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SEPTEMBER 1977

MAGAZINE



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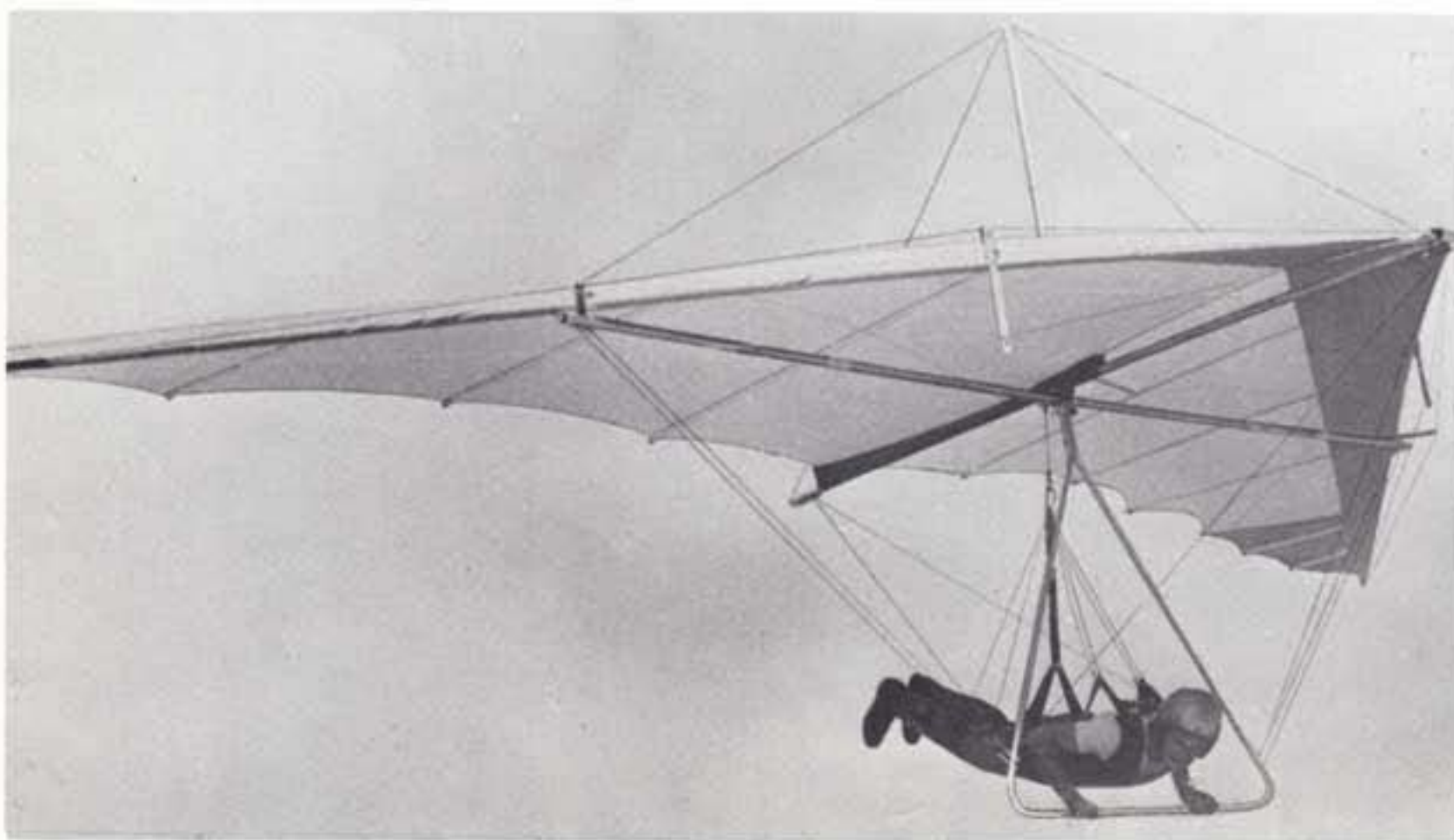
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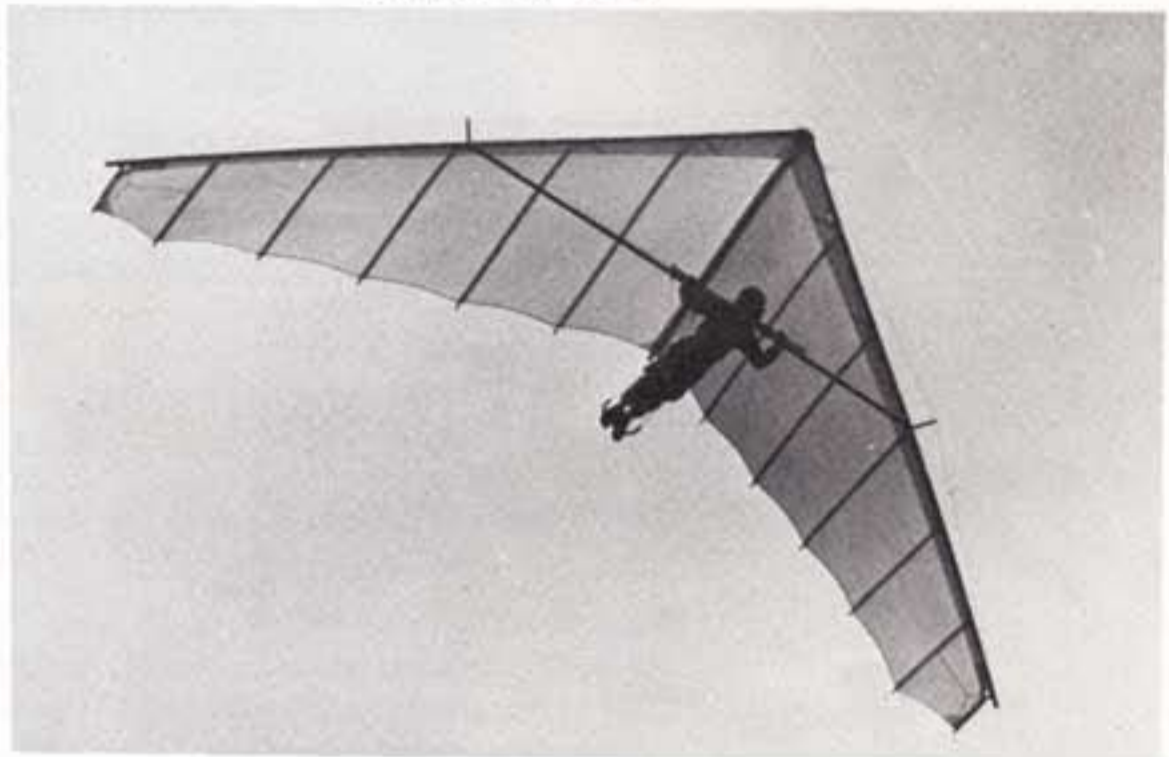
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# WINGS!

The official magazine of the BHGA

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Cover: Mike Robertson soars above the beautiful Shropshire countryside on his Scorpion. Photograph by Mark Woodhams.

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**BRITISH  
HANG GLIDING  
ASSOCIATION**  
MONKSILVER, TAUNTON,  
SOMERSET.

*Wings!* is published monthly by the British Hang Gliding Association. The views expressed by our correspondents are not necessarily those of the Council of the BHGA, its officers, members or its editor. Contributions are welcome. Articles should be typewritten if possible; photographs and cartoons should be accompanied by appropriate captions. Any material which is to be returned should be sent with a stamped and self-addressed envelope. The editor reserves the right to edit contributions where necessary. The magazine can be obtained by joining the BHGA. Membership is £7.50 per year (UK and Overseas), (£10.50 family membership) and should be sent to: Audrey Evans, Membership Secretary, 2 Lynch Down, Funtinton, Chichester, Sussex PO18 9LR. BHGA President: Ann Welch, Chairman: Pat King, Treasurer: Derek Evans, Council: Brian Milton, (Press Officer), Gordon Wyse (Acting Secretary), Robert Wisely, Reggie Spooner (Insurance), Jeannie Knight, Malcolm Hawksworth, Will Jones. Flight Training Officer: Keith Cockroft. Accident Investigation Officer: John Hunter. Registration Officer: Terry Dibden. Solicitor: Anthony MacLaren. Technical and Safety Officer: Ted Shreeve. Medical Adviser: Dunstan Hadley. Radio Communication Officer: John Westcott. Enquiries regarding pilot grading etc. should be addressed to Keith Cockroft, Flight Training Officer, 3 Mill Field End, Midgeley, West Yorkshire. General enquiries should be made to the Monksilver address.

# 'OPINION'

**Fred Ashton expresses his views on the current proposals for the selection of a British Hang Gliding team as put forward by Brian Milton, Chairman of the Competitions Committee.**

*When a team is to be chosen to represent Britain, the competitions committee chairman sends out a precis of the tasks required, together with a request for all individual committee members to nominate the best team possible. If the team has to fly in 3 classes, 3 in each class, the chairman will ask for 9 nominations. Initially, no attempt will be made to rate by class.*

*The chairman then receives back the nominations, compiles them — with the numbers of votes each name received — and sends the compilation back to committee members to consider prior to the next committee meeting (or one called especially to make the choice). It's important to know that no committee member may nominate himself, however good a flyer he is.*

At a meeting of the BHGA Council held on the 29th May 1977, *Item 10* on the agenda was Examination of Method of national Team Selection, and Team Manager.

The chairman of the competitions committee outlined the proposals of his committee for the selection of a national team to represent England in future international events.

After listening to these proposals, council members were asked for their comments on the subject.

What immediately came to my mind was, firstly the *possibility* of some small conspiracy taking place. Here we have a situation where the committee comprises *some* of the country's top fliers and one or two manufacturers, with a big juicy carrot in the form of the possibility of all expenses paid and the accolade of success dangled in front of them, and asked to put forward their nominations for a team to represent their country.

Now don't get me wrong, I have known most of these members for some three and a half years, and doubt if any of them would intentionally approach one another with the view to selection, but unfortunately the

possibility is there, and this to me is the weakness and unfairness (even to the committee themselves) of the system of team selection.

I now come to my second point.

When my turn came to air my views I put forward the situation I have just outlined and added my disagreement to it. I then went on to express my opinion of team selection.

After the Pickering Event, a team was to be selected to represent the BHGA in Kossen. This team was selected from the winners of classes (1) (2) and (3) e.g. first second and third in each class. The competitors were informed prior to the competition commencing that this was to be the system.

What a Hull-a-Baloo there was when the two top fliers were knocked out. I for one went in defence of these two fliers and fought for some consideration so they may be given a second chance to prove themselves. As it happened they just couldn't make up the gap on the points system. What I didn't realise at the time was, what would two other pilots have felt like had they been pushed out of the British Team because we favoured

*At the next committee meeting, all the nominated names are considered, with attention paid to the tasks a team would have to fly, the 'form' of each flyer, his league results, and his temperament. Discussion would also occur on which flyers should be chosen for each class.*

*At the end of debate, committee members, in secret ballot, make their selection for the team. These are compiled, and those pilots who top the ballot are invited to go. When the committee has made a choice, and determined pilot availability, the decision is sent to BHGA Council for ratification. After the team has been chosen, nominations are accepted for the post of team manager, discussed and voted upon, and his name also goes to BHGA Council for ratification.*

giving two other individuals a second chance. It was this situation which prompted me to put forward a proposal in defence of the Dedicated Points System, i.e. That the League points and positions, should stand, in the selection of our National Team. Surely this is what the league is all about, isn't it? The league fliers are fighting for their place and form for selection to a national team, if it isn't, then some of the league fliers could well be disappointed.

One of the arguments against my proposal was, the need to select the best pilot for a specific task, for instance Willie Smith being outstanding at spot landings and Barry Branston-Pickle the leading pilot in Slalom events and so on, and on this information the team is then considered. It had been mentioned previously that the competitions now being flown in the league, incorporate practically all the tasks now being encountered and devised in competitive flying. So why select a particular pilot for a specific task.

I contend that the fliers who are placed in the first ten positions in the league table, when the time comes to

select a national team have automatically proved their worth and should have undoubted right to represent our sport in future events for that particular year.

After stating my proposal, a seconder was not forthcoming and so the situation was defeated.

Before closing I would clearly like to state that I am in no way accusing or condemning any one individual of indiscretions or unconstitutional behaviour, what I am saying is that whatever system we choose must be foolproof and water-tight, so that all involved have a clear understanding at what they are aiming for before they commit themselves, and so save some big disappointment because of some silly misunderstanding of the rules and conditions.

What will one of you fliers say, being in one of the first ten positions in the league, and you are dropped because in the opinion of the final selection committee you just haven't quite got that final qualification required to be selected. I don't think I need answer that question for you, but just think about it very seriously.

**Fred Ashton**

## EDITORIAL

As usual the Mere event was bedevilled by poor weather conditions and on the last day the quest for a British Open Champion was reduced to meaningless procession of pilots being hurled off the ridge in quick succession. I'm full of admiration for the marshalls who made it possible to run through a field of 150 flyers twice in a day, but wonder if justice was really done in finding a worthy champion. This situation is nothing new, just about every championship we have had seems to have been spoilt by the competition. Looking back at Mere the highlights for me were the distance knockout (as always), Ian Grayland performing a magnificent thermalling flight way back behind the ridge, the powered Midas and the short burst of soaring/stunt flying towards the end of the competition.

It must be time to rethink these public events which must bore the pants off the public, when they have seen the umpteenth pilot score

70 points on the slalom and miss the target. We know already that the best way to find a true hang gliding champion is to hold a non public event which is geared to real flying. Why not treat the public to an *exhibition* of hang gliding with much more emphasis on free flying demonstrations. Some of the more exciting Class III machines were relegated to one flight from a corner of the field where nobody noticed them. With no fixed itinerary, random tasks designed to test pilot ingenuity could be arranged ad. hoc. More experienced pilots could be given the ridge to demonstrate 360's, wingovers, stalls, backward flying or whatever. Intermingled with free for all flying, distance competitions and ridge soaring races I am sure the public would get much more value for money and also learn a lot more about the sport.

Despite my grumbles, the good crowds on Sunday and Monday meant that Mere was a financial success, with £3,300 plus to place in reserve. We must thank Long John Whisky who put up over £4,000 plus many expensive services to make the event possible. Derek Evans tells me that spectators were once again signed in as Affiliate Members for the day so hopefully we will not raise a tax liability on the car park receipts. There will be a full report in the next *Wings!*

## MERCI BEAUCOUP

Dear Sir, Could I through your columns thank all those people in the hang gliding fraternity for their kind wishes expressed when I flew the channel on 21st July. The efforts of many people contributed to the success of the operation, in particular the flying of the Olympic balloon pilot David Liddiard.

I would also like to say that there is absolutely no truth in the rumour that Brian Milton has been invited to go hang gliding with Jacques Cousteau.

Ken Messenger

## GROWING WINGS

Dear Sir, Congratulations on the new look *Wings!* — definitely a big improvement, it really does give our association a professional look, and I've found that it creates a big impression on 'non-flying' types.

Anything which shows that we're really an organised bunch of nutters is to be welcomed. It can only help us get away from the image that the press has cultivated ('Intrepid Birdman' 'Jumping from Cliffs' etc) and show that we have a real sport here and most importantly — that we can act accordingly. Hoping that you never hit 'sink'.

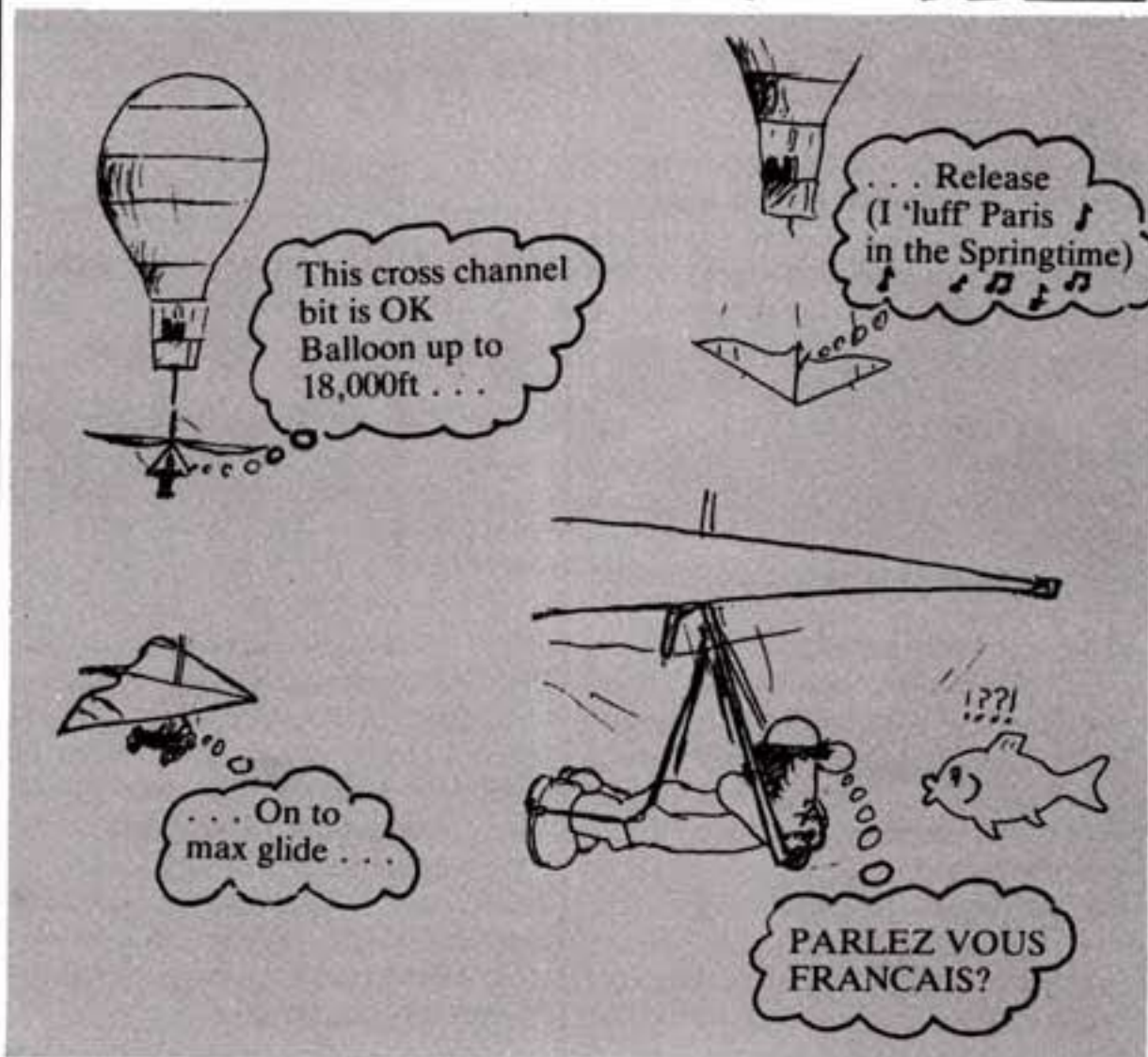
Pete Allgood  
Birmingham

## PILOT RATING PROMISES BROKEN

Dear Sir, In the July *Wings!*, you published an Information Notice that 'all' flying sites in Norfolk are under the sole 'jurisdiction' of the NHGC, which is just about as misleading as an advertisement by a manufacturer in another magazine that it was 'illegal' to buy a hang glider without an Elementary Certificate. The NHGC are not a Statutory Authority and cannot therefore claim jurisdiction over all the possible flying sites in a given area. Obviously what Greg Thomson meant was that the NHGC have contractual leasing and rental agreements on certain pieces of land which represent something less than 0.1 per cent of the total acreage of Norfolk, and (quite properly) they wish to select the person who will participate in the use of that land.

Albeit proper, whether it is wise to be so selective is a different matter. There are a small number of flyers who have no wish to participate in a rating system which was devised primarily for 'kite-flyers' rather than 'aircraft-flyers'. Due to the nature of their gliders, those people are able to use sites quite unsuited to the average kite, and consequently are able to look after their own interests. But there will also be quite a number of 'kite-flyers' who have not attained the necessary experience for a pilot-rating. In future it appears that those people will have to make their own arrangements for the other 99.9% of Norfolk, and if there be no experienced flyers at hand, it might be a case of the blind leading the blind. Surely far better to allow them to use sites where there are

# AIRMAIL



experienced flyers around, to give any help required.

It is not long ago that the council stated verbally at general meeting (and also in print in *Wings!*) that the 'voluntary' rating system would not be used to debar anyone from any hill. Are we about to see an 'about-turn' so abrupt that it would shame even the most adept Politician? If so, what future credulity could be given to council utterances. If not, will the council ensure that all affiliated clubs adhere to the policy discussions of the council, in order to retain that affiliation.

Tommy Thomson  
Middlesex

## ROT SETTING IN

Dear Sir, We of the Northampton Hang Gliding Club are most concerned about the rot setting in where flying sites are concerned.

Not having any soarable sites of our own, we must rely solely on the hospitality of other clubs. In the July issue of *Wings!* the Norfolk Club have closed their sites to non pilots. We know they are not alone in this decision. The choice now open to non-pilots; to join their club or no flying. Does being a member make them better flyers.

The site certainly is not dangerous but ideal for progressive flyers. Will all clubs follow their example; goodness knows what it would cost to fly suitable sites to obtain a pilots certificate. Surely the BHGA should stop them now and stop the rot from getting a proper hold.

P.W. Fathers  
Chairman Northampton HGC

## MUM CONVERTED

Dear Sir, I've got to write and tell you about my first flight the other week — dual — with my son Ashley. We went off the top of Milk Hill near Marlborough (about 200ft) and we went at dusk when he had finished the day's training with his students.

I could never describe what a glorious, mind-blowing experience it was, flying into the sunset. It was like a fabulous dream, like being reborn, like breaking through into a new dimension, like suddenly knowing what life is all about.

The first thing I said to Ashley when we landed was: 'You couldn't know, could you? How could you know without actually doing it?' He grinned at me. 'Right!' he said.

Dianne Doubtfire  
I.O.W.

## LACK OF COURTESY

Dear Sir, I am writing on behalf of the members of the Dover and Folkestone H.G.C., when I say how dismayed we were when the balloon attempt was made from our area by B. Milton and K. Messenger. Full credit for the achievement, but full criticism for the lack of courtesy.

We would have been glad to assist on this occasion and on the previous abortive attempt, but not a word was spoken. I also think it goes against all the principles of the BHGA to make such an attempt without the knowledge of the police or coastguard services, whose trust we have gained after much hard work. (I was Officer I/C Dover Police Station on that morning, when a Mr. Hunter rang to ask me where the launching-pad was!

He stated he was a member of the team.

We fly the cliffs regularly, and it is inexcusable to leave to chance the probability of a coastguard and police alert. To spend even an hour in the Channel is extremely dangerous,

Whether this was done for publicity, money ego or whatever, to do so without courtesy must be against the good of our hard earned image.

Ted Battersea  
Sec. Dover & Folkestone HGC

## AND DON'T COME BACK

Dear Sir, Our very best southern facing slope is beside the sea at Inchdoney, near Clonakilty. There is a track along the top, driveable in dry weather, but a 300 yards level walk if wet. We are on good terms with the landowner at the top, and Cork County Council who own the beach.

Ten days ago we were faced with an irate farmer; some hang gliding had been carried out the previous week, by whom he thought had been some of our members, and the car had been driven into a cornfield to run, thereby flattening a thirty yards patch of wheat that was just ready for the harvest.

On enquiry we discovered that the visitors were driving a brown, GB-registered, BMW, and were in the area for a day or two.

We don't own the site, neither do we control it; it's very much a grace and favour situation. So, if the guilty party reads this, please don't come again if this is your caper. We have to live here, and we like to fly here.

Roy Hammond,  
Cork, Ireland.

## PILOT GRADING

Dear Sir, TASKS like RULES facilitate standards of judgement, since without predetermined tasks how could examiners/judges agree and thus judge different people in different places at different times with the same severity/leniency etc. In other words TASKS exist to eliminate individual bias on the part of examiners.

However, it appears that some people who have obtained their 'Wings' fail to exhibit the degree of competence one would expect from a person who has fulfilled his pilot's tasks.

There could be several different reasons for this: 'the old boy network', qualified seated; gone prone etc. thus it appears that TASKS and their objective fulfilment are not in themselves sufficient to ensure competent pilots.

It is tempting to deduce from this that the tasks are not rigorous or pervasive enough or that there is something going wrong in their administration.

I would like to suggest that this is not necessarily so, that excluding darn right dishonesty more complicated rules inevitably lead to complications of administration and possibly even many of the 'injustices' these rules were designed to eliminate.

If this is indeed the problem, then I respectfully submit that this may be an

answer.

The existing pilot grading scheme should remain, but like guide lines for magistrates. The tasks are fulfilled but the issuing of pilots wings nevertheless remains at the discretion of the examiner/judge vz. An Observer (preferably elected at local club level) appointed by the BHGA on the basis of his/her own pilot ability and known integrity.

In the event of a dispute arising between the examiner/judge/observer and an aspiring pilot the latter should be free to ask another such appointed observer to ratify his pilot grading. However, should disagreement continue there should exist the right of appeal to council acting as tribunal. But bearing this unhappy turn of events, the observer who passes/ratifies a flyer as being of true pilot ability should also be answerable to council should his protege subsequently foul up.

In conclusion may I suggest that this whole scheme might prove easier to adopt than a completely revised pilot grading scheme; that it is not restrictive or difficult to implement because it delegates responsibility... the clubs will get the flyers they deserve... that it is democratic (power in the hands of the people) and that the peoples representatives are themselves answerable to the people in as much as they can be made accountable to council and/or the annual general meeting

Mick Barclay

### LEAD BOOTS

Dear Sir, I must congratulate you on your editorial in the July edition of *Wings!*, I immediately recognised myself as the intermediate nonk. Having obtained my elementary certificate nine months ago, it has seemed as if I had been wearing concrete anchor boots for the last three months.

Being a member of the Southern Hang Gliding Club and not yet having mastered the art of soaring, I find myself trapped. Site restrictions leave precious few wind directions which allow bottom landings on a 'decent' site.

Keith Morgan  
Surrey

### HORRIFIED

Dear Sir, I was horrified to read in the 'Daily Mail' about a bloke — Trevor Meacham — who takes his five-year-old son hang gliding. I was even more horrified to learn that the BHGA Council apparently approves of this sort of thing. I immediately wrote to the Editor of the paper telling him what I thought.

Quite apart from the moral aspect of exposing a very young child to dangers, the photographs which illustrated the text showed what both John Hunter and I consider to be deficiencies in the equipment used.

Take-off is seemingly accomplished with the child clinging to its father's

back — this would make it difficult to run. But much more seriously, the crash helmet shown appears to be much too large for the child's head. This is incredibly dangerous — we have commented before that in several accidents known to us, in particular Barbara Jones' fatality, the injuries were exacerbated by the fact that the helmet was too large.  
Now I'm as dedicated a hang glider as everybody else — and when my own children reach the age of decision, and feel that they'd like to go up with me, then I'll take them. But I want to be sure that they know, and can

appreciate exactly what they're letting themselves in for.

There is the additional point that as ex-PRO for the BHGA, the reporting of this type of thing is terrible PR for the sport — I know it's not Trevor's fault that some nerk in Cornwall crashed as well, but after the 'Sunday Mirror' report about Gerry Breen flying his three-year-old, which also gave the general impression of irresponsibility. I'd hoped that people would have had more sense.

Tony Fuell  
Brighton



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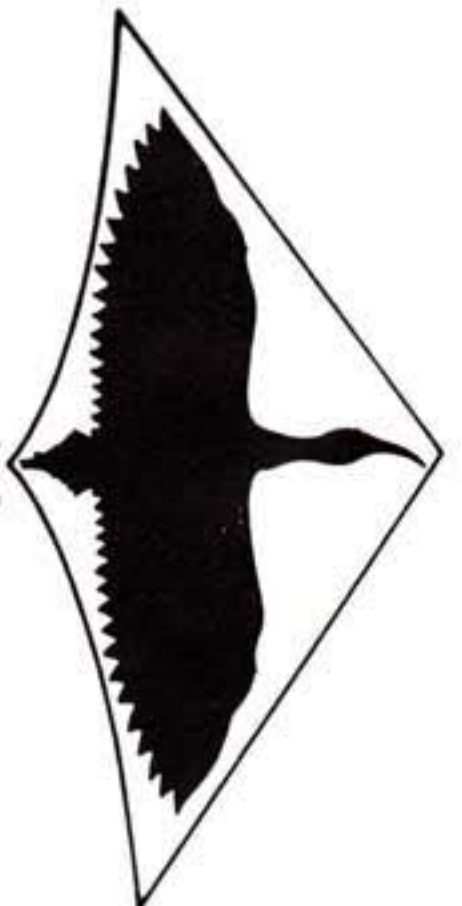
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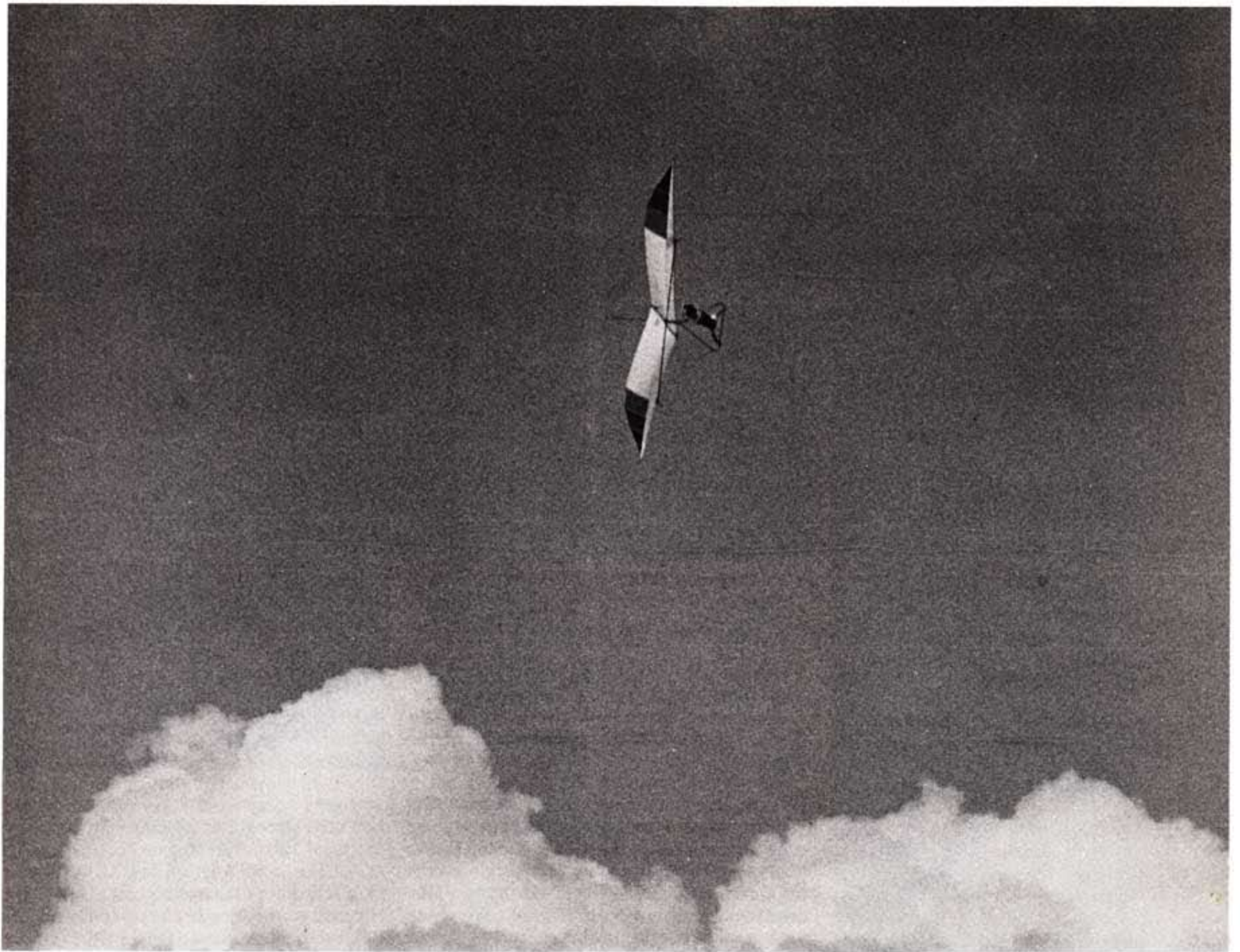
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Roger Wates.

# THE BEAUTIFUL DREAM

by **DAVE COOK**

It's probably true to say that everyone, whether they are aviation minded, or not, has had dreams of flying. In our slumbers we are free to fly as high or fast as we wish. There seems a hidden ambition in all of us to fly. The relative few who pursue this dream and try to witness the reality are in search of this beautiful dream . . .

If you want to fly there are many different forms available to you: You can sit, wine in hand, music playing and be comforted by a lovely stewardess in the ultra safe airliner or drone along in a single engined light aeroplane; or hover around in a helicopter . . . whatever. But as any hang glider pilot could tell you those ways are not the complete and real story of flying. Brute force produces that type of flying and it is far removed from our 'Beautiful Dream'. Even Richard Bach appears to be more obsessed with aeroplanes than with 'flight' in his 'Gift

of Wings' publication. I believe that the majority of hang glider pilots know that it is 'flight' that we all seek and it has little to do with aeroplanes.

The idea of flying before a flight in light aircraft or airliners one can find appealing — the result, usually, is disappointing. Of all the various forms of flying, I have experienced, there are only two in which I have 'seen' the 'Beautiful Dream'.

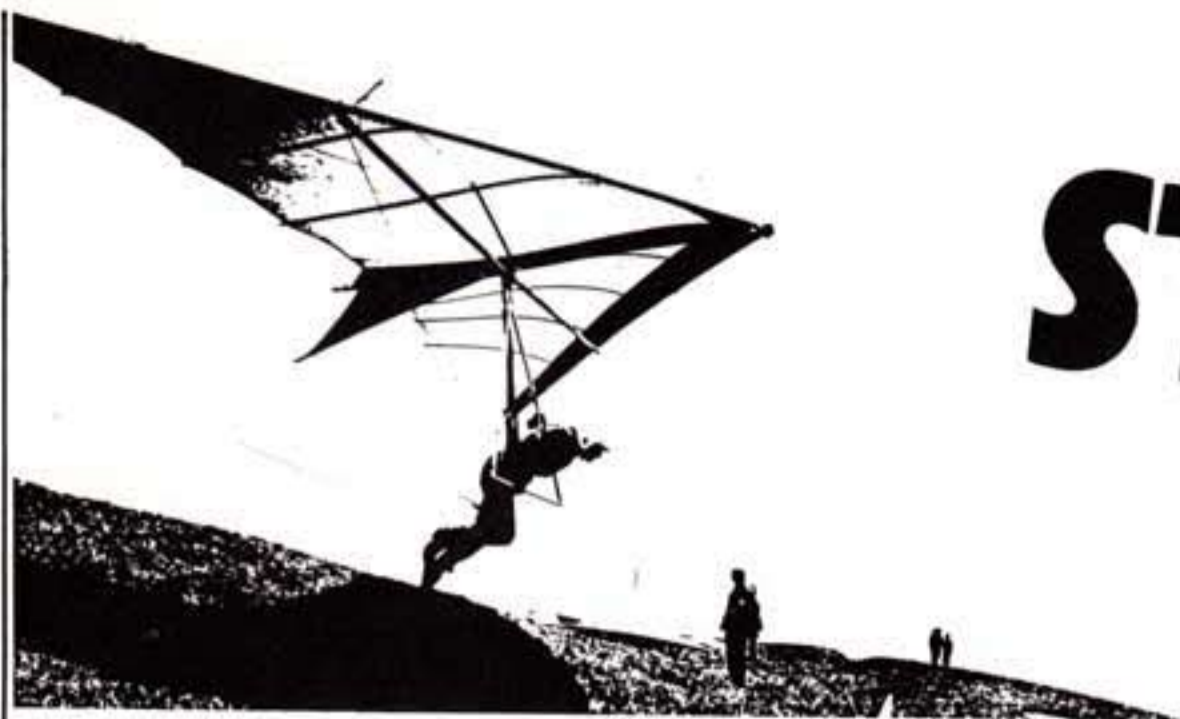
My first form of flying is available to only a few i.e. Armed Forces fighter pilots. To bowl a jet fighter around the sky and letting it loose at altitude amongst the cannons of huge cumulus clouds witnesses the 'dream'. The faster you go the quieter it becomes until just a flickering of air on the windscreen is discernable, you can go up if you wish, up and up or curl around fluffy hill-tops of cloud to rush down valleys and through gaps and tunnels. It is the 'dream' that few have the

opportunity of experiencing but it is beautiful.

The second form of flying is our world of Hang Gliding. To self launch and fly on a lovely multi-coloured piece of simplicity and to soar successfully is difficult to translate into words — but we all know when we get it 'right' that the sheer exhilaration and satisfaction that exists can never be felt or witnessed by aviators who sit in cockpits.

I would suggest that Hang Gliding is producing some of the finest aviators ever — the parameters between flying and not flying are so fine that pilots just have to be good. Having watched air shows for years it is rare to witness the artistry and purity displayed by Hang Gliders in flight.

We witness true flight — the realisation of man's greatest dream the 'BEAUTIFUL DREAM'.



# STRUCTURAL INTEGRITY

**I**t has always been the first and foremost responsibility of a hang glider manufacturer to build SAFE gliders before considering the maximisation of performance. There are three main areas where hang glider safety requires care in design — in handling, in configuration stability (including limit cases such as locked-in dive possibilities etc), and in structural strength.

At the time when hang gliding started in England the machines we flew possessed little by way of good handling, configuration stability was little considered, but lack of structural integrity and strength became a major problem almost immediately. Many gliders employed clamps on rigging wires rather than Talurit or Nicopress swages; one small manufacturer actually sold gliders with all the structural tubes made from plastic drain piping. This sad state of affairs led Miles Handley to do a vast amount of valuable work preparing guidelines in a small handbook for the manufacture of Rogallo wings. Everything was covered from recommended wire sizes and swaging systems to permissible tube sizes and swages for various parts of hang gliders. This work resulted in a good standard method for the construction of basic Rogallo wings, and almost all used 1in. diameter tube for control frames, 1½in. x 18 gauge tube for all the main booms, and Nicopress or Talurit swages on all wires.

These hang gliders were all very flexible, and in particular would flex away at the wing tips with any gust loading ("gust alleviation"), but as time progressed and world-wide knowledge and experience increased, more advanced sail shapes became practicable. These sail shapes increased the loads on the airframes and single wing wires were commonly added to give greater stiffness to the new gliders' frames; but still, with about a 2G loading, these frames would flex and in one way or another would "gust alleviate" to prevent the development of high airframe loads. The Hiway Cloudbase was typical of this type of glider and still used 1½in. x 18 gauge tube for all parts of the airframe.

Worldwide developments in 1976 led to the introduction of the current range of basically swept flying wing type hang gliders. These almost all use two wing wires to support the flight loads generated towards the wingtips, and because of the high stiffness of this system, these loads can now be much higher. It is unfortunate that on a world-wide basis many of these new gliders were put on the market

**Despite the rare occurrence of structural failure, modern kites with greater manoeuvrability, higher top speeds and less billow, are becoming increasingly vulnerable to overstressing. Steve Hunt writes about structural integrity of hang gliders and reports on the findings of Hiway during their recent static load testing of the Scorpion series.**

without much thought of structural integrity and still with all the main tubes made of 1½in. x 18 gauge or similar tube, and many deaths resulted from the collapse of such machines in flight.

When finalising the design for the new Hiway Scorpion range of cambered sail gliders, we were looking for a very stiff leading edge system and were hence expecting higher loads than on our previous production gliders in three key areas: the side guys, the crossboom and the control frame. We opted for a new type of control frame made from a stiffer tube than we had used before and with hinged corners, and we also used a crossboom of a larger diameter to take the high compression loads without failure in a "Euler buckling" mode; we then wished to make tests of the actual strength of these gliders.

At first we had hoped to conduct strength tests using a car-top aerodynamic loading system, but we were warned by the experience of UP and Albatross in America that any test done in this manner tends to result in a large pile of scrap after the smallest fault develops in the glider. We therefore opted to test the strength of the glider by a static loading method (as is used for conventional aircraft). The glider was placed upside-down on the factory floor (without the kingpost in place), and in this position was attached from the hang-strap via a hoist to a 2,000lb spring balance in the roof; the sail was then covered with weights in such a way as to simulate air loads on the glider. The hoist was then used to lift up the glider gradually, and as the winch hook was raised the load on the glider increased, and during the whole test the spring balance accurately registered the load carried from the hang-point of the glider. The advantage of this method is that tubes and other components can be taken up to their breaking point which can therefore be defined

quantitatively, and the exact mode of failure can be studied. For instance, as a tube fails in compression (Euler buckling), a check can be made on whether the tube is entirely free-floating about the zero deflection point, or whether the load is acting eccentrically and artificially weakening the tube.

We conducted tests with two old gliders only replacing parts that broke during testing with new parts. We therefore were able to ascertain the service life of critical components. The gliders proved to be well up to the design strength that had been calculated around the BHGMF-agreed requirements of 3.5G with a safety factor of 1.5 (i.e. 5.25G). Joint discussion between the BHGMF and BHGA has now resulted in the adoption of figures more in line with internationally-agreed strengths for conventional aircraft, the required strength now being 4G with a safety factor of 1.5 and an airspeed correction factor of 1.1 (i.e. 6.6G). These new figures required an alteration to the two biggest machines, and the size of the crossboom on these machines has now been increased from 1¾in. x 18 gauge to 1⅞in. x 17 gauge.

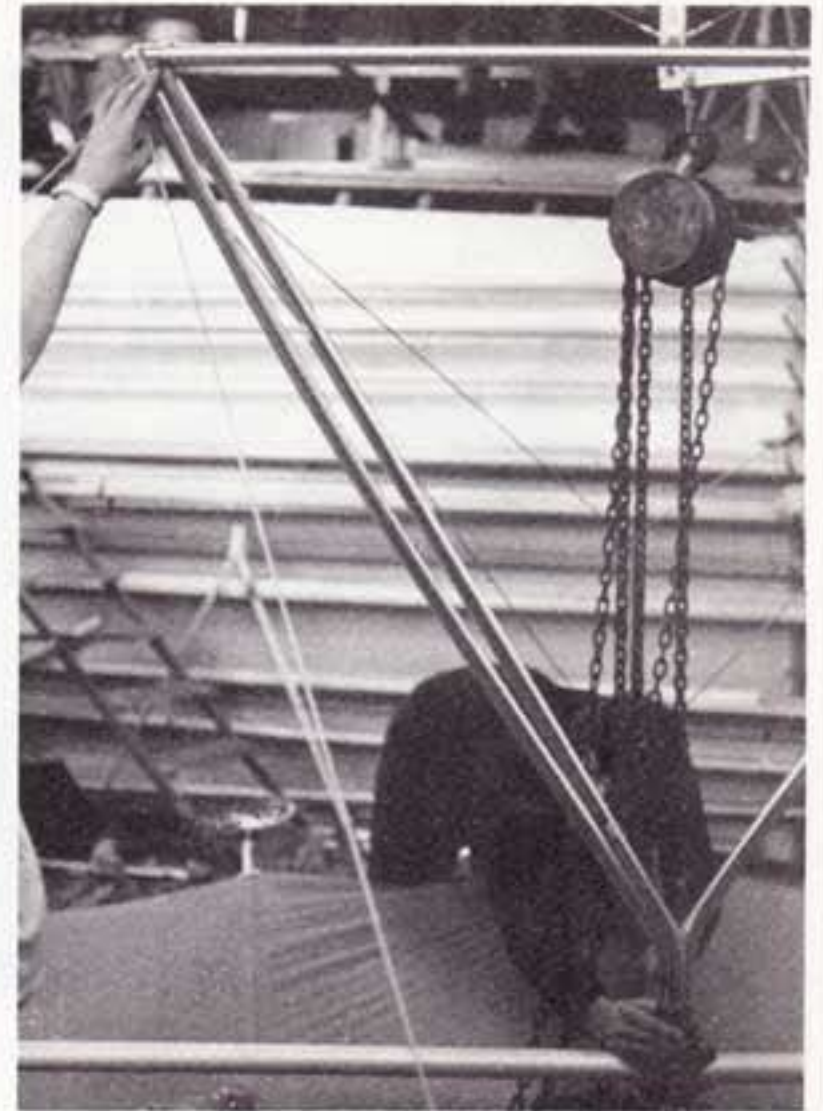
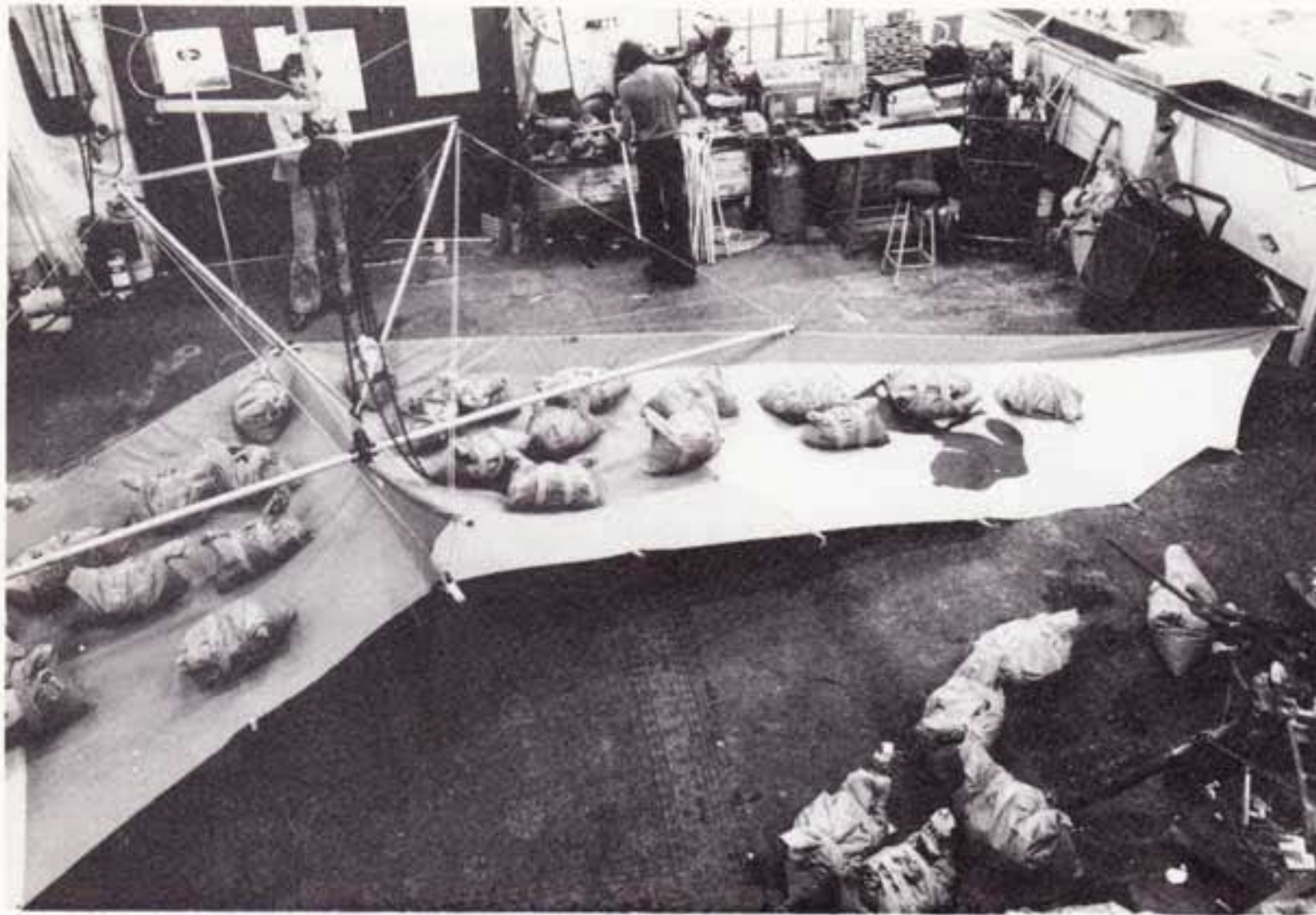
The load-testing results gave glider strengths as follows:

Scorpion B & C: 1,280lbs total ultimate load implying a maximum pilot weight of 13st 10lbs or 90kgs for full 6.6G ultimate strength;

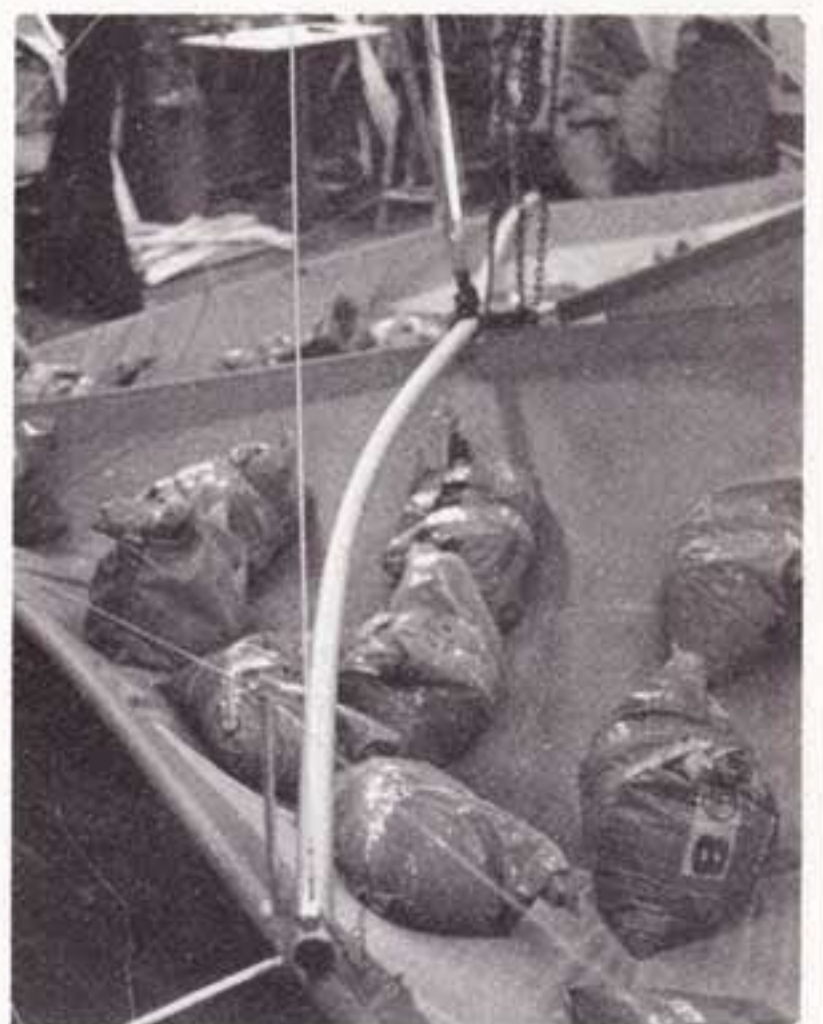
Scorpion D: 1,480lbs total ultimate load implying a maximum pilot weight of 16st or 100kgs for a full 6.6G ultimate strength.

We tried numerous further tests on the largest glider at even higher loadings and found that various parts can give trouble. As a part nearly failed it was strengthened and the load applied again; the process was repeated as necessary to ascertain the relative strength of various components. The conclusion that we were able to draw from this exercise was that we had a consistently sound structure with the strengths and stiffnesses of all the components being in balance.

How does this relate to flight loads in practice? Consider a stiff glider \*\*\* with a stall speed of 16 mph on the ASI. This corresponds to a real airspeed of about 22 mph.\* If this same glider can dive at 44 mph then, as the lift is proportional to the square of the speed, the lift generated if the glider is gust-stalled causes a 4G load, which is about the limit of strength which the BHGA airworthiness committee has agreed should reasonably be applied to a



*Above: Weight bags distributed on wing balancing the glider about the hang point and simulating possible air loads. Left: Elongation of the side guy thimble and sail stretched forward by 1,600lbs load. Top right: Comparison of uprights shows only slight distortion to uprights. Eventual failure however is at 90 degrees to this bend. Middle right: Cross boom exhibiting Euler buckling. Bottom Right: Load deflecting the L.E. with load accentuated toward the tips to test deflexor set up.*



glider. This load can be generated by a full push out from a "knees on the control frame" — type dive. If the glider was capable of going faster, say 50 mph, then it could pull 5G — very close the maximum strength of the glider. If it flew at 60 mph, the maximum possible load would be 7.5G — this would definitely break a glider with a pilot of the maximum recommended weight for that machine.

We have always tried to manufacture gliders to the highest standards, not only to have structural integrity but also to give good handling and a basic configuration which ensure full three-axis stability from all flight attitudes. Consider the glider \*\*\* (theoretical — no particular make) we spoke of earlier. If this glider's peak dive speed is 44 mph then the maximum airframe load will be 4G. However, even if this is the maximum speed, let us consider two cases:

1. Let's say the glider tends to sideslip rather freely; the drag in this mode is usually low and the glider may fall sideways at a much higher speed than would normally be possible in forward flight. When the glider realigns itself to the airstream it will almost definitely gust-stall due to the pitching action of the inflated wing. This could break the glider.

2. Let's say that despite a limited smooth air top speed of 44 mph, the glider displays an unsuitable pitch characteristic — say the nose tends to keep going down with the pilot being able to feel a definite push back from the bar as he tries to make the nose come up. Slowly the pilot and glider pick up momentum and the downward acceleration of the pilot begins to exceed that of the glider, and suddenly the

glider pulls out of the dive. This is a second definite way of gust-stalling a glider at a speed which could be way in excess of the smooth air top speed; this could also break the glider.

Nobody in his right mind should try to aggravate problems such as these two, hence risking overstressing his glider.

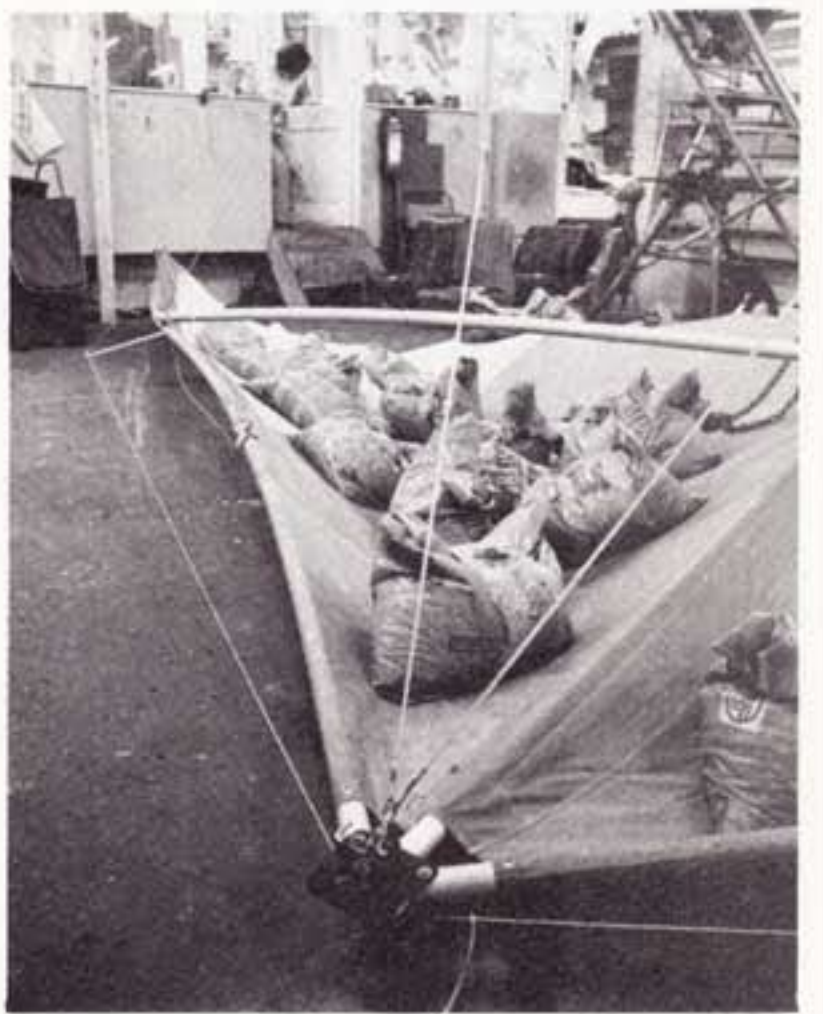
A close study of collapsed-airframe accidents shows that it is not only pilot stupidity that breaks gliders; more usually the damage is done by flying in radical conditions associated with entering or leaving areas of lift and sink connected with powerful thermals. Our own investigations with a G-meter show that in fact it is very difficult with a Scorpion to pull more than 3G in the air by performing radical aerobatic manoeuvres.

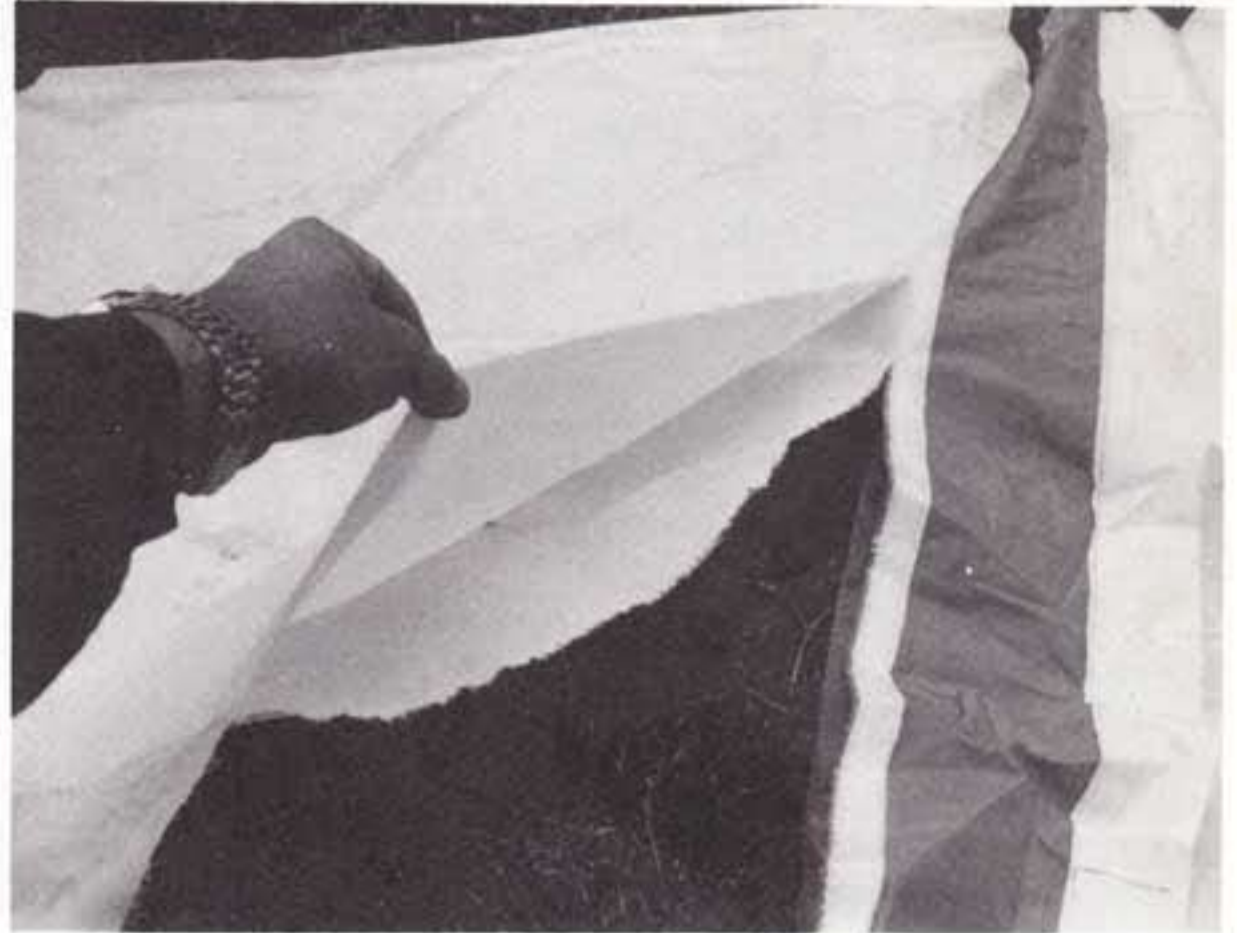
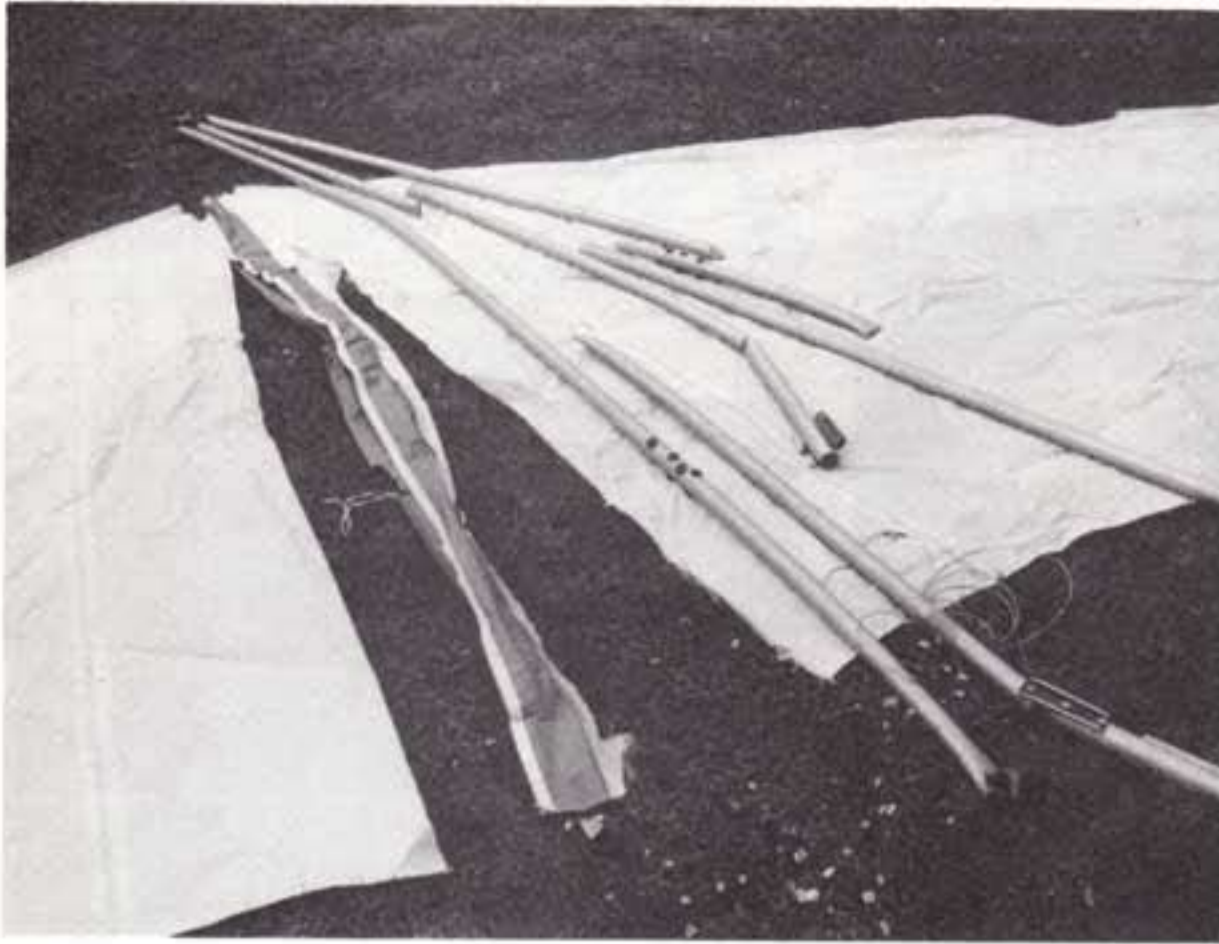
In conclusion, there are four reasons why a hang glider can break up in the air:

1. Airframe of inadequate strength;
2. Violent pitch characteristic or heavy turbulence associated with a very high top speed;
3. Configuration instability resulting in airspeeds high enough to break the glider;
4. Direct glider breakage by pilot hitting part of the machine after inversion (caused by radical aerobatics, extreme turbulence, or configuration instability in extreme dive).

People have died because of all these reasons. Make sure you don't become a statistic; if you are the slightest bit worried about your hang glider, ask the manufacturer for the answers.

Note \*: Jim Walker, 'Trolling for Standards', Hang Gliding, May 1977. 🍷





I have been asked to write an article clarifying what happened in Austria on 30th January 1977.

Before I begin I would like to thank all those people who asked after me when I was in hospital, especially those who wrote and particularly those who took the trouble to telephone. It was nice to hear from you all.

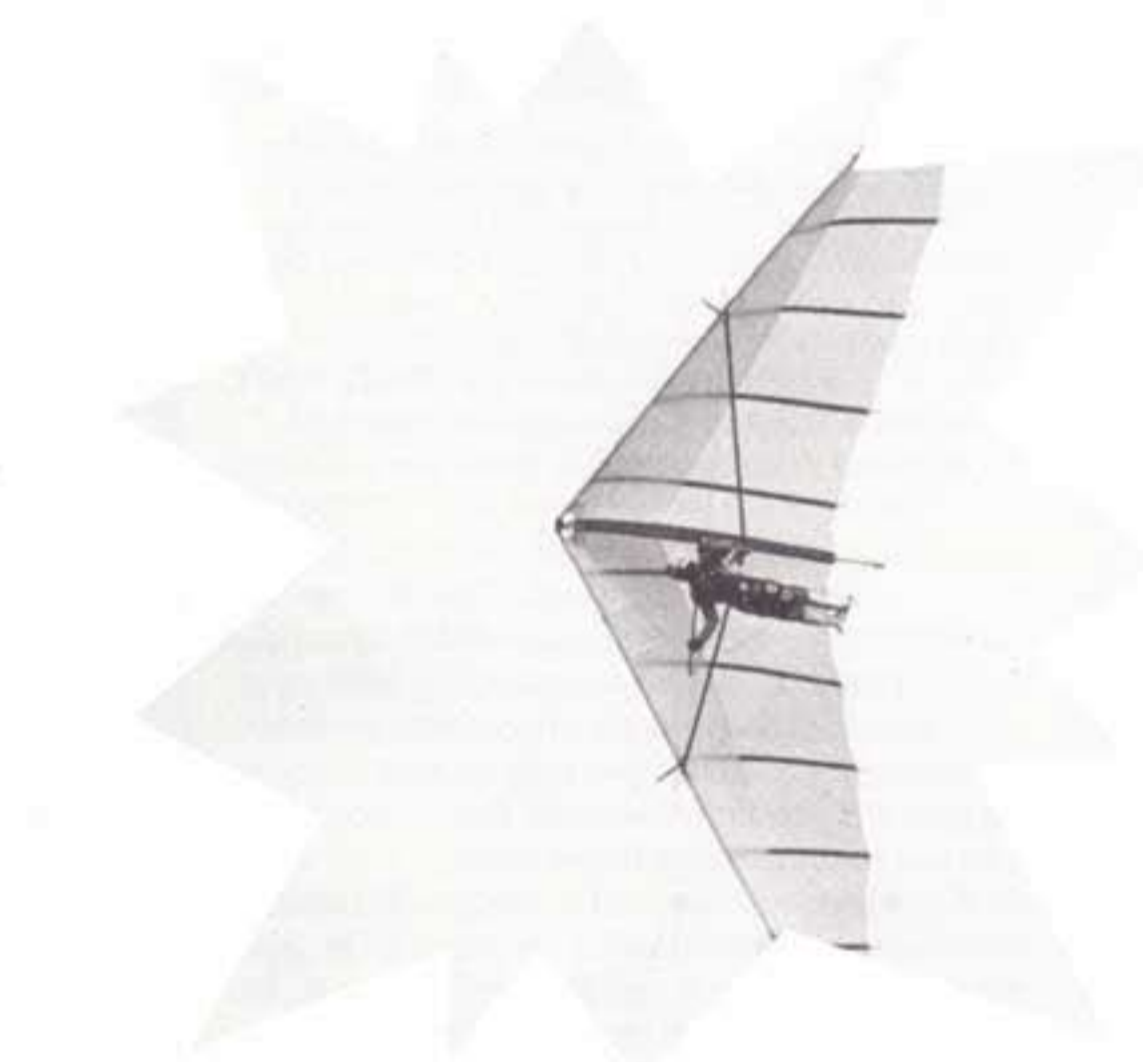
There were many wild rumours going around including one that I had expired and much speculation as to how it happened.

It's common knowledge that I fly radical manoeuvres and that I am particularly interested in the loop and since the World Championships in Kossen last September where I was pushing unsuitable machinery to its limits, I have been waiting for the right equipment and opportunity.

The equipment was a hot rod we called Super Nova, a lovely little prototype that I was really getting together with. 118° nose angle, 175sq. ft. fully cambered sail and a 32ft. span. Nice design work by Terry Haynes and potentially the best wing I had ever flown.

I work full time for Waspair Ltd. largely on development work, building, testing, and demonstrating hang gliders. I also accompany Robin on promotional trips abroad and this is where the opportunity came in. A trip was proposed in January taking us through Luxemburg, Germany then into Austria and the mountains of the Tyrol. The mountains often provide the necessary altitude in the still air conditions I find useful for assessing a wing's performance.

The glider was strong, already with 3mm rigging, 19ft. leading edges and triple steel deflexors, it



# don't be loopy!

Lester Cruse gives the full story of his miraculous escape in Austria. A sobering account of the forces which can be met during radical manoeuvres. Photo: Roger Wates

felt really stiff and I was into 130° wingovers on the Sussex Downs as it was. However, in view of the proposals I had for the glider, it was decided to make it even stonger using 1 in. tube. At this stage, I must point out that Terry was helping me reluctantly as he was very much against my radical

manoeuvres, stating that the stresses couldn't be accurately calculated, and in fact. I undertook not to attempt a loop until we knew more, particularly as efforts were made to provide a parachute but a suitable one was not available at short notice.

Anyway, after the usual

disorganised departure we made tracks in my little Escort van. First stop across the water was Luxemburg — there are a few hills in this tiny country but they mostly fly in France.

Germany next around Lake Tegernsee in the Tyrol. Beautiful. They usually fly the Wallberg here but the ski lift was out of action so we went to the small training slope called Bookhiem. Here I got a go on a Sun Swift (nice kite) before having a squirt on the Nova which was the first since its Charles Atlas course. My flight here revealed slight differences with the handling. The C of G seemed back a shade and directional stability not as good but it was still air and most of my flying on Super Nova had been in soaring conditions. So I had to wait until the next flight to clarify the problems and it was this next flight in Austria that turned out nearly fatal for me.

We moved on that afternoon to stay with a friend and colleague Heinz Dorler in Kirchberg, Austria where there are a number of mountains to fly all with ski lifts or road to the top.

After a good nights sleep and a little business in the morning we joined forces with two other fliers, Austrian Helmut Lorenzoni and Australian Wally Reeves. Wally worked at Heinz Dorler's school and has since worked at the Wasp factory. We set off for the Guisberg, a local mountain below which a horse race was taking place and we had been asked to do some exhibition flying and land on the course.

Flying to the race course would have used up all the useful altitude so I decided not to participate in this activity, instead

I could fly over the usual landing area at the bottom of the ski lift and evaluate the glider some more.

I informed the lads of my intentions and explained to Heinz that I would probably do some wingovers but would *not* be attempting the loop at this stage.

Heinz was particularly interested in our latest design so wanted to take off after me and watch it from the air. Wally went first and made for the race course.

I launched next, the deep snow making running difficult and the wearing of snow boots essential, but I was cleanly into the air settling down in a different course from Wally.

The glider felt fine obviously trimmed a little differently as it wasn't quite "hands off" but not as bad as I'd thought after the flight in Germany.

By the time I was vertically over the landing area Heinz had taken off and was observing me. I was happy enough with Super Nova to wing it over so . . . here we go . . . stall out then bar way bay into a steep, fast but controlled dive . . .

now bar out to pop it over, rolling off at 90° . . . that went well so I thought I'd go over the 90 this time. I was not anticipating any problems, I'd been over lots of times before and I had plenty of inertia coming out of the first wingover so . . . accelerate by pulling on even though already in a steep dive, then bar out applying less bank and timing it perfectly so it doesn't roll off before winging over, peachy 120/130° but a little slow over the top . . . The steeper the wingover the more inertia builds up and things were really buzzing at this moment. Doing a triple continuous wingover should have provided enough speed and so I decided coming fast out of the second to go again. I made sure of the speed by going right through the trapeze bar and holding for at least 3 more seconds than previously then . . . Pow, up it went, the rate of conversions was always amazing but "Oh Gawd! What have I done". The glider was going over at about 160° and had already pitched over the 90° so pulling the bar back at that stage would have put me into a horrific keel slide and a possible forward tuck. Apart from being too steep Super Nova was slowing down and I had no choice but to go with it.

She crept over the top and 'parked' upside down too far over to roll off, instead it stabilised inverted. I had actually prepared

for this by fitting catch rigging on the back wires which I dropped into and holding tightly onto the control frame I was fully supported off the keel. I was looking down on the nose of the glider and I could see land below me so I was almost over but the sail had turned inside out and it began to free fall upside down. Now, at this point I wasn't too worried because the kingpost was holding out and I knew that it would pull out sooner or later because my weight had to transfer to below the glider somewhere, but what followed was quite mind disturbing.

It was inverted for only a few seconds but during that time it was falling, it built up dangerous speed and was just beginning to oscillate when it flipped rotating about the crossboom.

This action was so fierce that I don't remember the transition period between being wrong and right side up, only being squashed into my harness by the centrifugal force and the control bar tearing out of my hands. I was totally disorientated by the speed and I didn't hear the noise of the sail whiplashing to the fully inflated position, which according to Heinz was very loud.

Super Nova simply blew apart. Both leading edges broke (one side before and after the crossboom) bending steel deflexors in the process. The keel broke making the control bar fly away due to loss of cable tension but amazingly the crossbooms survived.

The 4.7oz sail burst both sides of the keel, one side in the stitching and other in the fabric itself and for this to happen the manufacturers of the sail cloth have calculated that the force generated by the whiplash was in excess of 100g's. The force I experienced has been estimated at about 10g.

This all happened rather quickly at about 300ft. and I wouldn't accept that it had broken until I was falling vertically with no trapeze bar around me and a lot of sail noise coming from

above and confirmed the fact by looking up and seeing a lot of sky, ragged sail, broken booms and not one part of the glider intact.

You can probably imagine the rest.

I seemed to fall slowly at first looking down on pine woods and fields but I got rapidly lower and faster until I was merging with the landscape at a terrifying speed, death seemed imminent and I tried not to be conscious over the last 50ft. Obvious thoughts and feelings went through my head but the fall lasted only six or so seconds and I hit the ground at what felt like 70mph. I hit the ground so hard that I still don't know how I survived but I did.

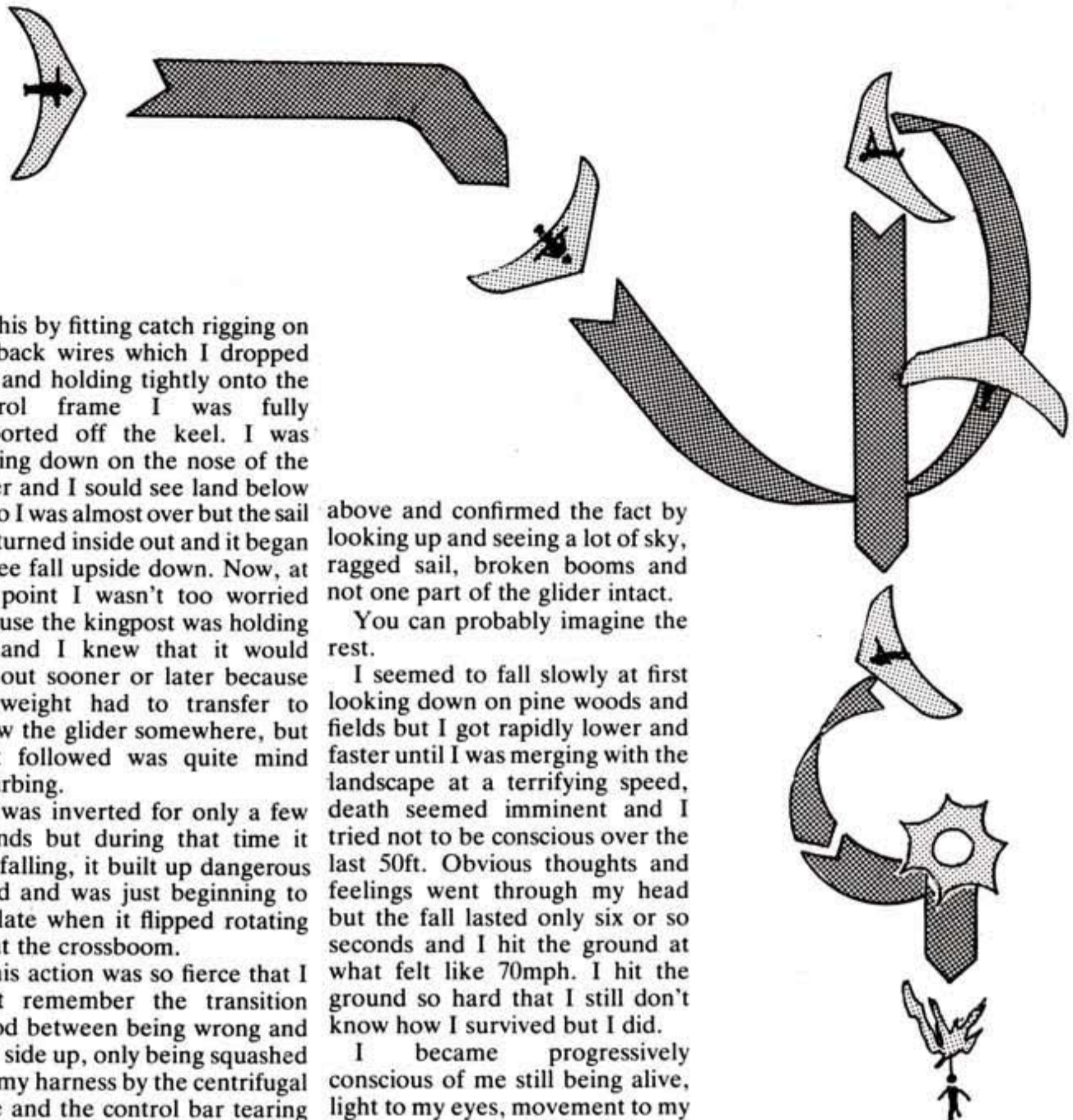
I became progressively conscious of me still being alive, light to my eyes, movement to my head, arms etc. I'd landed feet first in the middle of a downhill ski racecourse and punched a hole in the well compacted snow up to my waist and the wreckage had luckily missed me. My first reaction was to get up and walk away from the glider and pretend it never happened but all I could manage was to crawl away spitting blood and gasping for breath.

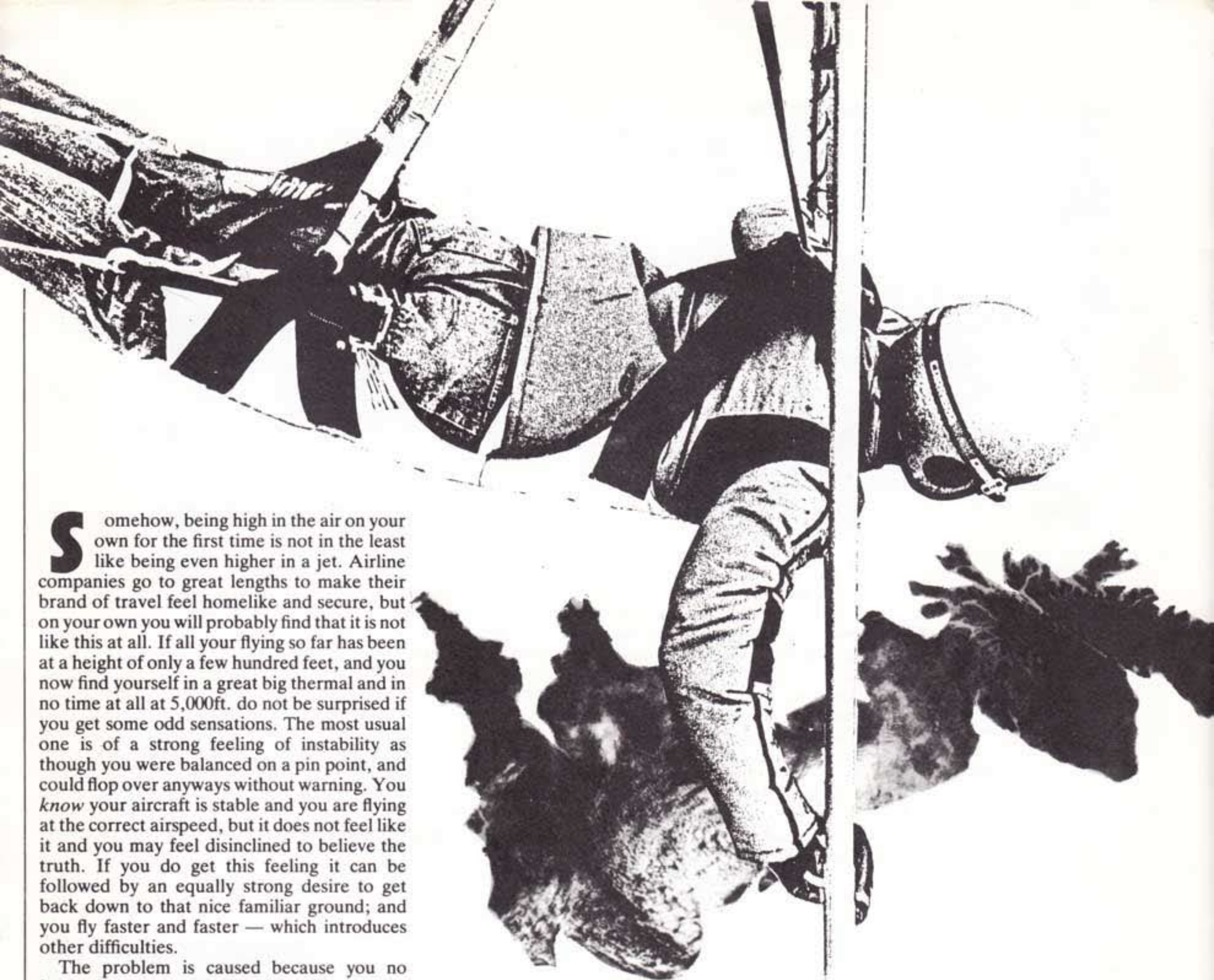
Heinz, who saw everything from the air came circling over, shouting, and landed as quickly and as near as possible and helped me a lot interpreting and escorting me to the hospital where they discovered I had compression fractures on two vertebrae and a broken ankle together with temporarily paralysed insides due to shock and a lot of pain for a few days.

They plastered me up and I was walking in a week and a half and back home in just over two. But I won't forget the lovely Austrian nurses, corridor racing on crutches, playing hookey to the pubs at night also on crutches and the farewell booze up in the

hospital reception.

I was flying again the day after removal of my leg plaster just seven weeks after the accident. Nobody knows how fortunate I was more than I do and whilst I wish it hadn't happened, I have become rather more experienced in the way in which I intend to carry on flying and a newly acquired parachute improves the safety aspect a great deal. ☺





**S**omehow, being high in the air on your own for the first time is not in the least like being even higher in a jet. Airline companies go to great lengths to make their brand of travel feel homelike and secure, but on your own you will probably find that it is not like this at all. If all your flying so far has been at a height of only a few hundred feet, and you now find yourself in a great big thermal and in no time at all at 5,000ft. do not be surprised if you get some odd sensations. The most usual one is of a strong feeling of instability as though you were balanced on a pin point, and could flop over anyways without warning. You *know* your aircraft is stable and you are flying at the correct airspeed, but it does not feel like it and you may feel disinclined to believe the truth. If you do get this feeling it can be followed by an equally strong desire to get back down to that nice familiar ground; and you fly faster and faster — which introduces other difficulties.

The problem is caused because you no longer have a range and variety of features or distances on which to focus your eyes. Near the ground they are able to focus on trees, or hills, or houses and you can relate yourself to these in ways that you are well used to. In a big jet totally enclosed in a so-called comfortable room the distant earth is a passing scene through secure windows. In a hang glider, or small open cockpit glider or aeroplane, you are merely part of the nothingness all around, and your eyes no longer know how to 'see' things. Passengers in a small aeroplane getting any sort of a feeling of disorientation or detachment simply transfer their gaze into the cockpit, concentrating on the instruments or other detail; but this is not possible on a hang glider, and if it were would be highly undesirable!

The answer is simple. However, tempting the beautiful thermal, go upstairs in small steps — particularly if you have so far only flown off very small hills. When you are happy at 1,000ft. above the ground, have a few flights up to 2,000ft. and then 3,000ft. before going into orbit.

Some people never have any odd or disorientating feelings on first going high; but this is not the only problem. The other one is the real probability of getting lost — because

you no longer know what to look for to locate yourself. All the steep hills have gone flat and the scale of everything is quite different. It is easier, of course, near the coast if there is a prominent headland, but some people fail to recognise even features of the utmost familiarity on the ground when they are lost. Being lost is not, of itself, a problem, as a hang glider needs no large space to land, but it does have more important disadvantages. If you

stray into controlled airspace or into an airfield traffic zone you are in trouble, and may have to pay heavily for causing it; and you may also do yourself out of a record distance simply because you flew the wrong way or went on a multi-directional wander.

There are three ways to avoid, or at least reduce, the likelihood of getting lost:

— Get yourself an air map of the area and before flying fix in your mind major features,

## FIRST TIME

by ANNE  
WELCH

# HIGH

particularly in relation to controlled airspace, and their relationship to your take off place.

— In the air, and as you gain height, keep a visual check on at least one or two of the important features; whether they lie in the direction you want to go or not — you would not be the first pilot to set off the wrong way.


— When soaring on the ridge note the position of the sun, and where it would be in relation to your direction if you did set off cross country. If you know that it should, for example, be behind you on the left, this will not only help you go in the correct direction, but may help you get somewhere near into wind when you land — if the farmer has not lighted a convenient bonfire for you; and he never does!

Circling up in your thermal, and feeling neither disorientated nor lost, do not get carried away with the delight of it all, so that you forget that other pilots may also be enjoying the same ride; they may even be flying a glider with 30ft. of sharp fibre glass sabre sticking out of each side, and making almost no sound at all. It is a convention in thermals that the first pilot in the lift establishes the direction of turn, so if there is anyone else — above or below — already circling, go round the same way. If you are one of those pilots, and there are many, who like to think that they turn in one direction better than the other, then it is a good chance to overcome this little weakness.

It is meteorological convention that thermals often wear a cumulus hat, to which it follows that the upcurrent will continue into the cloud; if the lift is powerful it will be easier for a hang glider to arrive inside the cloud than to stay out of it. It is also conventional for the lift inside clouds to be stronger than below, due to the boost provided by the latent heat of condensation. So once in, it becomes even more difficult to get out. This problem is least likely to occur in anticyclonic weather with small, flat cumulus like little plates, but becomes increasingly likely as the vertical size of cumulus becomes greater. When they look like high rise buildings your destiny will be sealed from about 500ft., or even further below. If the lift is strong and cumulus in the sky are taller than they are wide the frighteners may not be far off.

Without much in the way of upward view the approach of cloud base may not be observed. Fortunately most cumulus have a concave base, with a fringe of cloud hanging down all round, so if all has been forgotten the appearance of any wisps at all at your level means that there is now no time at all to lose. Straighten up and get out. In the absence of any desired or apparently suitable direction, downsun is as good as any. Quite often cumulus seem to grow more actively on their sunny side, and in any case you will be able to see better.

The ability to use a greater depth of air will not only make hang gliding more fun, but can make it safer. But in exchange for not having a nearby hill to hit there has to be a fair sharing of the air with balloons, aeroplanes, parachutes and gliders. There is plenty of free sky available but its free use needs quite a variety of new skills. ☺



chārgus  
**MIDAS 'E'**

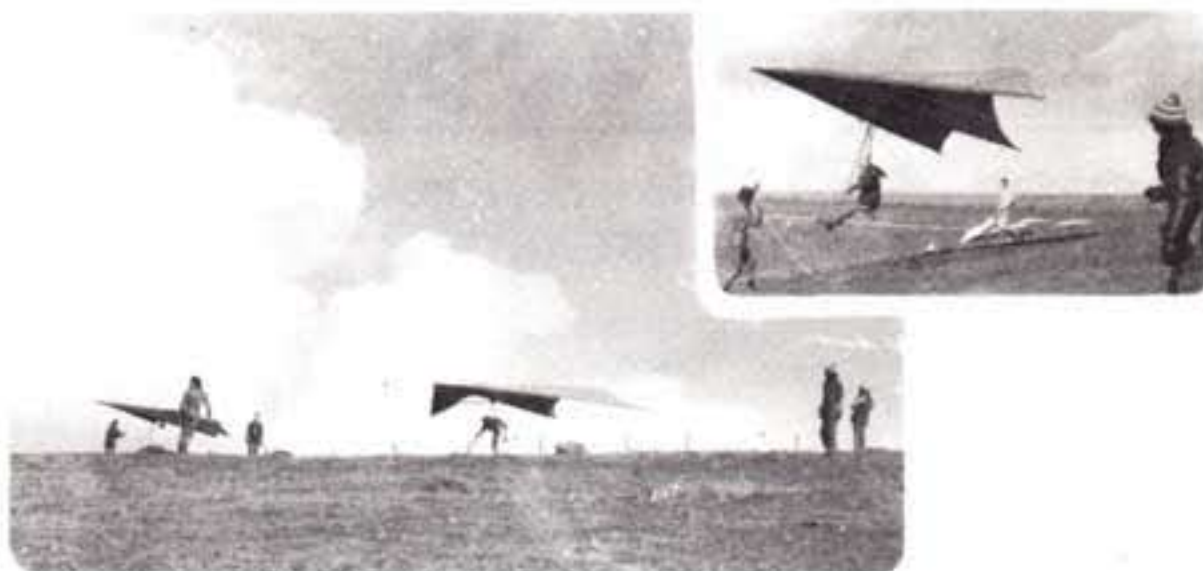
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# NEWS ROUNDUP



Photograph: Mark Woodhams

## WILLS WING XC BACK IN PRODUCTION

Malcolm Hawksworth is now back in business with the Wills Wing XC after a long delay. After announcing that he would not be manufacturing XCs in

the UK, Malcolm has now stated that he will after all be making up the XC. This will mean a considerable reduction on the import price.

Malcolm is also going to market the Flexiform Vector developed by Paul Maratos.

## FIVE CONQUER SNOWDON

Imagine spending four hours climbing to the top of Snowdon and finding your over-centre lever had dropped off on the way. But it did not deter Welsh Hang Gliding Centre club flier Allan James who borrowed a piece of string and practised his knots.

In all five fliers from the club slogged up Wales' highest mountain 3,560ft. and enjoyed a 3,100ft. vertical descent to the bottom making distances between 3 — 5 miles.

They were Allan James SST, Dave Mudie Hi Fli, John Searle Cirrus 3, Simon Mitchell — Moonraker and Bernard — Falcon 3.

The fliers had unsuccessfully tried to get a lift to the top with the service train. However even though the train driver did not mind, the management were resolutely opposed to the idea because they claimed that passengers hung around too long on the top to watch the flying and hence did not return on the first available train.

**John Searle**

## RESULTS OF USHGA NATIONALS, HEAVENER, OKLAHOMA

Class	Pilot	Points	
Class 1	Robert Reed (Sylmar, Ca., Cirrus III)	3333	
	Dave Braddock (Bridgeman, Mi., Moyes Stingray)	3000	
	Tom Goodman (Tempe, Ariz., Cirrus II)	2806	
	Stan Palmer (Arlington, Tx., Cirrus III)	2771	
	Dan Alban (Spokane, Wa., Bobcat III)	2644	
	John Davis (Portland, Or., Brock Firefly)	2500	
	Class 2	Henry Braddock (Bridgeman, Mi., Moyes Maxi)	3448
		Jim Braddock (Bridgeman, Mich., Moyes Maxi)	3385
		Jeff James (Grandfather Mtn, N.C., Phoenix 8)	3343
		Sean Dever (Idaho Springs, Co., Phoenix 8 Jr)	3307
Scott Buchanan (G'father Mtn., N.C., Phoenix 8 Jr.)		3080	
Dean Tanji (Santa Ana, Ca., Wills W. XC)		3042	
Class 3	Brad White (Anaheim, Ca., Mitchell Wing)	3000	
	John Coyne (Airada, Co., Fledgling B)	2896	
	Tom Vayda (Sandy, Utah, Fledgling A)	2500	
	Greg Duhon (Palo Alto, Ca., Fledgling)	1615	
	Steve Coan (Grandfather Mtn., N.C., Fledgling)	571	

Henry Braddock the overall winner and champion! Jim is his brother, and Dave Braddock is Jim's son. Quite a family, they have the Mid West School of Hang Gliding in Michigan. Robbie Reed is the first ever to win his class or any contestant to win any class, two years in a row.

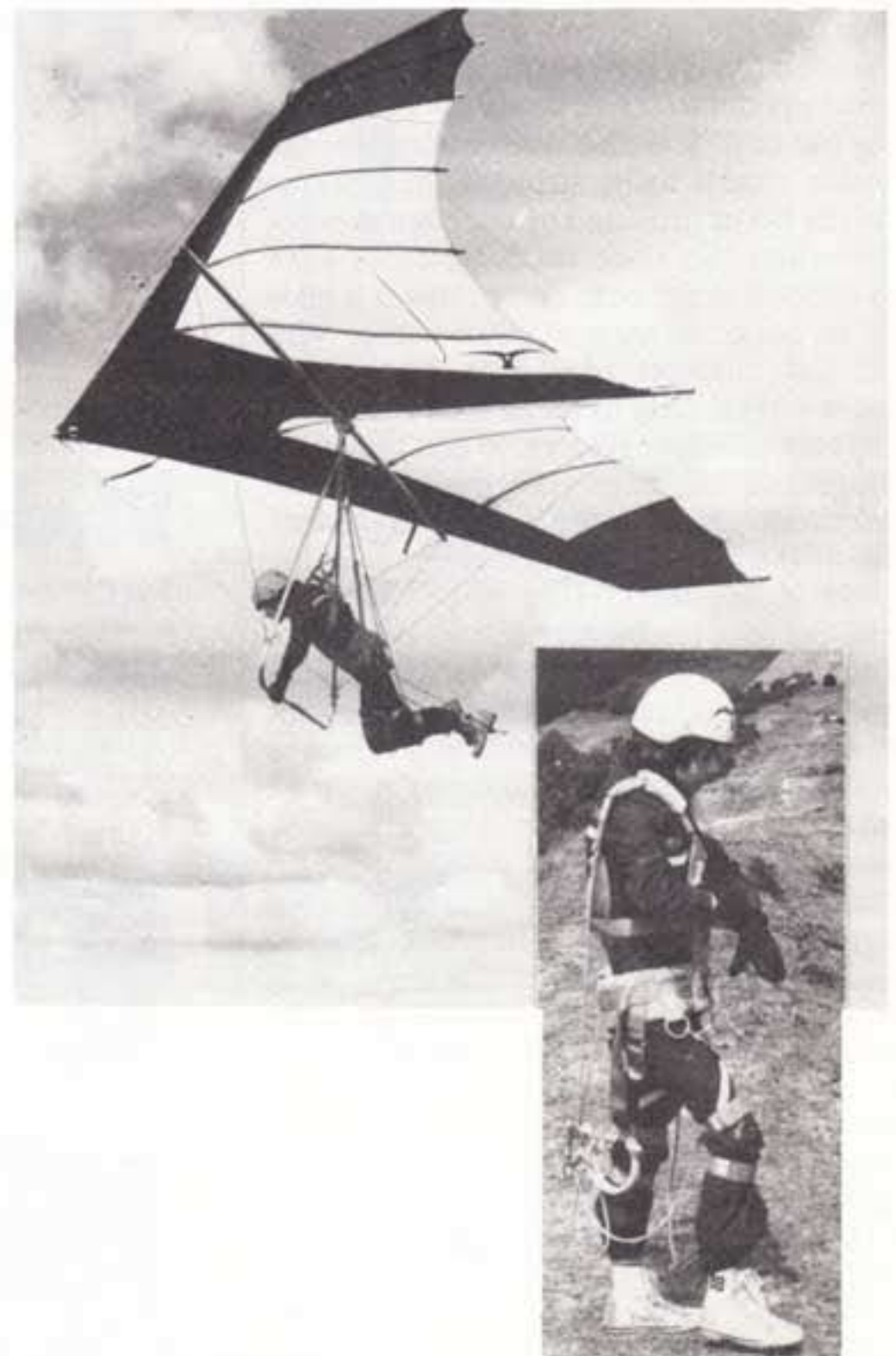
It was a hot, hot, meet, and the usual unco-operative hang glider meet weather.

Dean Tanji was voted by all the pilots and participants to receive the newly created Bob Wills Award, the most highly respected pilot. He richly deserved it, and as he was a close friend of Bob's, it was a teary time.

**Bettina Gray**

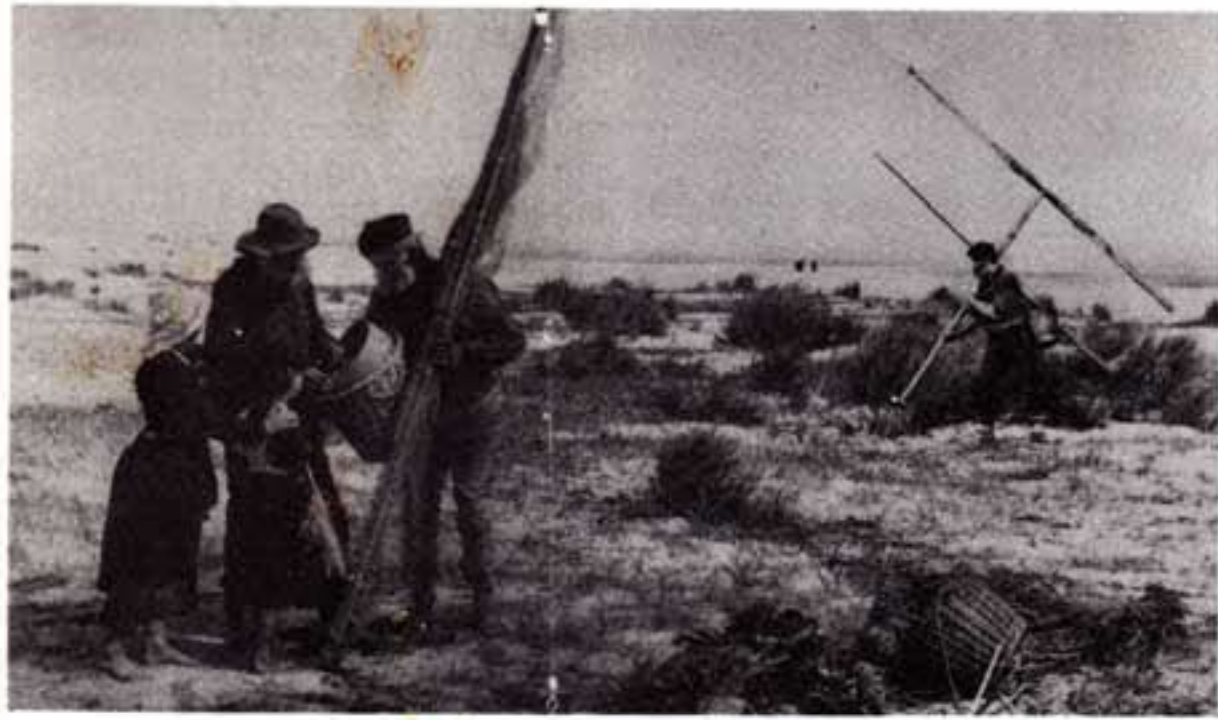
### A FUTURE CHAMPION?

One of Britain's outstanding young pilots, Andrew Hill is seen here flying a Moonraker specially adapted for his 7 st. weight. Andrew took up flying 3½ years ago on a home built Orion when there were as few as twenty hang glider pilots in the country. Andrew progressed from his Orion to a Breen Butterfly and then a Firebird 'miniature'. His current kite is the original Moonraker prototype changed to his own specifications, with a truncated/diffuser tips and 140 sq ft sail area. We shall undoubtedly see more of Andrew in the future. He is already setting Johnny Carr's teeth on edge!



Photographs: Mark Woodhams





The training officer checking the ballast during a Swansea University HGC training trip. Notice the new twin keel, high aspect ratio prototype in the background. This machine incorporates a revolutionary control frame design giving a greater roll and pitch response and hopefully increased stability. More pictures next month.

### MID AIR

Two flyers had a narrow escape at Tredegar — South Wales when a mid air took place. A beginner soaring for the first time on a Hi Fli was in collision with a visiting flyer's Spirit. The leading edge of the Hi Fli sliced through a deflexor on the Spirit ripping its sail in the process. Both flyers managed to make a successful landing albeit erratically.

As a result of the incident local flyers

who know the site well are being encouraged to throw their weight around — on the ground — to deter beginners from taking on more than they can handle and warn visitors of the tricky conditions this site can produce. In view of trouble with local graziers which has verged on all out violence, visiting flyers are not encouraged to come.

**John Searle**

### SAFETY IN CORNWALL

For three and a half years the Kernow Sailwing Association has had an accident free record, but recently three incidents have threatened the security of our sites. Unfortunately all the accidents were caused by visiting flyers. One of them involved a member of the public. After a poor cliff take off the pilot got turned back into the hill and flew into two elderly people who happened to be walking by. The outcome was one lady with a bleeding nose and bruises and shock and a broken glider. The most recent accident was a more serious incident and deserves a fuller description.

Christopher Harold Hepburn who has only been flying since April and had not reached soaring stage, successfully flew a 300ft cliff at Hawks Point, Carbis Bay, 2 or 3 times seated in his standard rogallo. He then made his first seven attempts at going prone off small sand dunes nearby, and thought he was capable of flying off the 300ft cliff prone. When he arrived at the top local pilots were packing up because the wind had dropped to 8-10 mph and advised him not to fly. Whilst carrying off their kites, he took off prone, went into a stall, dropped a wing and went into a down wind dive. The pilot crashed face first into a railway line about 60ft below. British Rail were involved as the train had to be stopped and he was taken

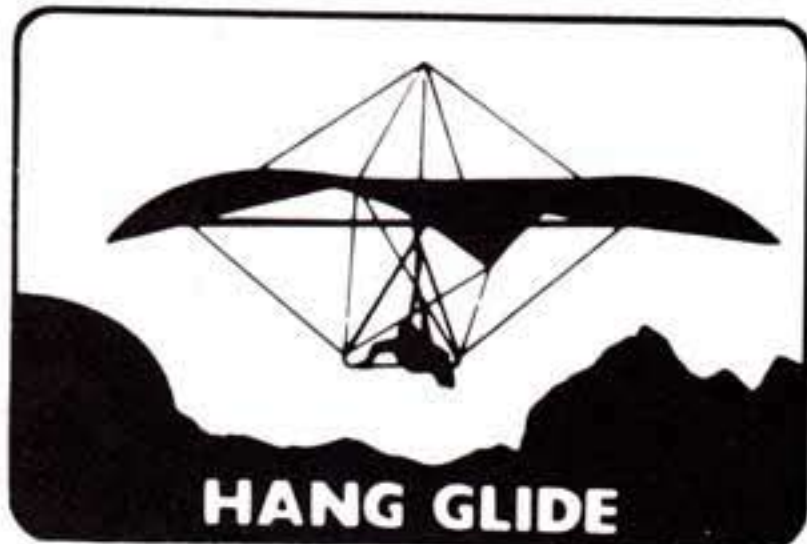
unconscious to hospital with serious face injuries. We stand to lose a good soaring site and I'm sorry to have to write this article but we have to do something to stop the next person from killing themselves. I don't wish to seem cruel but if every pilot could see his face as I have done it would stop irresponsible flying.

Ninety per cent of visitors write in advance asking for information on safe soaring sites, stating their experience and end up having good safe flying. Please help us to help you by contacting the local club before you fly and don't ignore the local pilots'.

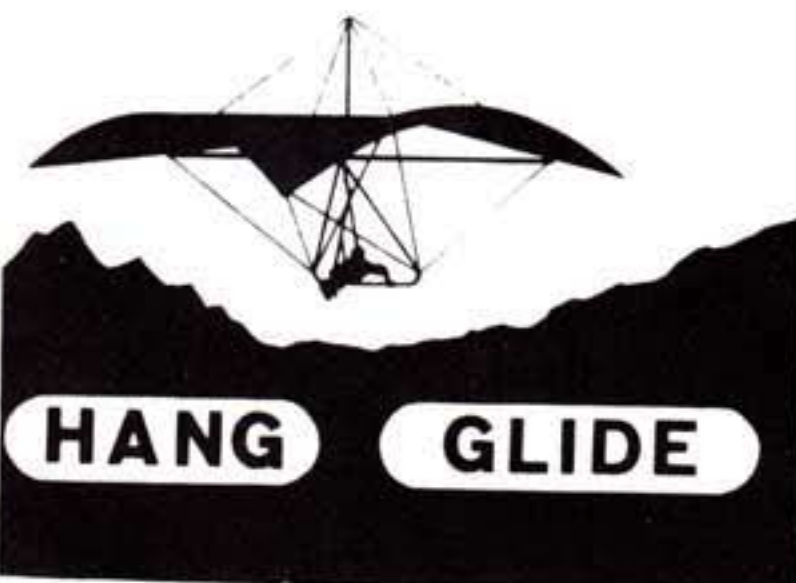
**Roger Full**  
Secretary KSWA

### CHRIS CORSTON APPEAL

This fund has raised £2,600 to date from the pockets of around 400 members. Will the remaining 2,900 members make one last effort to repay some of the vast amount of work which Chris put into our sport — the fund closes at the end of October. Donations to Derek Evans, Treasurer, 2, Lynch Down, Funtington, Chichester, West Sussex.



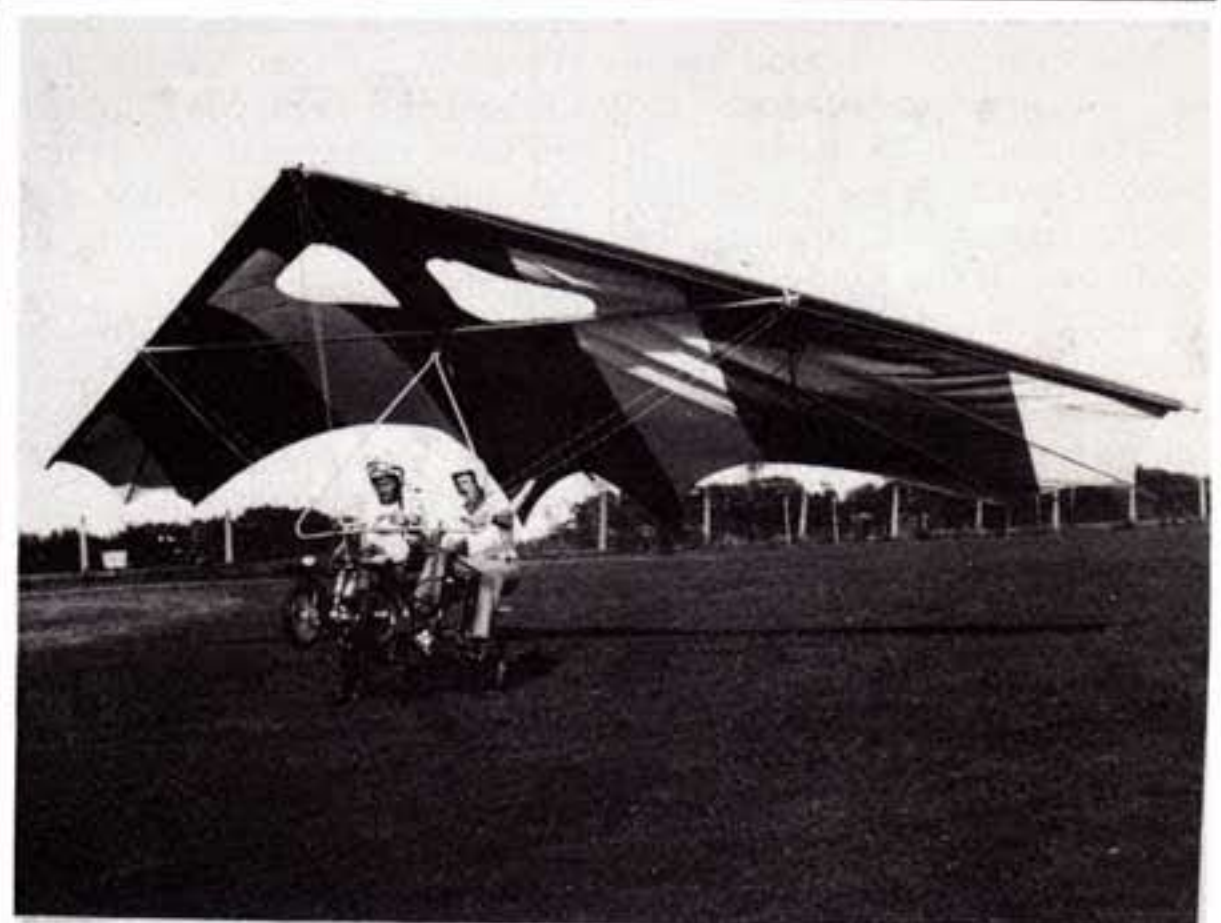
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*Is this Britain's answer to man powered flight. A beautiful flare out by Roger Full and Terry Tempest after a trip from Heathrow to Cornwall!*

### UK PARACHUTE

It has been brought to my notice that a British manufacturer is developing a parachute system to rival the available American product. Information says that the tests are underway and production should start soon at considerably less cost than the American chutes. Brian Gaskin, parachute maker and parascender is carrying out production development. More news in the next *Wings!*

### NEW BRITISH RECORD

On July 31st, Paul Whitely of Fakenham flew 26.6 miles along the cliffs of Cromer, Norfolk. The flight took 3½ hours. This broke the current British distance record of Nigel Milne's by 4.6 miles. No further details are available.

**If you have any news or photographs of current interest send them to the Editor, 14 Earlsthorpe Road, Sydenham, London, SE26.**

# FLOAT LIKE A BUTTERFLY....

Dr. Martin Pickford reports on the low level antics of the Suffolk Coastal Floaters, where a 30ft sand dune is considered a soarable ridge.

**T**he Suffolk Coastal Floaters have appeared within these pages on a variety of previous occasions, under the guise of David Cook, the unofficial leader and prime mover of the group. The SCF is a loose affiliation of several active and passive hang gliders in East Suffolk, centred on the Albert (pub), in Aldeburgh. The name refers to the fact that most of the unpowered flying in this part of the country can only be done off the local seacliffs. Unlike the pound, the floating is predominantly successful, and a great deal quieter than the other form of flying carried out by our friendly neighbours from across the Atlantic.

Apart from flying, the SCF are pretty active in a number of other projects at the moment. It appears that almost as much satisfaction can be got from building your own wings as can be experienced by defying gravity. But more of this later.

Whenever an east wind blows we all anchor off to the Thorpeness Cliffs in order to launch David Cook, or any other willing participant towards the North Sea. If the wind is normal to the cliffs and blowing hard enough some spectacular flights can be made, the local record being a return trip from Minsmere to Dunwich, a distance of 4 miles which took about 12 minutes. Before you all scoff, remember that this is based on a cliff of about 30ft height and that during the flight David was on occasions 200ft above the ground. I gather he takes his cue from the gulls, heading into the wind when they do, and cutting back when he gets substantially over the sea. The return flight downwind is something to behold, groundspeeds of up to 55 mph being the order of the day. 'Zus pruving zat zer Suffolk Coastal Floater can get to zer parts other hang gliders cannot reach.'

Neil Moran, the group's computer expert and brains, was flying an Icarus V, until he decided that it would look better in light blue. So it has been ignominiously grounded, stripped and whatever else happens to wings, in preparation for its

refurbishment. And purists will shudder at the news that Neil has modified it to take a small motor so that he can fly on days when the wind wouldn't normally allow him the pleasure. It seems that the conversion is almost complete and that he will be emulating Fulmars by the end of the summer.

In the meantime he has built a small prop. (airscrew he calls it) 28in. in diameter with a 9¼in. pitch from maplewood. It fits onto a tiny engine (McCulloch 10lb, 122cc, 15hp, 12lb weight) and the whole kaboodle delivers 72lb static thrust at 6,000 rpm.

Chris Tansley occasionally stops flying along our narrow country lanes on his Suzuki long enough to add one or two more parts to a 'Sunseed' that he's building. It's a pretty solid looking wing with diffusor tips and draggons and I'm told, is very good in the air. It ought to be, stressed as it is to about 6g. A lot of people aren't stressed that much. We all await your maiden flight Chris, if only to get you flying over our lanes rather than along them. I'm sure it won't be any more hazardous than your trips to and from the hangar.

John Wells, a man who has never flown, is busy rivetting, sawing, filing, cutting and joining in the hopes that when he's finished his 'Fledgling' he'll enjoy the sensation of ytivarg. At first I thought John was an itinerant

plumber moonlighting every Wednesday evening, so many pipes was he piling up in the corner. However, last week he laid out the spaghetti in the shape of a sweptback wing and it did resemble the skeleton of a Fledgling more than it did the tangle of pipes in the boiler room next door. With a fabric or similar covering he should be airborne by the end of summer. When this one is finished the Suffolk Coastal Floaters will have a pool of four high performance rigid hang gliders.



David Cook's VJ23 has been revarnished and is in the air at every decent wind. As a matter of fact, David is now flying in almost any weather, having fitted the McCulloch with maplewood prop to the VJ23. It is mounted above and slightly behind the

wing on two fore and aft struts, and employs pusher configuration. We've experienced a few teething problems with the unit. The first was pretty quick to emerge, when the ground crew, local fishermen, two dogs and a turtle were showered in nuts and bolts. Evidently the vibration from a 6,000 rpm motor is enough to loosen any tooth. We've alleviated the problem by drilling holes through every bolt and wiring the nuts into position. A generous use of 'stick-anything' tape also helps.

The second problem became evident when David found that he couldn't get more than 10ft into the air without considerable help from the wind. In one memorable flight David 'flew' from Thorpeness to Aldeburgh without getting high enough to clear a fisherman's umbrella and according to our tracker made contact with the ground every 50 yards or so. It seems a pretty expensive and somewhat dangerous way to break the world mile record, and I doubt if the AAA Committee would ratify it. The real reason David does it, is that he's often offered a beer when he lands in some old lady's front yard. The poor old ground crew, (more earthbound creatures) can't compete and the beer is generally finished by the time we arrive.

During the flight debriefing in our headquarters at the Albert,

*The powered VJ23*



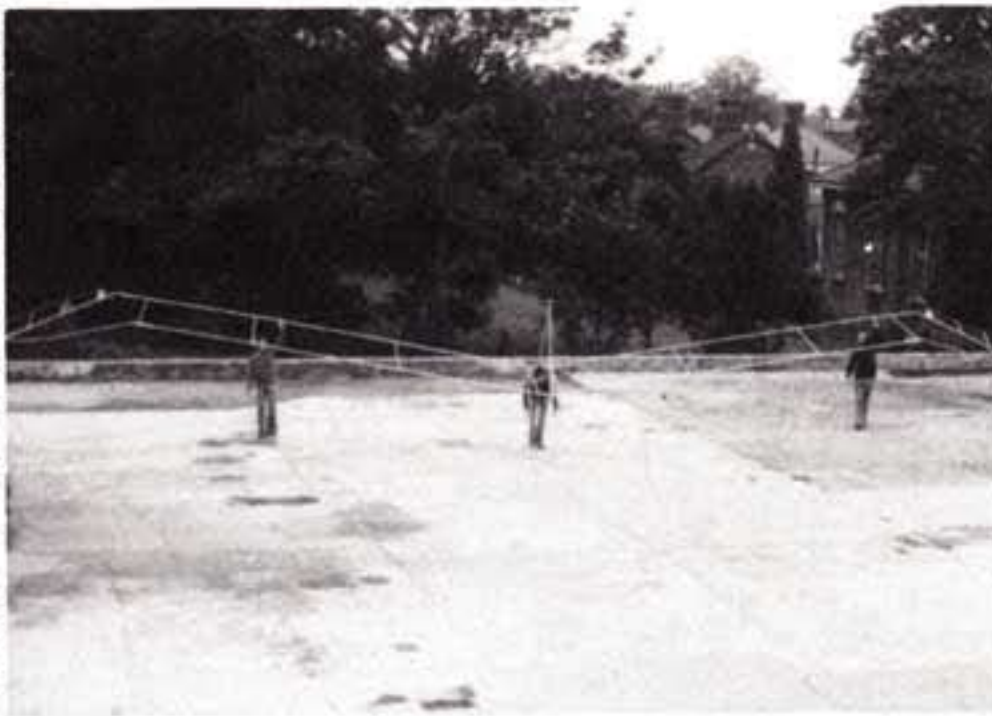
# SKIM LIKE A... VJ 23!

aided by a healthy supply of Adnam's throat and stomach panacea, we discuss the 'flight' and its ramifications. It seems that we have a sink problem, caused by the wind pushing us down. Is it possible? We also have a forward speed problem, as the engine only gets us up to 15 mph, just the stalling speed of the VJ23. Perhaps the prop which was designed for most 'bite' at a speed of 25mph is wrong for this engine and wings. We should aim perhaps at a prop which delivers its oomph at about 18mph. Before altering the prop, a job which takes at least three weeks if you have to make your own, we have tried other tricks in an endeavour to convince the VJ23 that it can fly with the present system. In the main this has involved altering the thrust line of the motor. Being above the centre of gravity, it develops a certain amount of torque in the pitching axis, and playing around with the thrust line apparently changes the amount of torque round the axis. It also changes the amount of wash over the elevators and rudder which must have an effect on the performance of the unit. All attempts have so far failed to improve the climb rate to satisfactory levels. We have had some enjoyable flights however, aided generously by the east winds. At these times David gets up to 200ft and can perform some elementary routines such as dive bombing the groundcrew, sideslips past bramble patches and concrete bunkers, and other heart stopping manoeuvres.

Needless to say, purist hang gliders will look on these motorised meanderings in the same light as a gourmet examines a bottle of Ketchup. But the motive is noble. We're trying to devise a system which will allow the hang glider to fly at competitions and elsewhere without the tedious and time-consuming business of having to man-handle it back to the start after each flight. All we intend to do is float silently to the end of the course, after which we'll start up the little devil and decibel our way back to the start. I believe I wouldn't be allowed to land or take off at New York!

Additionally, if we can get the gremlins out, what could be nicer than climbing to a thousand feet under power, switching off and floating gently back to earth at 9-1.

The most challenging project we're undertaking and potentially



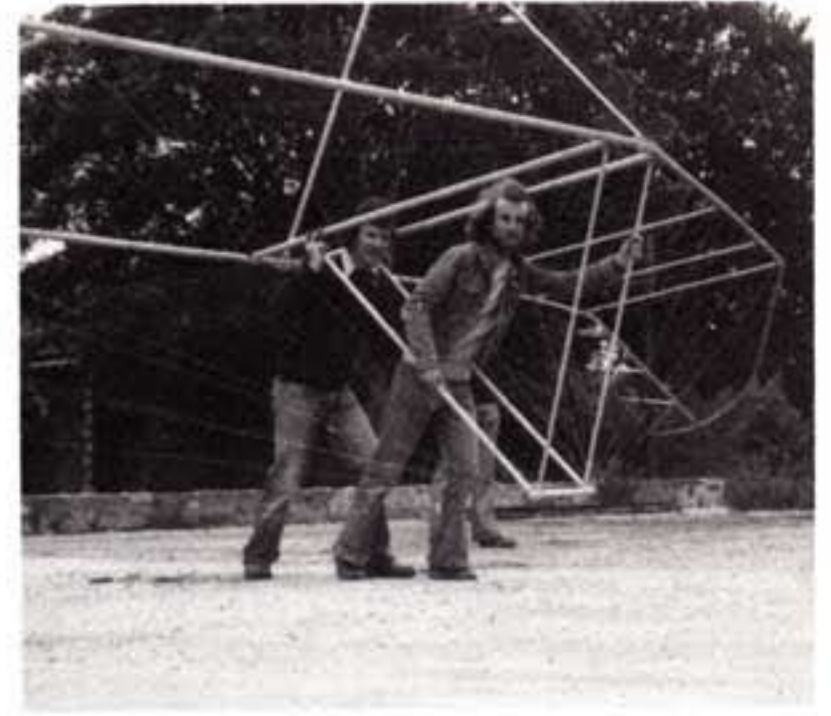
Musfly MPA

the most interesting is the manufacture of a manpowered aeroplane. The designers/builders, Neil Moran and David Cook, ably assisted by Bob Jelliff and generally bugged by other members of the ground crew, have got the creature into skeletal stage, and the ribs are just being glued on (fig. 3). It has been christened the 'Musfly'\*

Basically it's a two-man, 62ft span flying wing with diffuser tips and draggans. The diffuser tips are a direct crib from the Herring Gull. The draggans are a poor substitute for the infinitely variable control surfaces of the Gull. The lack of a tail in the Musfly necessitates the use of weight shift control for pitch, achieved by a pendulum attachment of the tandem to the wing. The draggans I'm informed, provide control in the roll and yaw axes.

The pilotless weight will be about 100lbs which is amazing for a structure of 62ft span and 7ft

Left to right: Dave Cook, Chris Tansley, John Wells



chord. Even an ignorant ground crew can see that. The lift/drag ratio is calculated at 26:1 which I have been reliably told, is calculated without adding the "MLF".\*

Propulsion of the Musfly is by a constant torque drive mechanism to a 10ft diameter fine-pitch propellor, mounted slightly below and behind the wing. Control is largely by the seat of the pants or any other method we can devise in time. Our tame computer, Neil Moran, tells us that the Musfly will fly at a power output of 0.8hp. Neil and David Cook, the pilot and crew say that they are capable of a sustained output of 1.2hp. Not after a couple of jars they aren't! We're making the plane in the happy knowledge that computers, unlike manufacturers, don't lie.

The only problem as I see it, is taking this very delicate machine from the hanger in Leiston, to a suitable airstrip for flight testing. How do you swan down our lanes

with a fragile 35ft long structure in tow? Any suggestions apart from flying it there?

You will have noted that all the airfoils used by the Suffolk Coastal Floaters are high performance rigid hang gliders. I gather that this is because the local topography and weather conditions in East Suffolk are not really suitable for the flabby hang gliders. Also, unlike some wealthy proponents of the sport, we enjoy building our own, rather than relying on tailormades. It seems to be cheaper to build rigid wings than to buy soft ones. But I'm sure we'd like to see someone anchor over to Thorpeness cliffs with a soft wing and try to equal or beat David's Minsmere-Dunwich-Thorpeness circuit. Anyone foolhardy (or brave enough) to try will find a ready welcome and a helpful if somewhat uninformed groundcrew, who at least know a great deal about the local elixir. One consolation you'll find here is the firm belief that if God had meant humans to fly, he wouldn't have given them wings?

One final word of warning. Keep off the Aldeburgh footpath. Our local bobby is onto us, and threatens to 'do' us next time out. I gather he is looking up the law relating to low-flying with intent to decapitate.

\* Footnote: 'Mus' — Suffolk verb denoting obligation. e.g. "I mus have another jar" — well known groundcrew call. hence "It musfly".

\* Footnote: MLF: Manufacturer's Lie Factor, an arbitrary number added to the RL/D (real lift/drag ratio) by various manufacturers in order to impress potential customers.  $RL/D + MLF = QL/D$  (quoted lift/drag ratio) see fig. 2 for ramifications to the pilot of ignoring the MLF. ☹

# Flight above 5000 ft

A BHGA report by Dunstan Hadley, on the flying of hang gliders above 5,000 ft.

**H**ang gliders have now advanced to the point at which not only is flight above 5000ft possible, but a number of flyers have already flown above this height and others will soon be doing so. It is important therefore that pilots should know something of the problems that will be found.

## The atmosphere

Temperature decreases with height at a rate of approximately 2° per 1000ft. The atmospheric pressure also decreases from the standard sea level pressure of about 14.7lbs per sq. inch. The following table gives a few approximate values.

	Temperature C	Pressure lbs per sq. inch.
Sea level	15°	14.7
5000ft	5°	12.2
10000ft	-5°	10.1
15000ft	-15°	7.6
20000ft	-25°	6.8

A mountaineer, by taking time to climb, can become adapted to high altitude. The pilot of an aircraft, of any kind, climbs too fast for any adaptation to take place.

This means that the pilot becomes subject to the physical changes of the atmosphere in several ways.

## Cold

As the body becomes cold it begins to shiver. Shivering produces heat, which helps to slow the rate of cooling. If the body continues to be cooled the shivering stops and muscular rigidity begins to develop, leading eventually to inability to move, unconsciousness and death. The blood flow to the extremities of the limbs and face is reduced, to conserve heat, and frost bite will appear in fingers, toes and nose or ears.

These effects are produced simply by lowering the temperature, but the additional chilling produced by wind blowing over the body accelerates the speed of cooling.

## WIND CHILL

Speeds	Temperature
Less than 10mph	down to -10°C minimal effect
20-45mph	-10° to -25° increasing danger
At over 30mph wind speed,	the danger is very great.

The hang glider pilot, who is more exposed to the elements than any other aviator, should therefore take great care to be suitably clothed, especially since he has no form of heating available. The best way to do this is to wear several layers of clothes with a high insulating quality, and especially, warm socks and boots, fleece lined or insulated; several pairs of gloves e.g. silk, wool, leather; protection for the nose, such as a balaclava helmet or full face crash helmet.

If despite all the protection the cold seeps through and stiffness and slow thinking begin to appear, a landing should be made. It takes time to get down, and increasing speed increases the wind chill.

In hot countries a pilot flying low must take care not to suffer heat stroke, and may have to carry water and salt if he is to stay up any time but above 5000ft the problems will be the same as for a pilot in temperate or subarctic regions.

Clothing, at take off, must be suitable for the height it is expected to reach, 25°C at sea level will be -5°C at 15000ft.

## Oxygen

Oxygen is required above 1000ft by the RAF. In practice it is used on most flights by the RAF. Any kind of effort above 5000ft will be noticeable to the pilot of a hang glider, because muscular exertion causes a big increase in oxygen consumption. Athletes competing at this altitude need several weeks of acclimatisation. Exposed as well to cold, and possibly to carbon monoxide inhaled from tobacco smoke, the pilot will rapidly become short of breath. This will lead to an increase in the rate and depth of breathing, which will compensate to some extent the oxygen lack. The pilot should be warned, however, that excessive breathing will lead to over ventilation of the lungs, which produces light headed feeling and tingling in the fingers and toes indistinguishable from the sensation of oxygen lack. Unconsciousness may result from this over ventilation if it is not checked. As height is increased the more severe effects of oxygen lack will gradually take over.

15000ft without oxygen should never be exceeded. Anyone contemplating flight above 10000ft in excess of 30 minutes must carry oxygen. The air contains approximately 80% nitrogen and 20% oxygen. Fall in pressure can be compensated for by an increase in the percentage of oxygen and this will take a pilot up to 37000ft using 100% oxygen.

## Changes in pressure

Apart from the oxygen lack caused by the reduction of the air pressure, an effect produced by the partial pressure drop of the oxygen alone, there are other effects caused by the total fall of atmospheric pressure.

**The Ears:** The middle ear is situated on the inside of the ear drum. It is an air filled space connected by a tube to the back of the nose. If the tube is blocked, pressure on each side of the ear drum cannot be equalised and the ear drum may be ruptured causing great pain and giddiness. Test by pinching the nose and blowing hard, with the mouth closed. If the tube is open the ears will be heard to pop. Do this every 1000ft during descent.

**Sinuses:** The sinuses are air filled spaces in the cheeks, nose, behind the eyes and in the forehead. They all open through narrow channels into the nose. They may become blocked, especially if the owner has a cold or hay fever or any other allergy or infection in that area. It is wiser not to fly if the sinuses are blocked. Air will probably escape on ascent, but may not be able to re-enter on descent. This causes considerable pain and sometimes bleeding from the sinuses.

**Abdomen:** Gas is normally present in the intestines. At 15000ft it will occupy twice the volume it requires at sea level, if allowed to. Confined in the abdomen it will distend the hollow spaces causing discomfort or pain. Many fruits and vegetables such as raw apples, beans, peas or cabbage cause a good deal of gas formation. These foods can be avoided by a high flying pilot if necessary. Carbonated drinks will also release a lot of gas as the pressure is reduced. Intestinal infections frequently produce much gas, as

well as diarrhoea, and high altitude will make discomfort greater. Rapid distention of the intestine may cause a fairly severe, unpleasant pain, and some people have been known to faint when this occurs.

**Teeth:** It sometimes happens that air may be trapped under a filling in a tooth. Should this be so, high altitude may cause toothache. A visit to the dentist should cure this.

**Bends:** Bends are caused by dissolved gases being released in the tissues or blood. They do not occur below 20000ft, except perhaps very occasionally, but above this height are a definite possibility. They are one of the symptoms of decompression sickness, and cause pain, most often in or near joints or muscles in use, or choking. They are rapidly cured by descent, which should be *immediate*, if any pain is felt at a height in excess of 20000ft. Decompression sickness can be rapidly fatal.

**Eyes:** As height is increased the convolutions of the ground become less noticeable. At 5000ft hills up to 1000ft appear almost flat. Speed over the ground also appears to be almost nothing. A hang glider pilot at 25mph air speed will feel stationary. There are a few other facts about the eyes which are important.

**Glare:** Glare from clouds, water, snow or the sun itself can be very tiring. It may be advisable to use sun glasses, or tinted goggles. These will also protect from the cold wind.

**Brightness contrast:** A bright object can be seen at a great distance. Light reflected from water, glass, metal rails etc., may make small objects visible at a greater distance than they would otherwise be seen. Animals, cars etc., look very small from even 2000ft.

**Colour contrast:** Landmarks will be much easier to find if objects of colour contrasting with their surroundings are used. A copper church roof, which has turned green, may show up well in a town but not so well among fields.

**Scanning:** During day time the central cone of vision is most acute. Scan the terrain at a

distance in an orderly pattern to pick up marks, which may not be noticed in a casual glance because they look small at a distance. At night central cone of vision is least sensitive and it is easier to see something by looking 10°-15° to one side of it. Whether or not an object is seen depends on:

1. Size—therefore distance away.
2. Reflected light from it.
3. Illumination of object.
4. Presence of haze or fog.
5. Contrast.
6. Type of approach e.g. sun behind or in front, etc.

At night time other factors apply also.

**Night vision:** Night vision is adversely affected by lack of Vitamin A in the diet, fatigue, tobacco smoking, alcohol, oxygen lack. Adaptation to darkness takes about 30-45 minutes, and is destroyed rapidly by white light, especially a bright flash.

**Other factors:** At a normal sinking speed of 250ft a minute, descending from 5000ft to sea level will take 20m minutes. At 5000ft sunset is somewhat later than at sea level, and later still

higher up. If the descent is started from 5000ft at sunset the landing will be made in darkness. As the landing may well have to be made in a strange place leave plenty of time to get down, and find a landing place before dark. High tension wires, trees etc. are not easily seen in the dark.

If flying in strong thermals or up currents near clouds, remember that descent may take much longer than anticipated. Above 5000ft both vertical currents and horizontal wind speed will be much greater than

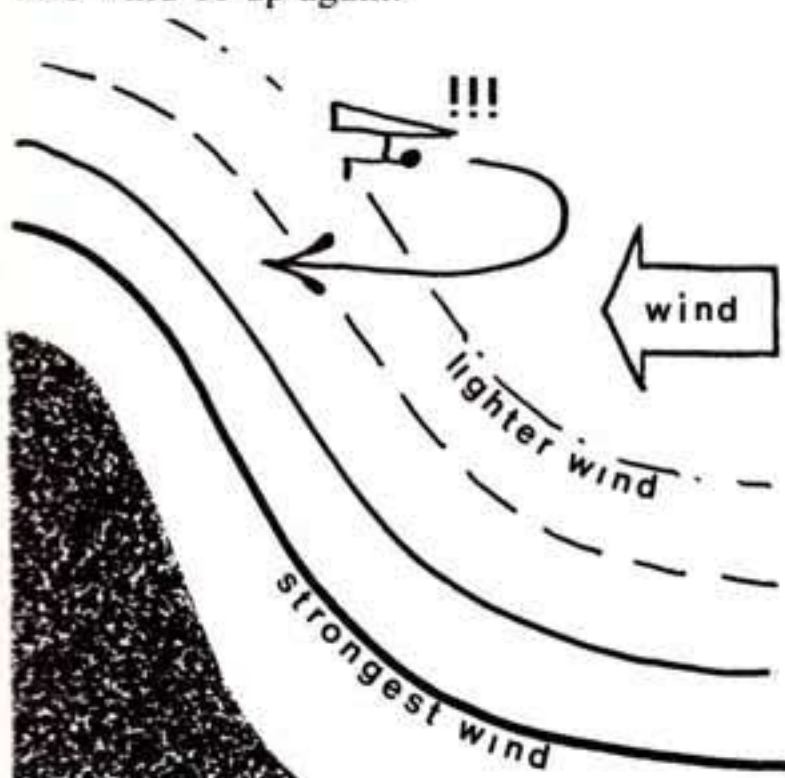
near the ground. Passing from a strong up draft to a down draft may be violent. Take great care.

If at any time you feel doubtful about your equipment, comfort, due to cold or any other reason, deteriorating weather leading to gusts or strong up currents, which could exceed the diving speed of your glider, decide early upon your course of action. You may have to fly some distance to a safe landing area and it may take a long time to come down. ☺

# WING TIPS

## THERMALLING TIPS

Whilst ridge soaring the vario suddenly reads 10ft/sec up, Peachy wait for 3 seconds, still 10 up then into a 360, Woops 2 down on the downwind leg but where is the 10 up? but back into wind 10 up again.



The problem is . . . Wind gradient, on turning downwind no matter how slow you fly you must be accelerating as you are entering stronger tailwinds.

From illustration 6mph has to be gained in airspeed for flight to be continued. This 6mph is achieved at the sacrifice of height

unfortunately. The unfortunate occurrence happens whenever ridge lift is used but will not occur say in 20mph winds over flat ground.

The answer is . . . Whilst in ridge lift weave from side to side in 'S' turns ideally or hover, go forwards, sideways, backwards, fly upside down anything but don't turn downwind until enough height is achieved to be above the wind gradient. If on getting to what you think is high enough and 360, the vario shows slightly less lift downwind you are still in slight wind gradient, but if the average reading is still quite high you will probably clear the wind gradient as you continue to circle. Once away from the gradient you are free to circle and continue to cloudbase!

### Tip

When circling in a thermal it is often necessary to recentre. Ideally as you circle watch the vario and when the reading is decreasing tighten the bank and when the reading increases reduce the bank, this method automatically keeps you in the centre. Frequently a very tight bank is the most efficient as it keeps you in the strong core. As the wind speed varies at different heights then the projected angle of the thermal varies.

### Safety Note

Forget Cloud Flying. Many good fliers have suggested that they would thermal up through

the cloud! Try flying for 10 seconds with your eyes closed that should convince you (whilst ridge soaring).

Without gyro instruments flying in cloud which might take 5 minutes or 30 minutes to be thrown out of, is asking not to remain the right way up! Anyway you are likely to get very tired and spoil your chance of a long cross country flight.

I recently climbed 1,700ft to a cloud street and as I approached cloudbase at 1,500ft/min on the sunny edge I decided to level out 200ft below cloud. I side slipped flat out and headed for the edge and I still went into the cloud and then popped out the side of it. Later the same day I again went towards cloudbase at the same rate and pulled out safely 500ft below cloudbase.

Did you know — Even in cloud streets there are cores of lift which are not always continuous. The lift is on the sunny edge of the cloud. If there is a blue patch in say 5/8cu then there is lift in the centre as the air is warmer. (Haven't tried this one yet, always rains in the north).

And please — don't upset the CAA by cross countrying into their legal airspaces. Get a map from a Flying Club or is it Malcolm Hawksworth who has some? Legally we can fly through airlines but only in a straight line. (You are braver than me if you do though).

## HOW TO RUIN YOUR DAY

The fluffy cumulus was scudding across the sky, helped on its way by the brisk wind. The sun was shining and perhaps the feeling of well being, was the reason my foot was steadily increasing pressure on the accelerator. The first indication of disaster was the 'ping' as the front bungee, clipped to the bumper, gave way.

A fraction of a second later, the strong cross wind caused my new Vector to slide off the front roof rack and I was horrified to see the whole kite balancing unsupported in the wind. — Well, the nose dropped and since it was still clipped on at the rear of the car, my next view through the side window gave me an unpleasant picture of a vertical glider, which

had started to climb skyward.

Instantly studying the rear view, the next thing I saw was my glider careering, end over end after me, rather after the fashion of the cabers, burly Scotsmen are want to toss around!

Needless to say, I stopped, reversed, threw the now unusual looking package back on the roof and disappeared rapidly, not wanting to get picked up for an insecure load.

Fortunately I was able to salvage the sail and rigging, straighten the keel and A frame, but needed new leading edges, crosstube and bag — it also ruined my weekend. — Reason — my faithful bungees, bungees I had used for many months were perished with age and use.

## by John Hudson

Total cost of the mishap — about £50.00. It could have been far worse. — What if I had been on the motorway? What if there had been a car close behind? What if the law had been around? — Moral — Check your fixings — use rope instead of bungees and ensure the glider is very firmly fixed onto your roof. — Fasten it on your nearside, so if it does come off, its unlikely to hit a car travelling in the opposite direction.

I was lucky. I've always thought my glider was very safe on my roof. I know for a fact that it was safer than some of the gliders I've seen travelling around.

— Give it a bit of thought — Don't ruin your day.

# BOOK REVIEW



## 'The Hang Glider's Bible'

by Michael A. Markowski  
(Tab Books, Blue Ridge Summit, Pa 17214, USA).

Reading books about hang gliding is not nearly as much fun as doing it. But enough people have written books about it make reading the available literature a pretty formidable task. Unfortunately, with the publication of this book the task becomes even more formidable.

Most of the authors to date have concentrated on trying to explain the sport to the beginner, or to other interested individuals, and in this area of the market, Markowski faces some very heavy competition. The book is heavily US-orientated, and from a UK standpoint, quite a lot of the sections are rather redundant. Admittedly, US gliders go all over the world, but as the 'Typical Hang Gliders' section is largely composed of manufacturer's PR handouts, it isn't very helpful.

There are, in fact about five books catering for the beginner/general interest area — they are (in order of size), Bob Mackay's; Anne Welch/Gerry Breen; John James'; Rich Carrier's and now this one, which at about 450 pages hits the top end in both size and price. All these books cover exactly the same ground, which by now is getting a little bit worn — once you've heard the "History of Hang Gliding" through more than three times, it does tend to become a bit of a yawn. Sir George Cayley? Lilienthal? Chanute? John J. Montgomery? Francis Rogallo? NASA? The Bamboo Bomber Brigade? Bill Bennett? De Dum, De Dum, De Dum . . .

Markowski's book is no worse, and in places is quite a lot better than some of the others. He hasn't been very selective — he's slung

in almost everything to do with hang gliding that he came across. There's an awful amount of dross, but one or two nuggets in amongst it all. There's also the occasional howler —

*'High altitude hang gliding — this type of flying will involve altitudes in excess of 1,000ft above the terrain'. Oh yeah?*

The author is an aeronautical consultant, a graduate engineer and a licensed private pilot. It is therefore not surprising that the 'Materials and Hardware' and 'Construction and Components' sections of the book are good, although even here, there are weaknesses in the text —

*'The type of truss used in a typical cable braced hang glider is known as a Pratt truss (See Fig. 9-25)'*

So you turn to 9-25, and what do you see? a quite ordinary photo of a Fledgling with a caption that says — 'The Fledgling is a good example of a Pratt Truss'. So you haven't learned a lot, really!

This book has obviously suffered badly from the dreaded 'time-lag' syndrome — it's very nostalgic to see a lot of grainy B & W photos of seated freaks flying flappy standards down off sand-dunes, but this isn't where flying's at now. And I was a bit surprised to find an aeronautical engineer putting forward the view that flying in a 10mph wind is 'four times as dangerous' as flying in a 20mph wind because 'when the wind goes from 10mph to 20mph its forces become four times as great!' (Even the exclamation is in the text). I'm no expert in matters aeronautical, but even I know that speed relative to the ground means nothing: When you're

considering the stresses and control responses of a hang glider, it's the airspeed that counts. If he'd said that "Flying a glider at 40mph can put four times as much stress on the airframe than at 20mph," I'd be more inclined to agree. Lester Cruse destroyed his glider by overstressing it in zero-wind conditions, when according to Markowski he should have been perfectly safe — a zero wind has no 'force' at all.

But the book has its good points, and some food for thought

for the home designer and builder — if there are any of that vanishing breed left in England! The appendices contain some useful bits of information—specifications for structural components, the USHGA Hang Rating Program, Recommended Safety Parameters, and a Source List of Ultralight Gliders, Organisations and publications (which might be helpful to the Man from Mars who couldn't find a hang glider pilot in his area to talk to).

All in all I think this book fails on a number of counts. The author has obviously tried very hard, perhaps too hard, to include all the material that would be of even faint interest. In the UK at least it is too expensive, and too orientated to the US scene to be of much interest against the excellent home-grown books we have available. And if there are any budding authors out there, what we're ALL looking for is a USEFUL pilot's book about hang gliding — leave out all the history, forget the Standard Rogallo (it's DEAD!) Just give us a book that EXPLAINS the modern Hang Glider in terms that an idiot can understand, tell us how the experts go about tuning for performance, and how the average-to-good pilot can become better. THEN you'll have a best seller!

**Tony Fuel**





# ONE GOOD TURN DESERVES ANOTHER

by Ian Trotter

The following is quoted from a letter signed by a self-confessed 'inexperienced nonk' in a recent newsletter of the Strathclyde HGC.

*'After I had completed my first 180s, I discovered that I had missed an important part of the manoeuvre due to not knowing . . . to let my own weight swing out under centrifugal force while in the 180. Result — I nearly side-slipped. At the time I took this to be stall characteristics.'*

Experienced pilots may be amazed, but the fact remains that we all learned sometime and this anonymous gent has obviously had difficulty in acquiring information, despite the availability (?) of such excellent articles as Bob Wills' 'The Methods and Dimensions of 360° Turns' (Groundskimmer, reprinted in *Wings!*) and John Lake's 'Do a good turn' (Groundskimmer, reprinted in *Flying Scot* (Summer 76)).

If people are still having the problems illustrated by the quotation above, that's justification enough for yet another article on turns. If this article saves a life, or a broken wrist, or a bent control frame or just a bad fright that's further justification. Experts need read no further, but if they do and find fault, maybe they should ask themselves why *they* didn't write a better article.

**So what is a turn?** A turn is any manoeuvre which changes the heading of the glider by rotating it about the yaw axis, which is conveniently represented by the king-post. One might think that, in order to turn, one merely causes yaw in the appropriate direction

but it doesn't work that way; hang-glidors (and this article is not meant to apply to machines with aerodynamic controls) are controlled by weight shifts which result in rotations about the pitch axis (represented by the cross-boom) and the roll axis (represented by the keel).

A turn is a turn is a turn, whether it be 10° to get closer to ridge lift, 90° to set up a landing approach, 180° to reverse a soaring beat of 360° (or more) to gain height in a thermal. Any turn, of whatever magnitude, is initiated, controlled and terminated in the same way.

A 180° turn which results in the glider following a reverse track over the ground when ridge-soaring may be considerably less than 180° when measured by the change of direction of the keel, because both beats are flown by crabbing into wind. Terminology is ambiguous here and 180° may mean either change of heading relative to the ground or change of glider attitude about the yaw axis. The first interpretation is probably more common.

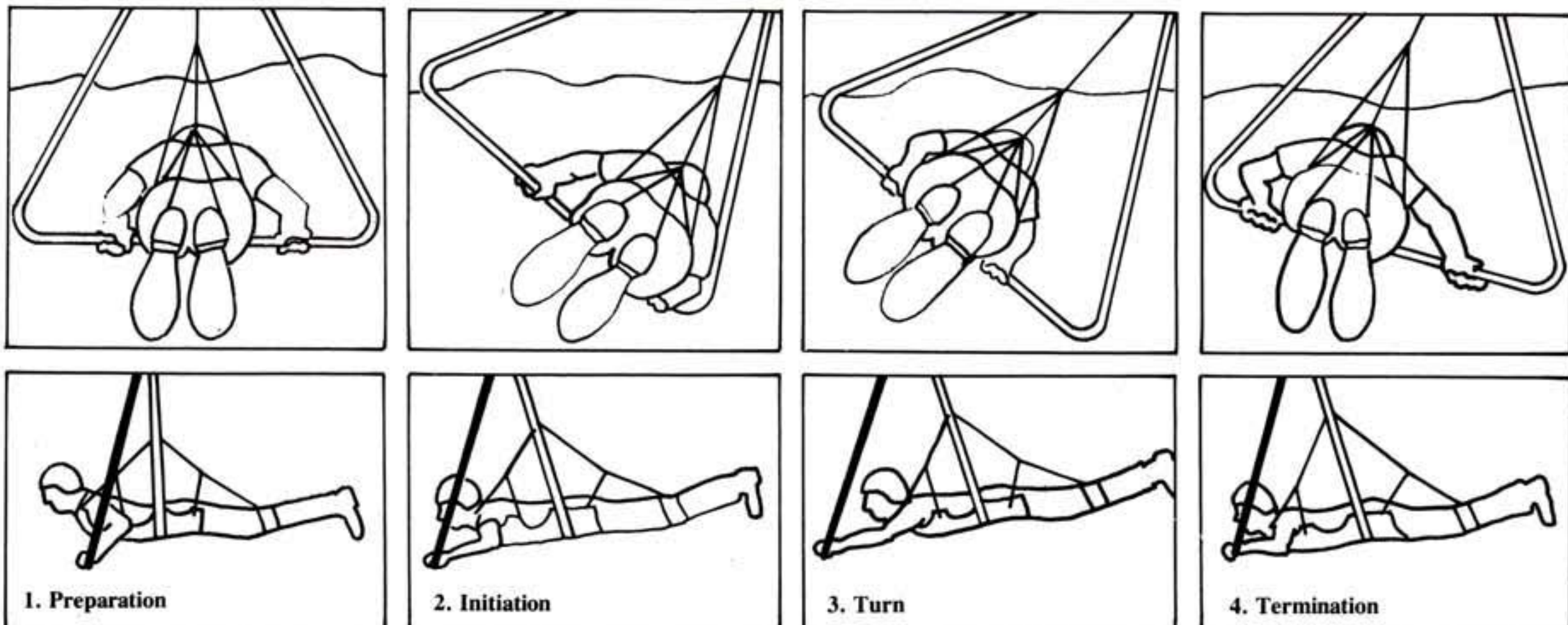
A turn is a turn, regardless of magnitude, but this is not to say that there is little difference, in terms of complexity or risk, between 10° and 360°. In a ridge-lift situation, any turn, regardless of magnitude, which causes the glider to point downwind towards the hill is potentially dangerous. Inexperience in controlling turns, ignorance of airspeed or turbulence in such a situation could terminate

or interrupt one's flying career. The other difference between 10° and 360° is related to the obvious fact that a 360° goes round further and takes longer, allowing more time for lack of control to make its presence felt, perhaps violently.

The most obvious distinction between one turn and another is how far it goes round. Further distinctions lie in turn rate and in height gain or loss. A tight steep quick turn may be used to avoid an unforeseen collision, or to show off, while a large radius flat slow turn may be made to minimise sink, or to maximise lift, which is the same thing. A turn may also involve deliberate height loss through side-slipping, for example by 360-ing into a landing area.

So there are three ways in which turns may vary: amount of rotation, tightness and height gain or loss. Height gain or loss is relative to the surrounding air mass, a slipping turn may raise the glider if performed in sufficient lift. Not only can turns differ one from another in these three respects, but the latter two can be modified in the course of a turn. During a turn, it can be made more or less tight ("variable rate") and/or height loss may be increased or decreased. Naturally in a small turn there is little opportunity to vary the rate or the side-slip but in a 360°, or a multiple, the scope for variation, like the scope for error, is immense.

A turn may be initiated from normal level flight, or from another turn by reversing direction, or, deliberately by the very experienced and accidentally by the



inexperienced, from a stall.

Having said what turns are, and how they vary one from another, *how are they done?* There are four stages: Preparation, Initiation, Control and Termination, and these apply whether it's 10° or 360°, steep or flat, slipping or efficient, variable or constant.

**Preparation.** It may seem obvious, but know what you want to do and whether conditions permit. Ensure that ground clearance is sufficient, with plenty of leeway in case things go wrong, and that no other pilot in the vicinity will even be given cause to wonder what you're up to. The bigger the turn the greater the scope for error and the more leeway required. Ensure that you have sufficient airspeed. Do not initiate a turn at 'min. sink' until you are satisfied that you know how to turn well and how to cope when things go wrong. On the other hand, if you're already flying at a reasonably high speed there's no point in horsing into a steep dive before starting to turn.

**Initiation.** Roll (or bank) the glider in the desired direction by shifting weight in that direction. Shortly after applying roll, apply flare, (pitch up) by pushing the bar forward, i.e. weight back. 'How much flare and roll?' you may ask — read on!

**Control.** Pitch and roll in a turn are intimately and complexly related, and they must be kept in balance. To make matters worse, the effects of control movements in pitch and roll become different in a turn from what one is used to in normal level flight. In normal attitude, pitch up will slow the glider, pitch down will increase speed. In a turn, the pitch control movement controls the turning radius, pitch up making the turn tighter, steeper and faster, "faster" in the sense of turn rate, not of airspeed. Pitch down (bar in) has the opposite effect.

The roll control movement has the effect of varying airspeed. Moving the body further out the bar increases airspeed, while returning to, or past, centre reduces airspeed. So to perform a gradual turn, apply a little bank and a little flare; to perform a steep turn, apply more of each. At this point the limitations of pen and paper become evident, for the only

way to learn how much flare balances how much roll is to go out and do it.

Once in a turn, flare will normally be kept fixed, unless varying the rate of the turn. Meanwhile roll must be continually trimmed to ensure proper airspeed. In a turn of any significant extent, having rolled and flared, airspeed will start to increase, at which point the roll control movement should be trimmed back. This increase of airspeed is the result of excess roll relative to the pitch applied and is caused by the glider side-slipping. If this is what you intended, well and good. If not, trim in.

Alternatively of course it is possible to balance pitch and roll by varying pitch instead of roll. Airspeed will be increased by reducing pitch and vice versa, but bear in mind that the turn radius will be correspondingly increased.

A well-balanced turn has the pilot in the centre of the bar once the initiation phase is complete. An "efficient" (non-slipping) turn has sufficient airspeed to avoid any risk of stalling, and is very much akin to normal straight flight at minimum sink, although the control movement required to maintain such a turn is totally different.

**Termination.** Reduce flare and apply opposite roll. If at the left of the bar, in a left turn, return to centre. If at the centre already, in a well-balanced large turn, trim right a little as the flare comes off.

So far so good but *how can you tell a good turn* executed by someone you're watching, or by yourself? Most of us have seen the pilot who appears to have an invisible wire attached to his inside wing-tip. To him it probably appears different. The answer is one word — AIRSPEED. In all aspects of flight, from take-off through straight flight and turns to landing, a good sense of airspeed is essential and it must be cultivated, whether by flappy sails or wind noise. An airspeed indicator may help in certain instances but most have problems in respect of angle of attack and side-slip mis-indications, time lag and distraction from flying and anyone who can trim a turn by reference to an ASI has my admiration. A good turn is evidenced by a smooth continuous rotation with no straight sections and no over-

control and above all by steady AIRSPEED.

**What are the risks** involved in a turn, and **how can they be avoided?** Obviously flying into the ground, or into another aircraft. Preparation is relevant here. Secondly, insufficient airspeed. If too much flare or too little roll is applied, the glider will stall. Ensure sufficient airspeed at all times and again ensure you've plenty of room, both horizontally and vertically.

At the initiation stage, applying flare too soon will reduce airspeed, possibly to the stall point. Apply roll first, and, if in doubt, have too much airspeed rather than too little. The stall speed of the glider increases with the tightness of the turn, so airspeed should be increased significantly in preparation for a tight turn. Thirdly excessive airspeed. A steep roll with little flare gives a steep side slip, which may be what was intended, but surely not if it results in a 40 mph impact!

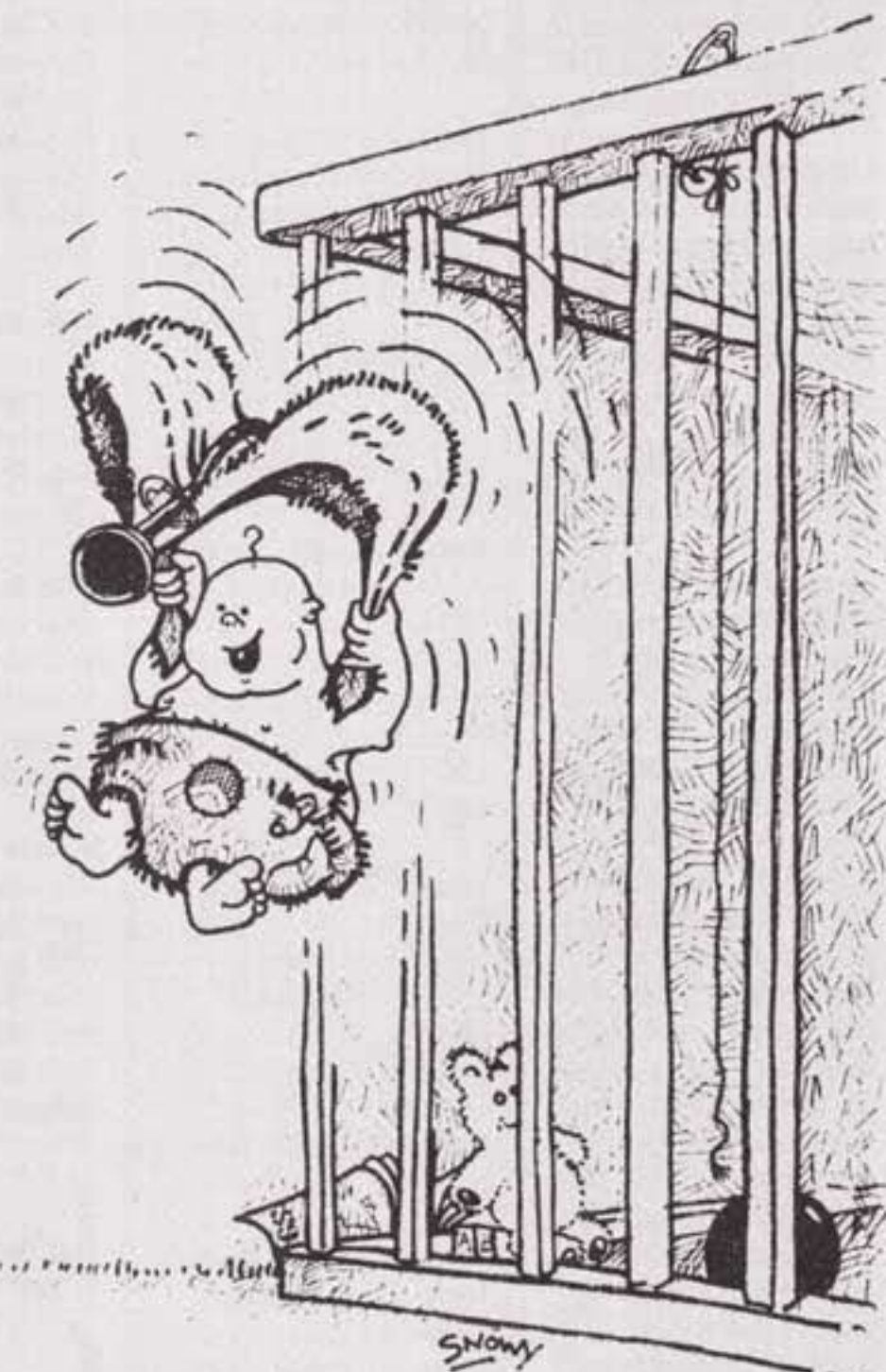
This may not be strictly relevant to an article on turns but if you find yourself heading out of control towards the hill DON'T try to turn away immediately, get the AIRSPEED FIRST.

**How do you learn to turn well?** Think, study, understand, discuss, argue, concentrate and din it into your 'bird brain' ('Soar like an eagle, land like a turkey' John Woods *Wings!* July 76, reprinted from *Fly Paper*) until it's second nature. Then practise. Get plenty of room. Cultivate a sense of airspeed. Don't try to do perfect efficient turns straight away. A slipping 90°, provided that you know what you're slipping and why is as helpful in learning as anything else. If the opportunity permits — loads of height and distance, smooth air and lowish wind — try a 360°. It goes on so long you're bound to find out your mistakes, but don't be too proud to opt out by terminating the turn if it doesn't feel right.

Finally thanks to the bloke (I assume it's a bloke) who had the considerable guts required to admit his ignorance in print. Hopefully he'll soon cease to concern himself with centrifugal force (which misled me for a while) and be able to distinguish a side-slip from a stall, and not worry about either because *he knows what he's doing.* ☺



# INFORMATION



further notice. The sites are Cats Tor Map Ref SJ 995 760, Shining Tor Map Ref SJ 995 737 and Whaley Moor 530700N 020000W (sorry no OS ref). An approach has been made to the CAA to see if it is possible to get dispensation to fly at these sites. Further developments will be published in *Wings!*

Roger Green

If any further incidents are reported we shall have no option but to ask you to restrict flying to the main ridge only.

Your letter of the 10th June last proposing a Control Point is encouraging and we look forward to an improvement in the situation when this is operating.

C.H.W. Griffith

## NORFOLK HANG GLIDING CLUB

The new Secretary is John Sharpe, 32 St. Peter's Road, Stowmarket. Tel. Stowmarket 4598.

## FLYING IN NORFOLK

Flying at Lighthouse Hill ONLY, if the first flyer to arrive contacts the lighthouse keeper before flying as helicopters land at the lighthouse, he will tell you if it is safe to fly.

The MONDESLEY site is for NHG Club ONLY, this rule has been made by site owner not the club.

John Sharpe

This is a final warning and the situation is now exceedingly delicate. We cannot afford to lose this site, both nationally and locally. Each flyer at Rhossili has the fate of the site in their hands. Please observe the National Trust's Site Rules — they're for our benefit. Remember — all visiting flyers must apply for 'Rhossili Membership' *Before* arriving — Don't arrive 'on spec' — if you're not a WHGC member you will not be allowed to fly. Send £3.00 (for 12 months membership) to: I. Lawson, 60 Swansea Road, Waunarlwydd, Swansea, W. Glam.

Rob Symberlist  
Sec. W. Glam Branch

## RHOSSILI

*The following is a letter from the National Trust*

Dear Mr. MacKay,  
Both H.M. Coastguards and our Warden have reported to me that hang gliders are being repeatedly flown along the cliffs over the sea contrary to the agreed flying limits.

I am very concerned at your lack of control over your members.

## THE WREKIN

Permission to fly from the Wrekin has not been given by the owner. All flying from the Wrekin must therefore cease.

Lesley Bridges

**RENEWAL OF SUBSCRIPTIONS — Those Members whose numbers fall between 4988 and 5293 inclusive are due to renew on 1st October.**

## DEVON AND SOMERSET CONDORS

Please note that there has been a change of secretary. Now contact: Brian Smith, 16 Tidwell Road, Budleigh Salterton, Tel. Budleigh Salterton 5253

## FLYING IN THE NE

The George Cayley Sailing Club would appreciate it if all visitors would write for permission to fly the following sites: The Hole of Horcum, and Cayton Bay. Please write and help us to keep these sensitive sites.

Site Officer: Penny Preston, 11 New Road, Guisborough, Cleveland. or Secretary: John Archer, 10 Parkside Close, Park Avenue, Hull.

## FLYING AT PORTLAND

After several months negotiation the Wessex Hang Gliding Club has obtained permission to fly the cliffs within the Control Area of the Naval Air Station at Portland. Flying there is subject to certain rules and permission will be withdrawn if these are broken.

If you wish to fly there you MUST contact either Peter Robinson (Warmwell 852136), Peter Tindley (Preston 832758) or Pat Fry (Parkstone 745840)

The police are currently still hostile!

## WELSH KO DISTANCE TROPHY

Saturday 10th and Sunday 11th December, 1977 Swansea/Rhossili area.

Closing date for entries September 30th.

Entry fee £1 per pilot entering at the Eliminator round.

Bob MacKay, 83 Wern Road Skewen, West Glamorgan.

## BREAM DOWN, SOMERSET

The owners of this site, the National Trust, have stated that there shall be no further hang gliding from this site. The main reason is that the owner of the Bird Gardens has suffered loss due to birds taking fright.

Dick Scates  
Avon HGC Site Officer

## HANG GLIDING WITHIN MANCHESTER CONTROL ZONE

It has been ascertained that three site have been used in the past are within the Manchester Control Zone and that there is to be no flying at them until

**Individual Membership:** £7.50 pa (plus £1.00 entry fee for new members).

**Family Membership:** £10.50 pa (plus £1.00 entry fee for new members).

2 adult members of same family and household. Existing members can extend to family category on payment of additional £3.00.

## ITEMS AVAILABLE FROM MEMBERSHIP DEPARTMENT:

Windscreen Badge .....	25p
Helmet Badge .....	25p
Cloth Badge (flying suit) .....	60p
(If above three ordered together) .....	£1.00
Pin on lapel badge .....	30p.
Keyring and fob with BHGA Badge .....	60p
Keyring and chain with BHGA Badge in acrylic "teardrop" ....	60p
(can be used as a pendant)	
"HANG GLIDER PILOT" — by Ann Welch & Gerry Breen .....	£2.75
An excellent up-to-date book for beginners and advanced pilots	
(Plus P. & P. if only ordering this item) .....	15p
"HANG GLIDING" — by Bob Mackay. An informative book	
mainly for those who have just entered the sport .....	50p
(Plus P. & P. if only ordering this item) .....	10p
Log Book .....	£1.00
The BHGA leaflet "An introduction to Hang Gliding"	
(including a list of major clubs) .....	Free to Members
List of British Hang Glider Manufacturers .....	Free to Members
List of Schools on Current Register .....	Free to Members
(Send s.a.e. if only ordering free items)	

'WINGS'! BACK NUMBERS: Single copies to Members 40p, to others 50p, for July 1977 issues onwards; deduct 10p for prior issues.

**'WINGS'! SPECIAL OFFER! — Members Rates Only**  
Last 3 issues £1.00 Last 6 issues £2.00 Last 12 issues £3.80

# 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 an experience pilot.**

**Variometer Indicator**  
Essential for thermalling, helpful for slope-soaring. US plastic, ball-type. Full instructions provided. Very sensitive. Tested and recommended by Mike Collis. Send £15 to: Ann Collis, 90 Oval Gardens, Gosport, Hants PO12 2RD. Tel. Gosport 21961. Immediate delivery unless sold out!

**Galaxy-Flyer Helmet**  
now with the new British Standard 5361. Price £16 inc. P & P. Frank Acton, 53 Royston Park Road, Pinner, Middx. HA5 4AB. Tel. 01 428 2686.

**3 Second Hand Swifts,**  
around £280 each. Complete with bags and seated harnesses. Reason for sale: owners buying new Hustlers. Orders for Hustlers now being taken. R. Full St. Ives 7651.

**19ft Hi Fli** anodised finish with beautiful floral patterned sail design, cambered keel, incorporates quick rig system. Can be flown seated, prone, two seater. Suit 10-13 stone beginner to intermediate. Includes seated/supine harness £260. Pat King, Bishopston (Glam) 3381.

**Cirrus III.** American built, multicoloured sail, 9 months old, well looked after, £350. Owner going abroad. Also, ElectraFlyer vario, as new, £105. Tel. Peter Robinson on Warmwell 852136

**U.P. Dragonfly** with green and yellow dacron sail, in perfect condition, rigged prone, complete with bag. This well known personal high performance American Hang Glider must now go at £350. Also several other high performance American Hang Gliders to clear. Mark Southall Marlborough 3021 (06725) day. Burbage 547 (067281) evenings.



## The Amethyst Hotel

*Keel, Achill Island (Minaun Heights)*  
Hang Gliders welcome  
Telephone: Keel 4  
For Brochure



**Bill Bennett Phoenix VIB** 7 months old, perfect condition — £450. Josef Bacher, Plymouth 65472, after 6

**Hang Glider's Mobile Home** VW Caravanette 'L' reg. Genuine 24,800 miles from new 12 months MOT. With full length roof rack and Wasp 229 hang glider. £1,595 ono the lot or will separate. Details: 021-744-6336.

**Cobra 17ft.** + seat, red and white sail, 9 months old. £175 ono. 0480 68882.

**HiWay Cloudbase 20** wanted. Tel. Bob Kelly, Littlebourne 553

**Ridge Rider** 240 sq ft. Seated harness, Terylene sail. Complete and undamaged but slightly tatty, hence £95. Martin Ingram, Tel. Byfleet (Surrey) 43121 (evenings).

**Wanted Hang Gliding Fanatic** to share flat in Taunton Somerset. Move to where there are large smooth hills within 30 mins drive. Friendly people and beautiful countryside all for £4 week. Apply Isle Brewers 537

**Moonraker** because I have to return to sea, I have for sale my immaculate, flown 6 times, Snoopy Moonraker. Colours: blue, yellow, red and white with Snoopy sewn into sail. Complete with bag £425 ovno. Tel. Jim Evans on Didcot (0235) 814176.

**SST 100B** as new flown less than 20 times. Distance, Domestic, Financial & Bottle trouble (not necessarily in that order) Forces sale. £425. No messers please. Also prone harness (air stream) used 6 times £20. Tel. 01 658 4245.

**Advanced Rogallo** for sale, class 2 machine, 95° nose angle, 2.75° billow, 26ft span, 15.5ft keel, one year old. Designed and built by Everard Cunion. BHGA registered. Offers to Everard Cunion, 155 Fairmile, Christchurch, Dorset. Tel. (02015) 3847

**Hiway 240** with seated harness, soars beautifully but little used. Only 10 months old, while kite in perfect condition. Must sell, hence bargain at £170. Tel. Ian Hunt, Camberley 64877

**Birdman Albatross** 240 sq ft, suit the heavier pilot. Modified at Birdman factory for quick rigging. Really good condition, quick sale. £150. Tel. Bert Tyrell, Wooton Bassett, Wilts 2994 evenings.

**Seated Harness for sale,** very good condition. Offers to Tony Elsdale, Ickford 298. evenings.

**Chargus Vega,** good condition, nice colours. Can deliver. 260 ono. Tel. Iain, Penn 2911

**1 Year old 20ft radial Cloudbase,** coloured red, gold and black. Included with the kite are harness, bag and free tuition if needed. £200. Contact Northampton 858274 after 6 p.m.

**Cloudbase 20ft radial,** seated/prone harnesses, bag, excellent. £245 ono. Also Skyhook 18ft standard. Really as new. Seated harness and bag. Sensible offers please. Scarborough 0723 582108.

**Hiway Cloudbase 21ft.** radial in excellent condition, seated or prone rigging. Zip up bag, seated harness. £225. John Beatham, East Grinstead 22305.

**Breen Custom Kite** 18ft. Good condition no accidents. Mauve/green sail, seat, bag, spares, and flying lessons. £145. J. Sealey, 25 Western Hill Close, Astwood Bank, Redditch, Worcs. Tel. Astwood Bank 3297.

**Hiway 220** rigged seated, with seated harness and carrying bag. Matt black with red V. Smart and excellent condition. £180. Tel. Roderick James, Fairbourne 244.

**Osprey 520** for sale. Red, white and blue sail, carrying bag. £90 ono. Joe Frame, 30 Patterson Drive, Law, Carlisle, Lanarks. Tel. 06983 72437

**Wasp CB 240** Kossen. Offshore commitments force sale. 30 logged flights. Prone and seated harnesses. Cover. Orange. £180. Broughton in Furness 462.

**Avon Kites Swift,** large size with bag and seated harness. £250. Reason for sale, purchasing new Hustler. Terence Tempest, Hayle 752413

**Midas C** excellent condition with E kingpost sleeve and C of G strop. Delivery considered. £375 ono. Tel John Long, Isle of Brewers 537

**Falcon IV,** good condition successful thermal flights £370. Also — Two audio varicos, very sensitive £50 and £60. Phone Nick Lawler Arborfield (0734) 760645

**Wasp First class** condition Unmodified. Only used three times still virtually new. Price wanted £150. Please apply either by phone no. below or letter. Reply wanted ASP. 24234851 LCpl SIM RN, 664 Squadron Army Air Corps, RAE Farnborough, Hants. Aldershot 24461 Ext 3571.

**Prone Web Harness**  
Brand new hardly used. £30. Tel. Newbury 40992.

**Hiway 240** Ideal for beginner, patriotic red, white and blue, good condition, recently checked by Hiway factory. £160. Tel. 01 669 0835 (Home). Epsom 23555 x 2586 (Office).

**21ft Cloudbase Radial,** Red, gold, blue sail. Good condition, never pranged, seated harness and bag. £225 ono. Winchester 880686.

**£350 Wasp Falcon 4** Excellent condition. Tel. after 6pm Titchfield (Hants) 45073. Ask for Frank. Or write: 15 Nashe House, Nashe Way, Fareham, Hants.

**For Sale — Fledgling** semi rigid glider, rigged for seated flight, new condition, first £300 for quick sale, reason for sale, cash required. A.H. Trapp, 135 Beeches Road, Kidderminster, Worcs. DY11 5JB. Tel. Kidderminster 62429 evenings.

**Flexiform Spirit** 22ft. blue & white, seated or prone, with bag £260, please Tel. Lancaster 67815.

**Small ads must be limited to 35 words. Non BHGA members or commercial small ads will be accepted at a cost of 5p per word. Send (a minimum of 20 words) to the commercial editor together with a cheque or postal order for the correct amount crossed and made payable to the British Hang Gliding Association. Copy date: 18th of the month preceding**

**Ultralight Spider 168** Black, brown, blue & white sail; high performance and excellent condition. For Sale after British and Welsh Open. Contact Skip Dennis c/o Welsh HG Centre, New Road, Crickhowell, Nr. Abergavenny, S. Wales.

**Wasp 229 B3 Red,** white, blue, orange sail. Spare wing boom. Ideal learners kite. £80. Tel. Knightwick 681 (Worcs).

**Wanted — Plans** for Quicksilver monoplane. Write: D. Robertson, York House, York Place, Cullen AB5 2UN, Scotland.

**Manta Fledgling** for sale. Immaculate condition. Blue sail with gold panels. Fully anodised airframe. £380 ono. Tel: Roger Ashton on Kingswinford 78372.

## lost & found

**Lost at Hay Bluff** on Sunday 31st July, Silver identity bracelet. Sentimental value attached. Tel: Roger Ashton on Kingswinford 78372

**Found At Mere** The following can be claimed from the Membership Dept, 2 Lynch Down, Funtington — please send suitable S.A.E. for return of items and supply description of goods for identification purposes: Zoom lens & case, lens hood, light meter, cigarette lighter, sun glasses, keys, peaked hat, overtrousers, several empty Long John Whisky bottles, Moyes Stinger etc. etc.

If anyone anywhere has any old USA HG magazines they would like to get rid of cheaply (or even free), please contact Devon & Somerset Condors Secretary Brian Smith at 16 Tidwell Road, Budleigh Salterton, Devon.

**Wasp 201 C4** Black and gold sail, prone bar, seated and prone harnesses, kit bag. 5th skirrid, 5th Pickering, 7th Mere. Delivery considered. Offers after 6 p.m. Tel. Medway 62685.

**Wasp C4/221** in Red/Black Sail, Gold anodized tube work. In Specimen condition throughout. Complete with harness and bag. £150. Check out at: M. Cross, 45 Charlton Avenue, Hereford, HR2 7HP. After 6 p.m. or weekend.

**Cloudbase 20, Radial**, good nick, pretty and clean sail. Upgrading. £230. Transport south possible for a small fee. Ian Trotter. 031 552 7736. 6-7 p.m.

**Two months old kite.** Designed and built myself (3 years of experience). Features floating cambered sail, wingbooms 20ft, keel, 13ft, inflated leading edges, stainless rigging. Royal blue, yellow, pale blue, white colours. £300. Tel. 01-3487952, Fred.

**20ft. Cloudbase Radial** prone & seated harness, green with gold and purple tips. It must be sold so £240 or very near offer. Phone Office hours 01 584 7070 Ex. 212 — Derek.

**Skyhook 3A** blue/orange little used, looks very smart, seated harness, £100. Tel. Sheffield 79018, after 6 p.m.

**Chargus 19/50 Solar**, very good condition. Green/white/red, 257 sq ft terylene sail, seat harness, cover, superior performer. For quick sale and to make space in garage. £130. Brian Hayward, Waltham Cross 26950.

**Hiway 260** Ideal for heavier pilot or dual. Prone or seated. £125 ono. Tel. Lewes 77183

**Wasp CB 240** red/white, good condition. A good strong soaring machine, 'Kossen' breakdown A-frame, prone & seated harnesses, breakdown crossboom, top rigging standoffs, suit beginner, or standard seated pilot wishing to go prone. £200. Gravesend 55051.

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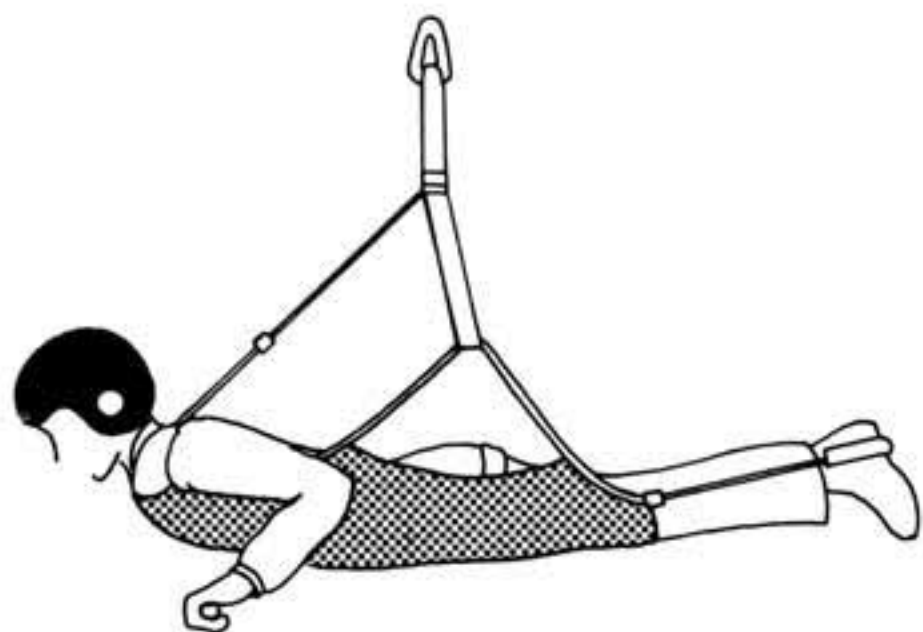
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