Jos Jonkers) but it turned out to be 24 (Hans König). I was getting quite low south of Longview so I had to stop for some lift and that's the last I saw of him. I climbed to near cloudbase and took off at a high rate of knots to try and catch up to who I thought was the Flying Dutchman. Never did!

The next possible turnpoint south of Longview was the Chain Lakes dam (55 km out), but decided I had to do something more ambitious if I wasn't to be waxed by Jos. If I continued south to Cowley (120 km) or even Pincher Creek (137 km), then I would have a choice of turnpoints to complete a triangle on the way home — Quirk Creek, High River, etc.

Crossing over the dam I moved one wavelength to the west where more altitude was stored. I probably pushed too hard at this point in trying to catch Jos who I thought was ahead (had I climbed to cloudbase and poked my nose to the west, RM and I might have caught the wave earlier. However, we were making reasonable progress in the strong thermals that were forming along the leading edge of this cloud and soon reached a point west of Claresholm. From here we moved southwest because it looked more likely to produce wave in that direction, and soon a distinctive chop was felt and some super strong areas of sink. Let's push through this stuff and get some wave! Finally on the north end of the Livingstone Range we got into green air — what a relief.

The rotor cloud tailed off diagonally from being close to the range to almost right over Cowley to the southeast. There was now just a little more than one hour to go in the task so I rejected Pincher Creek as too far, and if there was any time left when I got back to Black Diamond, then a short out-and-return to Quirk Creek (23 km west of the field) might be possible to fill out the time with some more distance points.

The rotor cloud would have obscured the Cowley turnpoint if I stayed in the wave (and besides, I would have been above 12,500 feet) so I decided to push along the wave as fast as possible leaving room to cross over the top of the roll cloud and drop back down in the down-going wave, get my picture, and penetrate back up wind and re-enter the wave.

So I got the picture and was crabbing north again and eventually saw that the wave window stretched all the way to Quirk Creek. I abandoned any thought of making High River the second turnpoint of a triangle, and with two hands on the stick, pushed for Quirk Creek. With less than an hour to go now I began to have doubts if we could make it on time: my alternate was to divert to Longview or possibly straight back to Black Diamond.

Well, we ducked under the cloud just before Quirk Creek and got a photo. Luckily, I was seen crossing the finish line right after JM because I had lost my radio and the finish line crew hadn't seen me approaching. As it turned out we won the day (with 266 km and 117 km/h); quite easy really when all you have to do is hold the stick forward with two hands for almost an hour.

• • •

Tony There was comment at the next pilots' meeting on the contest director's ability to unnecessarily influence pilot decision-making by calling a too short or too long task time. Yesterday's flying could have been extended two hours to give the pilots more options and time to prove their soaring skills, yet if the director called a task time that forced everyone past the last lift, then tactical planning by the pilot is reduced to maximizing a final glide, again an unsatisfactory restriction to the POST philosophy. It was agreed that if a task time is to err, it should probably be on the long side, and should not be less than three hours unless major weather or operational constraints force otherwise.

The day began with an unstable southwest flow tempered considerably by a lot of cirrus cutting down the heating. Task time — 3-1/2 hours. Then, just about the time the last gliders were being launched, an unforecast and cooler airmass moved in from the north. The clash of the two airmasses over the low hills to the north of the field produced an amazing cloud mix and wild lift — under an 11,000 foot asl cloudbase developed rotor-like cloud 3000 feet lower — pilots waiting for the gate to open cruised around the sides of these cloud fragments, climbing or sinking in almost a random way that was very difficult to interpret. Several pilots admitted to using up turnpoint film to capture the unique cloud scene. As the "front" moved slowly off to the south, the air behind was quite dead, and the higher pilots hung on another ten minutes waiting for the start, while those low down never got away.

This turned out to be my day — sort of. There was some decent-looking cu to the south, but I thought my best bet was to get southeast, catch up with the frontal lift, and try for a good ride to the east and south to any of several turnpoints of opportunity. This new airmass was quite turbulent but no consistent lift was to be found in it as I headed towards High River. Finally, I caught up with the interface north of the High River airport and found some lift that was going up all the way around. JM came in a couple of thousand feet below me but couldn't connect and landed at the airport along with two other gliders in quick succession.

The cloud shadows moved from the southwest while dust on the ground blew up from the north, and a great looking high cloud street always remained frustratingly out-of-reach — it didn't seem to be connected to anything.

Don Jessee

A clash of two airmasses prior to the start produces wild lift and rotor-like clouds beginning two thousand feet below the pre-existing 11,000 foot convective cloud deck.

The encroaching airmass wasn't moving fast enough to provide a continuous area of lift in front of the interface or produce any visible indication of its location, but it did assist in producing three knot thermals regularly. The problem was finding the interface and feeling along it to some consistent lift . . . consistent for at most three turns until the interface arrived and chopped it off at the ankles, so to speak. Flying through the interface was extraordinarily rough — lots of negative "g", ten knots up on one side of a turn and ten knots down on the other with a strong horizontal shear that instantly shifted my airspeed from 60 to 40 knots or vice versa. I hung on with knees pressed against the center console of Echo Echo and right hand hanging on to the stick. One particularly strong negative gust threw my left hand up past my right thumbnail which chiselled a piece of flesh off a knuckle.

I tried to avoid the worst of it by biasing most turns southward, but inevitably I would lose it, get bashed around as the interface passed me, strong down, then dive southwards and get bashed some more until I passed into the southwest airmass, struggle to regain the height in unsure lift and work southeast, then repeat the process again, until I got a picture of Vulcan (73 km out) and headed upwind southwest towards a couple of other potential turnpoints.

Thus, it had gone for an hour and a bit — it was the roughest continuous ride I've had in 21 years of soaring!

As I ground on upwind towards Claresholm airport in spotty lift I could see what looked like good development in the lee of the Rockies, and I imagined all my foes roaring back and forth up that valley like Dick yesterday. It looked like it was going to be a distance only day for me with the only satisfaction being that I would be landing close to home. However, by the time I got to Claresholm, conditions towards Black Diamond, 87 km away, began to look better with an hour left to the task.

The radio had been silent for a long time, so I called in to let the ground know I was still alive, and headed back towards Black Diamond full of confidence. On the way, I heard Hans König transmitting that he was finishing — the only one so far — maybe I'll do well after all. Unfortunately, each great looking shred of cloud disappeared as I approached, and I flew into the ground 16 km short for a 214 km effort.

On calling in for my retrieve, the contest director said I have good news and bad news — congratulations, you had the best flight, and it's a no-contest day! What a let-down. Hans had turned in a Pincher Creek/Longview triangle for 275 km but was credited with only 44 km because he photographed the wrong turnpoint at Pincher, and no one else had gone more than 50 km either. I stewed over the news and got mad as hell. Why am I not getting credit for working my butt off all day demonstrating exactly what the POST task is supposed to extract from the pilot?

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AN AUSTRIAN CONTEST

Jörg Stieber
SOSA

Preface

In 1989, the 21st World Gliding Championships will be held in Wiener Neustadt, Austria. To give interested pilots the opportunity to prepare for this event by familiarizing themselves with the terrain and the local weather conditions as well as to allow the organizers to gain some experience in running an international gliding championship, the 1988 Austrian Nationals were held at Wiener Neustadt and opened to international participation. The selection of Wiener Neustadt as a world contest site was quite controversial because many pilots felt that flying in the Alps required too specialized skills, would give local pilots an over-proportional advantage, and finally, would be dangerous because of the limited off-field landing possibilities. Harry Pölzl, Peter Masak, and myself decided to participate in this pre-world contest to see what it was all about.

Getting There

It felt strange arriving at Munich airport carrying nothing but my parachute and pilot's licence, and I was a bit sceptical whether all the necessary bits and pieces which I had organized from the other side of the Atlantic would come together at the right time.

Early the next morning, I went to Landshut to pick up a VW camper van that Thomas Fisher of F & E, the manufacturer of the "TOP" bolt-on sailplane power unit, was so kind in lending me. Then I had to drive some 300 km to pick up a Ventus C from the Kitzingen Soaring Club. The glider (contest number X) and a Comet trailer were arranged by Klaus Holighaus of Schempp-Hirth. It had taken me months and dozens of phone calls to locate a suitable sailplane — for awhile I had given up hope of finding one.

When I arrived late that night back at my base in Munich, I had all the essentials except for a barograph which was to be ordered the next morning.

Bad Start

On May 2nd, in the early afternoon, I was packed up and ready to depart for Graz, Austria to meet Harry Pölzl for some pre-contest training. It was too late when I realized that early rush-hour traffic is a very inappropriate time to maneuver a glider trailer through Munich. Disaster struck when I had to make a left turn on a jam-packed main road intersection. While I was trying to get past a vehicle turning left from the opposite direction, the rear end of the trailer swung out too far and destroyed a brand new Mercedes. A review of the damage with the owner revealed that the car would need a new door, new front fender, new mirror, and new front spoiler. The only good news was that the trailer hardly had a mark and the glider inside was not affected either.

I was a bit shaken by this early mishap and it took me a little while to regain my emotional balance. After a while I was able to fully enjoy the drive on my way to Salzburg on a beautiful day with the Föhn (Chinook) making the entire line of the Alps clearly visible.

The Canadian Team

Our team was represented by Bruce Finlay who supported us as team leader and watched out for our interests in meetings with the contest organizers. Harry Pölzl, Peter Masak, and I looked after the flying part. Peter actually flew for the USA since the contest organizers had allowed only two Canadian entries. All of us flew 15 m Class — Harry and Peter with the LS-6. We were spoiled by an excellent crew. George Dunbar from Calgary did a fantastic job in finding me in the strangest places in record time.

Heidi, Harry's wife, and a local support crew, were always busily supplying us with the latest weather information from different parts of the country. Finally, Maria Grove from Pennsylvania kept Peter's glider absolutely spotless and added a touch of loveliness to our team.

Contest Site and Organization

There is a civil and a military airfield in Wiener Neustadt. The military airfield will be the site for the 1989 World Championships. The history of the airfield dates back into the very early days of aviation when a forward-looking mayor of Wiener Neustadt decided to designate a large area as a test site for "Flying Machines". The field is a circular shape with a diameter of approximately two miles. There are no hard surface runways on the field. Although the organizers repeatedly made the point that the military had only allowed certain portions of the field to be used for the contest and we had to stick to certain runways, it was quite comforting to know that in an emergency this field could accommodate the simultaneous landings of 50 or 60 gliders without problems.

Considering that the contest organizers had no experience in holding a contest of this magnitude, the organization went

George Dunbar

The Canadian team, left to right: George Dunbar (Jörg's crew), Harry Pölzl, Jörg Stieber, Evelyn Finlay, Hans Stacherl (Harry's crew), Bruce Finlay.

quite smoothly. It can be expected that the experience they gained with this contest will allow them to do an even better job next year. Absolutely outstanding in his performance was the weatherman. Dr. H. Trimmel managed to come up with surprisingly accurate forecasts even on days when he had to deal with extremely complex situations (such as three different air masses in the contest area).

Terrain and Meteorological Conditions

The Alps act as a barrier between central Europe and southern Europe and the Mediterranean. The main ridge runs in an east-west direction and is only interrupted by a few major north-south valleys. As a consequence there are usually different air masses north and south of the main ridge. In France and Switzerland the peaks are over 12,000 feet high. In the east towards Wiener Neustadt, they range from 6000 to 8000 feet. Wiener Neustadt is located approximately 20 km east of the eastern end of the Alps in a basin that stretches eastwards into Hungary.

Hungary has agreed to open its borders for the 1989 World Championships. This will allow tasks to be set from Wiener Neustadt east to the plains of Hungary or into the hilly terrain to the north and northwest, into flat terrain to the south or into the high mountains to the west. Due to the topography of the area it's possible to find completely different weather conditions in a fifty mile radius. The first lower mountain (3000 feet) is located approximately 15 km west of the airfield. It usually provides good thermals and is used as a stepping stone to get to the first higher mountain (6000 feet) which is approximately 30 km west of Wiener Neustadt. On days when tasks are set into the high mountains, a crucial fact will be how quickly a pilot gets past this mountain (Schneeberg).

After the passage of a cold front, the cloudbase will be too low in many cases to fly in the high mountains. On these days tasks will be set in the flats either to the northwest or southwest. Once a high pressure area develops over the Alps, conditions are expected to be very good with an early start of convection, average thermal strength up to eight or nine knots, cloudbase 10,000 feet or more. The air north of the main ridge is very clear under those conditions, and under the influence of high pressure it is quite common that clouds dry up very quickly but conditions remain excellent in the blue.

Flying in the Alps is Different

Lift   As in any mountainous region, the Alps provide three types of lift: ridge lift, thermal, and wave. Contrary to what is generally assumed, ridge lift is not the major source of lift. For cross-country flights, thermals are mainly used with support from ridge lift during the weak hours. Unlike the plains, thermals in the mountains have very narrow and strong cores and can be quite rough. In order to understand how thermals come off a mountain, one has to picture how the flames are coming off of a pile of logs in a fireplace. The warm air rises up the flanks of the mountain and comes off as a thermal wherever it cannot follow the contour anymore (ie. knobs, rocks, etc.). If a mountain does not have such protrusions it is very difficult to catch a thermal below mountain top. In general, whenever possible one will try not to sink below the tops. Since thermals are rough, particularly on the lee side of a mountain, special care will have to be taken while thermalling close to the rock faces. It is advisable to maintain an airspeed of ten to fifteen knots above regular thermalling speed in order to ensure sufficient aileron effectiveness. It is not uncommon that gliders get turned completely upside-down by a strong gust in such thermals.

Navigation   Peter and I went through three sets of maps, all in different styles, and still had problems with navigation. I saw the Czechoslovakian team bring a three-dimensional model of the Alps out to the grid before take-off to allow their pilots to study the course and memorize the shape of the mountains on course. The major problem in navigating from a map lies in the fact that the map provides a top view of the terrain, while the pilot gets a sideview of the mountains. It is also impossible to look into the valleys for roads, railways, bridges, etc. unless one is directly above the valley. Once the terrain is known, use of a map is not necessary anymore because the pilot can determine his position quite precisely by just looking out for the major landmarks (mountains) at any time.

Off-field Landing Possibilities
It is clear that in such rugged terrain, off-field landing possibilities are scarce. Interestingly, the situation is better in the high mountains than in the foothills. The wide valleys in the high mountains are well cultivated and usually provide enough room for safe landings. The foothills look quite flat and landable from a 6000 foot prospect; however, down at 1000 feet the steep grades of these hills and the very narrow valleys become apparent. The best bet in this type of country is to land on cultivated hilltops. Eugene, a friendly Austrian pilot, undertook to mark all landing sites known to him on a large wall map. This was very helpful as long as the pilot in trouble knew his position in relation to the nearest off-field landing site.

Dangers

There are two major sources of risk every pilot flying in the Alps should be aware of:

- First, being pushed into a mountain face by a sudden gust while thermalling or flying close to the rock. A good friend of mine, with over 1000 hours of experience in the Alps and Barron Hilton Cup winner, lost his life this way.
- Second, power and transportation cables. Since the Alps are well-developed, there are numerous cables standing in valleys and going up from valleys to mountain tops. The most dangerous are unmarked, uncharted, temporary cables put up by farmers to supply construction sites. One of my friends had a very bad accident when his Libelle struck such a cable, but survived. Others have not been so lucky.

On a positive note, there is no danger of flying in large gaggles because it is impossible to spot gliders over a distance of more than two or three kilometres against the background of snow-covered mountains. During the entire contest I never saw more than five or six gliders together once we had passed the first few mountains.

Budgetary Considerations

It is well known that prices are rather stiff in Europe. Here are some examples of current costs for budgetary planning of prospective world championship competitors:

- Glider rental - $800 per week
- Accommodation - $40 per room/day
- Aerotow - $32.40
- Gasoline - 80 cents per litre
- Dinner $15.00

The Contest

Day 1

Weather situation — A low over upper Italy (Adriatic Low). Strong high to the NE over Russia. Adriatic lows are very bad news for glider pilots in Austria and southern Germany because they tend to have a potential for hanging around for several weeks. This particular low had already been dominating the weather for more than two weeks and the only changes were caused by the low filling sometimes and then again deepening.

The task was a 432 km triangle westwards into the high mountains — first leg to the WNW, second leg to the SE crossing the main ridge of the Alps, third leg to the NE. All three of us started within three minutes of each other and set out to fly the first leg. Conditions were good, although mostly blue with only one snag — it was impossible to climb to a comfortable altitude over the mountain tops.

We made good speed along a wide east-west valley and then proceeded to the NW toward the first turnpoint (TP). By that time, Peter had managed to get roughly 20 km ahead of us together with a group of locals. The TP, surrounded by some 7000 foot high mountains, is known as one of Austria's worst sink holes. By the time we arrived, some of our competitors were already in trouble, scraping around way down in the valley.

After we had rounded the TP, Harry and myself tried to reach the mountain that had given us the last thermal. However, we stumbled into a lee flow and lost several thousand feet in a couple of minutes. While I had still enough height over the valley for a relatively easy recovery, Harry had to sweat deep down in the valley for quite a while until he found a strong thermal that carried him back up to working altitude.

The second leg became increasingly difficult since we had to fly into the wind. Thermals were very broken up and rough and more than once we got caught in strong lees. Peter notified us that he was landing out approximately 40 km ahead. After some hard work we reached a mountain chain that is known to provide good thermals under similar weather conditions. Warned by Peter's mishap, we made sure to arrive well above the tops of this chain in order to safely catch the first thermal.

Much to our surprise, there was not only no lift, but very strong sink which got even stronger as we sank below ridge top pressing on to get out of the sink. Fifteen minutes later and 20 km further, we found ourselves low above the ground of the valley. The slope angle of the valley was apparently less than best L/D, therefore our landing was imminent. In the maze of the railway cables and power lines I spotted a field with a reasonably clear approach and decided to make this my landing field. About two minutes after I had touched down, Harry was on the ground in the same field as well.

Having reached a marking distance of 279 km, we had initially flown ourselves to position 25 on the scoring list of 32 competitors. After evaluation of the TP photos we were moved up to 21st. Later discussions with local pilots offered rotor downwash falling on the ridges as only explanation for this unexpected and persistent sink.

The next three days fell victim to the Adriatic Low.

George Dunbar

Jörg strapped in and ready to go.

Day 2

Weather situation — Adriatic Low bringing in very moist air in the upper levels. High to the NE, air mass boundary roughly over Wiener Neustadt airfield, a third dry air mass lying approximately 100 km to the NW. Development of thunderstorms were expected in the mountains early in the afternoon.

The task was a 278 km quadrilateral, first TP to the NW in the northern foothills, second TP to the WNW, third TP to the south of Wiener Neustadt, again in the eastern foothills. There was no need to fly into the high mountains, but speed was required in order to beat the thunderstorms expected for the early afternoon.

Harry had a marvelous flight in the early stages of the storm development which brought him in ninth with 931 points. Peter had a navigational problem and flew past the first TP and lost so much time that he nearly got cut off by the overdevelopment. He rounded the last TP in rain and managed to reach the field in a tight final glide. Myself, plagued by a nasty cold and navigational problems, I got low twice and lost so much time that I got cut off at the last TP by rain and was unable to finish the task.

Day 3

Weather situation — same as day 2 but even more of a tendency to overdevelopment early in the day. The task was a 231 km triangle: first TP to the SW at the southern foothills of the mountains, second TP to the NW in the northern foothills.

We started as early as possible but had to fly through a rain shower immediately after the start gate. Fortunately, to the south of the shower, we managed to pick up a strong thermal. In order to avoid overdevelopment in the mountains to the NW we detoured to the south and then approached the first TP from the east. The conditions were reasonable with three to four knot lift. After rounding the TP, it got rather tricky because the direct way to the second TP was across the mountains. It was completely blocked by thunderstorms which forced us to stay in the plains and detour to the east. We had to carefully pick a flight path avoiding developing showers and also avoiding treacherous blue holes over wet ground. Working our way carefully to the north along the eastern flanks of the high mountains we found ourselves finally confronted by a massive wall of heavy showers which was impassible. We picked the only option left under these conditions and chose to make a final glide into Wiener Neustadt without having reached the second TP. All other competitors of our class did the same except for a few who had already landed out.

Day 4

Weather situation — After having endured four more rest days, which taxed our patience to the utmost, the dreaded Adriatic Low disappeared and a cold front swept through the area with stiff northwesterly winds. Low cloud made flights into the high mountains impossible. Accordingly, a task in the plains was called: 255 km triangle, first TP to the S, second TP to the NW.

I started a couple of minutes behind Harry and Peter in moderate conditions of approximately two knot average lift. For a while, I followed a cloud street, which unfortunately ran at an angle of almost 30 degrees to the east of the course line. West of the cloud street on course line, everything was completely blue and a slight haze seemed to indicate a different air mass to deal with. In order to reach the TP, I had to finally leave the cloud street and fly into the hazy and quite stable air. A navigational error caused me to fly some 20 km extra but I rounded the TP without major difficulties, flying very conservatively and trying to stay high.

Right over the TP I picked up a weak thermal and was joined by a number of other competitors. I was faced with the choice to either fly directly on course north in the blue and hope for better conditions in the mountains or to fly back east to reach the still good looking cloud street and follow it to the north. Justin Wills (UK), the superior pilot of the contest, and Harry chose the first option. Peter, myself, and a gaggle of mainly Open class ships selected the second. Conditions were difficult, but manageable above 3000 feet agl. Peter got too low and landed out. Once I reached the cloud street, everything went well until about 35 km south of Wiener Neustadt where the entire area was shaded by an overcast.

Gliders landed everywhere and I had no choice but to ridge soar some foothills near Wiener Neustadt. While I patiently waited for the clouds to break up, watching a soccer game going on 500 feet below me, I picked up a radio message from Harry saying that he had rounded the second TP but had no hope of getting up again.

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TOTAL ENERGY COMPENSATION

Rudolf Brozel
from Soaring Pilot

The following article is a summary of conclusions drawn from theoretical work over several years, including wind tunnel experiments and in-flight measurements. This research helps to explain the differences which exist between the real response of a total energy variometer and what a soaring pilot would prefer, the ideal behaviour. This article will help glider pilots better understand the response of the variometer, and also aid in improving an existing system. It is suggested that the reader will understand the semi-technical information better after the article is read the second or third time.

The Influence of Acceleration on Sailplane Sink Rate and the Variometer

Astute pilots may have noticed when they perform a normal pull-up maneuver as they might to enter a thermal, the TE (total energy) variometer first indicates a down reading, whereas the non-compensated vario would rapidly go to the positive stop.

One would expect the TE variometer to not move at all. Many pilots interpret this phenomenon as an error of the TE compensation device and proceed to install further devices, or to begin shortening or lengthening tubes and/or tubing in an attempt to trim the system to remove this initial down indication. On the contrary, if your variometer does not show this initial down indication, your total energy compensation is not working properly!

When you perform a pull-up maneuver, the lift of the wing must carry the weight of the glider, as during an un-accelerated, steady speed glide, but also must induce the additional force to accelerate the glider upward. Lift becomes $n \cdot w$ where n is the load factor and w is the weight of the glider. This increased lift also causes increased drag. The additional drag consumes additional energy. The increased energy loss rate can only be fed from the glider's stored potential energy which causes the glider to sink faster, or climb slower than it would have without the acceleration. A total energy variometer must register this additional energy loss, therefore the down reading.

A TE variometer doesn't indicate vertical speed, but the rate of change per unit of weight, therefore its name. It measures the variation of the glider's *total* energy, which is the sum of potential energy (proportional to altitude) and kinetic energy (proportional to the square of velocity). Its indication can only be regarded as being equal to true vertical speed in the case where kinetic energy does not change, in other words: where the absolute value of velocity (airspeed) remains constant. On the other hand, a non-compensated vario will measure the rate of change of potential energy alone, which means the rate of change of altitude, or true vertical speed, independent of whether the glider's velocity changes or not. Conclusion: the two types of varios do indicate the same only if the glider's airspeed does not change.

If you have your glider shoot up on a straight trajectory ascending at an angle of fifteen degrees at a speed of 82 knots, you will climb at a vertical speed of more than 20 knots. This rate of climb will be indicated by the non-compensated altitude variometer, whereas the TE variometer will indicate the actual rate of climb corresponding to the decreasing actual velocity, and according to the glider's performance polar, for instance, -4 knots at 82 knots in calm air. Both varios would have the same indication flying at a steady airspeed.

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The effect of acceleration is also present when spiralling. The glider has to be constantly accelerated towards the circle's center (the velocity's direction changing constantly). The additional force required during a turn demands greater lift, which also generates more drag, which increases the energy loss rate of the glider, and thus increases the sink rate. Every glider pilot knows this effect, and takes it into account when spiralling in a thermal.

When pulling up, the same phenomenon occurs, only its effect on sink rate is not directly evident as in the case of spiralling. This is so because the effect is not so noticeable to the pilot because it is swamped by the large true vertical speed, the latter being caused by the inclination of the trajectory, and being much greater than the glider's proper sink rate. However, the energy loss is still there.

The effect of normal acceleration during the pull-up maneuver will not be discernable on the non-compensated variometer. However, it is easily seen on the TE variometer if it is well compensated because the part of the vertical speed which is due to the trajectory's inclination is compensated out, and the part due to the energy loss caused by the increased drag is still indicated. During actual pulling where the load factor is high, the additional sink rate exceeds the glider's polar sink by a significant amount. Therefore, it becomes clearly visible on the TE vario.

Conditions are inverted in a push-over maneuver. As long as the aircraft remains on a trajectory curved downwards it will be accelerated towards the ground and the load factor becomes smaller than one. Lift is reduced and also drag, and consequently the energy loss rate. The sink rate indicated by the TE variometer decreases as the glider follows its curved trajectory. It can approach zero sink rate in the case where one follows a parabolic trajectory near zero 'G', calm air being assumed.

The affect of normal accelerations (load factors) on the sink rate of the ASW-19 follows (for other gliders, the effect is essentially the same):

- The normal sink rate will double when pulling up at 1.5 G at a speed of 44 kts, or when flying at 48° bank angle at the same speed. Upon pulling even more, the flow around the wing will begin to separate.
- Pulling to a load factor of three at a speed of 61 kts will multiply the sink rate by a factor of four!
- At 122 kts, one can pull as much as one can stand. This will have nearly no influence on sink rate and/or TE indication.
- At 39 kts, you can reduce the sink rate by one half by pushing to one half G.

Total energy compensation does not absolutely eliminate the effects of pulling and pushing. To the contrary, it really only shows the accompanying energy losses. What it eliminates is only *the vertical component of velocity due to the inclination of the trajectory,* or the effects of the exchange between kinetic and potential energy as a consequence of the inclination of the trajectory.

This state of affairs should be kept in mind when indulging in accentuated dolphin flight or following the speed command computers. One should not attribute the sometimes powerful negative excursions of the TE variometer to a poor TE compensation, but to one's own too-rough style of piloting. Be gentle on the controls to give more useful variometer readings.

The Role of Turbulence

As we have seen, the TE variometer measures the rate of change of the total energy of the glider. The pilot normally thinks in terms of gain or loss of altitude as it happens in a thermal or downdraft area. Unfortunately, there is another kind of influence on total energy imposed by the atmosphere: the gain or loss of kinetic energy by a sudden increase or decrease of the aircraft's velocity with reference to air by horizontal gusts or wind shear.

Every pilot knows this effect and also knows that after the impact of a long-term gust, he can either pull up to gain some altitude, or push over to gain speed. In the process, he either gains or loses altitude, which means energy. If you watch closely, the TE variometer will jump up or down as the glider passes through such a gust, indicating a gain or loss in the total energy available to the glider.

This jump in "energy" is seen by the variometer exactly the same way as if the glider had made an equivalent jump in altitude at constant velocity, because the TE variometer cannot discriminate between the two sorts of energy change. Expressed in mathematical terms, this jump is:

$$dH = Vdv/g$$

where: g = gravitational constant
dH = height change
dv = velocity change from gust
V = glider velocity at moment of gust

We observe that the jump registered is proportional to flight velocity. How large are these disturbances in reality? In order to answer this question we have to determine the magnitude of the disturbances in velocity. There are good physical reasons to suppose that the horizontal component of turbulence is of the same order as the vertical component. This means that we will have to consider typical horizontal gusts as high as 10 kts.

If we assume a horizontal airspeed of 83 knots and use the formula above, we arrive at the most astonishing value of ±60 feet for a ± 10 fpm gust. Depending on its response speed, the variometer will make a large but short duration, or a smaller but longer duration bounce. A moving vane variometer with a time constant of three seconds will jump about 15 feet per minute and then descend to its original indication in about six seconds.

This phenomenon is a basic property of TE compensation. There is no remedy against it. It is absolutely independent of the type of measuring principle the instrument uses (compensation by aero-dynamic probe, membrane, electrical compensation, moving vane, pressure transducer, or flow sensor types).

One can only try to obtain an indication as calm as possible by optimizing the time response of the instrument. Variometers with second order gust filters are superior for this purpose to the more common first order filters. Second order filters "tranquilize" the response without increasing the delay of the signal as do first order filters. Increasing the time constant of a first order filter will increase the damping of the disturbing pulses, however at the price of an increased signal delay. A large signal delay is very unfavourable for thermalling because one has to mentally transpose the signal back in time. Many soaring pilots have modified their instruments with these filters and wrongfully think they have improved their signals.

Generally speaking, we will have to live with the disturbing effects of horizontal gusts as there is no means to prevent them. One good way is to learn and understand them in order to be able to deal with them. Attempting to filter gust "noise" with damping (time constant) will cause you to pay heavily in the form of increased signal delay. Pulses in the TE indication induced by horizontal gusts are generally the same magnitude as the strength of the thermals; strong thermals are accompanied by strong interference.

You can distinguish between a jump in airspeed caused by a gust and penetration into an up or downdraft. In the first case, you will not notice a change in vertical acceleration (no seat-of-the-pants feel), but an up or downdraft will easily be noticed. However, the two events are usually coupled. This has its problems, but its advantages also. Not every pulse is caused by that alone; quite often it marks the beginning or end of a thermal. This might be the reason why most glider pilots have not noticed the difference. The pilot who flies in the mountains or does ridge soaring will certainly have noticed the phenomenon.

When thermalling over flat terrain, one will notice in about 90% of all thermals (if one observes carefully) that the TE variometer shows two maxima and two minima for every circle flown. (You need a reasonably fast variometer for this. An instrument that has been slowed down with capillaries or the like may calm the pilot, but it will hide the real state of affairs from him. The fast competitor with good instrumentation will know better, and centre thermals quicker.)

Horizontal turbulence has another disagreeable influence on the output of the vario. Sudden movements of the air perpendicular to the aircraft's direction of flight will make the glider sideslip through the air. One could argue that a good pilot would be able to react to that and reduce this sideslip. This is wrong because he needs time to recognize and eliminate it. This is also true of vertical gusts.

The glider's pitch stability is very strong, and the glider will vigorously eliminate disturbances to its angle of attack. Yaw stability, however, is comparatively very small, therefore, disturbances last longer and affect the glider more.

If the TE probe is sensitive to sideslip, this will cause a change in TE pressure which the variometer will indicate as a change in energy. The largest angles of turbulence-induced sideslip occur at slow speeds as in thermalling. You can expect slips as great as fifteen degrees! Only the best TE probes can handle this. It must be added that the problem is much more difficult to solve in the case of electronic TE compensation because of the sensitivity to slip is ten to twenty times that of a good aerodynamic probe, not to mention static ports on the fuselage which will most likely be much worse.

Testing a Total Energy System

There is one simple and reliable method of testing, namely the test on a straight and inclined trajectory. A well-known method using two airspeed indicators is a dangerous one as static pressure errors may lead to errors in the pressure coefficient measured for the TE probe of up to 50%.

The test method is as follows:

1 Use calm air (early morning).
2 Fly the airspeed of minimum sink, or minimum speed plus five knots for ten seconds.
3 Push steadily until reaching a 10 to 15 degree nose-down attitude. The G-meter should indicate 0.5 – 0.2 g. Dust should remain on the floor of the cockpit.
4 Maintain pitch angle by observing horizon and gently acting on the stick.
5 Pull back before reaching Vne, and bring the nose to 10 to 15 degree nose up attitude.
6 Maintain pitch angle until reaching minimum speed.

Observations

During phase 2, the variometer must indicate the aircraft's actual minimum sink.

While pushing over (phase 3) the vario must climb to near zero because of the load factor being smaller than one. If your TE probe is far aft of the center of gravity (on the tail or fin), the positive excursion of the vario is increased by the effect of the longitudinal air column between vario and the probe. This latter effect becomes stronger with the length of the air column and with the change in pitch angle. The effect of the air column is rarely stronger than about one knot, meaning that the total reading should not exceed about +1 kt. Damping of the vario's response leads to a reduction of the pointer's movement, however, it will also cause the duration of the response to occur over a longer period of time. Thus, one will hardly notice the difference with a slow vario.

In phase 4, airspeed will linearly increase with time. Parallel to this, a well compensated variometer must indicate the proper sink rate corresponding to the actual airspeed indicated (the glider's sink rate increase with airspeed). One must take into account the signal delay by the time constant of the variometer's response. For a moving vane mechanical variometer with a time constant of three seconds, this would be an advance of about 16 knots of airspeed signal with reference to the variometer signal in a dive of 15 degrees! Therefore, you should fly a gentle slope for slow variometers.

When recovering at the end of phase 5, the load factor should be about two depending upon the type of aircraft and the airspeed, you may see a more or less important deflection of the TE variometer in the negative direction. (There is an amplification of the effect of the longitudinal air column, however, it is less marked than when pushing over.)

In phase 6 the polar is run through in the reverse direction. When the average of the readings in phases four and six corresponds to the polar, the compensation is perfect for flight without sideslip.

One should carry out a number of flights with varying pitch angles in order to get a good picture. For better correlation between airspeed and variometer, one can note the polar sink rate on the glass window of the airspeed indicator with a felt pen. The numerical values mentioned above are valid for modern high performance sailplanes. For older sailplanes and trainers, somewhat smaller values should be taken.

Testing the Influence of Sideslip on TE Compensation

All methods of compensation suffer from the influence of sideslip to varying degrees. It is practically impossible in a strong thermal to maintain a severe sideslip angle. If compensation is sensitive to sideslip, then it will generate disturbances which can span the range from simple nervousness of the variometer indication to strong deflections.

Insensitivity to sideslip is an important criterion for good compensation. You can check your compensation by yawing the glider to induce a sideslip of at least 30 degrees for at least three seconds and then straightening (without haste) to streamlined flight while maintaining a steady airspeed. The TE variometer should indicate the correct increased sink rate polar of the severe sideslip and the proper polar for streamlined flight. The variometer indication should be smooth while the transition from slip to streamlined is made.

Influence of Angle of Attack

Longitudinal stability is very great and the angle of attack, therefore, remains constant within reasonable limits. The change of angle of attack due to turbulence or intended flight maneuvers is only a small problem except when one uses a poor source of static pressure in the case of membrane systems or electronic compensation. Unfortunately, there are at best only poor sources of static pressure.

When using a good TE probe there is normally no problem with angle of attack, as long as the probe is mounted at right angles to the longitudinal axis of the glider and at a correct location. TE probes are best mounted high on the vertical stabilizer parallel to the aft fuselage cone.

Influence of the Elevator

There can be an influence on the vario in cases where the TE probe is mounted ahead of the elevator. If the probe is very short, or if it is very sensitive to angle of attack changes such as the older venturi type probes, then the elevator will cause a pressure change via the probe.

The pressure field in front of the horizontal tailplane is rather far-reaching. Therefore, the local static as well as dynamic pressures will vary with elevator deflections. Cg position, airspeed, and load factors also influence the pressure field forward of the horizontal tailplane. Note that only during, and shortly after a change in elevator setting do these interferences occur. You can test interference by the elevator by rather strong reactions of the variometer in both directions when successively pulling or pushing at moderate speeds. When pulling and pushing in a rapid sequence, the variometer may well deviate downwards but not upwards over the zero line.

The remedy for these problems is to mount the probe further ahead of the horizontal tailplane with a longer probe that is less sensitive to angle of attack. The head of the probe should be exactly in line with the plane of symmetry of the tailplane. Vertical distances of half the depth of the horizontal tailplane are very bad!

TE Probes on the Fuselage

The fuselage creates a very strong pressure field around itself which will seriously disturb any pressure probe in its vicinity. This is so even in clean straight flight without any sideslip. Conditions become even worse during sideslips or accelerated flight. An estimation of errors created is quite difficult because the airstream pattern around the fuselage is very complex and naturally different for every type of glider. Some general precautions:

- Avoid the area near the wing. The further away, the better.
- The measuring head of the probe should be as far away from the fuselage as possible – as a general rule of thumb, at least a full diameter of the fuselage at the mounting point.
- Avoid the region between the wing and a projected line to the trailing edge of the horizontal tailplane (in the case of a T tail). At low speeds, this region is very turbulent and will affect a probe severely.

As you can see, there remains very little space for a good position of the TE probe on the fuselage. By contrast, the position on the fin in front of the horizontal tail is relatively problem-free.

Further Disturbing Factors

The influence of load factors and turbulence on the proper sink rate of a glider is something we can do nothing about. We will have to learn to live with them.

Other influences are errors stemming from the complete measuring system proper, errors which could be eliminated by a more perfect, but complex, system. It can be said with justification that the more serious errors can be attributed to aerodynamic phenomena induced by the aircraft itself, and to the tubing.

Many of these pneumatic measuring errors are very difficult to get hold of because they depend on several influences at the same time. Fortunately, they are generally weaker disturbances of the TE compensation which one will only notice with a very perfect system.

Mutual Interference Between Varios

If more than one variometer is being supplied from one TE probe or static source, some caution should be applied. The varios can react with each other, or other instruments producing responses different from normal. This can be particularly so where large air volumes (flasks, or so called gust filters) are involved in the system. It is possible that the initial response by a variometer is actually reversed in this manner. You should absolutely avoid restrictions of the airflow in ducts common to instruments, like capillaries, sharp corners, or manifolds forming jets of air.

As a precaution, you should first install one instrument and flight test to measure its response, then add another instrument and perform another flight test to see what affect might have occurred to the first one in any way, and if the second instrument also functions correctly.

Normally, a modern instrument such as the ILEC variometer with a very small built-in capacity will function very well side by side with a mechanical variometer with a flask volume of 0.45 litres.

Quality of Compensation

- There is no perfect compensation.
- If, during phases 4 and 5 of the test, the average sink rates stay within a band of ± 0.4 kts of the polar sink rate in the speed range up to 83 knots and if sideslip and elevator influence tests are okay, one can qualify the compensation as being excellent. Not many systems are as good as that.
- If the deviations are smaller than one knot, and the other tests are not too bad, you have a good system. You will be very happy with this as long as you avoid a rough style of flying.

TE Compensated vs. Non-compensated Variometers

In modern soaring, one cannot really do without the TE variometer for the purpose of looking for usable lift and for adjusting airspeed during the cruise phase of flight. In both cases the pilot does change airspeed quite a bit. A non-compensated variometer would always be at the end stops during these exercises.

Yet there is one situation where the non-compensated variometer's quality of not being disturbed by horizontal gusts is a definite advantage. In rough thermals where the horizontal disturbances can be nasty indeed the non-compensated variometer will deliver an astonishingly quiet signal, whereas the TE variometer may give an output hardly to be interpreted by the pilot. It is worth a trial.

Observing both a non-compensated and a compensated variometer at the same time can bring some good information as long as they show the same climb rate, there is a real thermal. If the TE variometer only shows something and the non-compensated variometer doesn't move, there is probably only a horizontal gust (constant airspeed assumed). When only the non-compensated vario moves, then the glider is simply changing airspeed.

With a little experience, having both types of variometer may well be a bonus. □

BOUNDARY LAYERS

Should We Suck or Blow?

Mike Cuming
from SAILPLANE & GLIDING

With the possible exception of "Stability and Control" (a subject so recondite that even the pundits skirt round it) there appears to be no technical topic more misunderstood and argued about than the boundary layer which surrounds an aircraft. Indeed, the subject of boundary layers may be said to generate quite some turbulence in gliding circles! In this article, I seek neither to attack nor defend the poor old boundary layer, but rather to explain it away. The concepts and figures I offer are largely cribbed from standard texts; the errors and omissions are entirely my own doing.

The first point to make is that the viscosity or "stickiness" of the air causes it to be slowed down as it slides along a surface. In fact, the air molecules actually touching the surface (say, a wing) remain stationary on that surface; these stationary molecules then retard the next molecules out, and so on. This is usually illustrated by a picture which looks something like Fig. 1, from which we are expected to see that there is a wind gradient close to the surface. In principle, this gradient continues until we are infinitely far away from the surface concerned; in practice, 99% of all airspeed changes occur very close in. This practical point conveniently allows us to think of a boundary "layer" and a separate "outer" airflow and yet still get a good picture of what is actually going on. The boundary layer grows as we move downstream along the surface and so we can see that the absolute size of the boundary layer will depend upon the length of the surface giving rise to it. The layer will typically be a 1 /4 or 1 /2 inch thick at the trailing edge of a sailplane wing, but six or seven feet thick at the rear of an airship — and dozens of feet thick over the ground.

Boundary layers may exist in either of two forms: **laminar** or **turbulent**. In a laminar boundary layer the flow is smooth, the thickness of the layer grows only slowly, and the drag due to skin friction is low. By contrast, the flow within a turbulent boundary layer is, as the name suggests, a chaotic jumble of eddies — leading to more rapid growth and significantly higher skin friction drag.

A laminar boundary layer can exist only for a short distance, however, so it is usual to find that the laminar boundary layer at the front of a body degenerates to a turbulent form some way downstream. This change from laminar to turbulent is called transition and is not reversible — like many other good things, once you've lost it, you can't get it back! Predicting the exact spot at which transition will take place is one of the oldest black arts in aerodynamics: it depends upon a great many variables and — even with today's (1988) powerful computers — the sums involved can still be solved only approximately. On older gliders (and most powered aircraft) it is common for transition to occur fairly far forward on the wing — around 10% or 20% of the way aft from leading edge to trailing edge, while modern sailplanes manage to delay it perhaps as far back as 70% of the chord on the wing, and almost as far aft as the wheel on the fuselage.

Note that "turbulence" as in atmospheric gusts, or the airflow behind a blunt body (eg. a truck, or a stalled wing) is not the same as a turbulent boundary layer. The only thing the two have in common is the word "turbulent" — implying the presence of eddies, large or small.

Transition is prompted by roughness of the surface (including dead flies and water droplets), by small-scale turbulence in the oncoming air, and particularly by any sudden rise of local pressure — such as exists behind a step, or near the front on the upper surface of an old-style aerofoil section (see Fig. 2 for an illustration of this). A rise in local pressure (known as an "adverse" pressure gradient) occurs whenever the air slows down, and it is inevitable that there must be some point on each aerofoil surface where, after having accelerated to get past the thickest bit, the air must begin to slow again. This is where the adverse pressure gradient begins. Too much adverse pressure gradient and the boundary layer can no longer cope and goes turbulent. Even more adverse pressure gradient (such as behind an open airbrake or in the lee of a steep hill) and the boundary layer gives up altogether and **separates** entirely from the surface. When the boundary layer separates due to too much angle of attack, we say that the flow has stalled. More about separation later; at the moment, we're still looking at normal "attached" flow.

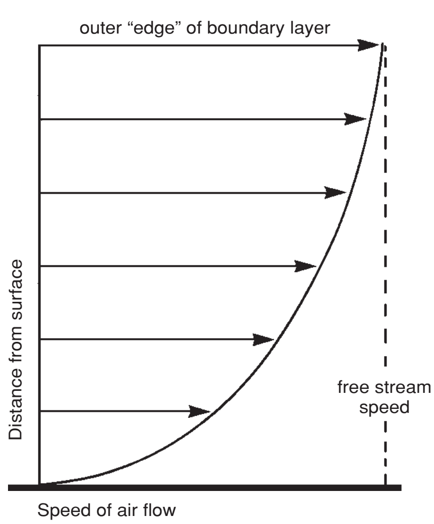

Figure 1 How speed of air varies within the boundary layer next to a surface.

From a practical gliding point of view, what is important about laminar and turbulent boundary layers is that turbulent boundary layers make much more drag. This is because of all the energy they consume in stirring up the turbulence that exists within the turbulent layer. A stretch of turbulent boundary layer will be 10 or 20 times as draggy as the same stretch of laminar flow. There is, therefore, a strong urge to keep the boundary laminar for as long as possible — on the wings, on the fuselage, and even on the tailplane and fin. Every bit helps. We find, therefore, that the designers of tomorrow's sailplanes use every means at their disposal to save that laminar flow, by using super-smooth glass and carbon fibre finishes to minimize the surface roughness and cut out any steps or notches, and by careful aerofoil selection to delay transition as long as possible.

Fig. 2 shows, for comparison, a typical old-style aerofoil section along with its characteristic pressure distribution, and also a newer "laminar" section with its different form of pressure distribution.

From this we see that the crafty designer has pushed the position of peak suction a long way aft (especially on the upper surface) in recent years — with a correspondingly large reduction in skin-friction drag from the now predominantly laminar boundary layer.

There are snags, however, for although the laminar boundary layer is vastly preferable to a turbulent one, yet laminar layers are more prone to complete separation — which is even worse than a turbulent layer. If this is discovered to be a problem with a particular aerofoil then it is now common to "trip" transition just ahead of the point where the laminar boundary layer would otherwise separate — giving rise to a turbulent layer which does at least have a better grip. Common devices for tripping transition are tiny air jets or, more simply, roughened patches on the skin; all these are generically referred to as turbulators. Turbulator tape ("zig-zag" or "bumpy" tape) has the advantage that it can be applied to the problem area — assuming that a problem has been found to exist, and that the exact location of the problem is known — and, of course, it can be moved around for testing purposes.

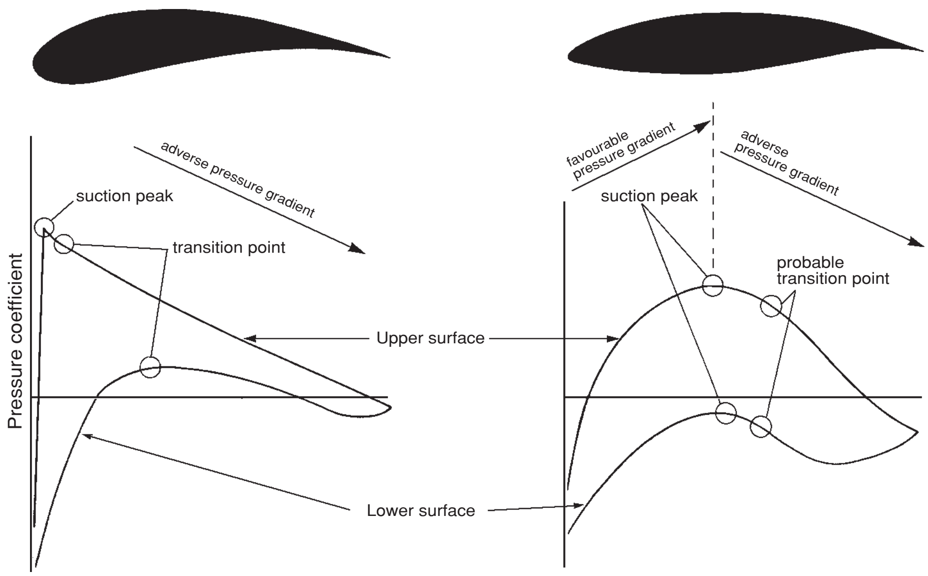

Figure 2 "Traditional" and "laminar" aerofoils and their pressure distributions.

Several questions concern the applicability of these turbulator tapes, and so here are a few simple guidelines. Turbulator tapes could probably be profitably applied immediately ahead of all control surface hinge lines; this will not give any performance benefit, but may just improve the handling a trifle (this would include both sides of the fin and both sides of the tailplane, and only the upper surface ahead of the ailerons to try and delay tip stalling in tight turns). These remarks apply more or less equally to all gliders. Of relevance only to plastic gliders, the random application of turbulator tapes to the entire wing lower surface is more likely to cause a worsening of performance than anything else, while the random application of such tapes to the upper surface may offer a small reduction in stalling speed, at a probably small glide angle penalty. Any application without systematic testing is random. This "taping" is not the same as sealing control surface gaps — which should be done to all control surfaces (taking care of course to ensure the continued free and uninterrupted use of those controls). Sealing of ailerons in particular can be expected to improve the slow speed handling, while sealing of the elevator or flaps ought to help the climb.

The fact that roughness can be used deliberately to provoke transition reminds us, however, that unintentional (and unwanted) roughness may have precisely the same effect. Thus, a poorly finished wing, or one with a lot of bugs or ice on it, will lose out significantly on performance owing to premature transition and higher skin-friction drag — assuming the wing was designed to be "laminar" in the first place. Clearly, the effect of surface roughness will be much less on older wing sections, which have little laminar flow to lose.

Now let's look at what happens to the pressure distribution and to the transition point as we vary the angle of attack. This corresponds to flying faster (lower angle of attack) or to flying slower, pulling g, or just turning (all requiring higher angle of attack) — as shown in Fig. 3.

We can see from Fig. 3 that, as we increase the angle of attack, the upper surface suction increases and the point of maximum suction moves forward. The rising pressure area thus begins steadily further forward, and so more and more of the laminar boundary layer is lost as transition creeps forward on the upper surface. On the other hand, the transition point moves forward on the lower surface when we go to lower angles of attack, such as on the high speed dash to the next thermal, with a corresponding loss of lower surface laminar flow as we accelerate. It follows that the special laminar properties of "laminar-flow" aerofoils are available only for a certain range of angles of attack (or range of speed).

As we continue to increase (or decrease) the angle of attack, not only does the drag rise as a consequence of earlier transition, but also the boundary layer downstream of the transition point gets a rougher and rougher ride on its way to the trailing edge as it has to negotiate a progressively greater and greater pressure rise on its way there. Finally, of course, we reach a point where — even with the added grip of a turbulent bounday layer — the flow separates entirely from the surface, the drag rises even more rapidly and the lift starts to fall off. The wing has begun to stall. The onset of this condition can be detected very early by pressure probes (so-called drag monitors) just behind the trailing edge or just off the wing surface: if extreme, the buffeting of the turbulent flow in the region of separation gives the game away.

The average pilot commonly waits until he can actually feel the buffeting of the turbulent separated flow (either on the wings, the wing/fuselage junction, or when the wake hits the tailplane in some gliders) but this is always too late in terms of efficient flying. Aside from the considerations of staying within the best bit of any thermal — which override all else — the pilot ought, therefore (all other things being equal), to keep the glider flying at such an angle of attack that the laminar flow is preserved as much as possible. This almost always means flying faster than instinct dictates.

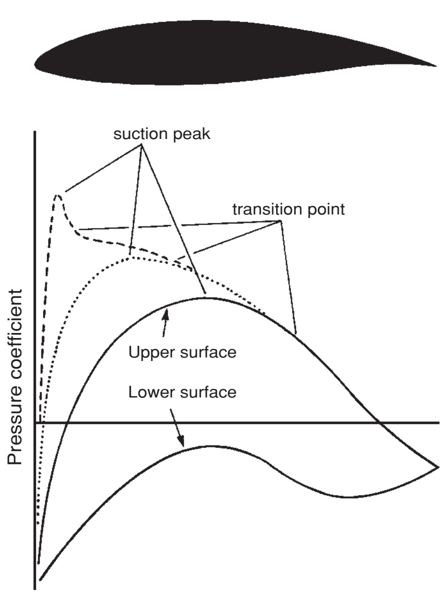

Figure 3 Laminar aerofoils – showing how upper surface pressure distribution varies with the angle of attack at low airspeed (or high g).

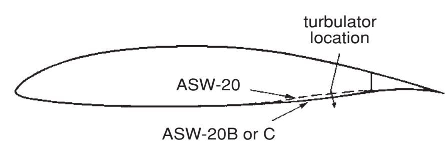

Figure 4 Change in the ASW-20B or C aerofoil from the ASW-20 to extend the laminar flow on the lower surface.

On the subject of flying fast, let's look at an actual example of a production glider which has been modified to provide better high-speed performance with no loss (and a probably slight improvement) at slower speeds. The example I have chosen is the ASW-20, whose designer Gerhard Waibel decided to thicken the section aft of the middle by using a new lower skin and so obtain longer laminar flow there. Fig. 4 shows how the later wing section compares with the early version, and the extended "flat" portion of the lower skin did indeed have the effect of preserving the laminar flow — an improvement from transition at about 55% to later transition at around 70%. Having thickened the middle/aft of the section, however, he was obliged to increase the curvature of the lower skin ahead of the flap, in order to use the same flap for both ASW-20 and -20B. This was fine at most conditions, but whenever the wing worked at very low angles of attack, the combination of unfavourable pressure gradient and low-grip boundary layer caused complete separation just ahead of the flap on the lower surface. This wasn't catastrophic, since the flow subsequently "re-attached" (in turbulent form of course) when it ran into the flap a little further downstream. There was, however, a region of separated laminar flow in that

continued on next page

little hollow which gave a worse drag penalty than the original saving had been! The solution was to install a small pitot tube to collect air in a chamber within the wing and then blow it out of a row of tiny holes in the lower surface at about 68% chord — just ahead of the point where separation was occurring. The result: laminar flow all the way up to the turbulators, no separation bubble and very satisfactory drag characteristics, even at quite high speeds. Note, therefore, that if you fly an ASW-20B/C or DG-300, etc. with "blown" wings, that these wings have been deliberately designed to operate by living dangerously and then relying on their row of tiny turbulator jets to stave off separation. If you don't keep all those little pinholes clean (and they *do* fill — if you ever polish the lower surface), then you would be better off with the earlier model!

Sucking? Given that rising pressure is one of the causes of transition, it follows that applying suction to critical areas may just help delay the inevitable. Indeed, a number of just such experiments have been performed (mostly on airliners — which suffer transition very far forward anyway as a consequence of their very high speeds). The chance of vacuum cleaner devices appearing on sailplanes is, however, small. Why does transition occur far forward at high speed? Well, it's the **Reynold's number** that does it, and Reynold's No. are pretty big business in the world of boundary layers. For the moment I shall confine my remarks to saying that the Reynold's No. is a measure of size, speed, and something called kinematic viscosity which varies with temperature (honestly, it is: when the size or the speed or the temperature go up, the Reynold's No. goes up), and that higher Reynold's No. tend to give rise to earlier transition. On the other hand, higher values of "R" mean that the turbulent boundary layer you have got gives less drag than the same turbulent boundary layer would at a lower Reynold's number.

Summary

Boundary layers may be either smooth (laminar) with low drag, or rough (turbulent) with lots more drag. Either form can separate entirely from the surface, with loads of drag (disaster!) — especially if provoked by rising pressure, ie. airflow slowing down. The laminar boundary layer is always at the front, and sooner or later makes an irreversible change to turbulent form (transition). We may choose deliberately to provoke this transition (using turbulators) by roughing up the airflow (either with air jets, roughness, or tapes) or we may try and delay transition by sucking. In any event we want to keep the overall surface roughness to a minimum (to minimize skin-friction drag from both laminar and turbulent parts of the boundary layer) and to avoid unduly early transition. Boundary layers exist on all the glider's surfaces, where they are almost always turbulent, so you may as well take care of them. By polishing, mostly. □

An Austrian Contest —
continued from page 8

When the overcast broke up a bit I was able to gain altitude in a weak thermal. I picked up another weak thermal right by the Wiener Neustadt airport. Therefore I decided not to land and give up for the day as originally planned but to press on. I rounded the second TP at 6:30 after a long time thermalling patiently and flying conservatively. The situation did not look very promising, I was low, it was late in the day, the sky was completely overcast and the lack of landable fields ahead discouraged every attempt to press on. In order to gain time, I joined Martyn Wells (UK) who was ridge soaring on a small hill. Martyn and I decided to land on top of the ridge when it became apparent, after some 45 minutes of ridge soaring, that there was no hope of getting any further.

Since only two pilots managed to complete the task this day, the off-field landing still yielded me close to 785 points and allowed me to share eighth place with three other pilots. Harry had made it a little further and ended up fifth for the day with 809.2 points.

Day 5

Weather situation — low cloud base (7/8 at 2500 feet). In eastern Austria and Wiener Neustadt, good conditions with cloud base up to 9000 feet in the high mountains. The task was a 278 km out and return to the SW into the high mountains south of the main ridge.

Initially the conditions were so weak that the majority of the 15m pilots, including Peter, Harry, and myself, needed a relight. A number of pilots had already landed out in an attempt to fly back to the airfield from the remote start point. Since the start gate was open when we took off again, we decided to immediately take the start picture after release and head out on course. Conditions got better as we got closer to the mountains, but it was still very hard work to climb up the first high mountains from down low. As we flew west, conditions improved considerably. Approximately 80 km west of Wiener Neustadt, I hit a solid eight knot thermal that carried me up to 8500 feet. After having rounded the TP, I first climbed up the side of a 7000 foot mountain, then up the side of a cloud to nearly 10,000 feet. Being high above cloudbase, I enjoyed a beautiful glide in still air. Two more thermals on the way gave me final glide altitude.

Harry finished 11th with 877.5 points, I finished 12th with 877.3 points, and Peter 18th with 818.9 points.

Day 6

Weather situation — similar to day 5; very bad conditions under an overcast close to Wiener Neustadt, good in the mountains. The task was a 381 polygon to the west.

Since Peter and myself landed out immediately after start, Harry will report on his tremendous flight.

The day turned out exactly as Dr. H. Trimmel, the weatherman, predicted. Cloudbase at start time was lower than the 2600 foot tow height and most pilots had to relight. As conditions did not improve I flew straight off my tow to the departure point, Wurflach, and took my start picture at 2000 feet agl. Things got really tough from here on for the first 50 km, flying always below the mountain tops at times, only 650–1000 feet agl, and mostly over unlandable terrain. The little lift found was a mixture of ridge and thermal lift topping at one knot and visibility was down to 2 km. I finally succeeded in crossing the mountains at Semmering Pass and Rax which acted as a weather barrier and conditions improved immediately. Visibility was 100 km, average lift four to six knots, cloudbase 8000 feet. The rest of the flight was uneventful. Eighty km out near Turnau on the south side of the Hochschwab mountain range, I climbed to 9800 feet agl in thermal wave and started my final glide. Again, once crossing the mountain range at Semmering, the visibility in the now stable air mass went down to less than 2 km making navigation difficult, but following the railroad line into Wiener Neustadt I finished eighth for the day at 1852.

Day 7

Weather situation — excellent cloudbase in the east 6000 to 7000, and in the west over 10,000 feet. The task was a 517 km out and return to the west.

Convection had already started at the time of the briefing at 0900. However, the logistics of getting ninety gliders ready did not allow a launch before 1100. It was a little tricky to get into the mountains but once we had passed the Schneeberg, the first high mountain, conditions became very good. As we flew west visibility increased from approximately 20 km to 200 km. I lost some time on the way to the TP due to the selection of a route which did not offer optimum conditions. After having rounded the TP, I took a better route back and enjoyed smooth, easy-to-centre thermals yielding solid eight knots on the integrator. This was soaring at its best, even after having flown many hundred hours in the Alps, I cannot recall a day with such phenomenal conditions. The fantastic scenery of the Enns valley made it hard to concentrate on the task of sailplane racing.

At about 80 km out, I started the final glide and followed the descending cloudbase into the pea soup over Wiener Neustadt.

I thoroughly enjoyed this last flight which seemed so easy, without any nail-biting, low-level flying, over difficult terrain.

Peter finished the day 16th, with a speed of 97.9 km/h, Harry was 18th with 96.2 km/h, myself 24th with 92.1 km/h. □

(Final placings in the 15 m class of 32 pilots: winner - Justin Wills (LS-6), 6237.7 points; 9th - Harry Pölzl, 5133.0 points; 22nd - Jörg Stieber, 3752.8 points; 25th - Peter Masak, 3344.8 points.)

Pilgrimage — continued from page 2

Now we made our official trek to the sacred mountain where soaring as a sport began in the 20s. The Wasserkuppe is a tall hill, volcanic in origin, and grassy and smooth in most directions, dominated by a large radar site. It now attracts the RC glider models and the hang gliders as much as the sailplanes. There is a paved runway on the gentler slope of the northeast flank. In 1986, a large circular museum opened behind the hangar line, and we did the tour inside, reading about the soaring history around the walls and looking at the many vintage sailplanes in the centre floor and suspended from the ceiling. I was particularly impressed with the replica of the Lilienthal glider and its ingenious folding "bird" style wings.

We were ill-prepared for the cold wind though, wearing only light clothing, and we soon got too chilled to walk around the hill and watch the action as much as we wanted

Tony Burton

A K-13 is ready to launch at the Oerlinghausen airfield.

to soak up the flavour of the place. So we bought pins for our hats, and Ursula got a small model of the Grunau Baby for Dave and a Ka6 for herself before doing some sightseeing elsewhere for the day.

The next morning Ursula and I were back up on the Wasserkuppe and much better dressed, but the cloudbase was low and there was no action except some hang gliding training on the steeper north slope, but it was enjoyable to wander around imagining the exploits of the pilots flying bungee-launched primaries to Fafnirs discovering what thermalling and cross-country was on this site not that long ago. In the afternoon, it was northwards to Witzenhausen to track down the Grunau expert. Navigating cross-country off the autobahns in Germany is fun and unpredictable, turnpoints are so close together sometimes that our intersection had often passed by the time I lifted my eyes from the map. After finding the town and getting phone directions to his establishment, we found ourselves parked in a very narrow cobblestone street looking at a wool shop. When we went in we were directed out through the back door into a miniature courtyard holding a workshop, and jammed with old wooden gliders under repair or restoration.

While I picked my way cautiously through the debris and poked my nose into all the wonderful corners of this place, Ursula got her hands on a Grunau Baby pilot's operating manual, a list of current ADs (how anyone could still find problems in a glider flying for 50 years already is beyond me), and a list of all the drawings.

On Sunday, May 1, we headed northeast from Neheim (dodging all the May Day bicycle outings) to visit Oerlinghausen, about a 70 minute drive away and about 40 km north of Paderborn (which hosted the world glider contest in 1981). About 18 clubs fly from the field on weekends (not necessarily all at once) with up to five double-drum winches working continuously, and a big gliding training school runs on weekdays. We were told there were 55,000 takeoffs in 1987. Besides winches, there is also a short paved strip for powered traffic and motorgliders and the field is also used by microlights, so it's a busy place. Making sure our Diamond pins were properly on display to set us apart from the common gawkers, we introduced ourselves to a group at one of the launch areas who turned out to be the Gütersloh club. I mentioned my interest in getting a ride and was immediately pointed to the back seat of their ASK-21 glass two-seater by a young pilot. I mentioned I hadn't had a winch launch for over ten years. He said, "OK, I'll do the launch, then it's yours." I thought I was going to be ready for the launch, but I wasn't — my head snapped back and up we went — it's a breathtaking way of getting airborne. After that, I had control and really enjoyed the handling of the ASK-21. It had the nicest coordination and quickest aileron response of any two-seater I've flown.

Well, to the flight. We picked up a four knot thermal over the ridge and were on our way. There were as many sailplanes milling around as I see prior to a Canadian contest start, and it was a German visibility day — which is to say — almost IFR in haze. I estimated the visibility at no more than 5 to 10 km, and certainly less when looking up-sun! At about 1700 metres (5500 feet agl) we headed off to explore, and my guide pointed out the major landmarks through the clag. Once he asked me how high I was, and I was baffled by the altimeter at first, which was calibrated in kilometres with zero at the *bottom* of the scale. Seeing where one was going was terrible heading into the sun, and I was able to pick out the next cumulus only by looking for cloud tops. We were doing well though, so my host said let's keep going south to Paderborn. Great, says I, and off we went on an ad hoc cross-country.

I couldn't find the Paderborn airport when we arrived over the city, even though I had been there for three weeks during the world contest. Navigating in Alberta is a dead cinch compared to getting a visual grasp of the "homogenized" German landscape with no straight lines anywhere and the very random mix of fields, villages, and woods dissolving into the haze. (Even local pilots are not immune though — the big news at the field while we were visiting were the adventures of an ASH-25 pilot from their club who strayed well into East Germany the previous week in poor visibility, and then outran two border patrol helicopters getting back.) Our flight was an hour and a half altogether, and I commented that his club members were probably going to be a little annoyed at him for staying up so long on a passenger ride. Probably, he said, but it was worth it for the experience; and we thanked each other in equal parts, I guess. (Ursula noted that some people on the ground sounded more concerned about who was going to pay for the extra time, as if I were going to evaporate on landing.)

The K-13 factory was closed, it being the weekend, so we returned the following Thursday and introduced ourselves to the manager, got a good interview (which readers will have seen in the last issue), and wandered around taking pictures of people building big model airplanes in a fibreglass world. It was fascinating, and I was struck by the comparison of ASWs being popped whole out of the mold so to speak, and the complexity of the hundreds of little sticks and gussets of the K-13 wing. The spar looked more like it was going to hold up a hangar roof rather than an airplane, compared to the ribbon of carbon I saw being patted into place for the ASW-24 wing a few days before.

So it was a good time. The whole soaring scene is quite different in Germany, and if any of you have the opportunity to visit Europe at any time, you should make a point of dropping in on a local club or manufacturer — you will be welcomed and it will definitely make your day. □

ASC CROSS-COUNTRY CLINIC FEATURES TOM KNAUFF

Rod Crutcher
from “ASCent”

Editor. The 4th Alberta Soaring Council XC and “Talent Identification” Clinic at the Edmonton club was honoured by the presence of Tom Knauff, late of Ridge Soaring, to act as our Master Coach. The expense of bringing in Tom was largely supported by a grant from the Alberta Sport Council.

Naturally, scheduling such an event — even during the serious drought in the West— resulted in the wettest single week I have experienced in Alberta since I moved here eight years ago! Nonetheless, everyone present thoroughly enjoyed the lectures given by Tom; his ideas challenged every pilot to closely question all the soaring theory we act on as if it were Holy Writ, and we may all go faster and further as a result.

After the course, Tom and Doris dropped in on Cu Nim for two weekends, flew their Discus, and were much impressed with the soaring scenery and cross-country record potential of Southern Alberta. We hope to see them back in the future (maybe as soon as the Cowley Wave Camp in October). Following is a comment on the course by a new cross-country pilot who flies an Astir.

On the evening of my arrival at Chipman, more precisely at 0400 that night, a spectacular lightshow and most impressive storm awakened me — thunder, lightning, hurricane force winds, and of course, rain. Our “soaring” week finally muted the farmer’s crying. It was a nice touch I thought, but by the fourth day the rain and cloud had become tiresome. What of the soaring? Yes, there was some — on the third day Tony Burton set the duration record for the week with a little over an hour under an 1800 foot ceiling — and yours truly, with a little coaching from Tom Knauff, set the distance record, 18 km out-and-return!

My very brief flight with Tom was very worthwhile. What did I learn? . . . “Fly poetically — every control movement costs you seven seconds — so fly smoothly and precisely, minimizing control input.” Tom had a knack for assessing wisps of clouds that, to my eye, simply did not exist. “See that wisp?” *(No)* “Let’s try this street.” *(What street?)* “Unlock the pattern of the clouds.” It was twenty-four minutes of excellent instruction.

Tom is a pilot of world reknown. Clearly, 14,000 hours in gliders, high placing in major competitions, founding a gliderport, publishing and teaching impose a measure of credibility. His talks were excellent. He is an educator, with a fine sense of perspective and humour. It is fair to say that even the most experienced pilots present benefitted from his presentations and the ensuing discussions. Here are some of the snippets of information that perhaps you may find of value:

• Look outside. *(The crucial information you need to soar is not to be found on your instrument panel.)*

• Develop the skill and habit of only “blinking” at the instruments, then re-read above snippet.

• The most important criteria which determine the best pilots are: they go to the best lift, but even more important, they avoid the worst sink. *(Stopping to climb is what kills cross-country speed, you can be wildly off your best-speed-to-fly between thermals at relatively little cost.)*

• One can impose order upon the randomness of the cloudscape and “invent” cloudstreets and a low-loss pathway across the sky.

• Speed-to-fly is not critical. “We all fly at the same speeds — 90 kts cruise, 60 kts climb — but slow down as conditions dictate and your search time to find the best thermals will be longer.”

• The two most common errors made in off-field landings are: flying the pattern too close in, and choosing a field with obstructions on the approach.

• Above the wind gradient, the thermals are directly under the clouds.

• Netto doesn’t work *(We fly in an imperfect world where the variables swamp the fine theory.)*

• If you are going to put your glider through a fence, aim directly at a post — there is less chance of the wire coming into the cockpit with you. (I hope none of us will ever be required to try this out— but for details see soon-to-be-published edition of “Soaring Pilot”, Tom’s excellent magazine.)

• Practice, practice, practice.

• In extolling the benefits of the blackboard as a tool for off-field landing circuit practice and theory, Tom said, “When we crash and die on the blackboard, it doesn’t hurt.”

Did it all help? Although there was little chance to fly at Chipman, a few days later at Black Diamond, Mother Nature relented and soaring was again possible. With water on board (first time) and a 300 km triangle set I launched, hopes high. Five hours later, the task was completed — not in grand style, and nothing that a few thousand hours won’t help, but completed and completed safely. The next week I received a phone call from my OO, Tony, inquiring about my turnpoint pictures.

“You took a lot of pictures of the Bassano Dam, Rod.”
“Yes, Tony, I wanted to be sure I got it right. It’s such a prominent structure and I was glad to be there.”
“And what was your declared turnpoint?”
“The Bassano — oh ... ! — east elevator! ... I don’t believe this...”

Practice, practice, practice.

Many thanks to all who made the week a success, weather notwithstanding. □

Tony Burton

Tom Knauff (right) has a hands-on discussion of sailplane preparation at the clinic. Onlookers are Bruce Hea (upper left), Mike Apps (left), and Rod Crutcher (centre).

Club News


Tony Burton

Ursula Wiese has a tailgate book-autographing session on the Cu Nim field when her book, "Stalking the Mountain Wave", came from the printers.

AIRCRAFT JOURNEY LOGS

It has been MoT's practice to approve all aircraft journey log books whose format deviated from the one published by the Queen's Printer under ministerial authority, to ensure that they complied with the Aircraft Journey Log Order, ANO Series VIII, No. 2.

Effective immediately, MoT will no longer approve log formats. Accordingly, aircraft owners are cautioned to ensure that the Journey Log they use will provide for all the particulars required by the ANO.

from Vancouver Soaring Scene

This will be a boon for pilots having trouble stuffing a large hardback log into the small storage spaces of a glider.

AIRTECH DROPS DEALERSHIP

In a letter to free flight, Airtech Canada of Peterborough, (705) 743-9483, indicates that they have terminated their position as dealers for Polish gliders (Jantar and Puchacz), stating difficulties of the factory in meeting the demand for new gliders and spare parts. Airtech says that lead times for spares are currently so long that they have no hope of maintaining a reasonably priced stock of consumable spares or of meeting requests for major assemblies. They can sell spares still in stock, and will provide service bulletins as they receive them, attempt to assist in repairs, and find sources of North American equivalent replacement parts. Requests for new gliders or not-in-stock spares should be directed to the factory through the Polish Trade Commission in Montreal, or "Pezetel".

PEZETEL — Attn: Mr. Konrad Lipinski
61 Aleja Stanow Zjednoczonych
Box 6
06-991 Warszawa, Poland (tlx 63812815)

Polish Trade Commissioners Office
Attn: Mr. Leon Blicharz
3501 Avenue du Musée
Montreal, PQ H3G 2C8 (514) 282-1732

THREE NEW CLUBS

SAC has welcomed three new clubs into our ranks. Good fortune and good flying to all the pilots flying with them. Here are their addresses:

Aero-club Sportair
1690 Ch. St-Damien
St-Gabriel de Brandon, PQ J0K 2N0

Eastern Ontario Soaring Association
Box 14, R.R. 1
Manotick, ON K0A 2N0

Prince Albert Gliding and Soaring Club
1556 - 10 Avenue W.
Prince Albert, SK S6V 5N5

RIDEAU FATALITY

A long-standing member of SAC and the Rideau Gliding Club, instructor and towpilot, Hank Janzen, was killed in the crash of the club's Cessna 150/150 on 26 June when elevator control was lost.

The CASB investigation found that the elevator cable had been chafing against the positive battery lead, and when the insulation eventually wore through, the attendant arc burned through the elevator cable. The battery had been relocated as a result of the installation of the 150 h.p. engine several years ago. MoT plans to send a precautionary notice to owners of similar aircraft.

It should be noted that an article in the June issue of "Canadian Aviation" discusses the possibility of controlled flight using trim only in the event of a loss of normal pitch control. It isn't easy and requires practice, and each aircraft responds differently, but it usually can be done.

Ray Lawton
Rideau Gliding Club


Ray Lawton

Hank Janzen

FAI Badges

Larry Springford
45 Goderich Street
Kincardine, ON N2Z 2L2 (519) 396-8059

The following Badges and Badge legs were recorded in the Canadian Soaring Register during the period 1 May 1988 to 30 June 88.

SILVER BADGE

754	Chris Herten	SOSA
755	Vaughan Allan	Cu Nim
756	Darren Grant	Regina

DIAMOND DISTANCE

	Thomas Foote	Bluenose	505.2 km	Open Cirrus	Julian, PA
	Larry Springford	SOSA	509.8 km	ASW-20	Rockton, ON

DIAMOND GOAL

	Paul Moggach	York	306.2 km	Std Jantar	Julian, PA

GOLD DISTANCE

	Paul Moggach	York	306.2 km	Std Jantar	Julian, PA
	Keith Crawford	Edmonton	367.7 km	Skylark 2B	Chipman, AB

SILVER DISTANCE

	Chris Herten	SOSA	59.2 km	Jantar Std 2	Julian, PA
	Vaughan Allan	Cu Nim	88.0 km	Astir	Black Diamond, AB
	Darren Grant	Regina	61.9 km	Astir	Estrella, AZ

SILVER DURATION

	Chris Herten	SOSA	5:12 h	Jantar Std 2	Julian, PA
	Tim O'Hanlon	SOSA	5:30 h	1-26	Rockton, ON
	Terry McElligott	SOSA	5:58 h	Club Libelle	Rockton, ON
	Darren Grant	Regina	5:22 h	Astir	Estrella, AZ

SILVER ALTITUDE

	Peter Beatty	Air Cadets	1219 m	1-26	Reno-Stead, NV
	Tim O'Hanlon	SOSA	1800 m	Astir	Rockton, ON
	David St Jean	SOSA	1700 m	Blanik	Rockton, ON
	Darren Grant	Regina	2010 m	Astir	Estrella, AZ

C BADGE

2114	Jan Perfect	Base Borden	1:03 h	2-33	CFB Borden, ON
2115	Tillman Steckner	London	1:01 h	2-33	Embro, ON
2116	Dan McRae	COSA	1:09 h	2-22	Chemong, ON
2117	Gary Bozek	Regina	2:36 h	1-26	Strawberry Lake, SK
2118	Tim O'Hanlon	SOSA	5:30 h	1-26	Rockton, ON
2120	Tom Weihmayr	Air Cadets	4:05 h	1-26	Arthur, ON

FAI RECORDS

Russ Flint
96 Harvard Avenue
Winnipeg, MB R3M 0K4 (204) 453-6642

Triangle Distance — Feminine, 317.6 km, 4 June 1988, Jane Midwinter, Pik 20D, C-GINY. Flown from Kars, ON with turnpoints at L'Orignal and Charteris. Exceeds previous record of 307 km by Ursula Wiese in 1983.

200 km Triangle Speed — Multiseat, Citizens, 79.5 km/h, 5 Dec 87, Charles Yeates (passenger, Kris Yeates), IS28-B2 Lark, VH-IUH. Flown from Tocumwal, Australia with turnpoints at Urana and Corowa.

CLAIM REJECTED **100 km Triangle Speed — Open**, by Kevin Bennett, for incorrect turnpoint photo. Current territorial record of 111.3 km/h and citizen's record of 141.4 km/h stand.

RECORD CLAIM **300 km Triangle Speed — Open**, 112.8 km/h, 15 July 1988, Kevin Bennett, Ventus B, C-GIJO. Flown from Black Diamond, AB with turnpoints at Fort Macleod A/P and Milo. Exceeds previous territorial record of 110.1 km/h by Dick Mamini flown in 1973.

TRYING POST — continued from page 5

The next day at the pilots' meeting I argued that the "no-contest day" formula is in the pre-set triangle race rules essentially to protect the contestants from a bad call by a task setting committee, resulting in the pilots being obliged to fly down an unsoarable courseline later in the day. Since in a POST task, every pilot has full control over their soaring tactics, they should get credit (or be penalized) only on the basis of their own flying, not factoring in the results of other pilots' choices, errors, and skills; hence all results should be scored, including those under 50 km. I noted that I was making no comment on the day devaluation rule, which is included to make allowance for bad weather in general. This rule requires its own separate analysis as to its precise formulation and place in a POST task. I also noted that I made no comment on bad luck — rules never do much good in allowing for it, and rules never seem to also penalize good luck (which seems only fair, right?).

The third day saw lots of cirrus which delayed convection, followed by overdevelopment and rainshowers within a two hour period. By the time the start opened, everyone who got out on course made what was essentially a final glide into pastures and all the local airports.

There were many favourable remarks by all the pilots on the new dimension of flying both for distance and speed and on the strategies involved in POST flying, and we will be trying it again. In conclusion:

- This first try showed that there are subtleties to this type of a contest that require some consideration by the contest director (even though he has fewer decisions to make for the pilots, they still can have an impact on pilot tactics).
- POST is very easy on the ground organization.
- The turnpoint and start sector rules worked well.
- Prior to the contest, good turnpoint selection is important to subsequent pilot course tactics, and several close (20-30 km) turnpoints allow pilots to "fine-tune" their courses and flying times which also adds more spectator interest at the end of the task time.
- If POST is testing the abilities of the "compleat" soaring pilot relatively independently of the results of all competitors as a whole, the "standard" rules and scoring factors should be re-examined very carefully to understand exactly why they have been used in the past and if they are relevant to the basic POST philosophy.
- Perhaps we could eliminate the computer. Surely a scoring system can be devised that will let a pilot know who has beaten whom without requiring a mechanical mathematician as a middleman. □

ACCIDENTS

LARK, C-GARQ, 28 May, Guelph Gliding Club. Trainer ground looped on take-off. Substantial wing damage. Est. $15,000.

CESSNA 150, C-FPLJ, 26 June, Rideau Gliding Club. Towplane crashed following loss of pitch control. Aircraft destroyed — fatal. $15,000.

L-19, C-GGCY, 23 July, Vancouver Soaring Association. Towplane made heavy landing due to severe downdraft on final. Right main gear collapsed and prop bent. Est. $10,000 (depends on state of engine).

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Mbrs: Hal Werneburg
Bruce Finlay

HOT SHIPS — THE ASW-24

Schleicher's new Standard class sailplane, the ASW-24, had its first flight in November of 1987. After many years of constructing high performance, long wingspan gliders, Schleicher has now worked out the concept for a new Standard class design to succeed the ASW-19 which ceased production last year.

The aramid fibre, Kevlar (DuPont), has only recently been used in the manufacture of sailplane spars, carbon being the fibre of choice for the past ten years. Gerhard Waibel, the chief engineer for Schleicher, wanted to combine the best available materials for strength and weight, which he had already used on the 24m ASW-22. The control surfaces and spoilers are made of a sandwich construction, Kevlar wrapped foam, resulting in substantial weight savings compared to fibreglass. This helps the mass-balancing of the controls to a calculated speed of 330 km/h.

Today's interest in Kevlar lies in main structural components. Its great tensile strength and shock resistance, combined with carbon fibre for rigidity, seem ideal. The Akaflieg in Stuttgart has worked on composite fibres since 1976 and constructed a two-place trainer — the FS-31. Today, the ASH-25 is built of Kevlar 49 (41%) and carbon fibre (58%). The new ASW-24 employs a new technology with the new material. Construction of fuselage, wings, and empennage is more streamlined than the ASW-19.

Wings   Through cooperation with the Low Speed Lab of the University of Delft, Holland, Gerhard Waibel researched the Wortmann profile of the ASW-19B for the problems associated with wet wings and insect accumulation. The new HQ profile used allows for a three to nine percent improvement on the "wet wing" stall speed. The wing profile thickness is decreased over the ASW-19 (17.6%) to 15.8%, a significant performance increase. A simple and cheap turbulator using an adhesive tape is incorporated.

Fuselage   The ASW-24 cockpit view is a welcome surprise as it is rounded out for superb visibility. A Wortmann FX 71-L-150/30 profile used for the fuselage of Kevlar/carbon offers a 20% drag reduction compared to other Standard class gliders. Pilot seating is comfortable and moderately reclined. All the "guts" are hidden by panels, only the controls are showing. The instrument panel lifts with the canopy. However, not all decisions have been made yet regarding cockpit ergonomics.

All controls are automatically connected. The gear is shock-absorbed with a big wheel of 500 x 50 mm, having a hydraulic disc brake. Because of its shock-resistant Kevlar and carbon construction, the ASW-24 offers great security in case of a crash. At the same time, the empty weight is decreased by 10% over the ASW-19.

Technical Data

Empty weight	220 kg (485 lbs)
Gross weight	500 kg (1100 lbs)
Ballast	150 L (330 lbs)
Max cockpit wt.	115 kg (250 lbs)
Max. L/D	43:1 at 57 kts
Min. sink	0.58 m/s (113 ft/min)
Stall	70 km/h (38 kts)
Vne	270 km/h (146 kts)

translated from Aviasport *(for pilots with about $80,000)*

Trading Post and back page (p20-22) omitted