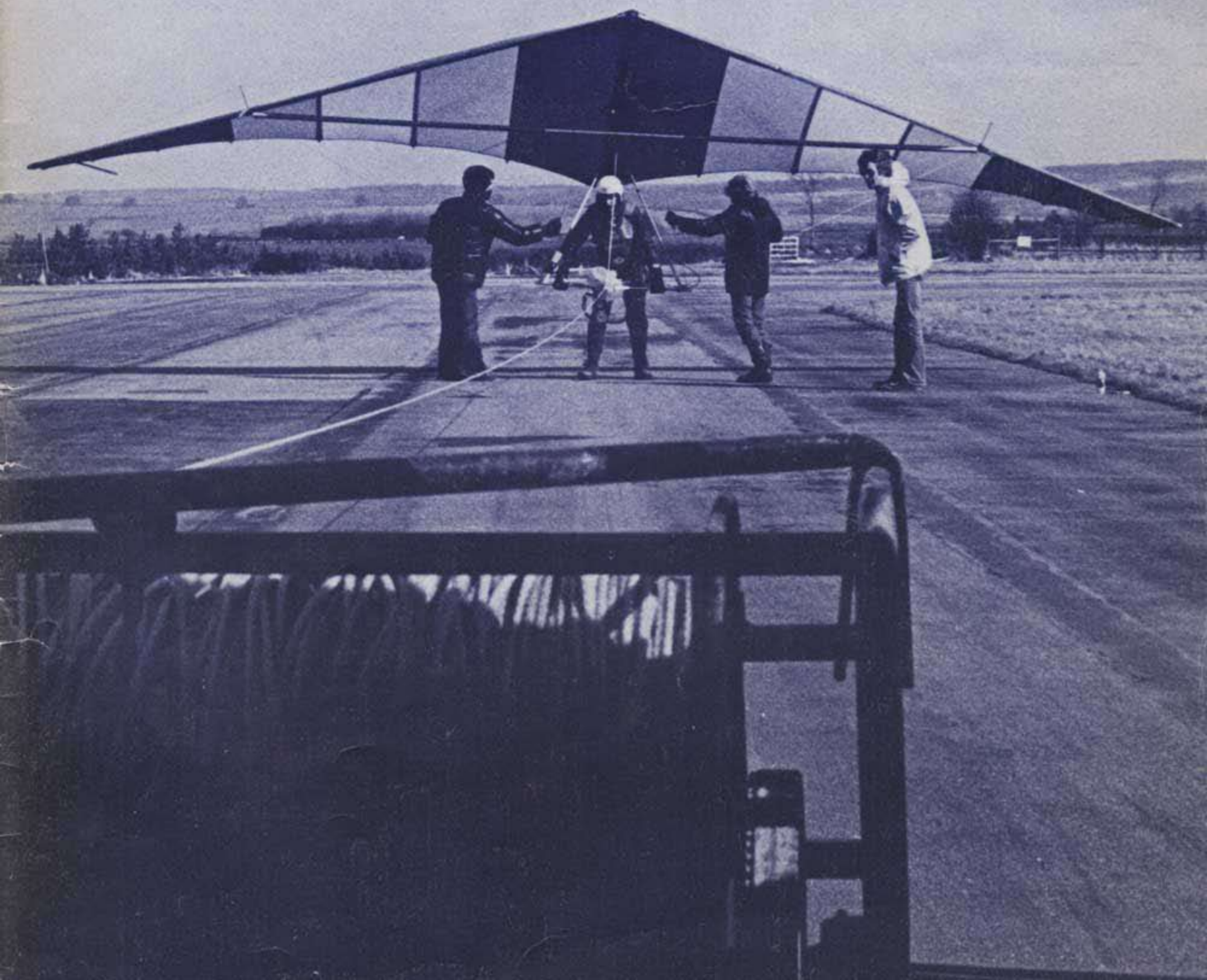


WINGS!

No. 3 1979

MAGAZINE



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WINGS!

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EDITORIAL

Hang gliding faces one of its biggest threats. We have been warned that the first incident between an aircraft and a hang glider will result in the permanent closure of airspace to hang gliders.

Our future is not at the mercy of officialdom — it lies in the hands of every single hang glider pilot in the country. Rules and regulations are here to stay, no matter how much they rankle or how many mutterings there are of infringement of freedom.

We have always suffered from irresponsible and selfish flyers whose blinkered acts have created fetters for everyone. It began in a simple fashion at club level years ago. Rogue flyers persistently landed in forbidden crops, left gates open, failed to pay fees to farmers — and sites were lost.

Like all other pilots who started flying six or seven years ago, I remember with nostalgia the bliss of those early experimental days. But they have gone for ever in the process of development and progress.

The route from those times has been littered with damage caused by unthinking pilots, who have often destroyed months of patient work by the caring few in a swift blow.

Now is the time for everyone to take their head out of the sand. Protect your own future by making sure your friends and fellow club flyers do the same.

Five months ago, air traffic controllers at Los Angeles International airport closed the north runway because of a hang glider in the Terminal Control area. An incident like that in this country could finish hang gliding.

The Americans have acknowledged their period of blissful ignorance is coming to a close. They have been told that if they want to go up to 10,000ft. they will have to do it in an aircraft and not a hang glider.

As Michael Jones said in *Glider Rider*, the Americans have got two choices — either they hold their noses and gulp down a bad tasting spoonful of medicine now, or the FAA will drag them kicking and screaming to the Great White Doctor in Washington!

The same applies to us. Our rules and regulations, our pilot rating scheme have a purpose. Please support them, and make sure others do.

My eldest son is rapidly following in Andrew Hill's footsteps. He certainly wants hang gliding to survive and so will others like him. I care about what happens to our sport. Do you?

JEANNIE KNIGHT



FUTURE OF WINGS!

Most readers will be aware that the post of Editor for *Wings!* was re-advertised in the January/February issue. This followed the Editorial Committee's recommendations to Council that the editor should be paid £150 per month.

Council felt that, in view of this substantial policy recommendation, the post should be re-advertised in that light. Garth Thomas would be able to reapply for the appointment under the new terms.



Jeannie Knight

On March 11th, Council relieved Garth of his appointment as Editor. The chief reason behind his removal from the post, was his failure to produce *Wings!* on time. The late publication of the November issue, the arrival of the December issue in January, and the amalgamation of the January and February editions in February were felt to be unacceptable.

There had been complaints about the quality of the issues produced, but it was stressed that the prime duty of the editor was to produce 12 issues of the magazine each year on a regular basis. Garth had failed to meet this duty.

The Editorial Committee recommended to Council that the post of Editor should be split into two parts. There should be an editor, dealing with selection and editing of material for the magazine and generating enthusiasm for a flow of material from the membership. Additionally there should be a skilled person to take over the responsibilities of layout-artist and artwork.

Mike Hibbit, of Thames Valley club, a graphic artist by profession, will be taking over the duties of layout artist as from the next issue. A suitable editor is still being sought — but payment rates will not be £150 in view of the division of duties. Rates will be negotiable for the editor's post.

Until a suitable appointment has been made, all copy and photographs for inclusion in *Wings!* should be sent to Jeannie Knight, chairman of the Editorial committee, at 10 Spring Gardens, Washington, Pulborough, West Sussex. Tel: Ashington 892770.

She will be editing the magazine until the post is filled in conjunction with David Worth and Tony Fuell, both former editors of the magazine. Jeannie is a practising journalist and Fellow of the Royal Society of Arts.

Issues for the remainder of this year will be numbered, rather than dated. This is to avoid further confusion resulting from previous late publication and every effort will be made to achieve the full 12 issues by the end of the year.

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AIRMAIL

NOT IRRESPONSIBLE

Sir,
Regarding last month's letter entitled 'Kili Conflict, I object very strongly to the allegation that my decision to fly when I did was irresponsible.

David Kirke and his party were very inexperienced, the take-off was exceedingly difficult and the whole flight was potentially hazardous. As the only experienced flyer instructor present, I would have been open to justifiable and serious criticism if I had allowed an inexperienced man to act as wind-dummy — especially if, like our friend back in 1976, he hadn't survived the flight! Alan Weston would have had to be the choice and he had already told me he was unsure about light-wind take-offs.

The letter was worded to make it appear that Jonathan Hardy's 'collapse' and Alan's failure to take off were due to irresponsibilities on my behalf. No mention was made of the fact that Jonathan had swallowed a large quantity of aspirins before leaving for the summit and had raced up ahead of even the mountain guides. This is the best way to bring on acute altitude sickness.

I must point out that oxygen had not been considered before I joined the party. It is not used as a rule on Kilimanjaro. I arranged it because, after consulting with specialists, I felt a small quantity just before take-off would prevent over-confidence caused by oxygen starvation. It would give us more energy for a nil-wind take-off in rarified air.

I spent some time looking for it when we arrived at the summit and assumed it was still being brought up with the rest of the party. Although screwing a mask into a cylinder is a child's task, I do agree it would have been a good idea to have a rehearsal. As organiser of another expedition to Kilimanjaro I would ensure that bags containing oxygen were clearly marked.

Before I flew, I briefed Alan, the next most experienced, on the best flying order, the flight plan and the importance of breath-control before take-off. I gave everybody a running commentary of my thoughts on take-off hazards. Mr. Kirke, who was to be next to fly, had worried me by stating that all he wanted to do was to get off the mountain as soon as possible. I therefore repeated a previous warning that it would be suicidal to take off unless there were still gaps in the cloud. He chose to ignore my advice.

The 'integrity' mentioned would have carried more credibility if the others, whose name were put behind Mr. Kirke's, had seen the final draft of the letter — very harmful in the way it was worded.

John Fack — for one — who is an experienced League flyer, was

unfortunate to have suffered badly with altitude sickness, but has stated that he would most likely have made the same decision to go first if he had been in my position.

I would also strongly suggest that Mr. Kirke joins the BHGA before he continues to fly from club sites.

Yours sincerely,
Ashley Doubtfire
Marlborough, Wilts.

UNCLE BOB WENT DOWN!

Dear Sir,
May I through *Wings!* have the opportunity to point out that when I wrote to Tony Fuell I had no idea that the letter would eventually be published in *Wings!* and that references to other pilots were made as private, casual remarks incidental to the main issue, under which circumstances they could be excused for being inaccurate.

However, since it was published I have been made aware of an error which seems to require public correction. When I said Allistair and Neil "went down" I was wrong. Only Allistair "went down". Neil did not "go down". Neil in fact top-landed! I also feel I should mention Neil hardly ever "goes down" and I am reminded that on Saturday September 23rd 1978, when the wind was well off the

slope at Slade, Bob Mackay "lost it" and went down, while Neil did not "lose it" and top-landed.

Bob Mackay,
Skewern,
Glam.

INSTINCT IN THE AIR

Dear Sir,
I read Bob Mackay's account of his near crash with great interest, and I would emphasise his points — *that a pilot must concentrate exclusively on what he is doing, and that no pilot ever should expect a second chance.* I am not so sure about warning light No. 3.

It is my belief that it is essential sometimes to convince yourself that you can do something supremely well before attempting it. In fact, if it is something a little tricky, only the confident elan of the expert will ensure success. Nevertheless the right mental attitude is all important, and this includes, as he so rightly says, not twisting the facts to suit your own wishes.

One of the purposes of a correspondence column is to stimulate discussion, so from the depths of my arm chair I will cross swords with Bob on his analysis of the situation as it happened "in the air". I admit that not being there at the time is a considerable disadvantage; still I too have frightened myself from time to time so I feel qualified to speak. If I retrace the events:

- (a) Up goes the outside wing — full correction.
- (b) Fuller correction.
- (c) She keeps going round — more speed, no effect.
- (d) Go with the turn, full bank, pull myself through the frame. She pulls out, Bob makes it, with four feet to spare.

Thinking about this sequence:

- (a) When the outside wing went up. Bob was probably flying fairly slowly, and only a little above stalling speed. Full correction. This would have instantly increased the angle of attack of the inside wing causing it to stall.
- (b) Fuller correction. The effect of this would have been to make things worse, by stalling even more of the wing, or, if the wing had not already stalled by converting an incipient stall into a full stall.
- (c) More speed. Too late. If this had been the first action Bob might have picked up the inside wing.
- (d) At last, with the instinct of a real pilot Bob realises that however desperate it looks, there is only one thing to do, go faster, get it flying. There is no alternative. He regains control and pulls out.

The whole crux of this problem is:

- (1) Recognising the problem, which I am sure Bob will agree should be at the beginning.
- (2) Having enough height for the solution to be effective.

As I said the idea is to stimulate discussion so I put forward the alternative theory that in this case the aircraft, flying near the stall dropped a wing, or the outside wing was knocked up by a gust. Applying Opposite bank caused the inside wing to stall and eventually the aircraft to go into a spin. In this situation the immediate correction must be first to increase speed, only then to lift the wing.

There are two things, which normally give you safety in the air. One is speed and the other is height. *Instinct in the air has to be learnt.* The natural instinctive thing to do is frequently wrong. Only training will give the pilot the instinct to do the right thing.

Dunstan Hadley,
Itchenor Green,
West Sussex.

CORRECTION

Dear Sir,
A small correction for *Wings!* I am Secretary of the Pennine club, living in Euxton, *not* Buxton, as printed in the latest list.

Buxton is about sixty miles from here, in the Peak District!

Kevin Moloney,
45 Empress Way,
Euxton, Nr. Chorley,
Lancs.



CONVERSION KITS?

Dear Sir,

Further to a previous suggestion of mine that manufacturers should market kits to improve kite performance, the Skysailor magazine features adverts of Australian machines which have swivel or hinged keels. It seems that this modification fitted to British machines which do not have floating keels might improve roll response and make them safer.

Could it be put to our manufacturers that a conversion kit on the above lines be tested out and if found satisfactory, issued for sale? Also, would a loose fitting sleeve (behind the heart bolt) inside a cut keel act as a swivel?

G.L.M. Jones,
Leeds.

SPLIT PINS V RINGS

Dear Sir,

I read John Hudson's chilling experience in which he nearly took off with no rear flying wires — because a split ring came out.

I should have written this letter long ago because prior to taking up hang gliding, I was a keen dinghy sailor for some years during which time I learnt to mistrust split rings, spiral rings and "safety" pins for clevis pins. These can all come undone, usually after contact with something which catches on one of their sharp ends.

A split ring can be pulled into a straight piece of wire by this means and then literally fall out of the clevis pin.

I have never had a properly fitted split pin come out on a boat and suggest that this is the best way to secure a clevis pin. The split pin should be new and carefully bent to prevent the ends from catching. It can then be bound up with sticky tape for extra protection.

Another lesson from sailing boats is that ordinary screw shackles should be done up tight and then locked with a piece of bent wire. Bottle screws should also be similarly locked.

Ben Wynne,
Newcastle on Tyne

MORE TAKE-OFF TECHNIQUES

Dear Sir,

Let me add to the confusion about take off and possibly even to the profusion of methods.

For a seated take off tight lines must be the best method as this puts the body into the right position immediately after take off so that control is at its best.

It follows logically that the prone take off should give the same advantage. All of those mentioned so far put the pedestrian in the vertical position when he should be trying to achieve the horizontal ready for the flight.

The nearest to achieving this is to crouch with the control frame on the ground, holding at the bottom and

low down one side. The trunk is near horizontal and a run in that position will gently lift the kite and then the body leaving the legs trailing.

I have found one great advantage of this method is that the stirrup comes easily to the foot as the harness has not been pulled up the body taking the stirrup with it.

This method is very effective in low winds and I am considering trying it in stronger winds because of this last advantage.

J.T. Meager,
Cheltenham.

SUPERSHIP '79

Dear Sir,

While many pilots eagerly await the '79 range of gliders on which to spend their hard-earned cash, perhaps we ought to stop and examine what we will be getting with our money.

Manufacturers continue to tempt us with "outrageous glide angle", "fantastic sink rate" etc. etc. Putting aside the obviously necessary traits such as structural integrity, stability and other safety factors, most of us desire characteristics that fall roughly into three categories. (a) excellent sink rate. (b) excellent glide angle at high speed. (c) excellent handling characteristics.

I don't really believe that the super-ship has yet arrived. Most manufacturers have produced gliders that demonstrate two out of these three desirable characteristics in varying combinations.

For example, excellent min. sink plus excellent handling = poor high speed glide angle *or* excellent min. sink plus excellent high speed glide = poor handling.

The answer must therefore be a compromise. The manufacturer to win my order will not be offering outrageous this or fantastic that, but a glider that is able to perform all of the desirable characteristics equally well. I would not expect this glider to be always 'top of the stack' nor would I expect it to fly in 40mph winds, but I would expect it to give me good, enjoyable flying in the widest range of flyable conditions.

Fortunately some manufacturers have put aside outrageous performance figures to build the "all rounder". Before ordering your '70 super-ship consider what you actually desire from your new glider. If you are a league pilot you may feel it's worth sacrificing a bit of handling to gain extra performance. But if you are Joe Average, who only flies at weekends, don't forget that you go flying for pleasure. Choose carefully and most importantly, test fly before you buy. If your manufacturer or agent can't give you a test flight, go elsewhere.

Alastair Geldart
Milton, Derbyshire.



the Cherokee!



Birdman Sports



WHAT DOES THE LEAGUE MEAN?

— a philosophical report on the first League event of 1979

By John Hudson

What does the League mean? So many things to so many people. To me it's the comradeship, flying and a competitive urge inside me — in that order.

There are many members of the BHGA who do not appreciate the real value of the British League. Not only does it bring about advances in glider designs, but also brings together flyers from all parts of the land, who benefit from mixing and flying with the top pilots.

After a 5 month break we all met in an hotel in South Wales for the first League competition of 1979. What an atmosphere in the bar that Friday evening! The air was filled with excitement as each new face was greeted with questions about how much flying had been got in.

Each year the bottom 25 per cent of league competitors drop out and are replaced with new blood. These pilots looked "new" as the old ones regaled them with tales on how dangerous it was for new pilots in the first event . . .

Mid-morning on the first day found us doing our usual League thing — waiting! Standing around chewing the fat! How often we have done that. This time it was different for the organiser was not waiting with us. It had to be a good sign.

An hour later, gliders on shoulders, we trudged across the moor, every tenth step sinking into a knee-high hole in the snow. After half an hour it was getting worse and the realisation that the sun was melting the hard snow crust sent us scurrying on to reach take-off before it softened completely.

The first task started with a zero wind take-off, a flight path a mile out and around a ground pylon, followed by tracking along a river as far as you could go. When past a line of electricity pylons you had to put in as many 360s as possible.

Out of 60 pilots, all trying for a top place, one is bound to stretch abilities far beyond anything one



Photo by Mark Junak

would at first imagine. The League makes 'go for it' mean something.

The wind dummies and first few pilots dropped in the field half-way down — grizzled fisherman Mike Atkinson hopped over the fence two fields further on. A hubbub of "that's screwed up the distance scores" was heard all around the launch.

Bob Calvert launched in zero wind for a free flight and all contenders for the top gave each other knowing looks. They knew that if he didn't make a thermal he would land at the bottom, and with the long climb up would miss his competition flight. In fact he circled back 200ft. above the top in what was the most skilful

demonstration of thermal flying in the competition.

Graham Slater won the first task, casually working weak lift over the town and eventually centreing to wind up the maximum number of 360s and also flying off for the longest distance flight.

To get a blob played a large part in the score. Some pilots tend to forget that hang gliding events are bound to have a luck factor and the League system of cumulative scores is designed to give everyone a fair crack of both good and bad luck. Still the need to look at things was there and we discussed the question as we ate that evening.

The next day any weather

advantages were eliminated by totally stable conditions. Final positions depended on flying skill. The first task called for a set flight time of two minutes to a gate, followed by a figure of eight and a foul line to cross to score. One had to accurately gauge the time since points were lost over and below the set two-minute time. Sixty per cent of the pilots failed to cross the foul line.

A speed range test followed involving crossing two sections of a course, designed to test both the fast and slow flying characteristics of gliders. Trevor Birkbeck made well of this task by whipstalling his Cherokee at the start of the speed run and diving across the course at 45 degrees.

The marshals were certain he was going to carry on into the deck, but he zoomed out of the dive and recorded the fastest time of the day. What a commotion this caused! Cries and protests about dangerous flying abounded in the hotel that evening.

It is a fact that hang gliding competition *does* push pilots to the limits of their abilities time and time again. However, is there a sport in the world which does not do that? Such is the nature of man that no matter how dangerous a manoeuvre, whether in the air, on a rock face or deep in the bowels of the earth, someone will attempt it.

To try to control and limit people by artificial means would be pointless. We do not set out in the League to run dangerous tasks. *However, any pilot can make the safest task seemingly dangerous by the way he flies it.*

Although I believe Trevor's whipstall and dive was acceptable in this instance, the danger lies not in Trevor's action, but those who try to emulate him. Hang gliding, whether for pleasure or competition is still an individual sport and the pilot flies as *he* thinks fit. In the British Hang Gliding League no one tells you how or when to fly — it's up to you.

The last day was perfect. We flew the same site as on the

second day — a road access site, 1000ft. high with a village at the bottom. The wind was about 20mph, subsequently rising to around 30mph and the valley below regularly sent off beautiful blobs.

The first task was a roll-rate contest and top landing spot. In this task a line is projected down the hill and the pilot has to cross and recross the line as many times as possible in one minute. It is pure technique and can be practised by anyone on a soaring day. It is an excellent judge of glider/pilot handling and Bob England had the most crossings with a count of 13-, the lowest score was six.

The final task was one of the most interesting that we have run in the League. Three visual targets were laid out, that could only be seen when the pilot was directly above them. The furthest was a mile upwind of the launch, tucked in behind a large factory and was worth 70 points. The other two were nearer and were worth 40 and 30 points each. The score was divided into target and time points. The pilot with the fastest time for his target got both

full time points and the target points.

The whole task was down to how well you could locate and use the thermals that were around and a free take off order was arranged. Everyone agreed that this was what the League was all about — real flying tasks coupling freedom of action, skill and judgement. This type of task can only be run in good conditions, but it is this kind of imaginative thinking that raises British competitive flying above that of the rest of the world.

The far target was almost at the other side of the valley and I know that had I been flying just for pleasure, there is no way I would have flown so far upwind. I for one learned a good deal from that task, and that is one of the most important things about competition — it's a great educator.

It's marvellous to belong in the League and hard to stay in it. Go out this summer for cross-country flights and log your results. Send them to Roy Hill (see *Wings!* December) and make every effort to get into the 1980 League — you'll have a great time.

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LOCALISED WAVE

FLIGHT REPORT

Date: 12.3.79. Monday.
T.O. Time: 17.03 hours.
Landing Time: 17.45 hours.

Glider: Moonraker 78.
Equipment: Ball Vario, Thommen Alti, Compass-Sky Sports, Parachute.

Typical, I thought. Back to work on Monday. No flying all weekend and now the weather is perfect. To make it worse, my office is situated very near to the take off area; the seagulls tend to rub it in when it is good.

Finally four o'clock arrived, which meant I could rip home and get my trusty Moonraker. Burning rubber all the way back up the mountain I arrived at take off at 16.45 hours. It was a beautiful sight: visibility was very good and you could see north to Bangor and west out to sea. The take off point is called Elidir Fach and is 2565 ASL and is situated two miles NW of Llanberis. Usually I land at Llanberis 2200 feet below but today was to be different.

Having rigged the glider carefully and checked everything, I was ready. It felt smooth. One last check of my windspeed revealed it was just north of west and gusting 18-22mph; not bad. I clipped in and took off and

pulled the bar in to get well out and away from the mountain.

The turbulence hit me first from one side then the other. I headed out for Llanberis. The vario was all over the place and yet my altimeter stayed at 0, so I wasn't losing height. Suddenly, after a few minutes battling away, somebody turned off the turbulence; the sail went perfectly quiet. Instead of the usual few ripples around the cross booms it was perfectly formed.

The vario went to one up and stayed there, even with me pulling three quarters full speed. It took a few moments to sink in what was happening. I have had these same feelings only four times in the past — it's wave. A feeling of deep satisfaction came over me, especially as the winter had been so bad.

I found at min sink that the climb rate went to 2½ up but I drifted backwards; so I eased in the bar and held station with the vario reading 2 up. The altimeter just kept on winding up while I looked at the view. On my left was Snowdon about four miles away: the top bathed in sunlight as the sun went down; the valleys were already dark. To the right were the Menai Straits, now a lovely shade of orange.

Eventually the vario slowed down. I

looked at the altimeter 1800ft. above take off, 4365 ASL. I was already looking down on Snowdon but I thought it would be nice to make 2000ft. ATO as well, so I hung on until the altimeter crept up to the 2000ft. mark. By now I was convinced even if it was late I would go for it; well, as far as I could before it got dark.

I looked around for the extent of the wave; no cloud as far as I could see but I knew in a westerly there was a good chance of wave over the Carnedd. As I turned downwind I kept some speed on and in flying from Llanberis over Elidir Fawr I found it was glassy smooth. I turned slightly north, hoping to pick up stronger lift and flew over Marchlyn Mawr noticing I had lost only a few hundred feet.

I had to make a decision whether to fly down the Ogwen Valley towards Capel Curig — fly south of Carnedd Dafydd — or north of it into the Northwest facing bowl hoping to pick up wave on the way, if not ridge soar the bowl and hop over the top to continue to Capel Curig.

As I flew across Mynydd Perfedd I hit violent sink and in flying across to Carnedd Dafydd lost about 1000ft. As

I flew into the northwest bowl of Carnedd Dafydd I encountered strong, but not strong enough, ridge lift. It was also very turbulent, and after working the bowl I quickly decided it was not worth trying to hop over towards Capel Curig anymore.

Then, with the height I had regained, I flew cross and downwind north-east across the face of a huge north-west bowl and finally landed on the side of Yr Elen, 200ft. higher than the point from which I had taken off.


It was late and the sun was almost down; I decided enough was enough and spent the next one and a half hours walking back to Tyn-v-maes to telephone for a lift.

Observers on the ground later told me that I had taken off, gone up very high and then disappeared towards and into a whitish-grey lens shaped cloud with a gently undulating top. There were only two such clouds in the sky then, the other one was between Bethesda and Mynydd Perfedd. I couldn't see them myself but in retrospect remembered the visibility being hazy once airborne. My route had taken me to the south of the second 'cloud' which I didn't see either. A shame.

Never mind. Next time, better luck.

Jan Ketelaar

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THE BHGA ANNUAL GENERAL MEETING 1979

By Jeannie Knight

Gone was the dull drabness of the Matrix Hall! The inertia and apathy of last year's AGM had disappeared. Enthusiasm and ideas flowed freely at the fourth annual general meeting of BHGA, which took a more sophisticated form in the surroundings of Warwick University, Coventry on March 31st and April 1st.

Although the two-day event was the brainchild of BHGA Council, the Mercian club played a vital part with their expert organisation. No details had been overlooked and the meeting opened smoothly at 2pm on the Saturday.

Chairman, Reggie Spooner, opened the event when he said that Council must represent what was best for hang gliding as a whole. Subjects that Council needed guidance on must be discussed thoroughly, he added.

Three vacancies were available on Council and candidates were given the opportunity to introduce themselves to the membership. The final list of candidates was: **BRIAN MILTON** (standing for re-election), **ROY HILL**, **DIANE HANLON**, **ROB STOKES**, **PERCY MOSS**, **MIKE CASTON**. **DEREK EVANS** was standing unopposed for re-election as treasurer.

The meeting was adjourned so that discussion groups could be formed — the objectives of which were to form policy for the future. Each group had a chairman and several topics were discussed throughout the afternoon, resulting in proposals to be put to the AGM the following day. These were:-

ANN WELCH Training, flying standards, pilot rating, towing and accidents.

DEREK EVANS BHGA Structure, Control of hang gliding, *Wings!* and Publicity, sites and the role of clubs.

DAVID SQUIRES Competitions, Amateur/Professionalism, Public Events, Air space usage.

JOHN IEVERS Power, towing (technical), airworthiness, ancillary equipment.

The new BHGA Development Officer, **BARRY BLORE**, was introduced to members.

Group discussions were often energetically heated ones and the outcome was a large number of constructive proposals and findings which were put to the meeting the following day.

Saturday evening brought the competition to find the best amateur ten-minute hang gliding film. **Dave** and **Katy Thomas** from the Skysurfing club won first prize with their humorous interpretation of a day in the life of a hang glider pilot. There were plenty of films to see and the surroundings themselves gave a flexibility of movement — the bar was

strategically situated in a balcony overlooking the film hall, where the drinking membership could follow both interests!

SECOND DAY

The AGM was continued on Sunday when Reggie Spooner, chairman, opened proceedings and the meeting adopted the minutes of last year's AGM and accepted them as a correct record.

President Ann Welch said the fourth birthday of the BHGA would be looked on in the future as the year in which everything began to come together for hang gliding. A pilot rating scheme had been established and a training scheme was in operation. The two together should produce better and safer pilots for the sport.

"Towing could produce a safe means of launching that could transform hang gliding. It could give clubs a home base from which to operate. But we need to get together and produce a proper understanding of the technical side and equipment", she said.



Ann Welch & Reggie Spooner

PRESIDENT'S TROPHY

This had been won by **Robert Bailey**, for the second year, with a flight just missing FAI Delta Silver badge. Ann Welch said she hoped to see one of these badges won in this country during the coming year.

Ann Welch was invited to accept another term as President of the BHGA — a proposal which was accepted by the membership with acclamation.

TREASURER'S REPORT

The year of 1978 had been one of great change financially. BHGA had taken on new headquarters and undertaken an ambitious competitions programme. The accumulated fund stood at £14,304, reported treasurer Derek Evans.

DISCUSSION GROUP REPORTS

DEREK EVANS

The Development Officer's role within BHGA had been questioned on the grounds of lack of resources and need. But the point was made that Council had been elected to protect and further the interests of hang gliding. The Development Officer's role was designed to do that.

Criticisms that Council did not communicate sufficiently with club members culminated in the Mercian club putting forward a proposal for changes in the present structure and in the present voting system.

The meeting welcomed the availability to the membership of Rhossili and Steyning Bowl, although there was criticism of BHGA support for payment of substantial rent for Steyning Bowl. BHGA's acquisition of sites was discussed and the membership felt strongly that a proposal should be put.

It was generally felt that *Wings!* should be for members' pleasure and should not be aimed at satisfying the public. Discussion followed on the removal of Garth Thomas from the editorship. An explanation of the reasons was given and a debate followed on Council's right to remove him from the post.

It was generally agreed that the editor's functions should be separate from layout jobs and artwork. The principle was reiterated that the editor had complete publishing freedom and that it was his duty to produce the magazine on time, with the editorial committee exercising overall policy control.

ANN WELCH

A full and general discussion took place about standards of flying and in particular problems and methods of training. It was fully accepted that accidents could be reduced if much better training was available to the post-school intermediate pilot.

Most people agreed that clubs should be able to train beginners provided they had the facilities and necessary instructors. A proposal would be put to the meeting from the group on this subject.

Accidents were discussed in detail with John Hunter reporting on the problems of 1978. It was agreed that not all accidents were being reported and there was not enough accident report information in *Wings!* It was essential for accident surveys and reports to be published regularly in *Wings!*, or as special reports. It was not necessary to give the name of the pilot in these reports.

Towing as a means of launching would transform hang gliding but there were still technical problems to be overcome. Contact should be made with local parascending and gliding clubs to learn the possibilities and problems.

It was recommended that the potential importance of towing should be recognised and that BHGA encouragement of this type of launch was also recommended.

Technical aspects of towing were reported by **Pat King**. It was recommended that only suitable gliders, bridles, winches and towing vehicles should be used. Paul Baker and Len Gabriels should be contacted with any queries in respect of this.

John Hudson had offered to act as a focus for information on towing. It was recommended that the BHGA master insurance policy should be extended to cover those wishing to tow. Reggie Spooner gave an assurance that this would be done.

DAVID SQUIRES

Competitions were necessary for hang gliding as a sport. The League fulfilled

one need but there was still a need for an open competition along the lines of Mere '78. It was felt that a public event was not worthwhile yet, but once towing was established it could be reconsidered.

There was a danger that professionalism could cream off the top pilots in the sport.

Airspace was divided into two areas. There was a danger of collision with low flying aircraft and a proposal would be put on this aspect. Education on air law is another aspect.

JOHN IEVERS

A general discussion on aspects of power brought suggestions that further work on design would enable powered hang gliders to be used safely in the majority of normal flying conditions.

Noise from the machines could affect environmentally sensitive areas and concern was also expressed that regulations covering the use of tail-less flexible wing, weight-shift control hang gliders could affect the use of types like the VJ 23.

The group's attention was brought to the need for a fire extinguisher when starting a powered hang glider and also that money for research at universities and polytechnics was probably available for hang gliding research projects. It was felt that powered units could assist with the development and testing of both powered and unpowered hang gliders.

Concern was expressed about the lack of progress in the implementation of airworthiness schemes for production gliders, second-hand gliders and obsolescent gliders.

The area of prime concern was new gliders and imported gliders where the need for the implementation of the airworthiness system was long overdue; the implementation of standards originally drafted two years ago had been so slow that the standards, although they afforded a considerable degree of protection to the consumer, were no longer comprehensive enough to be in line with the requirements of continental countries. The current registration scheme for home-built gliders was, however, felt to be adequate.

CHAIRMAN'S REPORT

Reggie Spooner reported that he had not flown for six months because of health reasons. He thanked Chris Corston for the work he had done for hang gliding and said that a Development Officer had been appointed in order to carry hang gliding forward.

Ten deaths during 1978 had resulted in an excessive workload on John Hunter, Accident Investigation Officer, and his family — but no fatality had been attributed to a failure by a manufacturer.

The real problem that faced hang gliding was within officialdom where there were active lobbies against hang gliding. An effort was needed to influence and change that.

The three most important things within hang gliding were sites, airspace and aircraft. There was a



THANK YOU MERCIAN

... all those who helped to make our AGM the most meaningful gathering we have yet had for the future of hang gliding.

The Mercian were our host club, were there in force, had done a mass of work in previous weeks — so that we could find our way — could sleep in comfort — could eat well and could enjoy ourselves.

Above all they welcomed us with a spirit and warmth that rapidly permeated the whole gathering.

Better pens report on the meeting, but I must reflect the spirit of it, the give and take, the deep discussion and understanding, even where protagonists enjoyed totally opposing views. Enjoyed really is the correct word to use — there was much discussion and much argument and within it there was understanding of the other view.

I believe it demonstrated our own maturity as a sport and in saying thank you to all those who were there — and especially to the Mercian club — I say it in the context that what the Mercian did was to catalyse an inherent spirit of understanding among the clubs — among us all.

REGGIE SPOONER
CHAIRMAN BHGA

growing threat to sites from pressure groups and from those who controlled land. As soon as there was an incident involving a hang glider and an aircraft, airspace would be closed to hang gliding. At present there was no guarantee given by BHGA that equipment produced in this country was safe. All these areas needed attention.

VOTING ON CANDIDATES

The following candidates were elected. **MIKE CASTON, ROY HILL,** and **BRIAN MILTON.**

Reggie Spooner warned that there might be a subsequent objection. Some voting slips belonging to the Southern Hang Gliding club had gone missing during the lunch break. Tony Fuell, chairman of the club, said that in view of the result, no objection would be raised.

The following proposals were discussed and voted on, with the outcome as indicated.

1. "that the BHGA Council takes immediate steps to bring pressure to bear on the CAA to up-date their air maps to include all major hang gliding sites in the UK. These could be marked with a simple triangle-shaped symbol or something similar. The present map shows both parachuting

and gliding sites", proposed **Dick Scates**, Avon club. Seconded, **Tony Tate**, Avon club.

The proposal was carried without dissent.

2. "that all insurance flying and ground cover be covered by the BHGA under one umbrella cover". Proposed **T. Fletcher** WHGF, seconded, **Doug Powell**, WHGF.

This was carried. A formal proposal that BHGA membership fee be increased by £1 to cover this was accepted. Proposed, **Derek Evans**. Seconded, **Garth Thomas**.

3. "that this AGM conveys congratulations to Garth Thomas for the changes and improvements made to *Wings!* since he became editor. Proposed by **Roy Hammond**, **Cork H.G.C.** Seconded, **Kevin Barry**.

In view of the absence of the proposer and seconder, the proposal was put forward by **John Ievers** and seconded by **Steve Hunt**, for the purpose of having the matter discussed at the present time.

The proposal was lost.

3. "that this AGM deplores the po-faced method (*Wings!* information page 22, January/February issue) of firing Garth Thomas as Editor and seeking a replacement. Further that Garth Thomas be retained as Editor

and that the increased editorial fee be back-dated to when he took over the magazine". Proposed, **Roy Hammond**, **Cork**. Seconded, **Kevin Barry**, **Cork**.

The proposal was taken over by **Dave Bedding** and seconded by **John King**. An amendment was proposed by **John Ievers** and seconded by **Steve Hunt**, that all words from the motion should be deleted.

The amendment was carried and the proposal lost.

5. "that this Council should investigate and acquire suitable sites with a view to developing them for the benefit of hang gliding generally and to set up an appropriate administration. Proposed, **Percy Moss**. Seconded **David Bedding**.

The motion was lost.

6. "that this Council arranges for suitable club members to train as instructors and should run courses for this purpose". Proposed, **Ann Welch**. Seconded, **Steve Hunt**.

The motion was carried.

7. "that this meeting recommends that powered hang gliders which are aerodynamically controlled in pitch (as opposed to weight-shift controlled powered hang gliders) should be treated separately by the BHGA in their negotiations with the CAA". Proposed, **Ashley Doubtfire**. Seconded, **Steve Hunt**.

The motion was carried.

8. "that this meeting proposes that the BHGA Council should seek funds to finance a test programme for hang gliders, using a power unit for height gain, to enable a full and properly monitored test programme to be carried out". Proposed, **Ashley Doubtfire**. Seconded **Steve Hunt**.

An amendment, proposed by **Rory Carter** and seconded by **Mike Collis**, that the words "using a power unit for height gain" be deleted was carried. The amendment was accepted.

9. "that the airworthiness discussion group recommends that the new BHGA Council make all necessary effort to ensure that all new gliders sold to comply with existing standards, and that an equal effort be put into up-dating the standards and testing procedures for all gliders". Proposed and seconded by the airworthiness discussion group.

Motion carried.

10. "that the group recommends that the airworthiness approval scheme be implemented with immediate effect for gliders not yet in production; such gliders shall not be offered for sale, advertised in *Wings!* or eligible for insurance and competition entry until approval is gained".

Proposed and seconded by the airworthiness discussion group.

An amendment proposed by **Brian Milton** and seconded by **Tony Fuell** that the words "and competition" be deleted for 12 months was carried by 56 in favour and 47 against.

11. "that the group recommends that the airworthiness approval scheme be implemented for production gliders which are currently on sale by August

1st 1979, and that after this date such gliders shall not be offered for sale, advertised in *Wings!* or eligible for insurance and competition entry until approval is gained". **Proposed and seconded by the airworthiness discussion group.**

Motion was carried.

12. "that this group recommends that an approval mark be devised for the identification of approved machines", **Proposed and seconded by the airworthiness group.**

Motion was carried.

13. "that this group recommends that the BHGA Council should approach the BHGMF to devise a reasonably priced system for the inspection of individual gliders no longer in production and the issue of a certificate of inspection to enable that individual glider be offered for sale or entered in competitions". **Proposed and seconded by the airworthiness group.**

The motion was carried.

14. "that this group recommends that the BHGA should consider the appointment of a full time airworthiness officer". **Proposed and seconded by the airworthiness group.**

The motion was carried.

15. "that a BHGA seal of approval scheme on the lines proposed by Jim Taggart should be instituted forthwith". **Proposed by Jim Taggart and seconded by the airworthiness group.**

The motion was carried.

16. "that the appointment of Airspace Usage Officer is essential". **Proposed by Doug Squires. Seconded by Keith Cronshaw.**

The motion was carried.

17. "that this AGM congratulates Brian Milton and all members of the Americas Cup team on their success in winning the Americas Cup". **Proposed by Pat King. Seconded by Bob Mackay.**

The motion was carried.

18. "to re-establish a CANP procedure for the use of BHGA members or to investigate and create an alternative system of warning military aircraft of midweek hang gliding flying". **Proposed Brian Smith. Seconded Keith Cronshaw.**

The motion was carried.

19. "that BHGA should, using the liaison facilitated by the appointment of the Development Officer, set up a committee to investigate and create a national site policy enabling the members of any BHGA club to fly any site in England, Scotland and Wales without extra fees other than those paid on site by the members of the club being visited". **Proposed by J. Croll. Seconded by P. Sutton.**

An amendment to delete "and create" and to insert "selected", proposed by Bob Mackay and seconded by Doug Powell was carried.

20. "that separate creche facilities should be provided at the next AGM for the succour of young children and comfort of adults", **Proposed John Ievers. Seconded Jeannie Knight.** Four other similar proposals were also received.



Derek Evans

The proposal was carried, noting that this was not a reflection in any way on the organisation and facilities provided by the Mercian club. It was a comment on the unexpected and unanticipated introduction of very young children into serious debates, by their parents.

21. "that this AGM requires the Council to call an extraordinary general meeting of the association to change the constitution of the BHGA so that a pyramid structure be adopted, by the BHGA". **Proposed, Robin Billington. Seconded by Simon Dudfield.**

The motion was lost.

22. "that this AGM require the Council to call an extraordinary general meeting of the Association to change the constitution of the BHGA such that only those members attending the AGM can vote on proposals raised at the AGM of the Association". **Proposed, Robin Billington. Seconded, Simon Dudfield.**

The motion was lost.

The last two motions were possibly the most contentious of the day and it was interesting to see that they were decisively beaten without any block votes being used.

Votes of thanks were given to Judy Hunter for supervising the complex voting system, to the Mercians club for their excellent organisation of the event, and to Reggie Spooner for his work as Chairman throughout the year.

Dave Cooke's achievement as the first person across the channel was also recognised at the meeting.

The attendance at the meeting was well in excess of 200 on each day. Those who missed the event because they thought it would follow the uneventful pattern of previous years were guilty of gross misjudgement. Next year's AGM can only be bigger and better after the successful innovation of 1979.

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KILIMANJARO — THE IMPOSSIBLE MOUNTAIN?

By Ashley Doubtfire

On January 18th, 1979, Ashley Doubtfire, Dave Kirke and Simon Keeling flew from the top of Kilimanjaro — the highest mountain on the African continent, with a height of 19,000ft. ASL.

Ashley, flying a Birdman Cherokee, landed at the town of Moshi after a flight of 18 miles. Dave Kirke and Simon Keeling followed several hours later, flying a Safari and Phoenix 12 respectively. Dave landed in a coffee plantation two miles beyond the rain forest surrounding the mountain. Simon put down four miles to the north-west of Moshi.

They were the lucky ones. Seven flyers had set off from Marangu in the foothills two days earlier with the intention of flying the mountain. Ashley Doubtfire tells the story behind the flights.



Part One

First mention of the trip came on a cold December afternoon at the Welsh Distance Knock-out competition. John Fack, another League flyer, came over to offer commiserations after I was knocked out of the event.

"I'm thinking of going to Kilimanjaro this winter", he added. I nodded, said it sounded great — and tried not to think about it.

Next mention of the trip came just before Christmas in Bristol. I had gone to have drinks with the Windcraft crowd and met David Kirke there. Dave is an extremely determined character who managed to pull off a flight from Mount Olympus in Greece during 1978 with a mere four days experience of hang gliding under his belt. Chris Baker and Alan Weston, two members of his 'Dangerous Sports Club' had accompanied him on that particular exploit.

They invited me to go with them on the Kilimanjaro trip and I asked for 24 hours to think it over. A host of questions sprang to mind.

Who were the other flyers? If they were more of Dave's friends, the chances were that they would be relatively inexperienced. Was this why I was wanted on the team? Hadn't someone taken off from the mountain and never been found? How high is it? Can one take off in rare air? What's down at the bottom — lions, snakes, swamps, hostile tribesmen?

The answers were about as frightening as the questions, but I found out as much as I could and gave them my answer — yes.

Statistics gave an average pilot a 33 per cent chance of not making it. John Fack had done some work on estimated glide angles relating to the gradient of the mountain and the extent of the jungle. It looked as if we could make it with a reasonable glider. We tried to think of everything which would increase our chances of survival. Kits with flares, matches, water, signalling mirrors were essential. One brain-wave was a lightweight cord of high breaking strain, which would enable one to descend from one of the 100ft. trees which abounded in the forest.

TWELVE DAYS LATER

Mount Kilimanjaro is situated in East Africa, near the Kenyan border. It is a volcano with crater two miles in diameter. It stands 19,340ft. above sea level. Six miles away is another peak, Mawenzie, which is a craggy, forbidding mass summing at 17,000ft. Between the two peaks is the saddle — an expansive no-man's land at 15,000, which takes three hours to cross. The foothills for ten miles in all directions are a combination of impenetrable bamboo forest and equatorial rain forest. Somewhere in this forest a German hang glider pilot met his end.

I was never worried about clearing the bamboo area, though we had been warned that an aircraft had crashed there and the plane, crew and passengers had never been seen since.

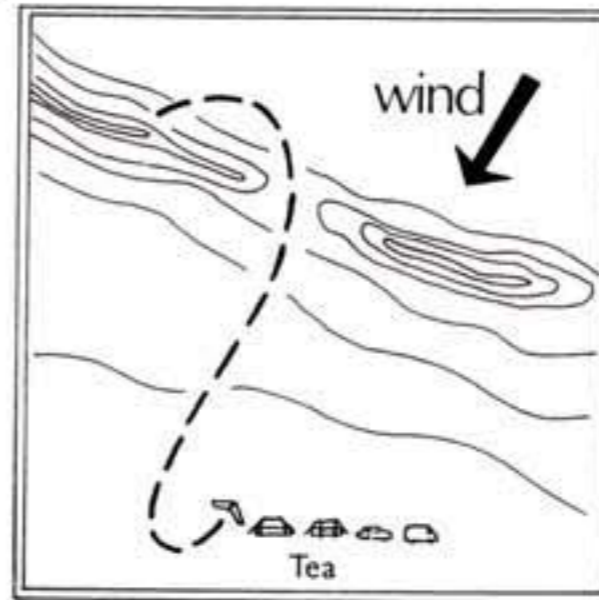
SITE ASSESSMENT

Extremely vigorous thermal activity had to be watched closely, for here in January were flying conditions superior to England's June. We knew we might have to fly early in the morning or late evening, when there was little thermal activity.

The flight plan was a classic one, similar to one I have used in this country. A good example was the Scottish Open site at Minto in 1976. There we had to make a downwind flight round

the back of the hill, turning back towards the hill for landing. (See diagram). The only difference was a massive change of scale.

Statistics show that an average of 30 per cent of the climbers attempting the mountain actually make it to the top. The reason is not lack of mountaineering skill — for the climb is nothing more than a glorified hike — but a combination of distance and altitude.



ALTITUDE SICKNESS

If you cover the 21 miles too quickly, headaches, acute sickness and vomiting result. The height of 19,000ft. is almost twice that at which a pilot turns on his oxygen.

After discussion with two experts, I decided it might be beneficial to take a small amount of oxygen for each pilot to breathe for a few minutes before his flight so the dangers of over-confidence through oxygen starvation would be avoided. After twenty minutes the pilot would be low enough to gain the benefits of denser air.

I accumulated enough bottles for seven pilots, with ten minutes usage for each person. One mistake was in not marking the bags containing the oxygen — for when we needed it most (for rigging and preparing to fly) nobody managed to locate it. The three of us that flew managed without it and I believe that Alan Weston's main problem was that the wind had totally dropped when he came to take-off. I made a point of forcing

very heavy and quick breathing to stoke up the system with enough energy for that difficult scramble over the rocks.

ULTRA-VIOLET RAYS

The sickness problem was not the only one we faced. When there is less air there is also less protection against ultra-violet rays from the sun. Temporary or even permanent blindness can result from not wearing dark goggles. We saw people whose noses and cheeks were completely raw with burns, wishing they had taken more face cream and worn a balaclava.

CLOUD

A first glimpse of Kilimanjaro is usually hard-earned and results from a wait of several days and being in the right place at the right time, for the peak is normally swathed in cloud.

The Senior Game Reserve warden advised us that the best time to fly would be between 6am and 9am. At other times the thermal activity looked too powerful and the wind was strong. During the climb up we passed a basic layer of cumulus and this was followed by fine water vapour being thrown in massive swirls, or a strange wave-like formation at the very top. To fly in cloud is dangerous enough on its own, but the risk of losing orientation while flying over the jungle made me decide totally against flying in any form of cloud.

ROTOR

Rotor is probably an inadequate term for what happens downwind of a mountain three and a half miles high! I had read accounts of pilots being turned upside-down in these circumstances and this emphasised the need for a precise flight plan, keeping the pilot as clear as possible of downwind areas of the two peaks.

In planning this aspect of the flight, a natural conflict existed between safety in the air and safety over the ground. If one flew a line directly between the effect of the two peaks, the ground track led over a much more extensive area of jungle. The compromise had

to be made by turning south towards Moshi as soon as one was far enough away from the mountain.

OTHER PROBLEMS

We entered Africa through Kenya and had to get to Tanzania over the western border. It was officially closed! Added to this was the fact that Kilimanjaro was officially banned for hang gliders but this particular aspect could be overcome by obtaining permits from the Tanzanian High Commission. Driving a van-load of gliders through the border by road was far more difficult and Dave Kirke solved this particular problem.

Another great worry was the lack of experience of the majority of the party. This was no team of experts! John and I decided that our responsibility would be to assess conditions, plan the flight and give everybody else as much advice as possible.

Chris Baker was third on the list of experience with a few hours soaring, some flights in the Alps and some towing flights in the States. Chris damaged his kite in practice and suffered from altitude sickness and was unable to fly.

Alan Weston had been flying a Phoenix 8 for a short while before we left and his climb of Kilimanjaro three

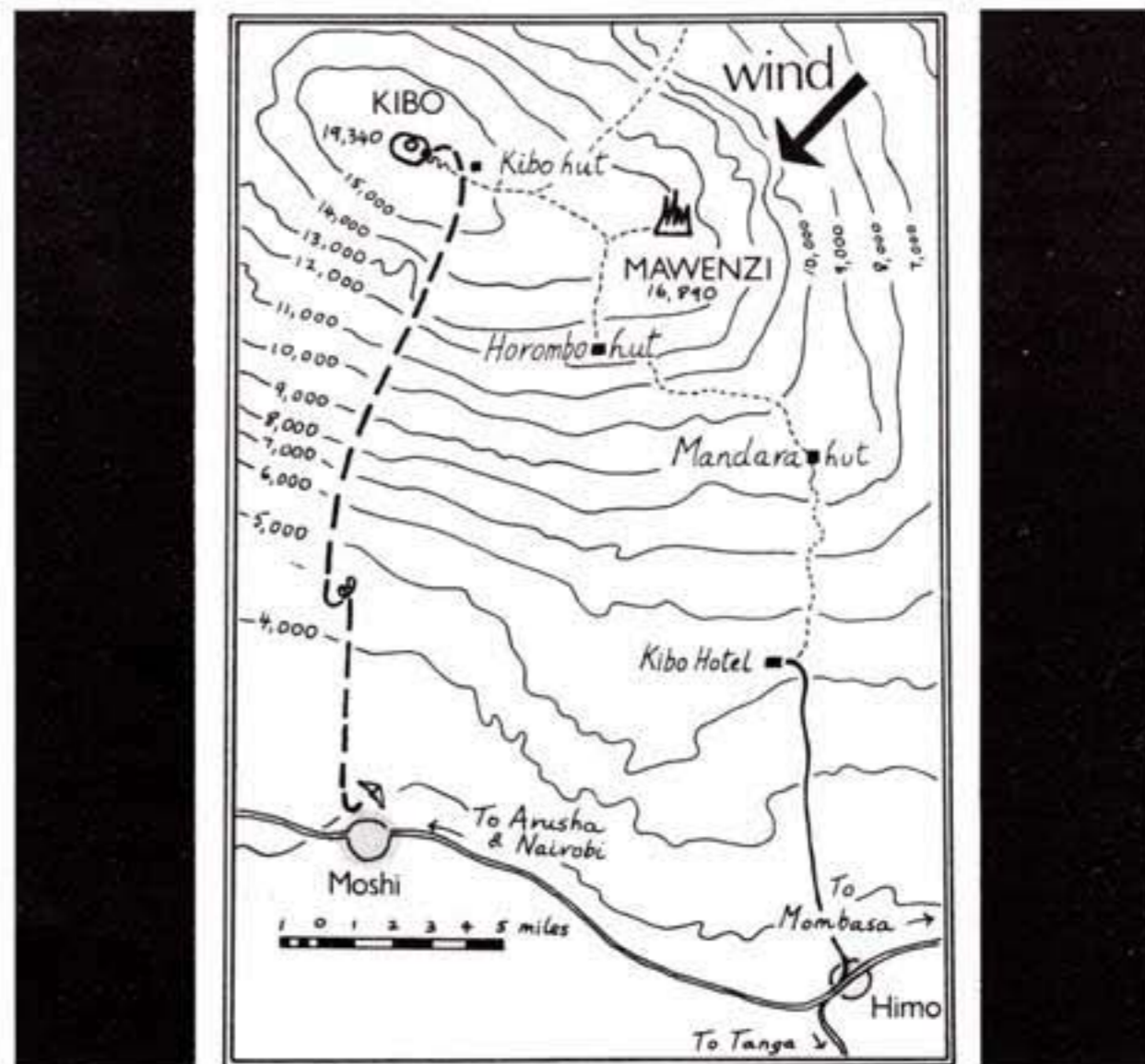
years ago was the inspiration for the trip. Jonathan Hardy was considering flying prone from the mountain, but eventually decided that he would fly seated. Glider flown up to date was mainly an Avon Swift.

Simon Keeling made a transition from a Cloudbase to a Phoenix 12 and from seated to prone simultaneously — something I would never recommend to any pilot. I've got a

good idea that now he is back in sane old England he might choose a glider with a slightly lower aspect rate.

Having set the scene, next month I will take you through the walk up the mountain, the overnight stops, our final ascent — and above all how it felt to be drifting downwind of Kilimanjaro towards a gap in the cloud bank, 16,000ft. above the warm African continent.

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with immediate response which is so necessary for all kinds of flying.

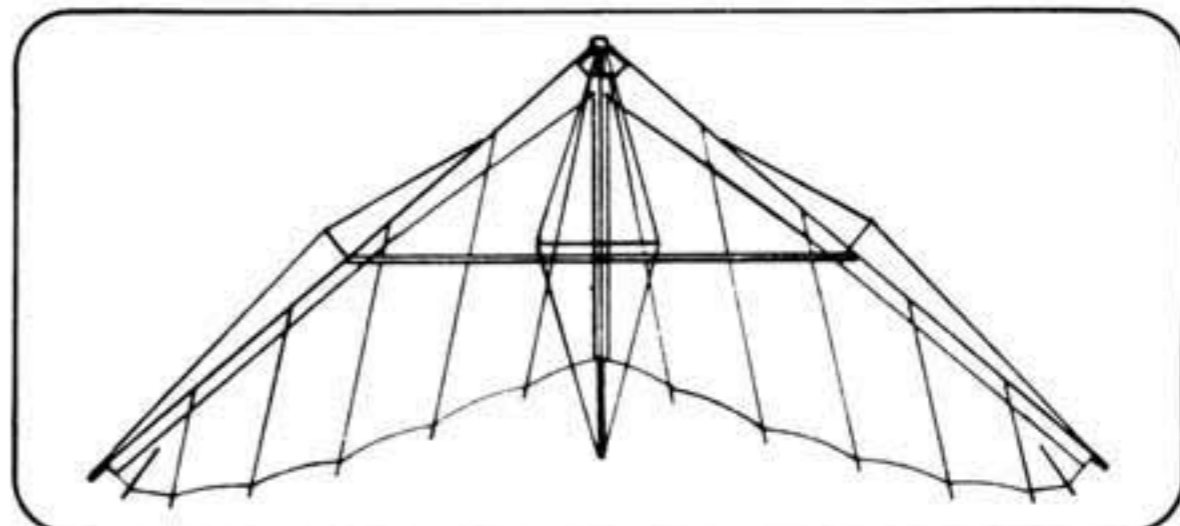
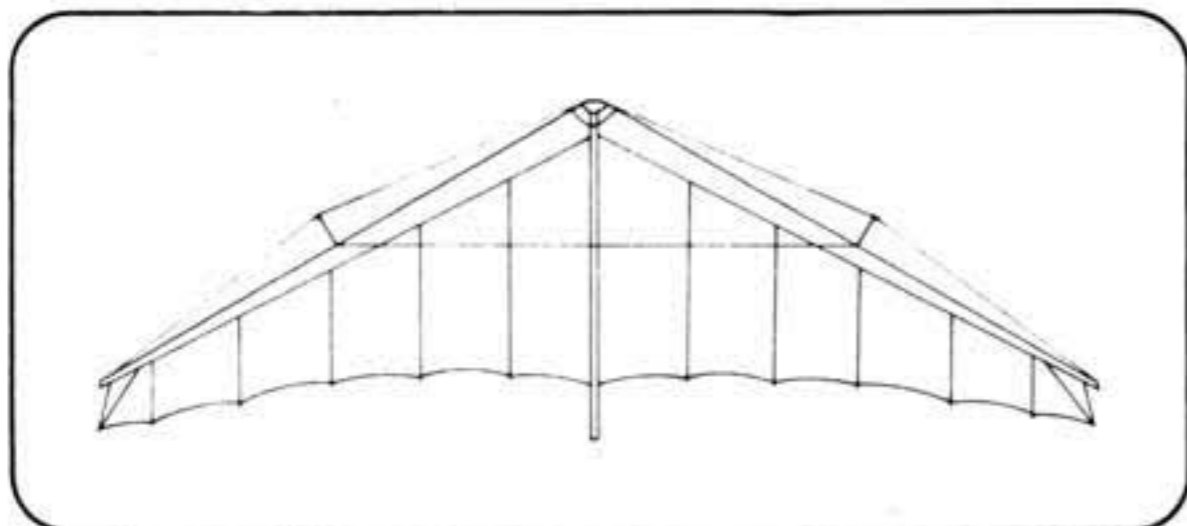
Glide angle at speed is good. The reflexed preformed battens in every seam make the whole wing pitch positive without the need for locked up tips etc. Vertical dive recovery is positive.

Safari is a real cross-country machine which easily makes use of thermals and handles the strong turbulence which often goes with them.

For the experienced pilot who demands the best performance but still wants outstandingly good handling.

Sunspot. Still one of the best all rounders next to "Safari" for fliers of E.P.C. standard.

104° nose angle. A/R 5. Available in two sizes. Prone harnesses and parachutes also available.



Skyhook Sailwings Ltd.

Vale Mill, Chamber Road, Hollinwood, Oldham, Lancs.
 Tel: 061-624 8351/3427 Telex: 667849 HOLMES G.

THE GEORGE WORTHINGTON COLUMN

Increased L/D versus increased cross-country distance potential



It is a well known common belief among soaring pilots and designers that if the L/D of a soaring craft is increased, the cross country distance potential will automatically also be increased. And of course, if nothing is sacrificed, in bringing about this increase in L/D, the statement is absolutely true. But as a practical matter, there is some degree of evidence that other considerations are *not* kept constant, and that a very large increase in L/D may not, in certain instances, bring any increase in cross country distance-potential.

This possibility first crossed my mind in the Summer of 1978 when I made thirteen attempts at the world hang gliding distance record. Eight of the attempts were made in a rogallo (Seagull 10 Meter) with an L/D of about 8-1/2. Five attempts were made in the Mitchell Wing which has an L/D which I would estimate at 14. All thirteen attempts were made from Cerro Gordo. The results were that the average distance flown in the rogallo was 28 miles, whereas the average distance flown in the Mitchell Wing was 24 miles. The longest flight flown in the rogallo was 86 miles, whereas the longest distance flown in the Mitchell Wing was 40 miles.

In a statistical sense, thirteen flights if too few to give much qualitative value. But it is, nevertheless, quite contrary to expectations.

It must be stated that one important reason for this apparent disparity is that I have a policy of wanting a suitable landing field within reach at all times when flying the Mitchell Wing, and because of this fact, I sometimes have had to leave an area of best potential lift (the mountains) at an altitude as high as 3000ft. above the valley. But when flying the rogallo, I had only the need to reach the valley, because all of the valley was landable. I could therefore "afford" to circle and drift at altitudes down to 3 or 4 hundred feet over the valley. This meant that if I found lift, and got back up, I could continue on for many more miles.

With this one example of L/D, where it was seemingly refuted in actual practice, I became more sensitive to the idea that, in some cases, L/D may not be the "end all" goal we are seeking in foot launched vehicles. I looked around and found a similarity in Britain. Two Scorpions hold the British distance record. (Not one, but two). The Gryphon, and maybe some other British rogallos, have a small but distinct

advantage in (1) L/D (2) speed range; especially the upper range and in (3) penetration (ratio of high speed to sink rate). But the Scorpion has the advantage, I believe, in minimum sink rate and perhaps in the ability to make tight turns with a minimum loss of altitude. So, theoretically, the Gryphon should hold the distance record, unless sink rate, for the average British type of lift available, is more important than (1) L/D, (2) speed range, and (3) penetration.

Now that we've taken the idea this far, what about the Fledgeling, Easy Riser, and Mitchell Wing? They are all available in Great Britain. They each probably have L/D, speed, and penetration advantages over the Scorpion and the Gryphon. And from my experience of these machines, the Fledge and Easy Riser can land just about anywhere that a rogallo can land. So why doesn't a Fledgeling, for example, hold the British record? Is it because the Scorpion has a better sink rate? Or is it because Bailey and Calvert fly Scorpions? I don't know. But it is great fun to contemplate these ideas and it will be fun to observe the outcome next summer (1979) when all of these ships will be competing against each other again, both in the US

and in Great Britain.

And now, if I may, let me state some random facts and beliefs which might have a bearing on this subject.

(1) The world hang gliding distance record is 95 miles for a rogallo, and 95 miles for the Mitchell Wing. In both of these flights, the pilot had sufficient altitude to positively make 105 miles, and maybe much more. Instead, the pilot decided to land at a *pre-selected* goal. So these flights don't tell us much.

(2) The world unofficial (no certificate from FAI) hang gliding distance record *claim* is 103 miles, made in a rogallo in 1977.

(3) In the US, where the thermals are powerful and have great height (often over 10,000ft.), if we limit our discussion strictly to rogallos, I believe that the pilot, and the lift conditions on any particular day, and luck, will have the overwhelming influence on producing a new world distance record. The particular model of rogallo will not, I believe, have any major influence on this, and will be insignificant in comparison to the pilots importance.

(4) The new hang gliding section of the FAI code will not take effect until November of 1979. Therefore, rogallos and rigid wings (i.e. Mitchell Wing) will still be "lumped together in one class, for World Record purposes, in the Summer of 1979. In the Summer of 1980 they will be separated into separate classes. (i.e. weight shift vs. movable aerodynamic control surfaces).

(5) In spite of the results of the "thirteen flights" mentioned earlier, I still believe that the Mitchell Wing, at Cerro Gordo, has the greater distance potential. I am even willing to make some predictions about next Summer's flights. (a) The Mitchell Wing will fly over 120 miles. (c) During the Summer of 1980, the Mitchell Wing will make a distance record over 140 miles. (d) In 1980, no rogallo will fly over 130 miles.

It's going to be an exciting and challenging Summer!



STEYNING OPEN HANG GLIDING CHAMPIONSHIP 1979 JUNE 2nd and JUNE 3rd

TROPHIES FOR WINNERS

The venue for these championships is Steyning Bowl, Steyning, Sussex. The site takes all wind directions except W and NW and is reached by road from Steyning village. Take the lane beside the White Horse Inn and follow it to the top of the hill. The site car park is on the left after the road levels out.

This is intended to be a **FUN EVENT** and will be divided into two classes, according to pilot qualification. Entry fee for both classes will be £3, which includes car parking on both days.

ELIGIBILITY. All pilots must be members of the B.H.G.A. or the National Association for their own country. Proof of pilot qualification will be required in the instance of foreign competitors and British entrants must quote pilot badge number where applicable.

INTERMEDIATE CLASS.

Those holding B.H.G.A. Elementary certificates or Pilot One will be eligible to enter. They must not yet have achieved Pilot Two or Pilot Wings. Tasks

will be of a simple spot landing and slalom nature.

PILOT CLASS.

Those holding B.H.G.A. Pilot Badge or Pilot Two will be eligible. Tasks of a more advanced nature will be set.

Entries will be limited and early application is advised. Please send £3 fee, cheques payable to **B.H.G.A. STEYNING**, and a large stamped addressed envelope to Jeannie Knight, 10 Spring Gardens, Washington, Pulborough, West Sussex.

Official entry forms will be sent, along with a list of accommodation within the area, and also car park passes for both days. Be sure to apply early in order to avoid disappointment.

Closing date for entries is May 21st 1979. Entries will be taken in order of receipt.

ATTRACTIONS

On the Saturday evening there will be a **JOHNNY CARR DISCO** held locally for competitors, flyers and their families. Tickets will be priced £1 and can be obtained with entry form.

SECOND-HAND GLIDER MART

This will be held on site. If you have a glider to sell, bring it and display it. If you want to buy a glider, come and see the display and talk to the owners. A nominal fee of 50p per glider will be charged for each glider displayed.

MANUFACTURERS AND SCHOOL EXHIBITIONS will be held. Display space for this purpose will cost £25 for the two days and can be booked with Jeannie Knight.

RAFFLE

Tickets will be available at the event for a draw with three big money prizes. The draw for the winning tickets will take place at the Disco.

PROCEEDS

Any proceeds from this event will go towards the Steyning Bowl fund, which is vital for future preservation of this flying site. The site is essential for the continuation of safe hang gliding in Southern England and the Management committee has a high target to reach.

WE WON THE CUP! SO, NOW WHAT?

Last year saw British Hang Gliding's breakthrough in International flying and, with two silver medals in the European Championships and a convincing win in the American Cup, the team efforts were well rewarded. We are on top of the tree now, but we have got to stay there, and you can bet your thermal underwear the competition will be far more fierce in 1979. In some ways, the pressure will be greater. We have a lot to lose this year and there are five occasions on which to prove whether or not British is still the best — The Scandinavian Cup, The Bleriot, George Worthington's Cross Country, The World Championships and The American Cup.

Great flyers, we have. Money? Not a lot! And we do need a lot this year. So, will you support the British effort again by dipping into your pockets for the odd quid or three and win into the bargain, one of these fabulous prizes in our **INTERNATIONALS DRAW**. 25p could put you on the plane to Chattanooga or in the coach to Grenoble — the entertainment over there is terr-if-ic!

British Hang Gliding needs your support more than ever this year — pop something in the envelope for Audrey!

Internationals Draw

1st Prize—Hang glider of your choice *or* air ticket to the American Cup.

2nd Prize—Colver variometer *or* transport to The World Championships in France.

3rd Prize—Thommen altimeter.

4th Prize—Thommen altimeter.

5th Prize—£50 worth of goods from Mainair Sports.

6th Prize—Flying suit by Protec.

7th Prize—Suunto Compass.

8th Prize—Bomber jacket—British Team design.

9th Prize—Leather flying/ski gloves.

10th Prize—Birdman equipment bag.

First and Second prize winners have choice of prize—travel prizes commence at team's departure point from United Kingdom.

Money and Tickets to:

Mrs. Audrey Evans,
15 College Drive, Tunbridge Wells,
Kent. (T/N: T/W 36026)

Cheques and Postal Orders payable to BHGA.

Closing Date

Saturday 2nd June 1979

Draw will take place on 2nd June at the Dover and Folkestone Club shindig — Gander Court, Barnsole, Staple, Nr. Canterbury.

We are grateful for our "Sponsors" Help Again — the hang gliders are offered by **Birdman, Chargus, Hiway, Skyhook and Waspair.**

Many thanks also to John Hudson's Mainair Sports and to Protec for their invaluable support.

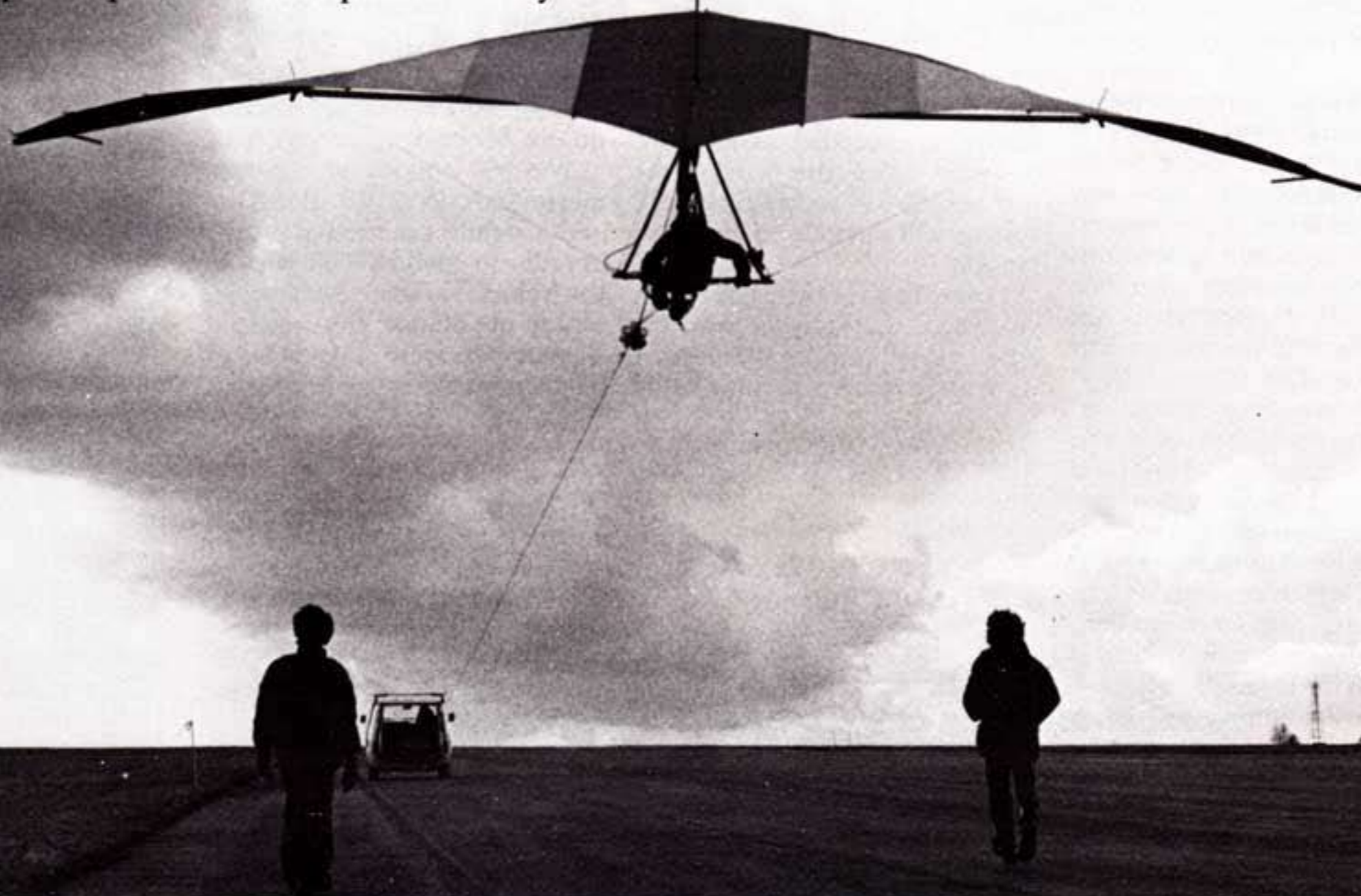
TOWING 1979 STYLE

Towing has crept up on hang gliding in this country in a quiet, unassuming way during the last twelve months. Dotted around the country, individuals have been developing and researching towing systems to enable hang gliding to take place from flat ground.

The Australians have been at it for years and have always concentrated more effort in the towing department than in foot launching from hills.

Bill Moyes pointed out on his last visit to England that towing enabled competitions to be held in large city parks. Towing means not being tied to wind direction when a flat expanse of land is used.

When these towing methods have been perfected in this country, might we one day see a British Open Hang Gliding championship based in the equivalent of Hyde Park?



Paul Baker takes to the skies with his towing system.

The system used is a three point bridle system. The loads are applied at the heart bolt and the two bottom corners of the control frame. We do not need to have a stainless control frame or any other nonstandard gear. A single release system is fitted to the point where all three bridle lines meet and this is operated by a lever on the control bar.

The bridle is so made that as the line goes slack and is released, the top wire winds itself up out of the way. The two bottom wires lie along the control frame upright and the pilot is unencumbered by wires flapping around his face. A further advantage is that this system applies tension to the top bridle wire during towing and the pilot has to deliberately push against this tension to achieve maximum climb. If he does not push out, the glider adopts a

lower climbing angle, which is safer than going up too steeply. Even pushing out hard the climbing angle is limited to a safe amount by the bridle dimensions. We have released under full tow without the glider whipstalling, and in fact the stall is well within the capability of a pilot to control it.

The towing effort can be provided in various ways — and to date we have towed behind boats, cars, by hand and by winch.

For car towing we sit a wireman

in the boot and let him hold the

TOWING SYSTEMS

Len Gabriels of Skyhook has been involved with all types of towing for almost five years. Realising that powered hang gliding is not everyone's answer to flat land flying, he took a fresh look at towing. The result was a simple towing system that he describes here.

The pull on the line is about 70lbs. and this is easily held by the wireman. If the car driver becomes too enthusiastic and the tow line pull becomes too strong, then the wireman is forced to let go. This provides a measure of safety.

Hand towing can be done by two, three or four men. If there is a good breeze, so that running is not necessary, then two men can easily pull the glider up. If

running is necessary, then up to four men may be needed, but even then a light breeze would be required. This method, like the car towing described above, is cheap, simple and useful for learning. Again this is inherently safe.

Winch towing is another method. We now have a winch which fits in the boot of an average car, weighs only 40lbs. and contains over 3,000ft. of tow line. Not so much a Bennett Mountain, more a Skyhook Pimple. The method of use is different from the Mountain.

This winch is powered by a two-stroke petrol engine which drives a small cable drum via a centrifugal clutch. A line levelling device lays the wire on the drum so that it does not become tangled or pull in to the drum under tension.

The winch is placed on the

ground and is held in place by two men standing on it, one of them being the operator. This could of course be fastened to a vehicle if required but leaving it loose on the ground provides an additional safeguard against overloading the glider.

Other safeguards are provided by the winch itself. The engine can provide only about 120lbs. of line pull.

The line has a breaking strain of 300lbs. and a weak link will break at about 200lbs. If the engine is throttled back or switched off, the clutch frees the cable drum from all load and this in the event of a severe load the line could pay out freely.

So the whole system working together would seem to make it impossible for the glider to be come overloaded. The main risk in towing therefore is the dreaded "lockout", or a stall at low altitude due to premature release or a line break. In fact, stalls are quite gentle with our system and are easily handled.

Although we have towed old MK.3a standards, Sunspots and Safaris by boat, car, hand and winch from 1974 until now, we have never experienced a lockout and are inclined to think that it is something which depends on kite design, plus care in operation, rather than something which is inherent in towing itself.

We feel that towing will be as safe as the kites and pilots make it, which is exactly the same requirement as for conventional hang gliding. In addition, for towing to be safe, the launch crew (especially the winch operator) needs to be clued up, methodical and organised.

Len Gabriels

TOW SHOW

A 7hp engine-driven winch developed for hang glider launching was shown to 130 members, wives and friends of the three clubs forming the Midlands Federation last month.

The clubs involved (Malvern, Mercian and Northampton) met at Lapworth, Warwickshire on March 27th when Len Gabriels of Skyhook Sailwings showed a film of his towing experiences.

These ranged from towing a small Skyhook at Oxwich Bay, four years ago, to car towing a Safari this winter. Len answered questions and we were left with the impression that towing need be no more dangerous than ridge soaring (yes, that safe) and that

for a "flat-lands club" with a scarcity of hills, a winch could be an excellent investment.

As Len himself pointed out, all the experimental work has been

done. It's now up to a club or syndicate to demonstrate that winch launching is a practical way for hang gliding to develop.

GARTH THOMAS

A YEAR OF DEVELOPMENT

Paul Baker has spent a year trying to perfect a towing system. Several prototype winches later he has come up with a powered winch that is working well.

The system automatically pays out extra cable when a certain line force is exceeded. Using his powered winch, the speed of the tow vehicle is irrelevant and the system will operate on zero line tension.

"I came to the conclusion over a year ago that towing was the answer to all our site problems. I want to do more experimentation

now in order to perfect the present system," says Paul.

During recent towing tests behind his Bedford van, using a Moyes Maxi, he achieved 1,000ft. height gain. His present tow line is 2,000ft. long, but he hopes to extend it to 3,000ft. eventually.

The present target is to work out techniques and standard procedures for launches so that incidents do not become major problems.

"We are working at achieving maximum safety," he added.

Foot signals are used at present in order to communicate with the tow vehicle — hence the dangling foot in the photograph sequence. The pictures were taken at Breen Sands towards the end of March.

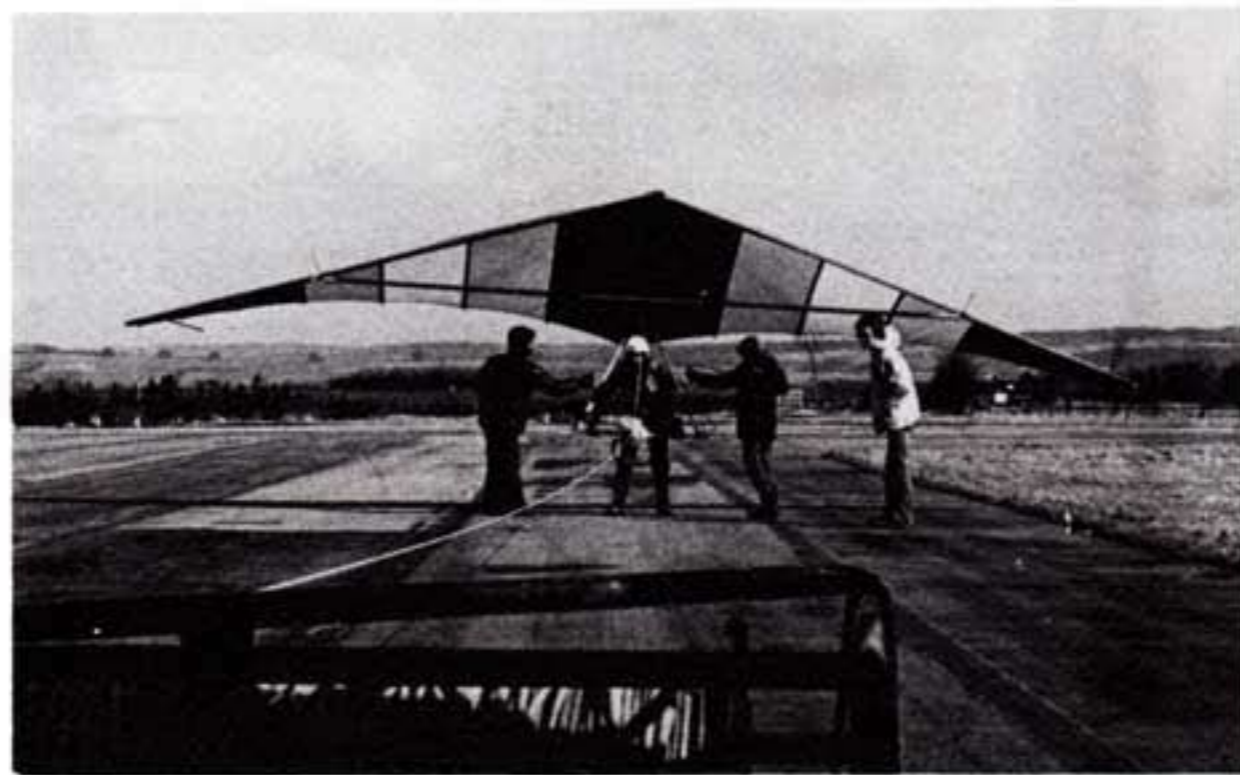
Below: Paul Baker ready for the off.

Bottom: Getting airborne.

Bottom left: Correction under tow.

Bottom right: Kicking for speed.

Photos by Mike Wisternof.



THE FIFTH

Scottish Open

Championships

14 th to 17 th June, 1979

The venue for the 1979 Scottish Open Championship will be the Cairnwell Mountain, Braemar, Aberdeenshire (I.O.S. Map Reference Sheet 07/17 - 135,774). The mountain is 3060 ft. ASL (top to bottom height is 1700 ft.). A road takes one to within 1000 ft. of the summit where pilot and hang glider are then transported to the top by chairlift. The site is reached by travelling north along the A93 out of Perth. The R.A.C. will erect signposts shortly before the event.

The Open Championship will concentrate on testing the cross-country skills of the competitors. Tasks will be set on the day of the event and will depend on weather conditions prevailing. With the mountain renowned for providing interesting, exciting and satisfying flying, the tasks that will be set will be hard, demanding and, if flown properly, rewarding.

The site is available for practice flying for three days prior to the event. Free flying during the event will only be allowed upon obtaining the permission of the Chief Marshall on the day.

Entry Qualifications

Competitors must belong to the B.H.G.A. or the National Association in their own country. They must be qualified for the B.H.G.A. 'Pilot' badge or their National Association equivalent. Where a National Association has not yet set up a mechanism for grading hang glider/

glider pilots, competitors are required to produce documentary evidence from their own Association that they are of an equivalent standard.

The Open championship will not have separate classes and will be open to any make or model of hang glider provided the following conditions are satisfied.

1. Capsule or partial fairing of pilot is prohibited.
2. Any physical or mechanical means to produce energy to increase performance will not be allowed (aerodynamic controls are permitted).
3. Communication devices are prohibited.
4. Air brake drag 'chutes' will not be permitted during competition flying.
5. All gliders must meet airworthiness standards and be B.H.G.A. "approved" or "registered". Aircraft manufactured outside the U.K. should conform to standards existing in their country of origin.

NOTES

1. Any item is permitted if not prohibited.
2. Competitors must use the same glider throughout the competition.
3. All gliders and equipment will be subject to random scrutineering as a safety precaution. The S.S.A. reserve the right to refuse entry in the competition to anyone whose glider or equipment is not considered sufficiently safe.
4. Crash helmets must be worn during all flights.
5. Boots or footwear with lace hooks are not permitted whether you fly prone or seated.

Please fill in the Entry Form overleaf if you wish to take part. Send it to ALISTAIR MUNRO, COMPETITIONS SECRETARY, 25 REGENT TERRACE, EDINBURGH, EH7 5BS before 26th May, 1979 with your entry fee of £10.00. (The entry fee includes transport for pilot and machine from the landing area to the mountain summit for each competition flight. Certain rigid wings, if not fully collapsable, may prove impossible to be transported by chairlift. Overseas competitors may send in entries up to 1st June, 1979. Regulations and entry passes will be sent out in the first week of June. Send a large stamped addressed envelope. Entries will only be accepted on the Entry Form or on photocopies of it.

Accommodation

The base for the Open will be the Dalrulzion Hotel, Glenshee (Telephone Blacklunnans 222). A camp site with full facilities and situated 1/2 mile from the hotel is available free to competitors and friends. Those requiring space allocation are requested to indicate this on their Entry Form.

Entry Form

SCOTTISH OPEN CHAMPIONSHIPS

Cairnwell Mountain, Braemar, Aberdeenshire, 14th - 17th June, 1979.

To: Competition Secretary, A. Munro, 25 Regent Terrace, Edinburgh,
EH7 5BS.

Surname (Block Capitals) Christian Name (Block Capitals)

Address (Block Capitals)

.....
(Please enclose a large stamped and self-addressed envelope with your completed entry form).

BHGA No: Telephone No: Home

BHGA 'Pilot' Badge No: Business

Name of your Club

Competitors from outside the U.K. must be able to produce documentary evidence from their own National Association that they are of an equivalent standard to the BHGA 'Pilot' Badge.

Glider to be used on Open Championship:

Make Type Model

I enclose a cheque/postal order No: for £10.00 (crossed and made payable to SSA please). I understand this is a non-returnable entrance fee (once accepted) to assist towards the Association's expenses.

British League fliers please tick

Competitors requiring allocation of camping space please indicate requirements (i.e. number of tents, caravans, etc.)
.....

If you require a list of local hotels, please tick

(DECLARATION ON NEXT PAGE MUST BE SIGNED TO MAKE YOUR ENTRY VALID)

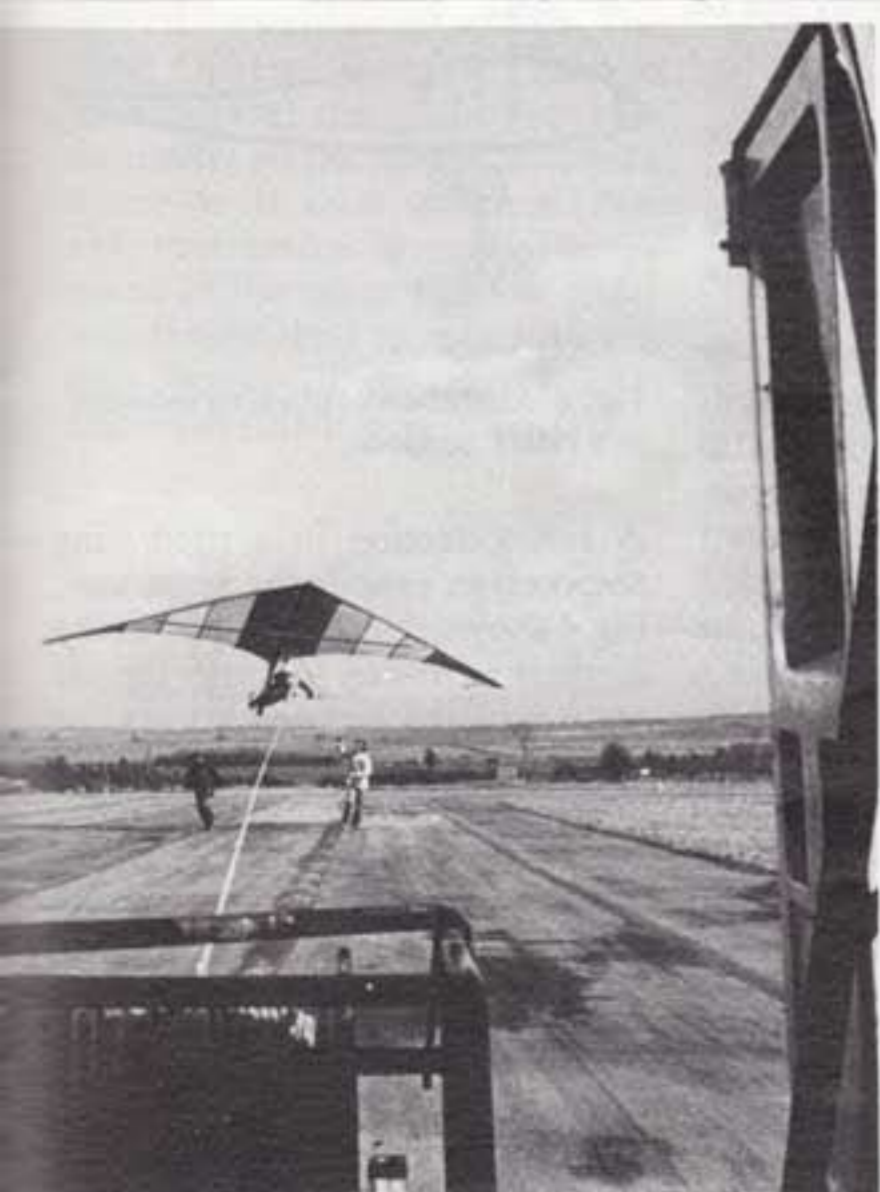
Declaration To Be Signed

I agree to be bound by the rules that the SSA lay down for this event and I declare that I am entering the Competition of my own free will and at my own risk. To the best of my knowledge the hang glider that I will fly at the competition conforms to the standards laid down in the rules. I further declare that I indemnify the Scottish Sailwing Association and the landowners and tenant farmers concerned and will save them harmless from and against all proceedings costs claims expenses and liabilities whatsoever in respect of deaths or injury or loss caused by me and arising out of or in connection with the event. I am over 16 years of age and do not suffer from any mental or physical defect which would render me unfit to fly at the Event.

..... (Signature)

Consent of parent is under 18 (Signature)

..... Date



A CLOSER LOOK AT PITCH STABILITY

By Mark Woodhams

1.0 Whilst I was writing 'General principles of pitch stability' I was constantly aware of the amount of generalising I had to make to illustrate a particular point. At the same time I read a lot of new material on the subject and re-examined a lot of the material that had already been published in various hang gliding periodicals.

I think I learnt a lot, and I would like to tell you about some of the detailed things I discovered and some of the things that appear contradictory. This article essentially covers the same ground as 'General principles' but at greater depth.

It is inevitable that a degree of technicality will creep in here, but I have attempted throughout to render what is a fairly complex story, as simplified drawings, graphs and illustrations. Whilst one can represent aerodynamic truths mathematically, drawings I believe provide a quicker route to understanding.

In the text of this article I have used a system of referencing the component parts and sub-parts of the main topics. I am hoping that discussion may be provoked on the subject generally, so some sort of reference system could speed up this process.

2.0 For the sake of brevity and clarity I have used a few symbols and abbreviations. The meaning for these is as follows:

2.1 CG is the centre of gravity. It is the net balancing point of all the various forces at work on you and your glider. On the drawings it is represented as a circle with alternate quadrants filled in.

2.2 AC is the aerodynamic centre. This is the point around which the lifting forces of the wing work. On the drawings this is represented by a black disc.

2.3 D is drag, which always directly opposes the flight path direction.

2.4 L is lift, which is always at right angles to the flight path.

2.5 The flight path is represented on the drawings as a dotted line and an arrow head to indicate the direction.

2.6 R is the resultant, or vector sum of lift against drag and always opposes apparent gravity.

2.7 W is the weight of the flying machine and pilot. W is always in direct opposition to R.

2.8 C is a dimensionless measure of force. Thus CL is coefficient of lift etc.

2.9 M is pitching moment. Thus CMAC is coefficient of pitching around the aerodynamic centre.

2.10 α is simply a label for any dimension or particular angle that it is convenient to give a nominal value to.

2.11 α is the symbol for angle of attack.

2.12 CP is the exact position at any moment of time or angle of attack where the lift could be said to be expressed. The CP moves its position with angle of attack.

3.0 Now why should an aerofoil pitch any way? It's simply that the shape of the aerofoil imparts a circulation to the air that it passes through, and the air anxious to return to its original undisturbed state imparts an equal and opposite reaction to the wing. A wing produces a net downwash and for a typical symmetrical aerofoil this equal and opposite reaction is expressed as a torque or pitching moment which is nose down at usual angles of attack. The greater the lift, the greater the pitching moment.

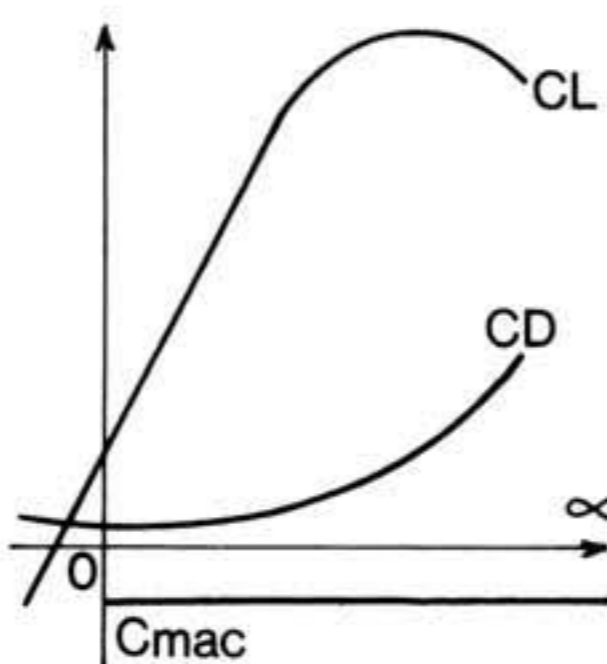


Fig. 1 Aerodynamic characteristics of an aerofoil.

3.1 The pitching moment is constant around the AC. This is an often quoted aerodynamic truth.

And here we come to the first apparent contradiction. At low angles of attack (reducing lift) the centre of pressure on an unreflexed aerofoil moves aft on the wing, and at high angles of attack

(increasing lift) it moves forward. If the pitching moment is constant around the AC it follows that at low angles of attack the CL is low but the moment arm around the AC is large, and at high angles of attack the CL is high but the moment arm is short.

3.2 Pitching moments are thus presented to us in terms that seem to mean very little to us. This is because formal aerodynamics tend to be taught by theoretical models exclusive of application, and of course where they do talk of application it is about conventional aeroplanes with rigid wings and separate stabilising empennage.

3.3 So why do some aerofoils pitch increasingly negative at low angles of attack then, if pitching around the AC is constant with attitude? It's because the only way to lower the angle of attack in a hang glider is to fly faster. If you feed increasing velocity into the pitching model stated in 3.1 and Fig.1, you can find that the negative pitching of an aerofoil far from remaining constant, can increase dramatically.

3.4 A central concept in hang glider design is that decreasing angles of attack mean increasing airspeeds, and of course vice versa. Research that does not take this into account may not be very helpful.

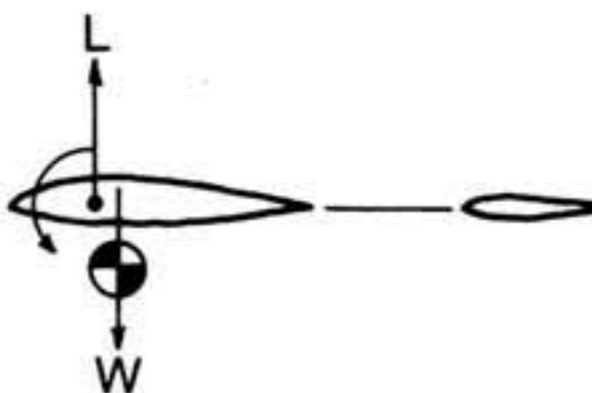


Fig. 2 CG relation to AC on fixed wing aircraft.

4.0 Now have established that an aerofoil pitches around its AC, the exact position of the CG has to be located relative to it. Fig.2 shows how the forces are conventionally arranged on a fixed wing aeroplane with separate stabiliser. Obviously for trimmed flight total lift ahead of the CG must equal total lift behind. For aerodynamic

efficiency the overall pitching moment of the aeroplane is arranged to be slightly negative. The CG is placed behind the AC in this case to exactly balance the negative pitching.

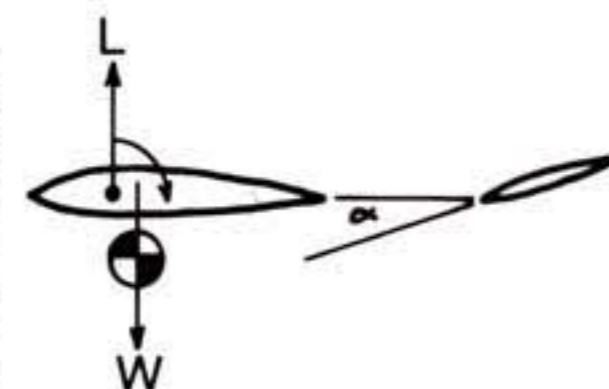


Fig. 3 Alteration of pitching moment by aerodynamic means.

Fig.3 shows that in this type of aeroplane control in pitch is effected by altering the pitching moment around the total AC by aerodynamic methods. The application of down elevator decreases the negative pitching of the whole aeroplane as it was in trimmed flight. The CG is fixed but its rearward position is now out of balance with the pitching moments and pulls the plane up into a climb.

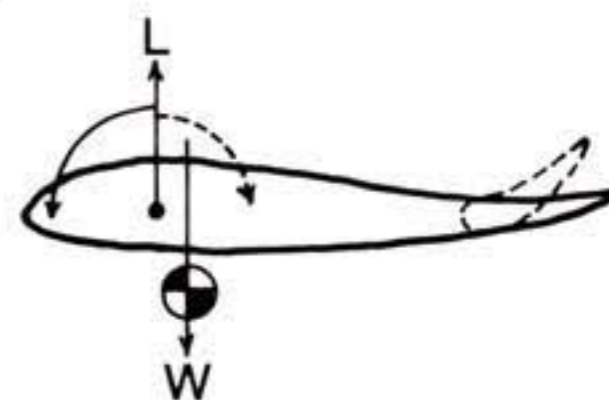


Fig. 4 Alteration of pitching moment in a reflex section.

A reflex section in a rigid wing responds in exactly the same way. Fig.4 shows that alterations to the amount of reflex fed into the aft section of the aerofoil affects the strength and/or direction of the pitching moment around the AC. 5.0 From Figs.2, 3 and 4 you could say that if you moved the actual CG only you would end up with the same result. This is quite true, if a little impractical. Indeed several types of aeroplane do in fact enhance their aerodynamic control by CG shifting.

But as you know the great majority of hang gliders control pitch exclusively by weight shift (CG movement).

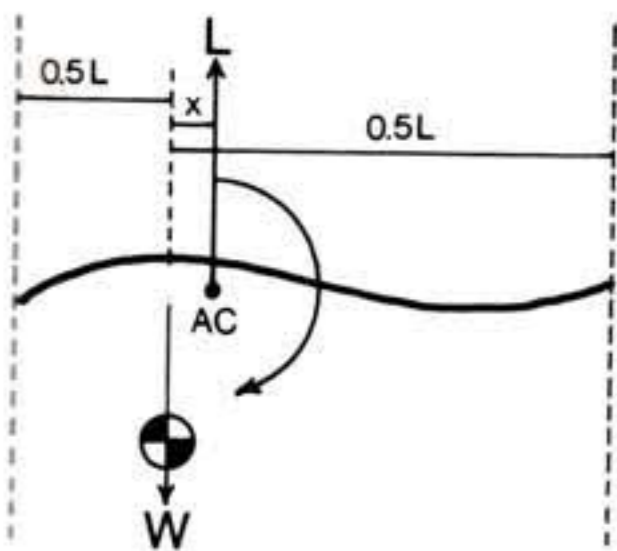


Fig. 5 CG relation to AC on a hang glider.

5.1 Whilst a rigid aeroplane with fixed CG and aerodynamic control surfaces can whittle trim drag down to almost nothing, a hang glider cannot indulge in these luxuries of pitching precision. Fig.5 shows that for safety the net pitching moment on a hang glider ought to be positive and thus the CG in trimmed flight is forward of the AC. Dimension x exactly damps the pitching moment to zero. The main reason for wanting the wing to positive pitch by itself is that in radical attitudes the CG may not be where it is supposed to be, so it would be inconvenient to say the least to have an unloaded kite continually trying to nose down.

5.2 We now know where the CG is relative to the AC in trimmed flight and we can also see that dive and climb results if the CG is moved forward or aft of trim. The hang glider designer has to arrange for the glider to trim naturally at the angle of attack where it is most efficient. Not only that, he has to arrange by the shape of the wings that the glider will always tend to return to this trim angle of attack. This is known as stability.

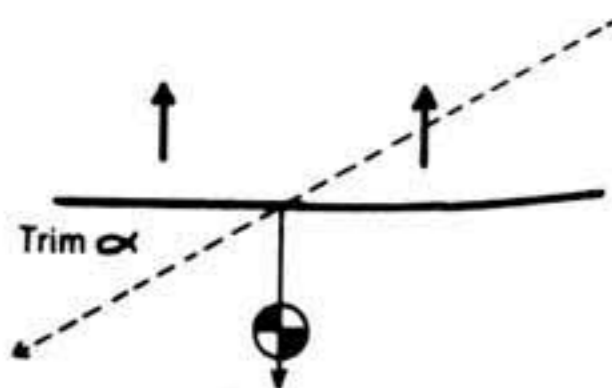


Fig. 6 Glider at trim speed.

Fig.6 shows a schematic hang glider at trim angle of attack. The

portion of the glider in front of the CG is at a slightly higher angle of attack than the aft section but both bits are generating the same lift.

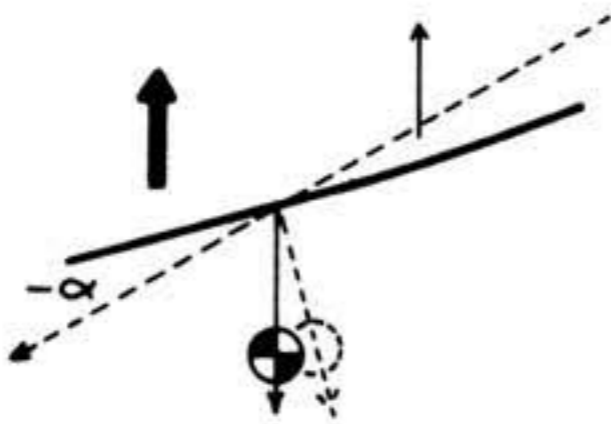


Fig. 7 Convergent glider in dive.

If the CG is moved forward as in Fig.7 the aft section creates progressively less lift than the front because of its lower angle of attack. Thus the glider will try and fight its way back to the trimmed situation in Fig.6.

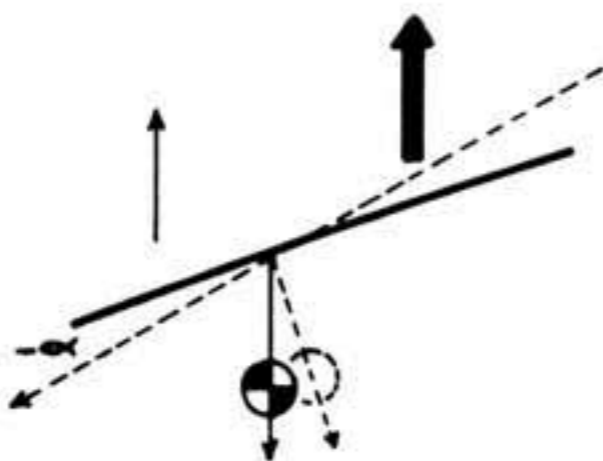


Fig. 8 Divergent glider in dive.

Fig.8 shows a radically different glider. Here the aft section of the wing progressively produces more lift with decreasing angles of attack. The tendency of this craft is thus to fly faster and not return to trimmed flight. In other words divergent flight.

6.0 At this stage it would be a good idea to look at some experimental data. Fig.9 shows several things. The top section is a graph of pitching moments around the CG of two hang gliders. The horizontal parameter is the angle of attack, negative to positive through zero. The vertical parameter is pitching moment from negative to positive through zero. Thus any position marked on the graph can define the pitching moment being experienced around the CG at any particular angle of attack between -50 degrees and $+50$ degrees.

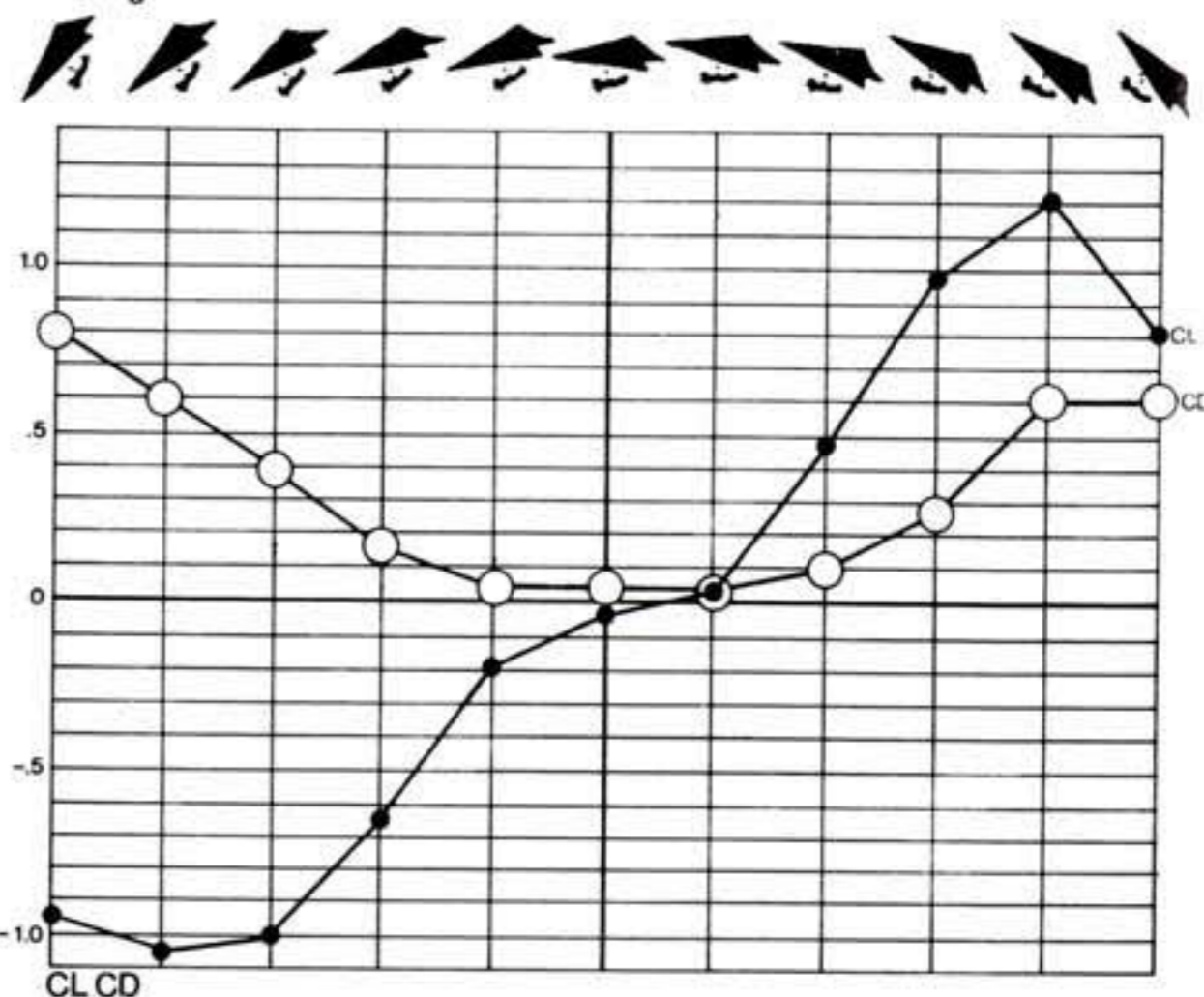
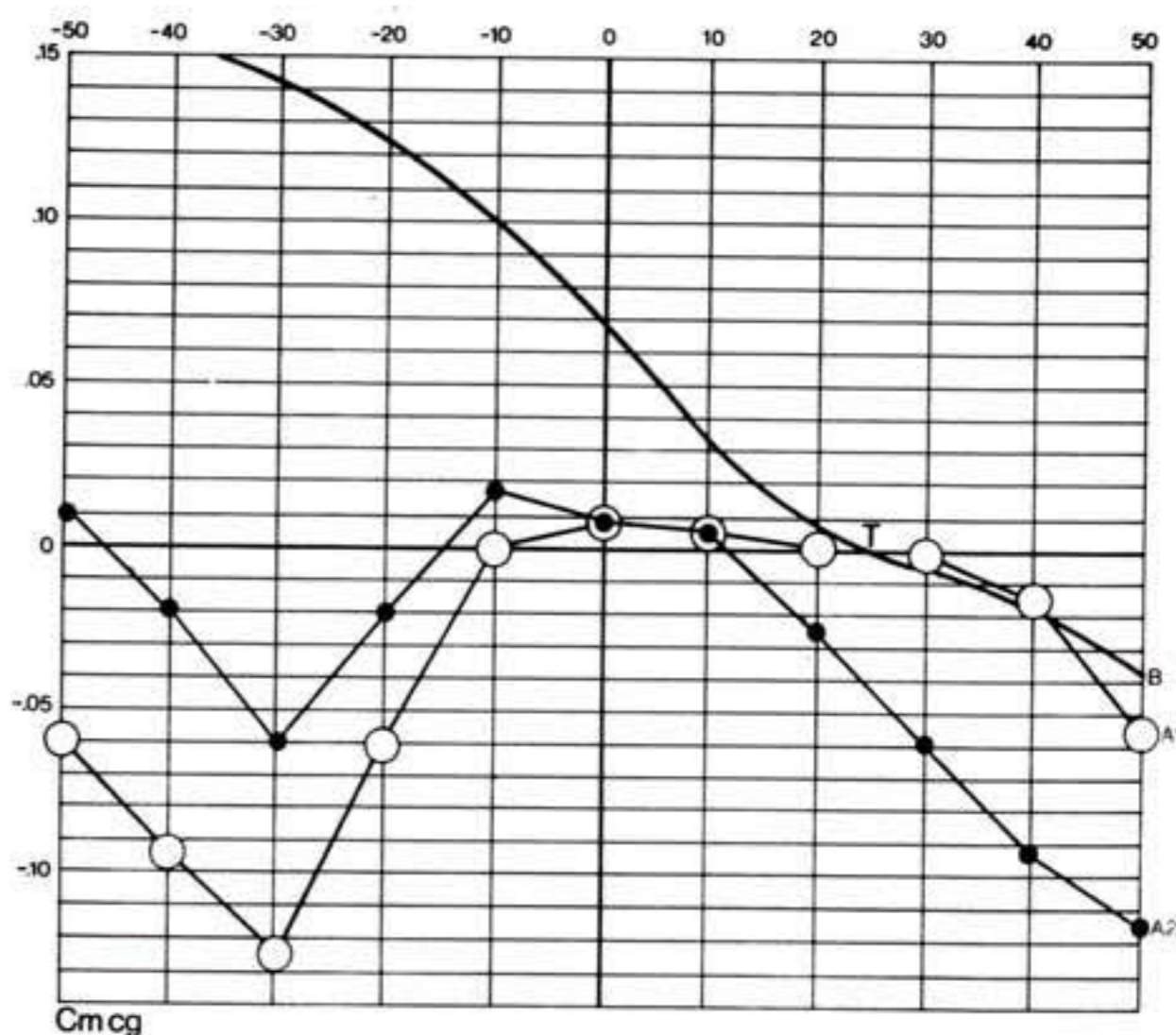


Fig. 9 Pitching curves and CL, CD plots of a hang glider. (NASA Langley Tunnel).

Hang glider A is an 80 degree nose standard rogallo with no keel reflex, equal length keel and leading edges, presumably about 5 degrees of billow per lobe, and a low pendular CG. The pitching plots of this glider are separated into A1, where the CG is moved back (pushout on triangle), and A2, where the CG is moved forward (pull through triangle). The data is the result of actual testing at the NASA Langley 12 foot wing tunnel. Hang glider B is the plot I have given to a theoretically 'safe' modern hang glider.

The interesting thing is that even with no keel reflex, hang glider A is relatively safe at normal angles of attack. It has a high speed and a low speed trim point. Demonstrably weight shift will give just positive moments around the Cg,

though admittedly low. Even the luffing sail at zero degrees registers as positive. But beware taking it below 10 degrees negative, because from that point on you are doomed. Violent negative pitching will ensure that you end up permanently diving or worse! The modern glider on the other hand pitches progressively more positive the lower the nose goes — or at least that's the theory.

The bottom section of the graph simply plots the values of CL and CD for Hang glider A at the various angles of attack that can be run down from the graph above. Note the amazing peak CL at 40 degrees angle of attack, and also note the stall immediately after it.

These figures were taken from an article by W. Hewitt Phillips in

August 1975 *Ground Skimmer*. My interpretation of the NASA graphs is that the pitching moments were derived from a specific wind velocity, but I may be wrong. They appear to be loci of static points rather than a dynamic trace of interrelated events.

At any rate the old standard was shown to be pretty doubtful in terms of pitch stability out of angles of attack that could be effectively controlled by weight shift. T on the graph for Hang gliders represents a well defined trim angle of attack. Note that at T there is zero pitching, according with the aerodynamic principle shown in Fig.5.

6.1 From now on the Hang glider that we are talking about will be a moderately high aspect ratio modern rogallo derivative.

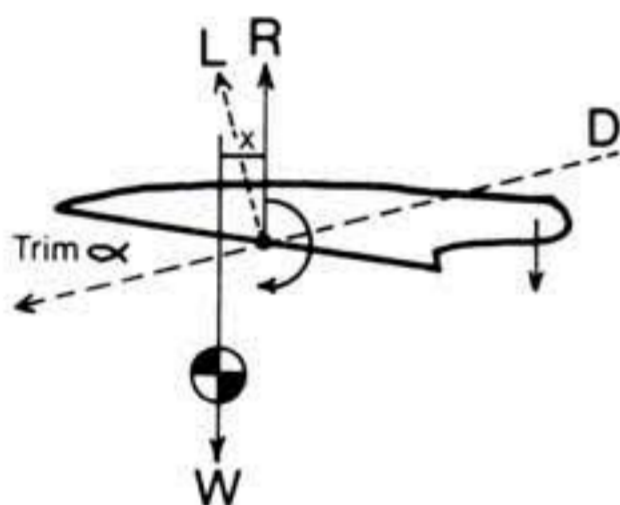


Fig. 10 Forces at work in trimmed flight.

6.2 A closer look at the forces at work on a stable glider reveals that at trim angle of attack (hands off), the CG is forward of the AC by x , which exactly balances the positive pitching of the wing to zero. See Fig.10.

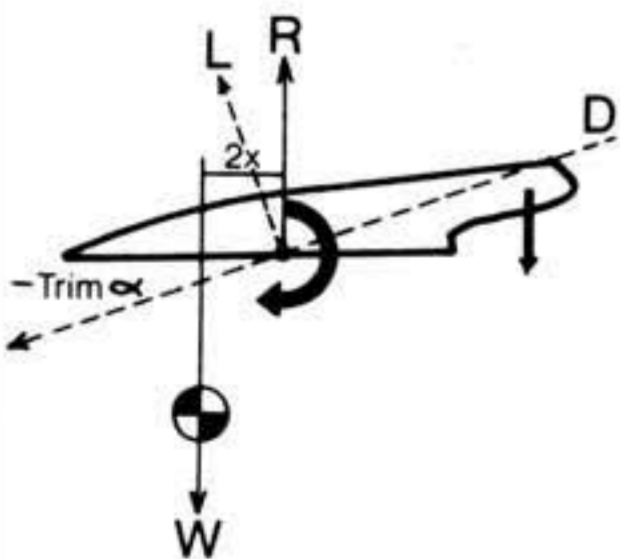


Fig. 11 Forces at work at high speed trim.

If the pilot moves his weight forward increasing CG/AC distance to say $2x$, the angle of attack will decrease below trim angle and the

glider will speed up. See Fig.11. As it speeds up the tips will contribute less to the total lift of the glider because of their lowered angle of attack, and increased positive pitching around the AC will occur until a new stable equilibrium is reached. In effect this will be a steeper glide angle than Fig.10 and bar pressure on the hands will indicate that the glider wants to return to the trim angle of attack. On a stable glider, letting go of the bar at this stage will do just that.

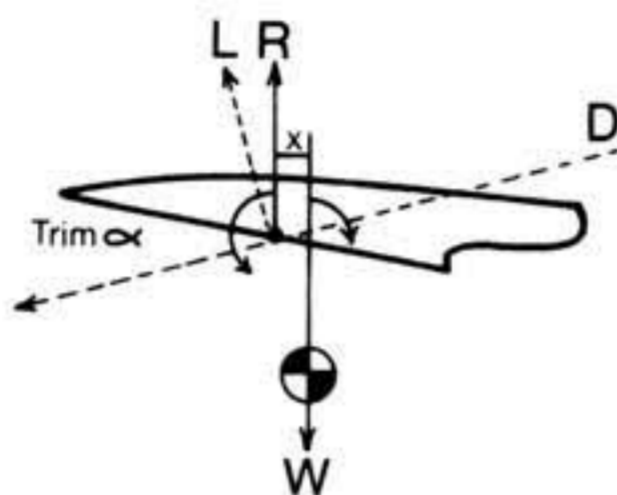


Fig. 12 Instable glider in precarious trim.

6.3 In an unstable glider the detailed picture is somewhat different. If the shape of the wing creates a net negative pitching moment, the CG will have to be aft of the AC to trim it out to zero, by let us say x in this instance. Fig.12 shows this precariously balanced system.

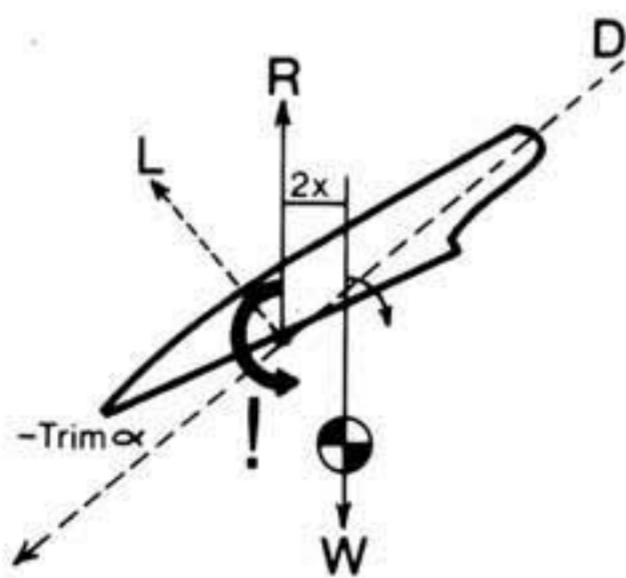


Fig. 13 Instable glider diverging.

Now the increased velocity of this glider in a dive may increase the negative pitching moment beyond the point where a maximum rearward shift of CG, say $2x$ in Fig.13, will have any effect. Remember that weight remains constant with velocity but lift increases at the square of the velocity. The angle of attack will then

progressively lower until luffing sets in.

6.3.1. Several things can happen at this point. The most dramatic is that the rotation around the CG may be so great that the wing continues into large negative angles of attack and performs an outside loop or tuck. Most hang gliders are not designed in terms of strength to resist these forces so you can normally expect a structural failure at this stage.

6.3.2. Occasionally the rotational inertia imparted to the pilot by the above manoeuvre may strike a hideous new equilibrium with the tucking canopy, whereby pilot and wing tumble longitudinally end over end and around the CG. Long keel kites have a tendency to resist this.

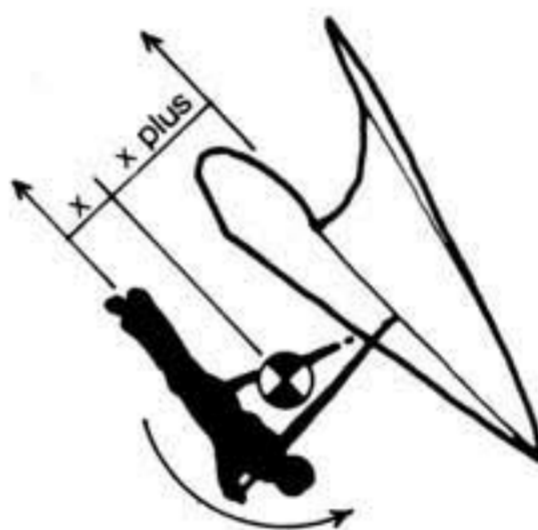


Fig. 14 Drag forces reaction in luff dive.

6.3.3. Sometimes a high speed stabilised dive can occur rather than actual luffing. Fig.9 shows that a luffing sail generates a small but positive pitching moment. Thus in a stable glider luffing should be no problem as the drag and long moment arm should pop the glider inflated quite quickly. See Fig.14. However, if the canopy immediately before the onset of luffing exhibited negative pitching characteristics, a new high speed equilibrium may result whereby the sail is balanced in a sort of half-life between full luff dive and full canopy inflation.

Fixed battens unfortunately are not the remedy for this condition, for if they support a negative pitching canopy they will ensure that the glider tucks. The advantages of tucking over terminal diving or vice versa are purely for the academics amongst us.

7.0 There is yet another pitching problem of hang glider aerofoils and this relates to very low angles of attack. A section through a typical hang glider wing reveals at most a 2" diameter tube within a faired pocket that blends itself

into a single surface aerofoil. Sometimes this structure is supported by a rigid pre-formed batten with a peak camber relatively high and relatively close to the leading edge. I am led to believe that this typical section provides high lift at low speeds with a high stall angle — just what we need in fact.

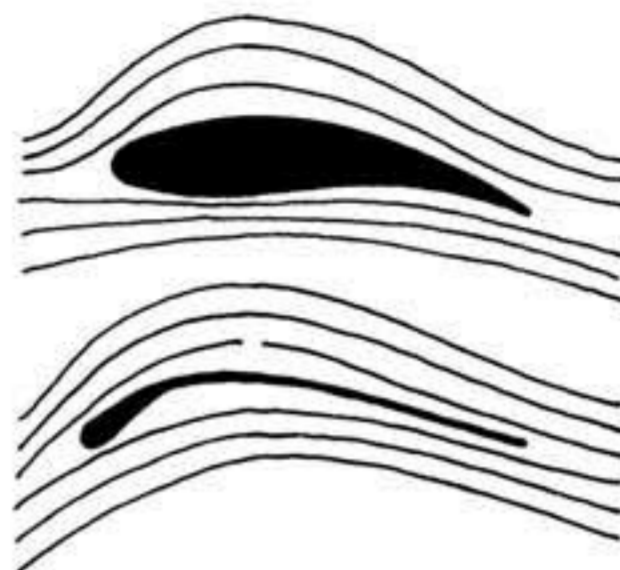


Fig. 15 Comparison of hang glider and sailplane aerofoils.

7.1 In aerodynamic terms this sort of aerofoil is very sharp nosed. It cleaves the air very neatly into that which goes over the wing and that which goes under. By comparison a blunt nose section on say a conventional sailplane allows the air some choice which way it goes at varying angles of attack. See Fig.15.

7.2 At all 'normal' angles of attack this is no problem. Whereas a flexible battened sail with this characteristic aerofoil sewn in will collapse at angles approaching zero, a preformed rigid batten will not. I believe that there can be a sudden build up of pressure above the leading edge and coinciding with peak camber of some sections. The result can be a sudden and violent increase in negative pitching. I make the visual analogy of a submarine at high speed suddenly giving full deflection to its dive fins. See Fig.16.

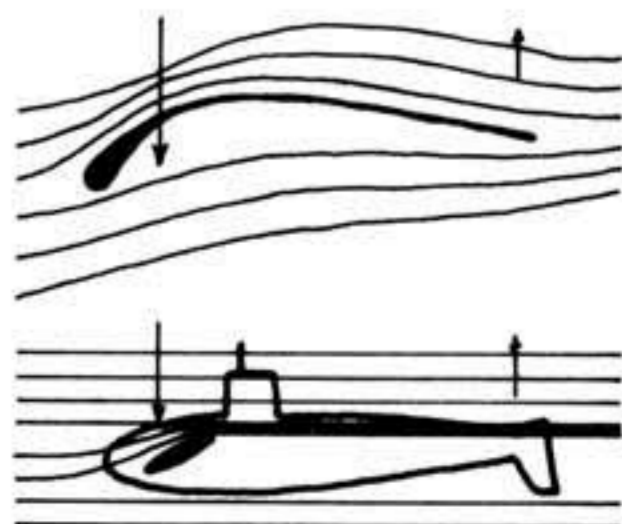


Fig. 16 Negative pitching at very low angles of attack.

7.3 I know of no research to support this idea, apart from my own models, but I know quite a few glider designers and people connected with hang gliding who agree with me.

8.0 We've discussed how the horizontal displacement of the CG affects the trim angle of attack. We must now look closer at the exact vertical position of the CG in relation to the glider as well.

8.1 As stated at 2.6, R is the vector sum of lift against drag and always directly opposes gravity. W is the weight of man and machine and is always in direct opposition to R. Fig.17 is a simplified statement of the case.

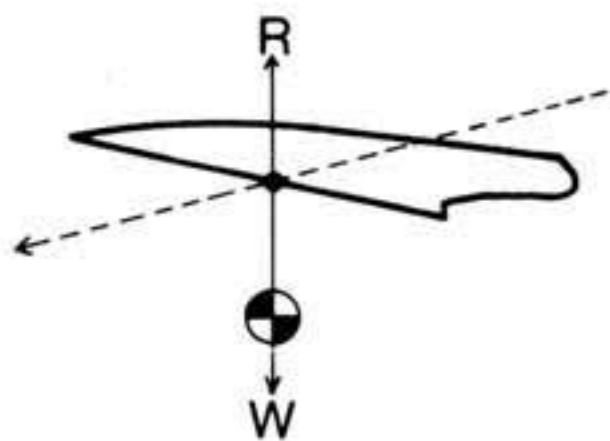


Fig. 17 Glider in trimmed flight.

It is obvious that in the diagrammatic sense the force pulling upwards at R and downwards at W will always try to be a vertical straight line. This is a response to the force of gravity.

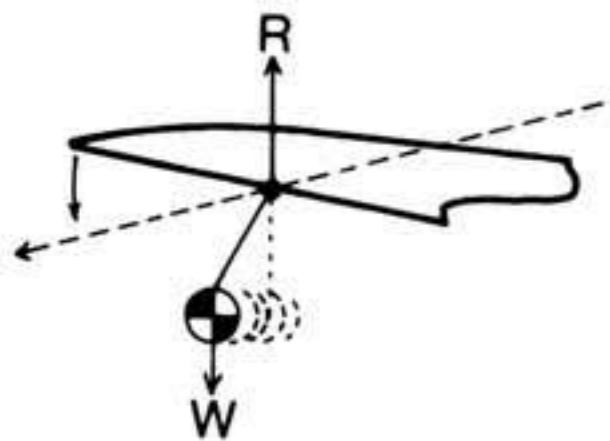


Fig. 18 CG forward — nose down.

In Fig.18, R and W are temporarily out of alignment. As a result of this the nose of the glider will be pulled down so that R to W is vertical again.

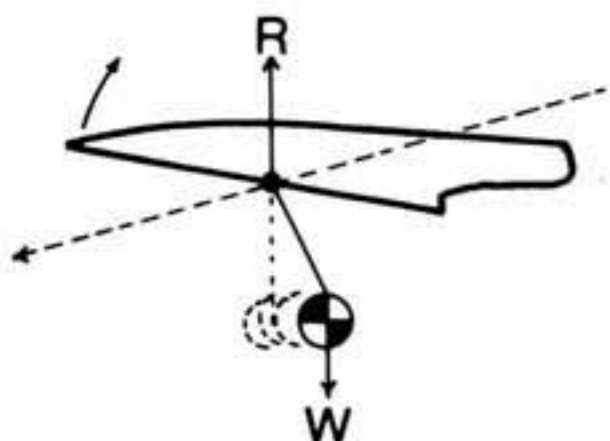


Fig. 19 CG back — nose up.

Fig.19 shows the re-alignment working the other way pushing the nose of the glider up.

8.2 As we just said, control in pitch is effected by deflecting the angle of attack away from the trim angle. Fig.20 shows that where x degrees is the desired angular change from y degrees which is the trim angle of attack, the CG will need to be deflected forward by x degrees from a point, which for simplicity's sake we'll call the hang point. It also shows that the larger the triangle the less effort there is required to change the angle of attack, but the greater the distance that that effort has to travel.

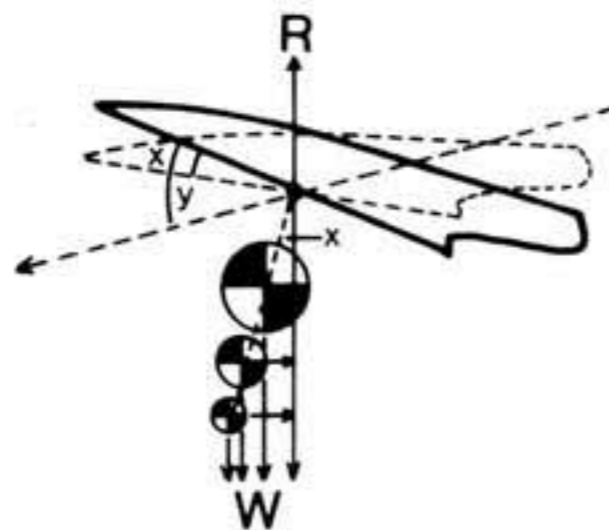


Fig. 20 Control input relative to CG vertical position.

A complicated system of inflight hang point adjustment could have the same effect but just isn't practical.

Shifting the CG by pendular travel of the pilot by the pilot is a highly efficient mode of control. A minimum of hardware is required and operation of the system is easy to effect (at normal angles of attack).

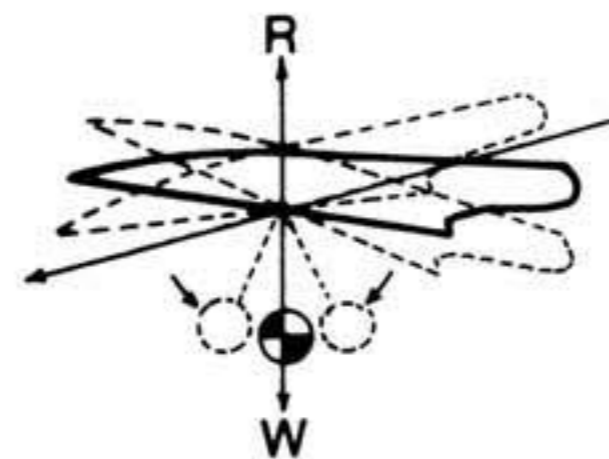


Fig. 21 Pendular stability.

8.3 The main advantage of a low CG in terms of flying comfort and available strength is that an element of auto-stability applies. As long as the pilot holds firmly on to the triangle, any momentary disturbance to the glider's angle of attack will be met with an opposite, equal and stabilising

moment. See Fig.21. 9.0 Just as alterations to pitch are made by CG shift, alterations to roll are made by the same technique. Turns are normally made by rolling and pitching the glider as an integrated and balanced movement. I hope to make flight control the subject of a further article, so will only deal with roll as a simplified alternative axis to pitch.

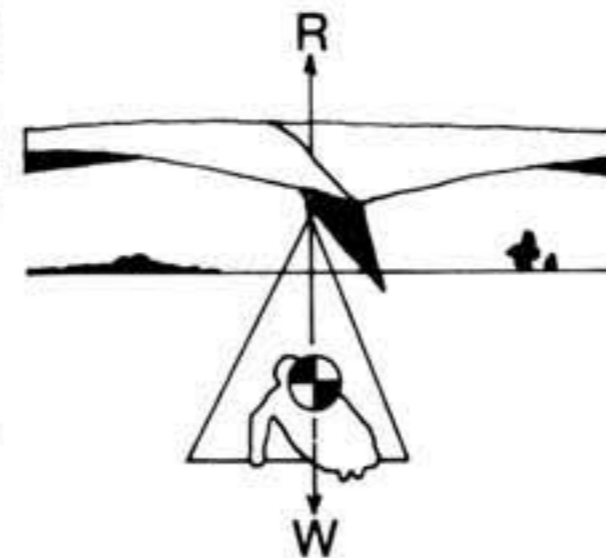


Fig. 22 Glider in level flight.

9.1 Fig.22 shows a glider in straight and level flight. Just as in trimmed pitch R is vertically opposing W.

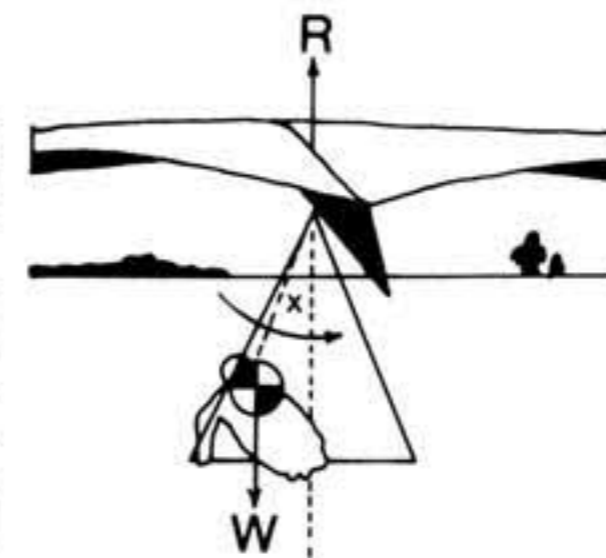


Fig. 23 Sideways displacement of CG.

Roll is initiated by displacing the CG sideways by the required amount of angular deflection, x degrees in Fig. 23.

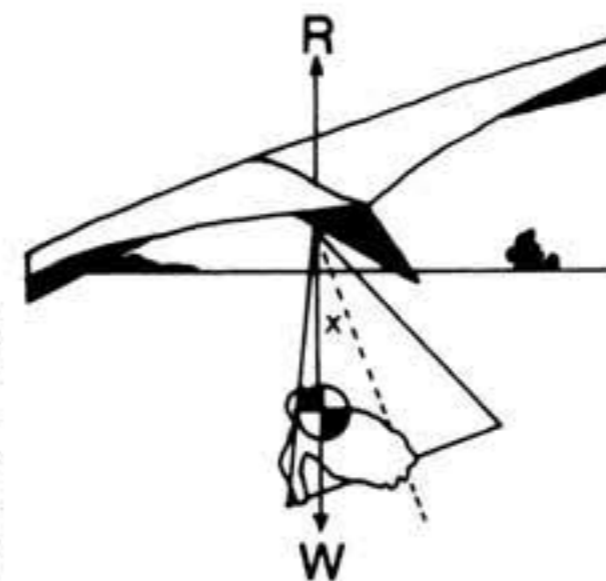


Fig. 24 Roll completed.

Just as in pitch, the force of gravity rapidly returns W to vertical alignment with R, but in doing so rolls the glider out of level by x degrees. See Fig.24.

9.2 In the same way that pendular stability acts as a restorative in pitch, see Fig.21, a momentary disturbance in roll is counteracted by automatic displacement of the CG sideways, x in Fig.25. Re-leveling of the wing swiftly follows.

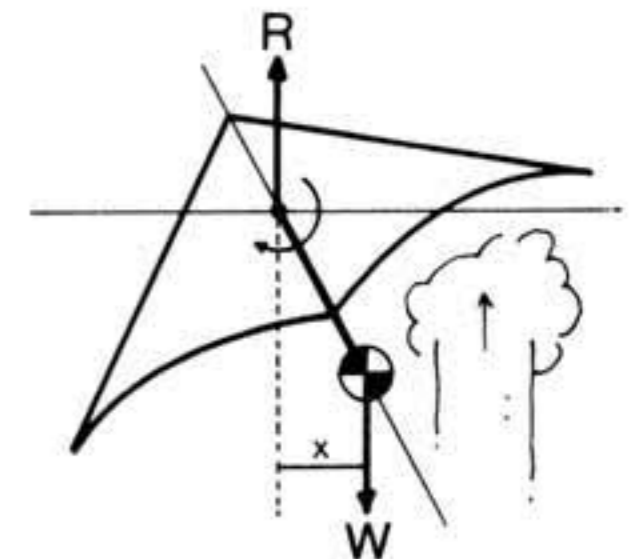


Fig. 25 Pendular stability in roll.

10.0 As a hang gliding enthusiast I am utterly amazed at the lack of decent research that is being carried out in this country. What research I have seen whilst being interesting is really very old. I understand that the French and Germans have done quite a lot, only some of which is available for general consumption and none of it has been translated into English.

The BHGA and manufacturers are showing marked resistance to initiating a programme of research. I should have thought that money that comes to us from various bodies could be put in that direction, or at least some of that money. How about a company sponsored research programme? In the long term a research programme will do more for the sport and the likes of you and me than a competition or two.

10.1 Why don't the BHGA pick the brains of someone of aerodynamic standing such as Gary Valle or even our own College of Aeronautics at Cranfield, and produce a national glider testing service that will be available to all manufacturers?

I am sure that a BHGA owned and run test rig which manufacturers would have to submit new models to, would go a great way to allay the fliers fears about pitchovers and structural failure. The CAA might quite like it too.

10.2 The following is a check list of subject areas which might be included in a research programme. It is not, nor is it intended to be, a complete list. They are simply a set of questions I would like to have definitive answers for.

Pitching moment characteristics around CG of complete glider for:

- 1) differing angles of attack, 0-360 degrees.
- 2) differing horizontal CG displacements.
- 3) differing vertical CG displacements.
- 4) differing velocities, and permutations of the above four parameters.

Wind tunnel investigation of a new set of aerofoils specifically designed for hang gliders and to cope with attitudes hang gliders sometimes find themselves in. (i.e. resistance to pitchovers).

11.0 If any person has any performance test data on modern hang gliders that they would like archived I would be very pleased to take responsibility for it. I am

trying to collect as much material on the subject as I can. It can be sent to me at 60 Compton Road, Brighton, Sussex.

12.0 References as follows:

- *The Anatomy of the Aeroplane* by Darrol Stinton. *Foulis*.
- *Pitch stability and control, parts 1 to 3* by Gary Valle in *Ground Skimmer*.
- *A preliminary analysis of the longitudinal dynamics of ultralight gliders* by Gary Valle printed in *Glider Rider*.
- *Basic Aerodynamics* by Mike Meier in *Hang Gliding* 1978.
- *Building an inherently pitch stable kite* by Chris Wills in 1975 *Ground Skimmer*.
- *The Stabilised Tumble* by Tony Fuell and John Hunter in May 1977 *Wings!*
- *Recovery from a vertical dive* by W. Hewitt Phillips in 1975 *Ground Skimmer*.
- *Stability and performance of flexible wing hang gliders* by Glen Brown in 1975 *Ground Skimmer*.

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- 3 Sylmar, California. Glider either tumbled and broke or broke and tumbled. Pilot landed in bush unhurt.
- 4 Kosson, Austria. Pilot doing Hammerhead Stalls. Glider tail slid, tuck and broke. Glider landed suspended between cable car cables. Pilot unhurt.
- 5 Santa Barbara, California. Glider pitched down further and further until it inverted. Glider stabilized inverted until it hit a tree. Pilot unhurt.

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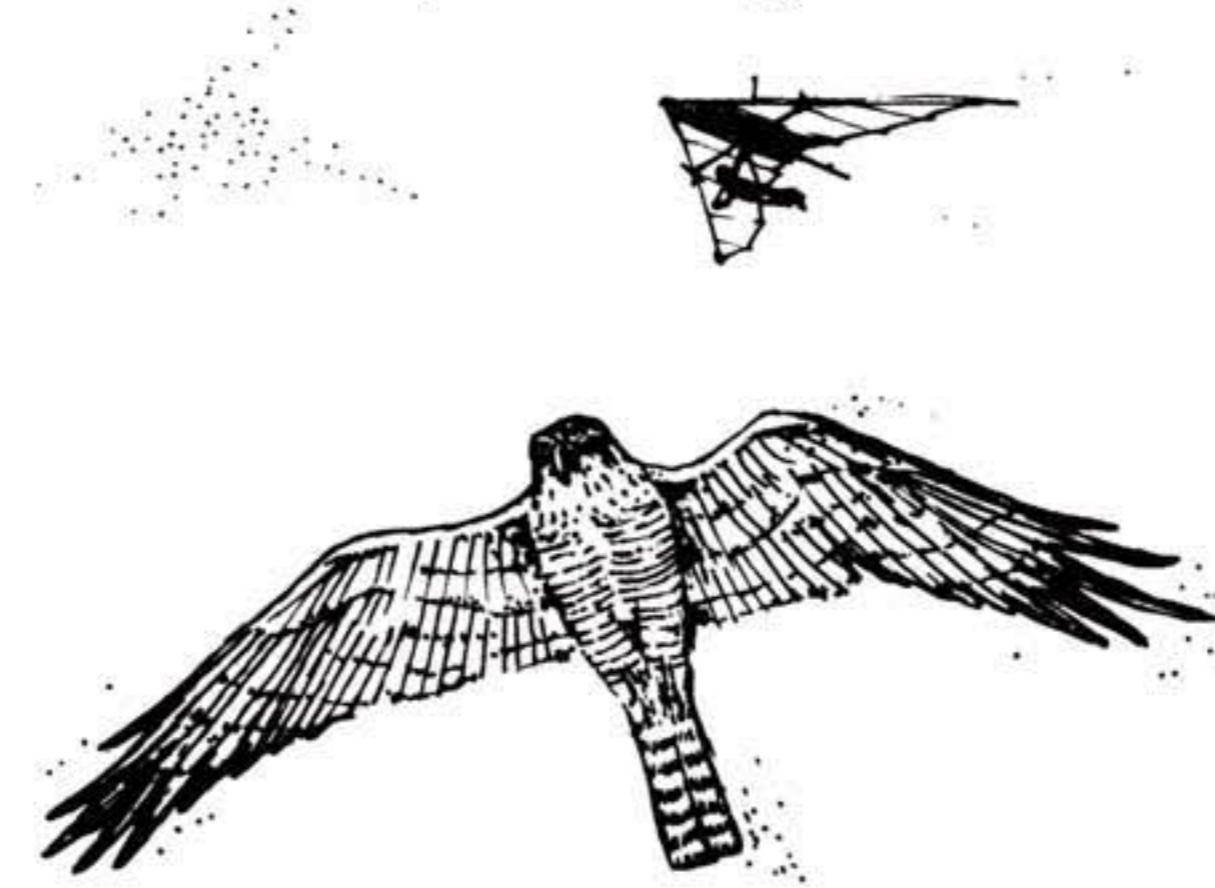
By Mike Lingard

I struggle to the edge of the ridge, my wings tugging and dipping as the wind tries to turn me this way and that. I am like a fledgling on its first flight. I stand at the edge unsure, looking at each wingtip to make sure they are level, angle of attack correct, I stumble, one wing dips, I steady myself, again raise the nose until I hear that familiar 'dink' as the sail goes taught. One last look around, three steps and I am airborne, feeling clumsily for my stirrup. Adjusting my body now for prone flight, I turn to tack along the ridge. I can see the hawk now two hundred feet above me — poised, static in the lift as I begin to feel the ripples of turbulence buffet my wings.

She is a Peregrine Falcon, nineteen inches of aerodynamic perfection, master of the art of flight. I consider multiple three sixties and wing-overs radical manoeuvres, this bird can fold back its powerful wings into a scythe shape and cut through the sky at a breathtaking 180mph, giving its quarry little chance of escape. Its talons strike the victim with such force that they may break off its head. Should she miss, which is rare, she will rise in the updraughts at a speed that would send my vario off the clock and dive again in a matter of seconds.

I can see her now, wings set for an eighth of her total efficiency, while I am flat out as I make hard work of riding the lift. I can see her mottled breast feathers, her head turning slightly now and again, as if listening to some far-off sound. She drops down to my level and wheels in front of me, now beside me, now below me, I move on to the end of my beat, the hawk follows me, then peels off across the wide rock-strewn gap in the ridge that I must avoid. This half-pound aerial acrobat sails across the gap with effortless grace, no wingbeats, no fuss, no anxiety about going down or getting caught in the dangerous rotas that lurk around this part of the ridge. She is very high now, a stationary dot six hundred feet above, looking down at me with eyes eight times more powerful than my own.

The blue grey sea below me pounds the rocky shoreline and white breakers slide back into the swirling water, throwing shafts of sunlight up at me. Far out to sea beyond the fishing boats, I can see a few Fulmars, a species of gull, wings held stiffly as they engage in Dynamic Soaring in the wind gradient one hundred feet above the waves. No wing beats, just working the variations in wind speed. They pick up momentum on a high fast windstream, then wheel down to a lower level, using their momentum



We both prepared for flight on different parts of the ridge. She with no more than a cursory glance towards the swirling sea far below and a quick preening of her slate grey wings, me with much tugging of rigging wires, tightening of screws, checking and re-checking of battens and sail. She stands on a rock, silently, — she has no pre flight check to complete.

With no more than a gentle flick of her feathered wing, she is airborne. Within seconds she is soaring effortlessly in smooth air high above the ridge, hunting for prey, every nerve straining to catch that slightest movement in the grass that may mean a young rabbit feeding. Her eyes are fixed on the ground. She is not worried about her flying speed, or how far the lift band extends, for she is a natural flier and pilots herself about the sky by instinct. If she kept a log book it would be crammed full with more than three thousand flying hours, and this is only her second summer.

to rise again — this time against the wind, and no sign of a ridge or thermal in sight.

I turn at the other end of my beat. I am getting good lift now. I check the windsock that means nothing to the hawk. I turn out towards the sea, then three sixty back over the ridge and across to a smaller grassy ridge, a little inland, with a ploughed field in front of it. After a few minutes scratching around my vario blips continually and my left wing jerks up. I three sixty into some thermal lift. Three up, four up. The ridge is getting smaller now. Then I fly out of it. I am in sink. I check all around to try and regain the thermal, but to no avail. I am just about to try and get back to the big

ridge when I see the hawk. She is circling slowly right in the core of my lost thermal, I move across to join her, and begin to circle below. It feels like a big one, but I am having trouble with turbulence. I cannot stay in the core of the thermal as well as the hawk. I am being buffeted by the downdraught at its edge. As I fight this unnerving battering, the falcon sails smoothly higher on her unstable wings.

My world is usually very quiet at this height but now I can hear a shrill kwee-a' kwee-a' from the bird above me as the turbulence subsides, I move away to my left, still in lift. My hawk is calling loudly now and looking UP. So she was not top of the stack.

Above her the male, called the tiercel, — smaller and browner in colour — is calling back to her and performing aerobatics in his mating display that would stress my glider beyond its limits in seconds. I am reminded of the Hen Harrier, another hawk that in springtime will climb slowly until it stalls, then somersault and dive at its prey with closed wings.

Suddenly both birds are slipping towards me. They pass in front of me at fantastic speed and they are a grey brown blur. I can see now that the tails are quite long. With a faint whistle of wings they are below me. I look down and see a small flock of pigeons flying lazily out to sea, shadows darting between the rocks and grass. Fighting against the wind, the birds are hard to see against the grey and white of the water below. The hawks call again at each other as if to signal and then the female tucks her wings and appears to drop like a stone — a black scythe heading earthwards with frightening urgency, careful to approach from behind so no tell-tale shadow is seen by her prey. I can no longer see the pigeons but I see the hawk pull out of her breathtaking dive seconds before impact. I hear no noise, but see a small puff of white feathers rising slowly into the air, then I see the pigeon tumble towards the sea. The smaller male falcon had dropped below the ridge as the female was making the kill and now he dives below the dropping pigeon and collects it in mid-air as the remainder of the flock scatter in all directions.

I am amazed by the speed and agility of these falcons. They are the true masters of the air. People that live all their lives on the ground rarely see such incredible sights as this and yet it is all going on above them day after day. If they would spend some time up here they would see aerial manoeuvres beyond belief. If they were lucky they could see a smaller member of the falcon family, the Hobby, that can twist and turn after a dragonfly, snatch the insect in its claws and hold it in its beak to eat — without pausing in flight. They have also been seen to loop the loop, tumble and glide upside down for sheer joy. The male, after snatching a small bird on the wing, will climb high to dive on the female and pass the prey to her in the air at full speed. Who has been lucky enough to see the majestic Eagle high in mountain country, with its wingspan of seven feet, soaring in pairs, plunging earthwards with half closed wings, rolling over in mid air, so close that the talons appear to link? These are manoeuvres I can dream about but never perform.

After flying around for another thirty minutes I fly back to the coast ridge. My concentration is not all it should be now, and I am beginning to tire. The sky has become cloudy and the windsock shows me that the wind has shifted off the ridge slightly. Time to finish my flight and land. Unlike the light, honeycombed boned wings of the masters of the air, my heavy arms are feeling the strain, so with caution I allow my wings to drift back

over the ridge and turn to land into wind. My tired arms pull on the bar and soon my feet touch the safety of the ground. As the kite is relieved of my weight, it moves forward a little. I should be ready for this, it has happened many times before but I react a little slowly and struggle to pull the nose down and finally unclip to end the flight. I walk a little unsteadily, with the kite fighting against the now increasing wind, to a safe area

and fold the wings on the grass.

I look up to the sky, grey cloud now scudding over the ridge. The wind will soon be too strong to fly in and has shifted away from the ridge. The first splashes of rain are falling on my folded wings. By the time I have my kite in my carrying bag the wind is forty degrees off the ridge, dangerous for human birds like me. The seagulls, after returning from a day at sea following the fishing boats, are soa-

ring without difficulty. They can soar cliffs when the wind is blowing over the ridge out to sea. They gain height effortlessly by riding the eddies which curl upwards as the wind spills over the edge of the cliff.

As I strap the glider on my roof rack I take a last look up at the darkening sky and see the female Peregrine Falcon high above the ridge soaring and calling, the master of the air.

ACCIDENT REPORTS

BRITISH POWERED HANG GLIDING CLUB

DATE: 13 NOVEMBER 1979

PILOT: BRIAN MILTON

HANG GLIDER: SKYHOOK SAFARI

ENGINE: SKYHOOK — ONE-OFF SIMILAR TO SOAR-MASTER USING McCULLOCH 101

SITE: SOUTHERLY BOWL, MERE, WILTSHIRE

WIND CONDITIONS: 260°, 15-

18mph, very gusty and turbulent. The hang glider had no fixed washout tips, it did have a fixed throttle option and did have locked-in camber, all contrary to BPHGC recommendations.

Brian Milton had already had more than one flight on this day and reported that the glider was nice to handle but, after inadvertently going down to the bottom of the bowl, there was a considerable delay to the next flight. The wind changed during this time from 190° at 6mph to 260° at 15-18mph; this change in the wind had altered the conditions from ideal to very turbulent as the wind was now passing over a spine at a similar height to the take-off point before arriving at the take-off point. The next flight was therefore expected to be difficult by the onlookers who included the manufacturer of the hang glider and engine pack, Len Gabriels.

The awareness of possible difficulties turned to concern when it was seen that Brian Milton was moving well away from the slope and encountering severe turbulence. The glider became stalled with the nose high and one wing high, and from this position it rotated nose-down smoothly but rapidly until, when slightly past vertical, it snapped into an inverted position whereupon the rear of the keel and different parts of both leading edges broke. The glider fell partially intact and when still some way from

the ground the complete structure collapsed. The engine during all this period was locked on full power.

It has been stated that the glider went inverted without gaining any airspeed: this is impossible as it is the dissipation of the Kinetic energy gained by the aircraft and pilot as it went inverted that broke the keel and both leading edges.

The thrust line of the glider was approximately 5° positive of the keel tube, thus the engine would have tended to push the glider through the air at a low angle of attack, thereby not creating much drag. This would help the glider to increase speed while maintaining a low angle of attack, especially as the predominant forces on the glider were the engine forces and gravity.

The Skyhook Safari has been tested to be positive-pitching at 0° angle of attack: however, no measurements have been taken of the C_m around 03° but as the glider has locked-in shape and a fully-floating wing, it can be assumed that the C_m is low as it is this low C_m that gives the Safari its undoubtedly good and easy-to-achieve speed range (low amounts of bar pressure required for changes in airspeed).

The theoretical calculations show that in the 1½ seconds before the glider snapped into an upside-down position it would have attained a speed somewhere between 30 and 50mph while rotating down-wards at 2.8 radians/second or 160°/second. To counteract this rotation we must have a strong positive C_m and C_D at the low angles of attack that are prevailing. A reasonable criterion would be that at a normal airspeed, say 22mph, the positive pitching moment must be greater than the downward torque which the engine gives about the centre of gravity.

This means the positive pitching torque must be greater than 5,760ft. pds. at 32ft./sec. This positive pitching moment is created from the C_m and C_D of the glider reacting against the centre of gravity of the total aircraft. Typical figures of $C_D = 0.15$ and $C_m = 0.2$ (Reference G. Valle, Sunbird Gliders) at 0° angle of attack, and these figures would give a positive pitching moment of 5683 ft. pds. at 32ft./sec — clearly sufficient to counteract the engine.

However, these are figures for a glider with locked-in washout; such gliders are not only more positive-pitching than those without tips, but obviously the locked-in twist creating a negative incidence of the tips means that at 0° angle of attack, gliders with tips create considerably more drag. This shows that in the case of Brian Milton's accident, the glider had very little chance of recovering without removal of the throttle control. It also shows with numerical support that if it had been fitted with locked-in washout, eg. by means of fixed tips, and therefore had C_m and C_D similar to the Sunbird Nova 190 (figures above), then it would almost definitely have pulled out even if the power had been left fully on. The theoretical calculations support the pilot's report about bar pressures and general feel of the glider during the final pitch-down of the aircraft.

The glider, when it started to rotate nose-down, probably gave little resistance to the mechanical accelerations on the wing because of the curved airstream through which the wing started to pass, thus leading to the glider going even further nose-down owing to the rotational velocity that the glider had already attained. As the glider rotated downwards it is unlikely that the glider exhibited any negative pitching moment or Brian Milton

would not have reported the bar pulling away from him. The glider snapped into an upside-down position when it had rotated to some degrees past vertical; this is when it pitches negative. This is the first period where a lack of locked-in camber may have helped.

The general structure of the glider was that the leading edges were made of 1½" tube and were over 20ft. long; the whole layout was not very rugged as all wing wires ran the full length of the leading edges; flight pictures prior to the accident show that the leading edges were considerably bowed in, both in front of and behind the leading edge stud. This system has not been used by most manufacturers; normally one or more wires stop short from the nose and the tail to make the whole system more stable especially under heavy gust loads. If the leading edges had not broken, the result of the accident may have been very different.

(NB: A leading edge loading system similar to this was believed to be the cause of the collapse of a leading edge on a prototype hang glider flown by Mark Southall in Norway two years ago in positive-G flight).

CONCLUSION

There were several factors that contributed to the accident:

- 1 wrong conditions, and
 - 2 locked throttle;
- (Most important primary cause of accident)
- 3 no tips;
 - 4 thrust line.
- After the glider had started to snap into an inverted position there are two subsidiary factors which could have worsened the accident:
- 5 locked-in camber;
 - 6 insufficiently rugged airframe.

Stephen A. Hunt
2 March 1979

Towing Accident

In view of a recent towing accident by a relatively inexperienced hang glider pilot, it has been decided to keep a national register of every person currently doing hang gliding tow launch of any kind.

Will you please forward your name, address and telephone number to Roy Hill at 68 Besselsleigh Road, Wootton, Nr. Abingdon Oxon. Telephone: 0865-735204 so that tow launching activities can be co-ordinated and repetition of the recent accident avoided.

DON'T HANG AROUND

It has been noticed that on some of the earlier type of Falcon IIIs and IVs the hangstrap has worn unevenly and it is advisable to change it with a type now used on all models. The main problem on this older type of hangstrap is not clearly visible, and points to look for are as follows:

Lift up the retaining band at the top of the uprights near the heartbolt and check for wear on the two main straps underneath this band, if worn should be replaced. It is rare to see anyone during their pre-flight look at their hangstrap for wear, etc.

Replacements are available direct from Waspair with fitting instruction at a nominal price, alternatively they can be fitted at our factory without involving any labour costs by appointment. For further details contact: Barry Bourne, Waspair, Restmor Way, Hackbridge Road, Wallington, Surrey. Tel: 647-4343/4.

Urgent Safety Notice

Will anyone with a Bennett Mark 1 parachute contact John Hunter before flying again.

Preliminary Accident Report

Paul Maratos.

Mam Tor, Derbyshire. 7.4.79.

Multiple injuries: Fatal

Summary

Flying a prototype cross-boomless glider, this pilot achieved a height of 800ft. above the site. He had indicated his intention of putting the glider through some radical manoeuvres to check its handling characteristics.

A witness said that the pilot stalled the glider, which then went into a steep, almost

stabilised dive during which it built up considerable speed. It eventually pitched up out of the dive and folded up.

The Pilot then deployed his emergency parachute — A Bennett Mark 1 B.U.S. Apparently the parachute became tangled in the wreckage and failed to deploy.



Paul Maratos

TRAINING COLUMN

SPIN RECOVERY

There are two stages in a spin — before it actually occurs, and when it starts rotating.

If the spin is recognised before it develops the method of recovery in most gliders (provided they are not overtuned) should be:

1. Pull on speed.
2. Apply opposite weight shift. (The spin is dealt with fully in the new Pilot handbook, page 26 and recovery is described — “apply full opposite sideways weight shift, whilst pulling well in, until spinning stops, then make normal dive recovery.”)

With some gliders, for example, finned, overtuned and ones with large keel pockets, application of the standard spin recovery, may result in a continued and worsened spin because of centrifugal force and the inner wing remaining stalled.

We hope to have a regular training column in *Wings!*, including advice, hints, news and general training information. In the first of the series, Keith Cockroft deals with one factor which is reflected in many accidents — the spin.

If autorotation has developed:

1. Pull on speed.
2. Apply weight shift **into** the turn.
3. Recover normally from the resultant spiral dive.

It is essential, that a spin is corrected in the early stages — otherwise, making recovery by weight shift into the turn may create a spiral dive situation using extensive height for recovery.

1. Be aware of the spin. Don't let it happen.

2. Get to know the characteristics of your glider. Remember that in attempting a recovery, plenty of height is vital.

Blue flow chart

Study the blue flow chart carefully. You will see that the Delta Bronze is an integral part of the Pilot Two task form. The FAI Sporting Licence is a totally different thing.

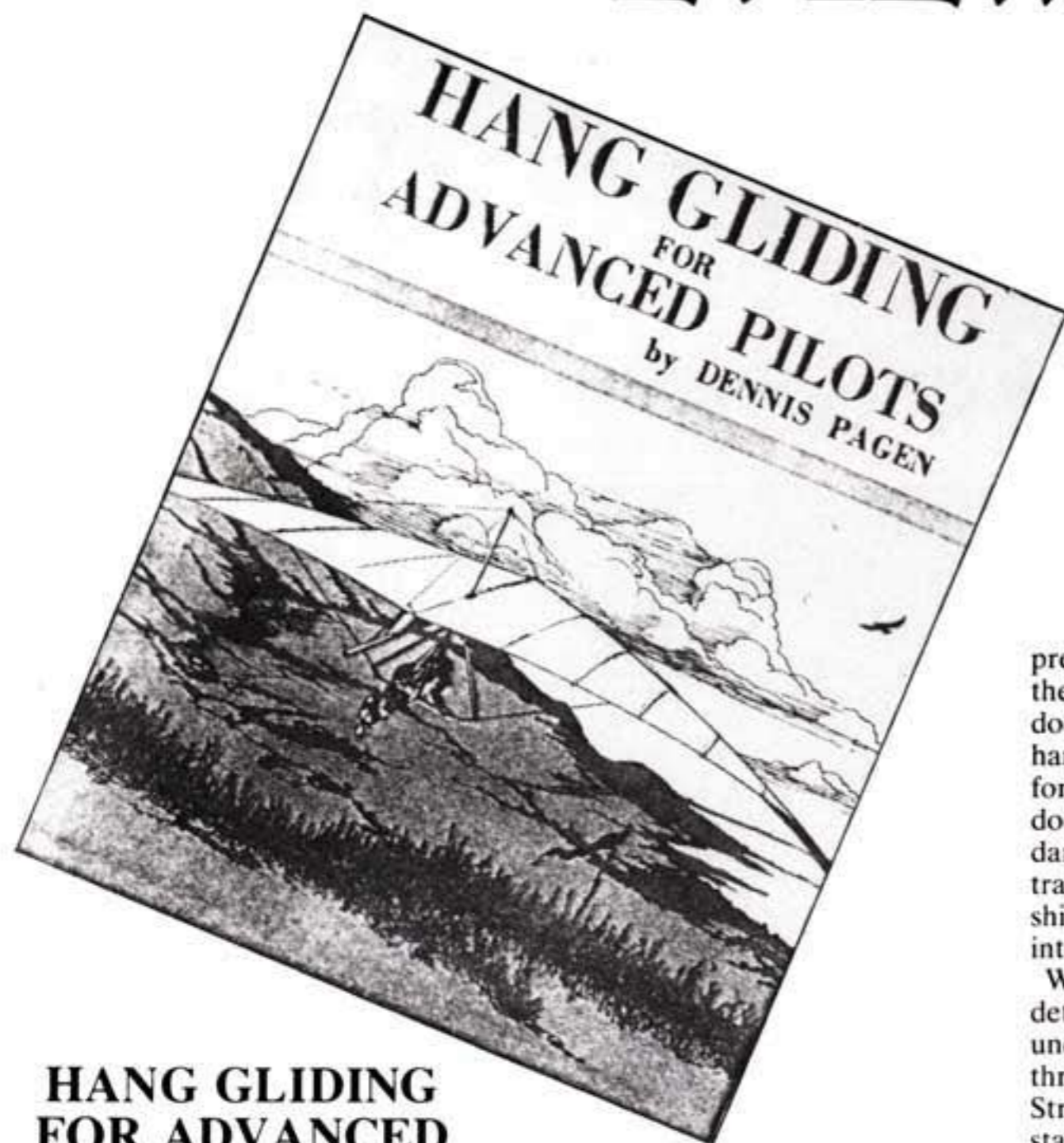
Observers

Any new observers do not get free entry into the pilot rating system. They must pay £1 to proceed from Pilot badge to Pilot Two. Observer badges will be available shortly and will be sent out as soon as any observer applies for Pilot Two. All observers please try to complete Pilot Two requirements as soon as possible.

EPC holders

Any Elementary Pilot certificates sent in after April 30th this year will not be counted and holders must approach a BHGA Registered school or their local club coach for confirmation of Pilot One rating. Where a club coach has been appointed in your area, ask them to deal with it to ease the load on schools.

BOOK REVIEWS



HANG GLIDING FOR ADVANCED PILOTS

Published by
Dennis Pagen.

1184 Oneida Street, State
College, Pa. 16801, USA.

(Available in UK from:
Robin D. Laidlaw, 105 Cler-
miston Road, Edinburgh,
EH12 6UR. Price £4.30 +
20p postage).

As a sport, hang gliding is definitely growing up. When I was Public Relations Officer for BHGA during 1975, I used to think that we would have achieved respectability when you could say to the average man-in-the-street, "Hang Gliding" and he'd know what you meant — even if he didn't want to try it himself. Well, after 3½ years of effort by people like Brian Milton, and thanks to the television coverage of both sporting events and our fight to retain sites, we have almost reached that situation. The sport is still regarded, probably rightly, as being a very dangerous one, but at least the general public know what a hang glider is, and roughly what it does. And, if they're interested and want to know more, there are now many books which will explain things further. I even saw a copy of Ken Messenger's book in W.H. Smiths on Brighton Station last week — surely a sign of the times!

The main problem for people already in the sport is the fact that, while the novices are well catered for by the available literature, things have

advanced so far in the last two years or so that an enormous gap has opened out in the levels of knowledge needed to really get the best out of the high performance ships now available. And up until now, no book covered this area.

Of course, you can get quite a long way by "trial and error" methods — watching other people on the hill, discussing things with your friends and so on. The trouble is, you're just as likely to pick up bad habits as good ones in this way — and, sooner or later, you will run up against a situation that you're not prepared. In a physical sport like ours theoretical knowledge is not all important but, nevertheless, a sound understanding of the theory of how your glider works will enable you to maximise the available performance and therefore get more pleasure. Your chances of finding lift and going cross-country will be much improved if you understand what's going on in the air around you — and how the kite reacts to it — and your chances of a successful, safe landing will be improved if you understand how to fly for maximum glide and how to assess where that glide will bring you to earth.

Dennis Pagen is one of America's top flyers — indeed the only US flyer to be placed in the top 10 in the recent British shut-down of the American Cup. He is a "professional" hang glider pilot, and has written other books on hang gliding. His latest book is badly needed, and is the only one

presently available which is aimed at the intermediate-to-good pilot. He doesn't waste space on the this-is-a-hang-glider routine. He doesn't go in for the history-of-flight blah. He doesn't even MENTION the Standard Rogallo, thank God! He concentrates on the 2nd and 3rd generation ships — the ones advanced pilots are interested in.

What you get for your £4.50 is all the detail you're likely to need to fully understand your glider. The first three chapters cover performance. Straight-line flight — min-sink speed, stalls, max-glide speed. Turning flight — roll control, billow shift, yaw, pitch control in turns. How to plot the performance envelope of your glider. (PLEASE, manufacturers, read this section!).

The next chapters cover the art of flying — turbulence, thermals, cross-country flights and so on, and subsequent ones discuss design concepts and flying equipment — parachutes, varicos, etc. There is a chapter on competition flying, which should be of interest to the League pilots, and a final chapter on powered flight. The illustrations are drawn by the author, and are excellent — very clear and understandable.

I found the sections on glider performance more interesting than the rest, and the book is well worth its price for these alone. New to me were Pagen's methods for visual determination of your glide angle — this is very interesting, and could be a life-saver on a cross-country. The book is generally of high quality, but some parts are better than others — the chapter on power, for example, didn't seem to be awfully helpful — probably this particular subject deserves a separate book in due course.

But I would say that any aspiring cross-country pilot would do well to buy and read this book. Study it carefully. Even if you never intend to go cross-country, you should still read it. Certainly, anyone in pursuit of their BHGA Pilot's Wings should get a copy — it will cover all the theory you need to know (except UK Air Law). Thank you, Dennis Pagen, for a valuable and worthwhile book.

Tony Fuell

**Adventure Holiday Guide
1979 — Abroad**

**Adventure Holiday Guide
1979 — Britain**

£1.75 Softback editions

**Published by Vacation-Work
9 Park End Street, Oxford
Edited by David Stevens**

Fed up with hang gliding? Then why not go Gorilla Tracking in the Kahuzi-Biega Forest accompanied by a Pigmy guide and gorilla tracker, finishing with a visit to the lava fields and smoking volcano of Nyiro-gongo. Sounds bizarre but this is one of the many holidays outlined in David Steven's excellent Adventure Holiday Guides. By the way, to come nose to nose — or snout to snout — with your first gorilla in Zaire will set you back about 1,250 dollars.

If that one sounds a bit hairy, why not keep your cool by going Husky Sledging in Greenland. An 18 day expedition in April will only cost you £1,360. To be fair, a general guide seems to be, the more exotic the holiday, the more you pay and there are so many holidays to choose from it is not difficult to find one within your price range.

The guides alphabetically list the activities available and then, under each section, the countries where the package holidays go to are also listed alphabetically. Under each country are the tours giving the name and address of the tour operator, a brief outline of the holiday and the minimum cost. Eg:

Cox and Kings

Vulcan House etc., etc.

... Visits to the lowlands of the Rio Aragon to search for such birds as the bee-catcher, short-toed lark, Griffon Vulture and the black kite. Prices from £300 including return flight to Bordeaux.

Bookings through . . .

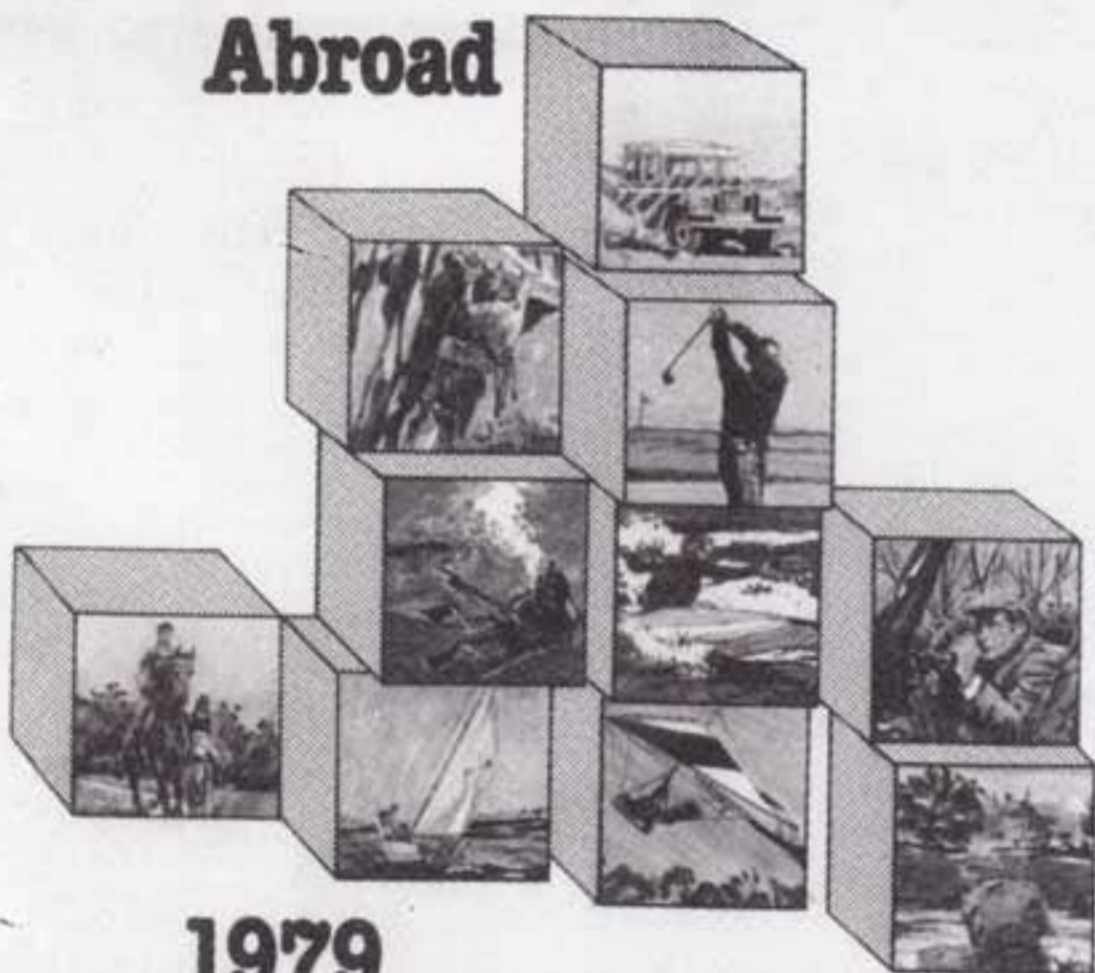
Sounds a bit like a visit to the South Downs!

The rear section of the book is put over to descriptions of the companies offering the packages. This is a very useful section in that it gives information of the kind of parties the tour operators deal with, their approximate annual number of bookings, and how many years they have been in business including changes of name, which must be a great way of knowing what sort of company you are dealing with.

The books are great reading and if you really do fancy using them for finding an unusual holiday, they must be invaluable. I can

Adventure Holiday Guide

Abroad



1979

only congratulate David Stevens on getting together such a stock of usable information — a public service.

I leave you to daydream a little: Coral diving in the Bahamas, 315 dollars from San Diego; Canoeing in the Cairngorms from £68 per week; River Rafting in Ethiopia, 1950 dollars for 3 weeks; Falconry in Gloucestershire from £80 per course; Archaeological tour of the Peloponnese from %185; Camel Safaris, Windjammer

Cruises, Caving . . . I can just see it now, me, the wife and three kids strapped in a barrel sliding over the lip of the Victoria Falls, the blood red sun, setting on the Zambesi, splinter into a thousand rainbows as it penetrates the spray drifting and from the rumbling depths far below . . .

On second thoughts, at least you know what you are eating in Clacton, none of that greasy food . . .

David Worth

GROUND TRAINING FOR THE PRIVATE PILOT LICENCE: AIR NAVIGATION & METEOROLOGY. AOPA MANUAL 2.

BY R.D. CAMPBELL.

PUBLISHED BY AOPA UK, 50a CAMBRIDGE STREET,
LONDON, SW1V 4QQ. PRICE £6.50 plus p&p 50p.

This is a text book, but unlike many it is clear, it is easy to find the bits of information you want, the illustrations are good, and — surprise, surprise — you want to go on reading more.

Almost half of *GROUND TRAINING* is about navigation, starting with a 'school geography' section on projections and great circles, but here it is a lot more comprehensible than it ever seemed in the classroom. It then works its way through wind, heading and groundspeed calculations, maps and charts, compass problems, and the use of the circular slide rule; but it is in the flight planning part that such apparently academic information relates to hang gliding needs.

At the present state of the cross-country art the pilot, who has flown 8km. and successfully landed in a strange field, may feel that flight planning is unrealistic and unnecessary; but it is actually essential when you cannot fly along with a map neatly folded on your lap. If a hoped-for flight is thoroughly studied for the expected downwind direction, it is not difficult to memorise the route for 50km. or so, provided that preparation has been carried out in a sequential manner. This part of the Manual describes such planning logically, and if followed should enable a hang glider to be flown cross country without the pilot either getting lost and/or straying into controlled airspace. Even when it does not remain possible to continue exactly along the

planned line it is wise to know how the new flight path relates to major landmarks which are known. The series of air to ground photographs which accompanies this section, together with the captions indicating what to look for, are an excellent guide to the recognition of ground features.

The meteorological section provides a good grounding for weather study and observation; though highly slanted towards the aeroplane pilot who is, hopefully, a lot more likely to become iced up in cloud than the flexwing driver. For the same reason there is almost nothing about thermals, although the information provided on pressure, density, and humidity etc. should enable the soaring pilot to base his in-flight findings and his forecasting on sounder ground than he may be able to do at present.

The last third of the Manual is devoted to a series of multiple choice progress tests — with answers at the end. There are 17 quiz sheets for navigation and 5 for met. Here again, it is quite easy to find the progress tests for the particular aspect of nav. or met. which is of interest.

This is not a book for the flier who intends to learn only the minimum to get through PILOT 2. It is a self-teaching guide to help any serious pilot who wants to fly cross-country more effectively and with the fewest possible in-flight problems.

Ann Welch



INFORMATION



KILIMANJARO NATIONAL PARK

Kilimanjaro National Park welcomes all hang glider pilots who want to fly from the summit of Mt. Kilimanjaro. This highest mountain in Africa has become a big challenge to hang glider pilots throughout the world, but there are some formalities to follow before entering the park with your glider.

1. You must get a letter from your embassy in Tanzania certifying that any expenses involved in the event of an accident will be covered.
2. You will need evidence from B.H.G.A. showing that you have sufficient experience to fly in Tanzania.
3. You must observe the following precautions: have a party on the summit to see you off, have a party in the Mweka hut to watch your flight direction, have a party in Moshi with radio contact with yourself and the two mountain parties, have with you emergency signal rockets, matches, brightly coloured bivouac sac, bush knife, food and water in case of crash-landing in the forest.

At all costs avoid flying into the deep river-gorges. They are very difficult to get out of. If you crash in the forest, try to make yourself as visible as possible to aircraft by trying to spread out your glider so that it can be seen. Smoke is easily seen from the air, but it can be almost impossible to locate a person in the forest — hence the importance of making yourself as visible as possible.

In March and November the northeasterly winds are bad for take-off for flights toward Moshi. The first two-three hours after daybreak are normally cloudless throughout the year.

The park warden in charge is Alfred Labongo, P.O. Box 96, Marangu, Tanzania.

F.A.I. BADGES

F.A.I. badges are now available for those who have qualified. Full details of cost is given in the pilot grading blue sheet recently sent out. Apply, with money, to the Taunton office.

DATES FOR YOUR DIARY

Midnight Sun Cup 1979 organised by the Bodo Hang Glider club, Norway, will be held from June 23-30 at Keiservarden, a mountain 1000ft. above sea level. Participants must have Hang 111 or equivalent. Applications to Bodo Hang Glider club, P.O. Box 93, 8012 Skeid, Norway by May 31st.

South Downs Hang Gliding championships to be held August 25th/26th/27th. Open to Pilot 2 holders. Full details of venue and competition will be published later.

NO POWER PLEASE

Whilst endorsing the development of powered hang gliders, the South East Wales Hang Gliding club request that pilots do not operate these aircraft from soaring sites in the South East Wales area.

CONDORS TEMPORARY MEMBERSHIP

The Devon and Somerset Condors are to continue their successful Temporary Membership scheme, which last year enabled visiting flyers to make the most of the Condors sites. For a fee of £3.00 applicants receive six months club membership, a site information pack, and a list of those club members best able to offer advice and assistance.

Last year this system enabled the Condors to keep track of pilots from other areas, who were in turn able to maximise their flying time. Those intending to fly in the area are asked to send their application, together with the appropriate fee, to Simon Murphy, Turf House, Luppitt, Honiton, Devon.

MERTHYR COMMON

Will people flying from this site please leave their cars on the made up track and not on to the place adjacent to the take-off point. The idea is to let the very muddy ground recover from the recent severe weather.

INSURANCE RATES

Insurance rates for hang gliding are at present being revised. Anyone requiring any form of cover can meanwhile obtain a quotation on application to *Reggie Spooner, Insurance broker for BHGA, Clifton House, Bath Road, Cowes, Isle of Wight, PO31 7RH. Telephone Cowes 292305.*

TEGG'S NOSE COUNTRY PARK

The C.A.A. has refused special dispensation for hang gliders to operate at this site inside the Manchester Control Zone. The site is adjacent to the Special V.F.R. route from Buxton and aircraft are entitled to operate down to 500ft. A.G.L.

Also the C.A.A. feels there are possibly other sites outside the Control Zone that can be used by hang gliders instead.

Cheshire County Council, who run the park, had already contacted C.A.A. to discuss air safety at the site. They are also considering revising the bye-laws which currently contain no reference to hang gliding.

ADDRESS & TELEPHONE NUMBER CHANGES

Treasurer: Derek Evans, 15 College Drive, Tunbridge Wells. Home: Tunbridge Wells (Kent). (0892) 36026
Radio Communications Officer: John Westcott, 32, Tommy Taylors Lane, Pittville, Cheltenham, Glos. Home: Cheltenham (0242) 56914.
Chairman: Reggie Spooner, new phone numbers and codes (work only) Cowes (0983) 292305/6

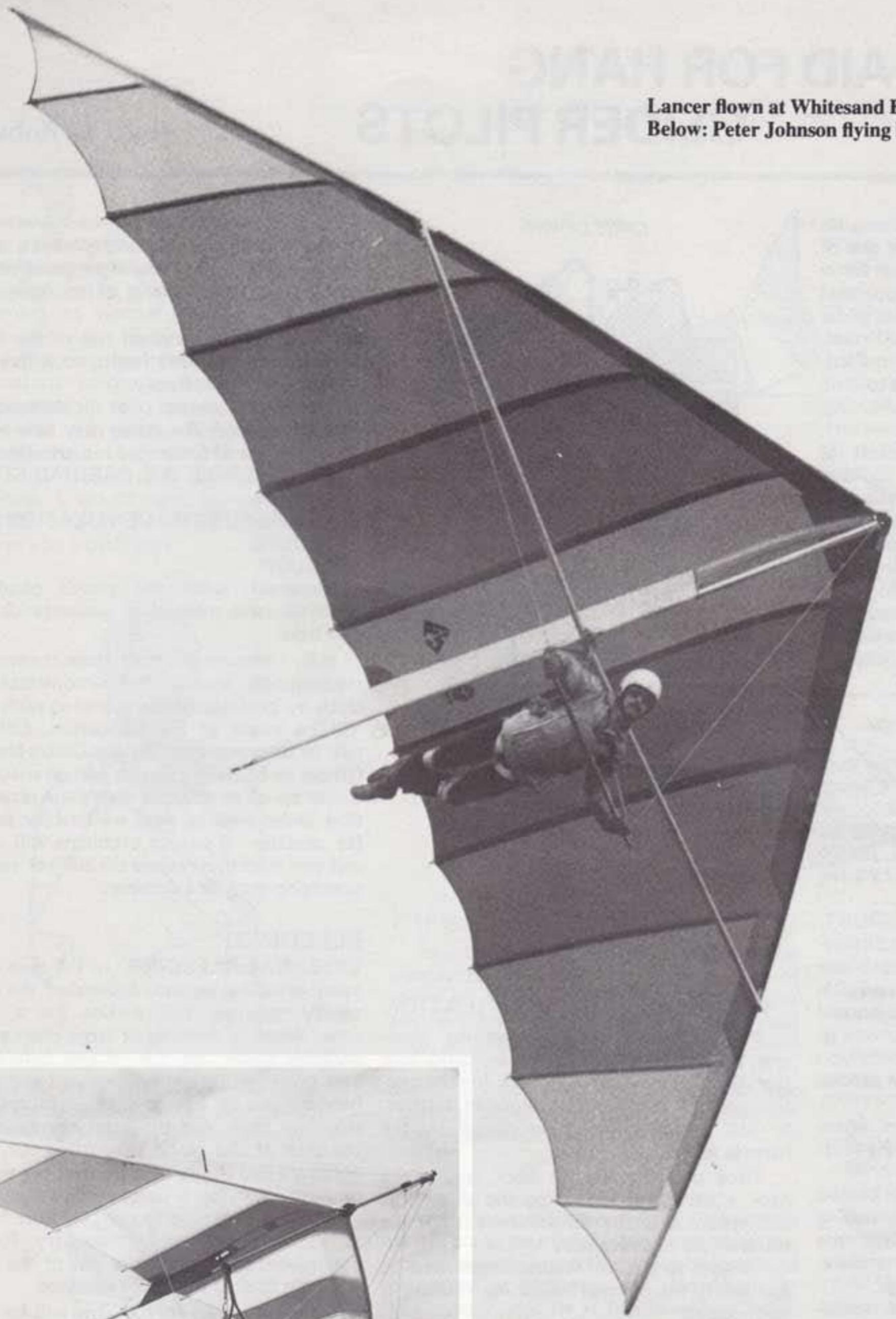
GLIDER STOLEN

Another glider has been stolen in the London area. John Woolgrove is offering a reward for information leading to the return of his Birdman Firebird S, 220sq. ft. glider, which disappeared from his garden. The sail colours are yellow, gold, orange, red, purple and blue and the serial number, on the slider box, is 20 x15 116977. John can be contacted c/o 4, Priorfields, Ashby-de-la-Zouch. Tel: 05304 2320.

MERGER IN SCOTLAND

Strathclyde and Lomond Hang Gliding clubs have amalgamated — and have had problems in naming the merged club. The name finally chosen was that of the Puffin Hang Gliding club. New officers are as follows: Chairman, David Squires, 33 Whitehurst, Bearsden, Glasgow; Treasurer, Ron Docherty, 182 Taylor Street, Methil, Fife; Secretary, Alan Keddie, 41 Townsend Place, Kirkcaldy; Sites officers, *East:* Jim McDougall, 49 Cameron Park, Thornton, Fife. (tel: Thornton 571); *Central:* Henry Heggie, Crawfordston Cottage, Kippen, Stirling, (tel: Stirling 3111 Ext. 261); *West:* David Squires.

**Lancer flown at Whitesand Bay, near Plymouth by Joseph Bacher.
Below: Peter Johnson flying his Gryphon on the same site.**



BASIC FIRST-AID FOR HANG GLIDER PILOTS

by J. G. Roberts

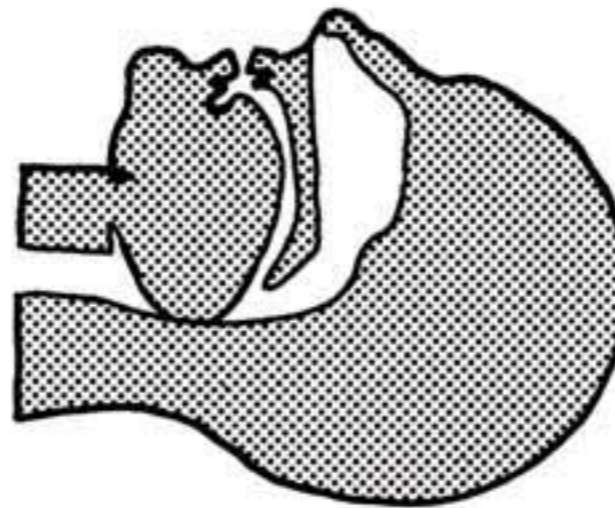
As most pilots will know, accidents do happen from time to time. It's just one of those things. Just stop and think for a moment how YOU might feel if your best friend lay dying under his shattered glider and you had to admit to yourself that, because of your lack of knowledge in First-Aid, you could do little if anything to stop his decline. That may sound a little strong, but think about it, it could happen.

Below I have written some points of very basic First-Aid, and I promise you that it will be heavy reading — no action or tales of 60 miles cross-country — just facts. The order of priority in the event of any accident is listed below. Read it and remember it and use the order at any accident at which you might be present. It is possible that this will save lives. More detailed information follows the order of priority for accidents.

THE ORDER OF PRIORITY

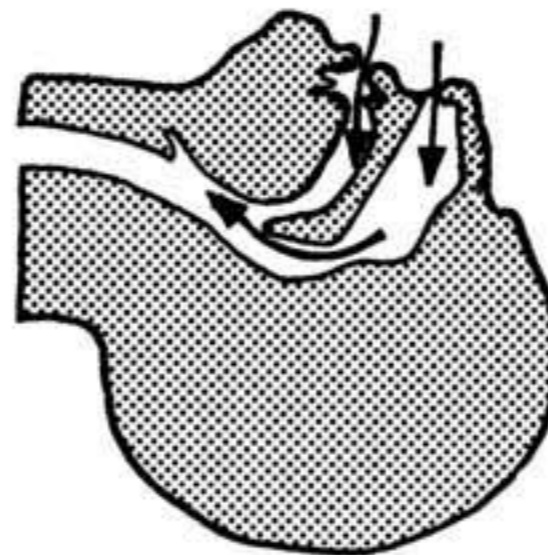
- 1) FURTHER DANGERS.** The pilot should be immediately unhooked from the glider to prevent further injury should the wind try to carry the machine away. Cutting the harness straps may be necessary if the pilot's weight is still on the glider's hang point.
- 2) BREATHING — SECONDS COUNT.** Check that the pilot's airways are unobstructed and that he is breathing. If he is not breathing you must start RESUSCITATION IMMEDIATELY. If the breathing is normal and the pilot is conscious, then try not to move him until he has satisfied both you and himself that he has no other serious injuries.
- 3) BLEEDING.** Look for any areas where bleeding is present. If necessary you must try to control its flow.
- 4) FRACTURES.** All large fractures should be immobilized or splinted before moving the pilot. Wounds associated with the fracture will also be immobilized and therefore reduce the risk of further damage.
- 5) MEDICAL HELP.** Send for an ambulance as soon as it becomes apparent that medical help will be needed. Give all details clearly and arrange for the ambulance to meet one of your party on the road near the site, so accurate location of the pilot may be obtained. Other non-involved members of the party should be useful in carrying the equipment up the hill for the ambulance men which will afford them a speedy arrival at the accident site.
- 6) SMALL INJURIES.** Pilots who are successfully treated by the use of splints and/or bandages may make the journey to hospital by car. Great care should be taken, if this is done, that no other injuries are missed and allowances made for the possibility of a delayed shock reaction.

CHIN DOWN



AIRWAY BLOCKED

CHIN EXTENDED



AIRWAY CLEAR

RESUSCITATION: VENTILATION

If the pilot has stopped breathing, whatever the position he is found in, make sure that the airway is open. Check for obstruction such as a denture plate, blood or mucous, or just a throttling action caused by the harness straps.

Place the pilot on his back, raising the neck a little and extending the chin, (this will ensure that the tongue itself is not the cause of the obstruction).

"Mouth to Mouth" Resuscitation must be applied if the normal breathing routine is not present.

MOUTH TO MOUTH

- 1) Take a breath.
- 2) Pinch the pilot's nostrils to stop the air escaping.
- 3) Place your mouth widely over the pilot's mouth and blow until the chest rises.
- 4) Remove your mouth well clear of the pilot's face to allow you to take another breath of fresh air.
- 5) Repeat, taking care not to exhaust yourself or you will become nauseated. 4 to 5 blows should be sufficient to saturate the blood with oxygen. If there is no response and the pulse has stopped cardiac stimulation is necessary.

CARDIAC ACTION

- 1) Kneel down alongside the pilot's chest.
- 2) Place the heel of the right hand on the pilot's chest at a level of the lower part of the breast bone.
- 3) Place the left hand on top of the right.
- 4) Keeping the arms straight, rock forwards and press down firmly.

The normal average pilot should need one push per second. A routine may now be set up in the case of prolonged resuscitation.

4 PUMPS FOR THE CARDIAC STIMULATION

1 BLOW FOR THE VENTILATION

4 PUMPS

1 BLOW

Repeated, until the pilot's condition stabilizes, this method of resuscitation will save lives.

N.B. I recommend that these methods of resuscitation should be demonstrated to clubs by professional personnel so each pilot will be aware of the difficulties. Either a talk or demonstration by the Club's Medical Officer or St. John's service will be adequate. **Under no circumstances may these resuscitation techniques be used on healthy people for practice** — serious problems will occur and you might just injure the subject you are practising on. **Use a dummy.**

BLEEDING

EXTERNAL BLEEDING. In the case of an open bleeding wound, squeezing the sides tightly together will suffice for a short time. Where a dressing or large clean pad is available cover the wound and bandage it into position. Be firm when you apply the bandage but do not go mad — you want to stop the flow, not the total circulation to the area. If the blood is spurting out, then holding a pad firmly in place over the wound or even applying a pressure bandage, will give the wound time to clot. Pressure for up to 15 minutes could be necessary. Raising the injured limb above the rest of the body will help to slow down the bleeding.

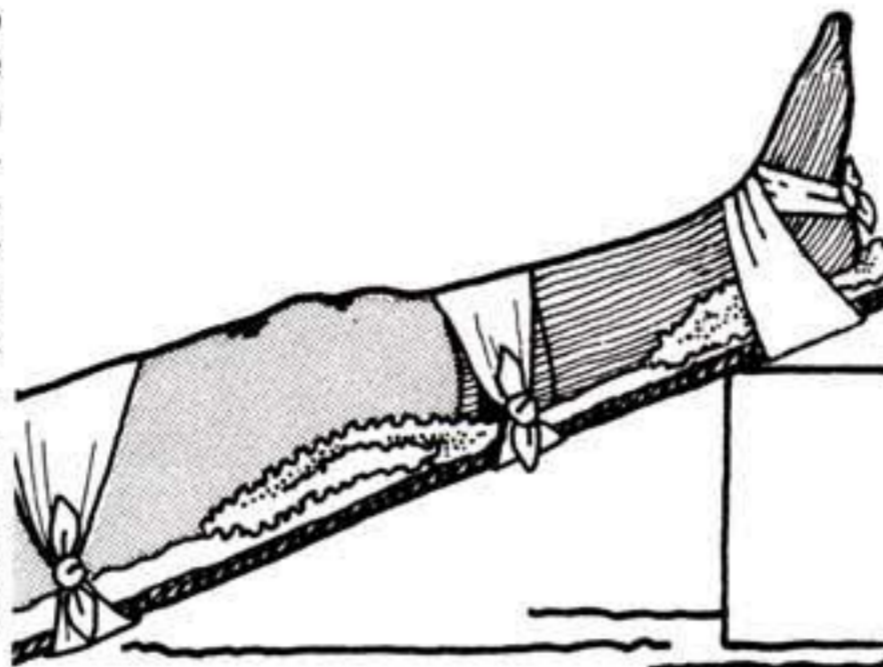
INTERNAL BLEEDING. This will be dealt with at the end of the chapter called ALERT.

FRACTURES

FRACTURES TO THE EXTREMITIES. Basically nearly all these may be treated with a splint. The splint should be made of a suitable strong material, long enough to include the joint of a limb near the fracture, e.g. 18" long for a forearm would do. It should be covered with at least ¾" of padding (cottonwool) bound with bandages. Once the injured limb has been placed on the splint, padding up where required to follow any deformities, it may be bandaged into place. Care should be taken that the circulation has not been restricted by over

enthusiastic bandaging. An easy check is to press your thumb into the limb below the splint/fracture site for a few seconds. When it is removed a white mark will be left—returning to normal colour quickly. The same test may then be applied to other uninjured limb and the time for returning to normal colour compared. If there is more than a few seconds difference — you have the bandages too tight. Simple but effective.

To go into all the various methods of splintage I would need the whole of this WINGS! edition so here are a few examples to give you a basic idea.



FRACTURES NEED GREAT CARE AND GOOD SUPPORT

mucous could indicate a serious chest injury. Place pilot in semi-coma position or lie him semi-recumbent to ease the pain. Maintain airway and watch for shock.

2) SPINAL INJURIES: Pilot complains of the loss of sensation to part of his body below the site of injury, e.g. loss of movement to lower limbs and/or pins and needles. **DO NOT MOVE PILOT.** Maintain airway and watch for shock.

3) INTERNAL BLEEDING (due to internal injury): Pilot is pale with pulse and breathing rates up, and could complain of a headache. Pilot could also experience frustration by feeling hemmed in (air hunger) and could slowly lose his sensitivity to pain. If he can move, turn him gently into the semi-coma position, maintain airway and watch for shock.



*THE SIMPLE TRIANGULAR SLING
For the majority of simple fractures of the upper arm and forearm to wrist. Hand inside sling and above elbow.*



THE SEMI-COMA POSITION

This position is primarily for use with the unconscious pilot and is used to prevent vomit or blood being inhaled and thereby obstruct his airway. It may also be used even if there are other injuries on most occasions. It is an ideal position for treatment of shock. Regular checks should be made to ensure that the airways have not become obstructed.

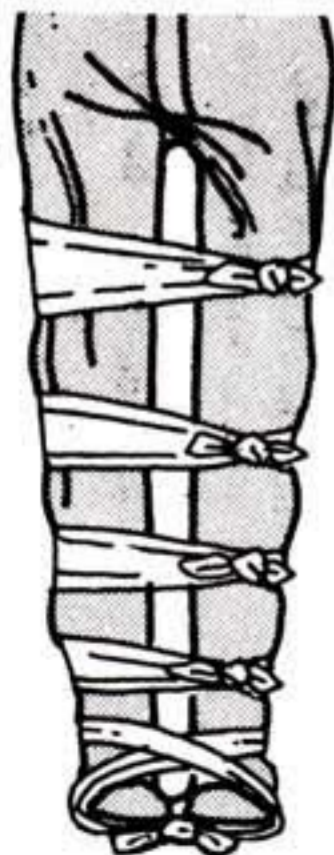
These 3 examples of injury need **IMMEDIATE MEDICAL ASSISTANCE**. Maintaining the airway and watching for shock are the most important acts you can perform until the medical crew arrives.

A person with a serious injury or one that might need an anaesthetic should not be given anything to eat or drink.

INFORMATION:

When the ambulance arrives, the crew would obviously appreciate an idea of the suspected injuries so that the relevant equipment can be carried up the hill or additional equipment can be requested by radio this saving valuable time. The hospital will need any relevant information that you might have. Name and address, Blood Group, when the pilot last ate or drank, has he any allergies? How the accident happened and the speed of impact will aid diagnosis.

CONCLUSION: I have only touched on the very basics of First-Aid, and I strongly recommend that you obtain a manual from your library or club. Does your club have a medical officer? If not, I recommend that you give the position some thought.



A simple method of using the uninjured leg via a rolled up blanket as a splint

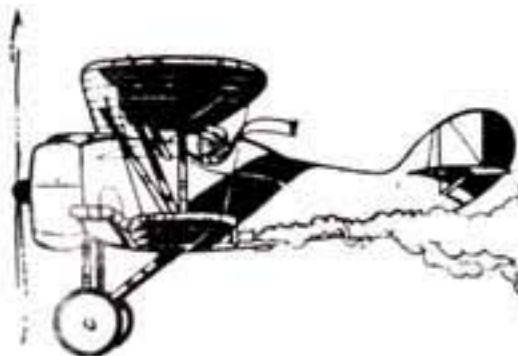
SHOCK

This may occur in many ways. An example of this could be a pilot (after an accident but not necessarily immediately after) complains of nausea or giddiness. His skin feels cold and sweaty, and he is breathing in a "sighing manner". If this occurs, try to reassure the pilot; do not move him without reason as this tends to aggravate shock; cover him with a blanket or coat. "Cooking" somebody with shock is not recommended. A visit to the hospital is a must and reasonably soon. Head injuries could present the same symptoms so take care. It's hospital either way.

ALERT

1) CHEST INJURIES: Pilot complains of sharp pain in the chest, not explained by the point of impact. Breathing may be rapid and shallow in an attempt to lessen pain. Bright frothy blood in the mouth or staining the

The author wishes to acknowledge the help given by: Dr. E. O'Doherty, Senior Consultant in Radiodiagnosis, Dr. Dunstan Hadley, BHGA Medical Adviser, Ashley Doubtfire, Birdman Flight Training School.



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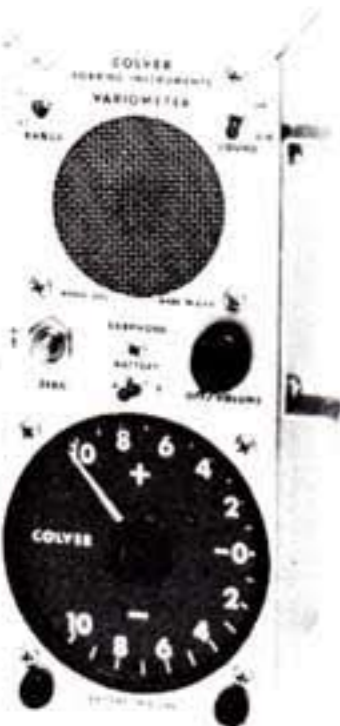
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Designed by Colver Soaring Instruments and exclusively distributed by Wills Wing, the latest Colver Variometer (5XC) offers hang gliding pilots a complete dual range audio and visual instrument to get the most out of lift conditions.

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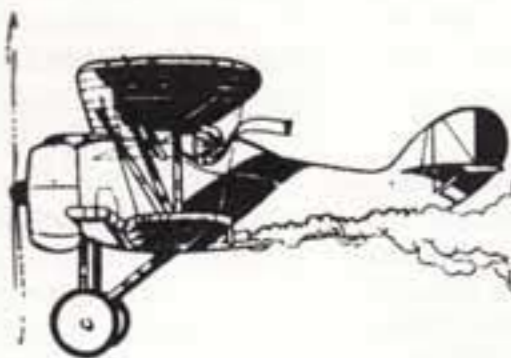
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This system incorporates a bag deployed 24ft. conical parachute of 20 gores and 20 lines weighing 6lbs. The gores are of solid block construction. The design limitations are 300lbs. combined weight at 100 m.p.h.

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This system incorporates a bag deployed 26ft. conical parachute of 22 gores and v-tabbed lines. It comes complete with container, bag and 20ft. bridle. This parachute weighs 7lbs.

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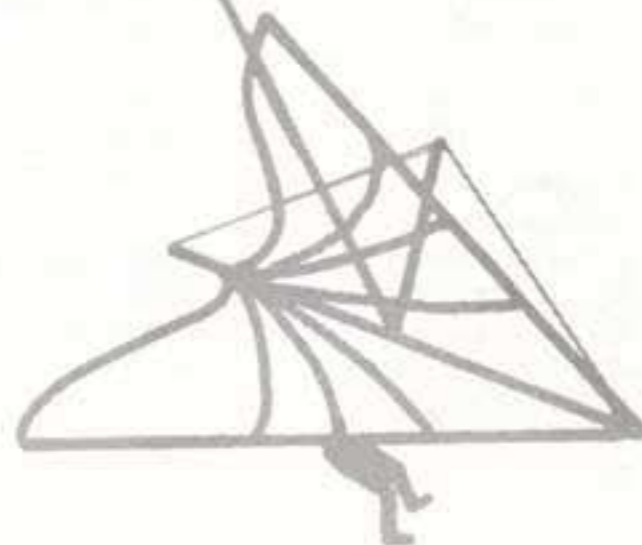
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small ads

For your own safety, if you are purchasing a second-hand glider, check that it is a registered BHGA model, see it test flown, test fly it, and inspect it thoroughly for damage or wear to critical parts. If in doubt seek advice from the Club Safety Officer.

All small ads should be sent to Lesley Bridges, Commercial Editor, *Wings!*, Yard House, Wentnor, Nr. Bishops Castle, Shropshire.

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Brand new **audio-visual Variometer** £50. Brand new hang gliding helmet, cost £19 accept £14. Second-hand Hiway Prone Harness £25. Phone Basingstoke 62536.

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Cirrus 5C intermediate kite, small size (150sq.ft.) with attractive American sail. Hardly flown, but extra weight of new parachute means I need next size up. £420 ono. Hemel Hempstead 63278.

Chargus Vortex 120. Six months old. Blue/white/gold sail, excellent condition. £360. Simpson prone, Hiway seated, Everoak helmet. Ring Birmingham (021) 706 3827 or contact: Lt. Mike Brown, Para Reg. Recruit Div., Dering Lines, Brecon.

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Midas Super E. 12 months old, in beautiful condition with red/white sail. A really nice machine to fly — urgently need the cash. £395 or any reasonable offer. Guy Burton, Cluny Hill Community, Forres, Morayshire, Scotland.

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Super Scorpion C. Bainbridge dacron multi-coloured sail. £460. Possibly can deliver. Tel: David Bluett, Brenchley 2890 (evenings).

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McBroom Lynx, fully battened sail, white/red, sewn in camber. Ideal for student flyer. Very easy to soar, good glide angle. Seated or prone, never pranged, hence good nick. Seated harness. £280. Dave, Worplesdon 3153.

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Moonraker 77, very good condition. Must be sold as I am leaving the country for an extended period. £370 ono. Tel. Newbury (0635) 42901

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Large **Spirit**. Good condition, pulley system, quick release nose catch. Sail with stronger battens, orange, white, green, black wing tips with yellow star. £270. Huddersfield 659156. Also large **Skyhook 3A**, with seated harness. £100 ono.

Wasp Falcon III. Excellent condition. Can be soared prone or seated in fairly light winds. Excellent for E.P.C. to intermediate standard. Comes with zip-up bag, seated harness and some spares. Bargain £225 ono. Brighton 721682.

Knee injury forces sale. New **Super Scorpion C** only 5 flights. £500 ovno. **Wasp Falcon III**, good condition £225 ovno. Airspeed indicator £17.50, prone harness £15. Phone Pondhill 3474.

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17ft. rogallo **Arion**, blue and yellow 34774. £120. Contact Brooke, Uley, (Glos) 045-386-258.

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Breen Butterfly 13ft. standard. Suit lightweight

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Chargus Prone Harness with unused Delta H.G.S. chute, all as new. £210. Phone Dave on Windsor 68121 Ext. 201 day, or after 6 on Maidenhead (0628) 30580.

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