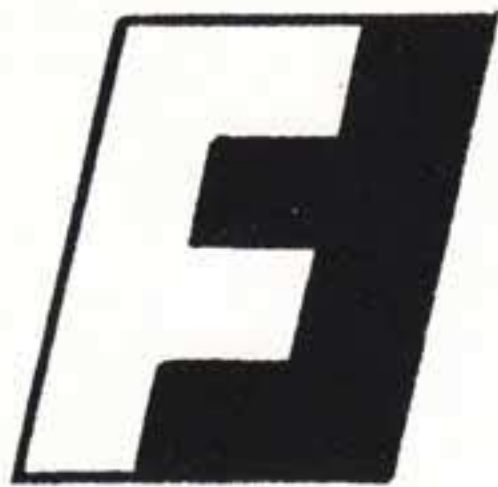


WINGS!

JANUARY 1978

MAGAZINE





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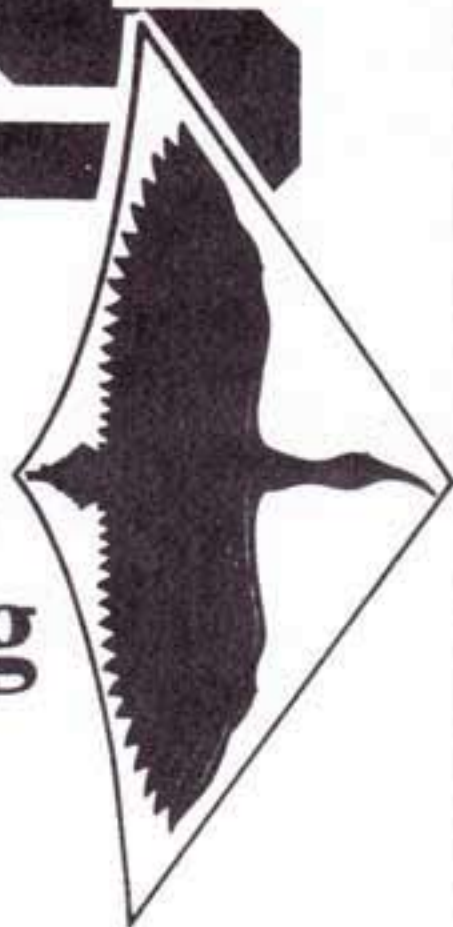
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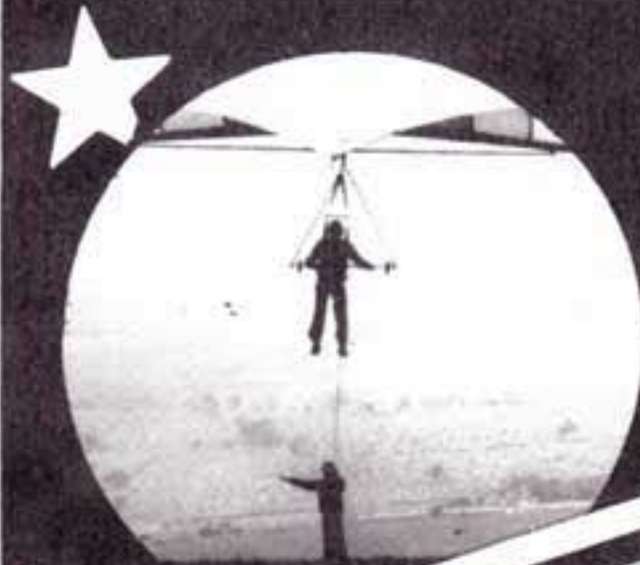
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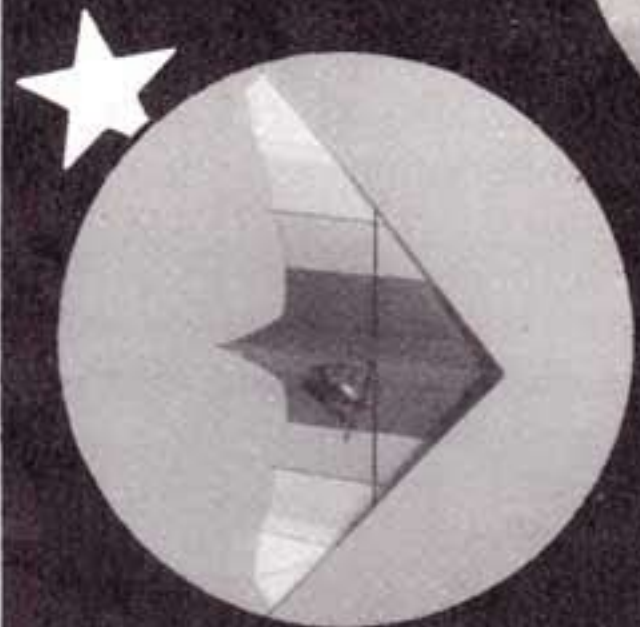


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WINGS!

The official magazine of the BHGA

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Hemel Hempstead, Herts.

Icarus returned? Martin Brenchley looks as if he is flying his Cloudbase a little too near the sun.

Photograph: Mrs. Brenchley.

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Two friends of mine are in hospital having suffered major injuries in hang gliding accidents. That they are still alive is a tribute to the medical care they received. They may or may not recover sufficient fitness to fly again.

O.K. so many of you are in a similar position, and some of you have lost friends for good and maybe I'm being unfashionably emotional about this but hang gliding can be lethal and too many of the fliers I know seem to have forgotten that.

At the symposium at the Royal Aeronautical Society in February 1977, I asked Martin Hunt to estimate what proportion of accidents was attributable to pilot error. He was understandably cagey. Steve Hunt was less so. The conclusion I reached, in a U.K. context, is that, apart from the very rare structural failure in normal flight attitudes, they all are. Given that the hang glider pilot requires skills in flying, aerodynamics, engineering, meteorology, micrometeorology, air traffic and probably every other skill involved in any other form of aviation except seat reservations, the scope for error is immense.

Let me make it clear right now that I have nothing but praise for Tony Fuell, John Hunter and Keith Cockcroft, and for the several schools. It's not the fault of Tony, John or Dave Worth that it takes time to publish results. I'm not offering criticism and I've no wish to tread on anyone's toes. Yet despite everybody's efforts, pilots are making errors and ludicrous errors at that. Often they get away with it and it's only when a serious injury results that the general, non-local flier gets to know about it. The trouble is that the margin between a bent control frame and a broken neck is tiny: if you lose control of a hang glider, the consequent damage is a matter of

OPINION

In Praise of Brown Flying Suits

by Ian Trotter

chance.

So what have I got to offer to help the situation, to try and prevent any more pilots, friends of yours and mine, lying for weeks in a coma? Not a lot, I'm afraid, apart from attitudes, emphasis and a quotation from that symposium, from Martin Hunt. Both he and Ann Welch, respected and experienced people, laid great stress on something variously described as wisdom, airmanship and judgement. I've seen little in print on the topic since then and heard even less in conversation. Maybe seeing Martin's words in print will redress the balance.

"What we need is a system of education to make people realise that airmanship is what counts. Treat it with respect and it's a great sport; neglect your education . . . and you're an accident looking for somewhere to happen. (The pilot's) Stupidity ignorance and lack of care can contribute greatly to the hazards. He puts himself at risk by failing to recognise his own limitations. There are times when he will be unexpectedly faced with unfair hazards, but the unexpected is what all pilots must expect".

I'm no brilliant flier as anyone in Scotland will confirm. I've had a moment's concussion but I think I've learned from it and I've no intention of

having another. Scraping a hill to me probably means at least one full wing span away from it and if I can't make it at that, I'll go down. I'm trying to eradicate a habit (in prone) of swinging the legs away from the hill on a soaring beat, because it's inefficient, but it does I think indicate good psychology: if anything goes wrong, I'm ready to pull the bar and roll away from trouble; in fact I'm anticipating it. When you've seen a pilot, moderately experienced, get gusted, fully downwind, straight into the ridge he was soaring and found yourself, despite First Aid training, unable to do much to help, maybe inelegant, drag-increasing sub-optimum SAFE flying is understandable.

Given the limitations of local conditions and a nine-to-five job, I probably fly a fair bit. I'm tense at take-off, at landing, when close to the hill, in turbulence and probably, to tell the truth, in every in-flight situation except hovering peaceably high up in smooth lift with nobody else around.

Education in push, pull, left, right, take-off, turn and land can safely be taken for granted, and I'm sure the schools go a great deal further than that. But the development of individual judgement is an on-going process and it's up to the clubs and *Wings!* and every individual pilot to

assist because the fliers at risk are those who already have an Elementary Pilot Certificate and who are probably rarely seen again at schools.

And it doesn't stop at Pilot badge level either. Brian Milton amazed me at that same symposium by suggesting that some experienced pilots had "lost their keenness to differentiate between airspeed and groundspeed". Vector addition notwithstanding, to me the two are almost unrelated, or perhaps it would be better to say that I'm not concerned about groundspeed unless I'm close to the ground. But how many people, a year after that remark, still have that problem? How many people have come into the game since then and, for one reason or another, failed to appreciate the importance of airspeed? How many of you reading this now use groundspeed as your main means of discovering airspeed? Are you an accident looking for somewhere to happen?

I admit it, I'm tense a lot of the time, my eyes are probably glazed before a tricky take-off and if you watch me carefully in turbulence you'll probably see the odd minute twitch near the back straps of the harness which has nothing to do with control movement. I'd rather make an unnecessary trip behind the bushes before take-off than an urgent trip to hospital afterwards.

We all know, or we certainly should, about the risks of simultaneous new experiences (site, glider, harness, conditions, tuning) and we all know, or should, the techniques of controlling a hang glider, and we all know, or should, the necessity of a proper pre-flight inspection.

I beg leave to question whether our judgement's as good as our technical knowledge, and to suggest that it's more important.



NOTES FROM THE FLIGHT TRAINING OFFICER

Accidents — People are still not reporting them. If you see an accident it is your own personal responsibility to report it to John Hunter as in the flow chart on page 26.

It does not matter how many reports we get on the same accident, this gives us a broader idea of what really happened. It is also the responsibility of the 'victim' to report any accident or incident, injured or not.

Sites — Sites should be every club's major concern and yet many clubs still seem to take them

for granted . . . until something happens. Clubs must get their sites tied up and registered with the BHGA. If positive action is not taken on this matter then you cannot expect to 'close the gate after the site has bolted'.

Gliders (the big rigid ones) — It has come to my notice that there is a bit of 'aggro' between US and THEM. Remember we are all fliers and it is possible for us to share the air in a 'safe and co-operative' manner. It is a good idea to spend some time at your local gliding club, learning their procedures and flying patterns; get to know them and talk with them . . . you will learn a lot.

Instructor Training Programme The first of the BHGA instructor training weeks went off well at the end of October. Much was learned both by assistant instructors and myself — yet we still have a lot to learn from our more experienced counterparts,

the BPA and BGA on instructor training. Once the schools have completed this programme a member club instructor training programme will stand

Accidents requiring hospitalisation within schools have reduced to two-thirds of the amount per hundred pupils, considering that most pupils were taught, on average, over three days instead of one day. (This involved less people (2,700) over a longer period of time (three days). The statistics are most reassuring:— i.e. consider pupil teaching days — in 1976 about 9,000 = 89 accidents, and in 1977 about 8,100 = 26 accidents.

So the amount of accidents in 1977 compared with 1976 are about one-third. NB. A hospitalized case is not necessarily a break.

Not all accidents were reported in 1976. Pupils have a 300-1 chance of ending up in hospital as opposed to a 100-1 chance in 1976 (quite an improvement).

Elementary Pilot's Certificates (EPC's) — These forms are only available through registered schools and clubs. Forms sent in from any other source will not be accepted and duplicates will be returned.

F.A.I. Licence — The minimum qualification for an FAI Sporting Licence is the FAI Delta Bronze. Applications for this licence should be sent to the FTO (Keith Cockcroft). As soon as the FAI Delta Bronze badges are available and a price is known, an announcement will be made in *Wings!*

Observers — From 31st December 1977 onwards, only observers, as listed in December *Wings!* will be allowed to sign task forms for the Pilot and FAI badges. EPC's should be signed only by club officials and chief flying instructors of registered schools.

Keith Cockcroft
Flight Training Officer

H.G.V.'s, V.W.'s, AND B.H.G.A.

Dear Sir, I must protest most strongly about the wording in Tony Fuell's leader to his comments on the League 1977 (*Wings!* December) as a H.G.V. driver os some fifteen years. In my opinion the only idiots on the M1 that day were the people in Peter Day's VW. If they were to get hold of a copy of The Code of Good Practice issued by the B.H.G.A. and read section 2C. "Drive considerably — you are easily identifiable with your glider on the roof". — they would see what I'm getting at. These are the pilots that the public tends to notice more, not the 90% of B.H.G.A. members who try to behave like normal considerate people.

Dave Lynch
London

DESIGN EXCHANGE

Dear Sir, From time to time letters have appeared in these pages lamenting the apparent lack of interest in producing a 'home-grown' high performance design. I say 'apparent lack of interest' because I don't believe that the non-appearance of a British worldbeater is a true indication of a lack of interest among BHGA members.

I for one have been very interested in hang glider design for three years and I know how difficult it is to obtain sufficient information to put a promising design together. Fear of committing myself to the expense of an unsuccessful project has prevented me 'cutting material' on a prototype.

I sometimes wonder how many other armchair fliers there are about the country waiting for something to happen, and therefore I propose the following scheme.

I would invite anyone interested in giving, exchanging or receiving technical information to write to me giving brief details of what your particular interest is, what you'd like to know and what you could perhaps help somebody else with.

If the response is good enough, I should be able to put you in touch with somebody who can help you (or vice versa). Hopefully this scheme will be successful; I believe that the exchange of information could be a great stimulus to the development of high-performance machines in this country.

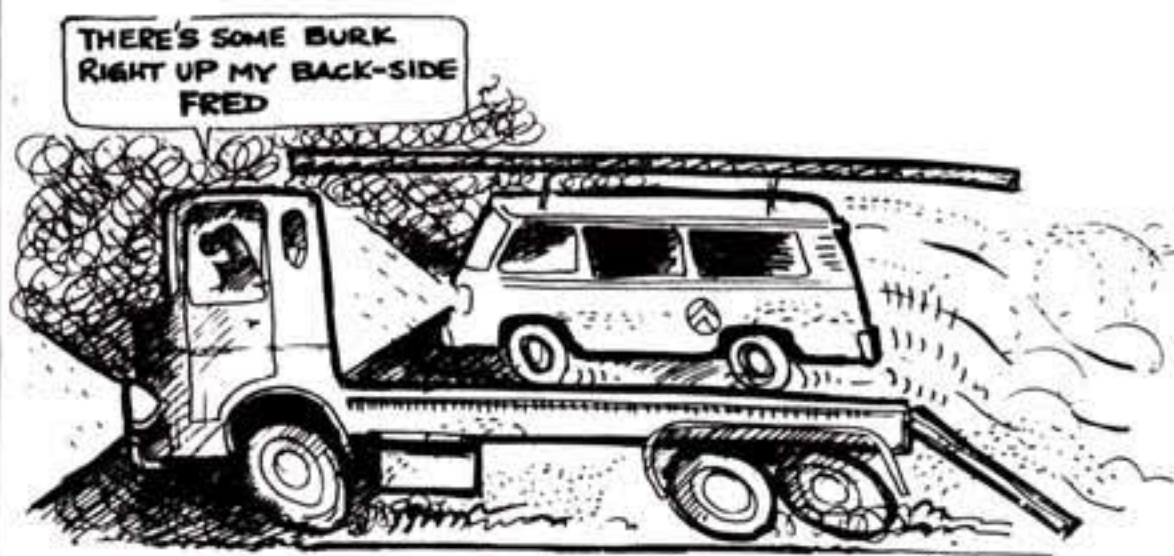
Wishing all fliers, both active and armchair types, and happy and prosperous New Year.

Neil Martyn,
20 Ventor Close,
Swindon, Wilts.

VARIO KITS

Dear Sir, I am sure that a Vario to most pilots is a luxury beyond the range of the average pocket and at the risk of receiving criticism see the profit margin as being rather large.

I would like to see Vario kits available for the ambitious, or even plans available for the more ambitious, surely this would create a



AIRMAIL

higher return for manufacturers and see a lot more pilots enjoying the delights of cross-country flying.

Dave Orrock
Hertfordshire

MIN SINK VERSUS MAX GLIDE

Dear Sir, John Hudson's interview (*Wings!* Nov.) with Bob Bailey, Bob Calvert and Graham Hobson contains an argument, friendly no doubt but never quite resolved, about flying downwind either at Min Sink or at Max L/D.

I did some sums on this for an article for *Flying Scot* and I side with Bob Calvert's suggestion of Min Sink in general. If you have something specific to go for, like a thermal marked by another glider, and don't mind losing height, by all means use Max L/D but otherwise Min Sink.

Take a glider with a Min Sink rater of 200 ft. minimum at 14mph. and a Max L/D of 8:1 at 22mph. Now fly it in a horizontal wind of 22mph. at Min Sink and at Max L/D, upwind and downwind. Flying upwind at Min Sink (you might have your reasons), you achieve a glide angle over the ground of minus 3.5:1. Upwind at Max L/D you go straight down (0:1). Downwind at Max L/D you get 16:1 and downwind at Min Sink 15.8:1, so there's nothing in it. Take another glider with 200 ft. Min Sink at 22 and 8:1 at 26 in a horizontal wind of 26. Downwind at Max L/D again gives 16:1, but downwind at Min Sink gives 21:1, which is well worth having. As Bob Calvert says, if you're going for distance in a fresh wind, fly downwind at Min Sink and keep your height as long as you can, unless you see something really worth hurrying for.

Can I suggest that we all stop confusing Max L/D with "optimum glide" (or "glide angle") by agreeing that Max L/D is relative to the air (which it obviously is) and that optimum glide (if we must use the term at all), is relative to the ground?

There are bar positions for Min Sink and Max L/D regardless of whether you're flying upwind or downwind and the terms are familiar and meaningful.

Optimum glide on the other hand is too often confused with Max L/D and the best thing we can do with the term is ditch it. If you don't agree, try flying at Max L/D (22) in order to penetrate ("achieve positive glide through") a horizontal 40. If you manage it, I'll think again!

Ian Trotter
Edinburgh

Editor: Technically no-one has been right yet. In Aerodynamics by L.J. Clancy pp. 400-405 a great many calculations give the following conclusions for an aircraft gliding into wind and downwind, with a greater or lesser wing loading:-

'Clearly for maximum range in a tailwind, it is necessary to fly more slowly than when flying for range in still air. This is because the endurance is increased by flying below the minimum drag speed (Ed: i.e. max. glide speed) and, although this results in a reduction in air range, it does mean that the aircraft remains airborne for a longer time in which to take advantage of the tailwind blowing it forwards. The optimum speed, though lower than the minimum drag speed, is not as low as the minimum power speed (Ed: i.e. min. sink speed) which is represented by the minimum value V_s in the curve (Ed: Curve is a plot of sinking speed V_s against forward speed V). In a headwind, the speed for optimum range is greater than the minimum drag speed, and the time for which the aircraft is subject to the adverse wind effect is reduced. For similar reasons, when gliding for maximum range in a tailwind it is helpful to jettison weight (Ed: i.e. having a lower wing loading is an advantage). This increases the endurance and allows the aircraft to gain more advantage from the tailwind. In still air, as we have seen, the weight does not affect the range, so that it would be pointless to jettison while in a headwind and it would be a positive disadvantage to do so!

FREE FLYING

Dear Sir, looking back to the Mere Championships, I find the pleasantest

memories concern the short moments of free flight that took place. Without doubt, free flight is the essence of our sport, and is also more rewarding to watch than an endless spectacle of good fliers flying down in a quite soarable wind.

Therefore I suggest we have a freestyle event next year, where each flier in turn as 5-10 minutes of soaring time with the airspace to himself, with, if desired, the music of his choice coming out of a PA. If points we must have, they could be assessed on qualities such as control, economy of movement, smoothness, co-ordination, rhythm, overall mystic beauty etc. I suggest this, not as an attack on the more technical tasks, which are necessary, nor as a slur on the commentators, who gave their all despite the acoustics acoustics acoustics.

Richard Lawson
Avon

ACCIDENT PREVENTION

Dear Sir, To comment on Jim Potts letter in the December issue, reporting your accident is not a quick way to get your name in the magazine: there are two reasons for doing it. Firstly, you have to comply with the requirements of UK Air Law. This requires the pilot of ANY aircraft which is involved in an accident causing personal injury or structural damage to make a report to the appropriate authority. In our case the BHGA Accident Investigation Officer John Hunter has the delegated authority from the CAA to receive such reports. By making a report to BHGA, either directly to John or via your Regional Accident Co-ordinator, you comply with your legal obligations. When reports are received, they are investigated if they involve equipment failure, or a fatality: we generally do not have time to deal with all the "pilot-error" occurrences, unless we have enough of the same type of accident to warrant such action.

But by making an accident report, you can help contribute to the second part, which is ensuring that a similar occurrence doesn't happen to someone else. A great deal of progress has been made in the development of safe equipment, and the pilot of a modern UK-manufactured glider with the recommended harness has little to fear from equipment failure. Most accidents are due to pilot error, and publishing good advice, in *Wings!* or elsewhere seems to have little effect on the silly behaviour you see on the hills. We have to keep plugging away, of course, but most of the "pilot-error" accidents result from failure to follow already published advice.

There is a limit to the amount of "accident prevention" information that I can produce. I would emphasise that ANYBODY can write an article for *Wings!* There's no point in moaning about a lack of information if you aren't prepared to do your bit. Our magazine is open to anyone who

can pick up a pen. I really don't like seeing *Wings!* full of Tony Fuell — writing these articles is bloody hard work and anyone who's willing to share the load is more than welcome.

And Yes, Sir, the standard Rogallo is D.E.D. — dead! The sooner those baggy, flapping, partially-controllable horrors are converted to garden furniture the better, as far as I'm concerned. And that goes for those giant lumbering Class III monstrosities as well — anything which requires a 17 ft. trailer and a ground crew and *still* won't perform better than the average 1977 glider will ultimately be consigned to the dustbin where it belongs. Dave Cook's welcome to bring that old VJ-23 to any League Competition he likes. He will be **EATEN ALIVE** — that is, if he dares to fly it in the marginal conditions we seem to get all the time. And if he and his ground-crew can still stand up after carrying it two or three miles in a howling gale up a thousand feet or so!

Tony Fuell
Brighton



TWIN KEEL: PHOTOGRAPH

For all those who enquired about the new twin keel high aspect ratio prototype mentioned in News Roundup page 17, September '77 *Wings!* I enclose a photo of yours truly putting it through its paces at Rhossili.

Edmund Hui
PR Officer UCSHGC

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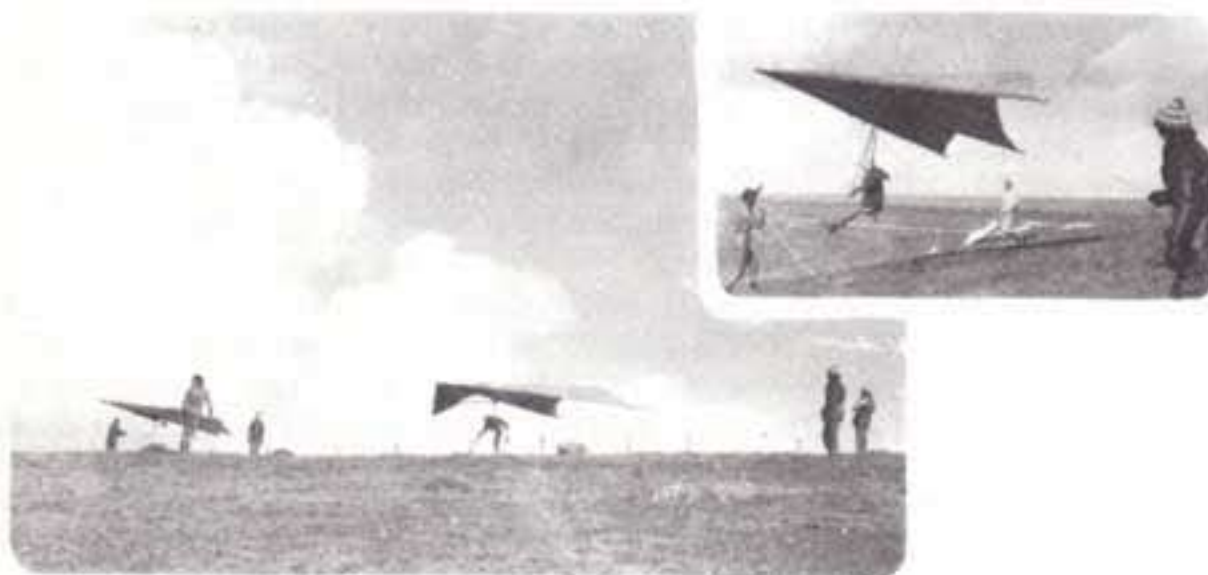
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WING TIPS

DROGUE PARACHUTES

by David Squires

I have been experimenting with a small drogue parachute after reading a letter in Hang Gliding.

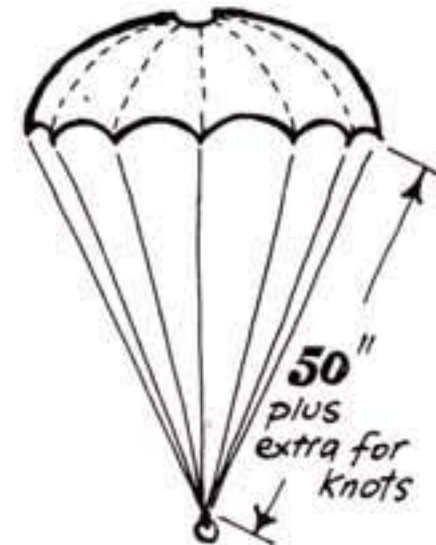
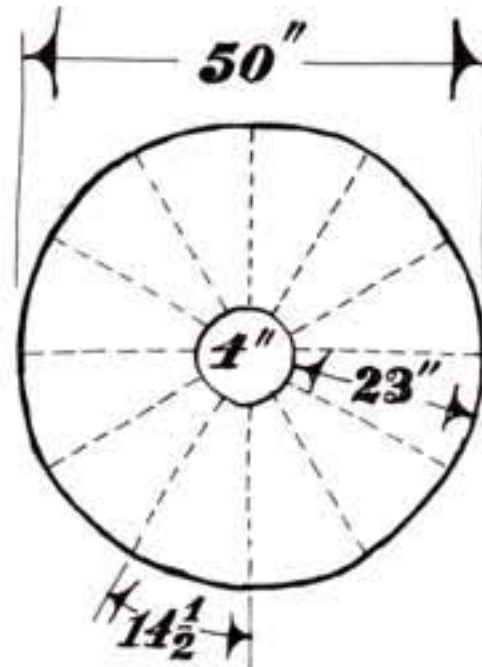
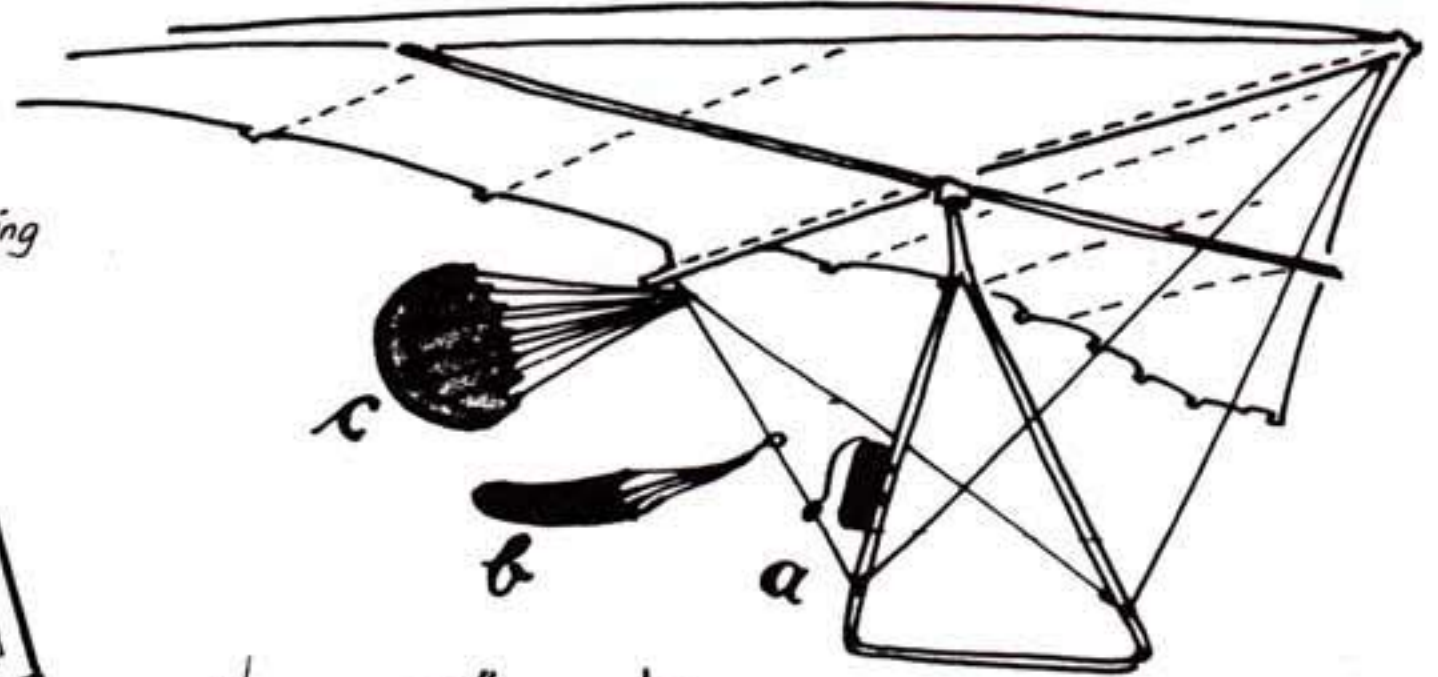
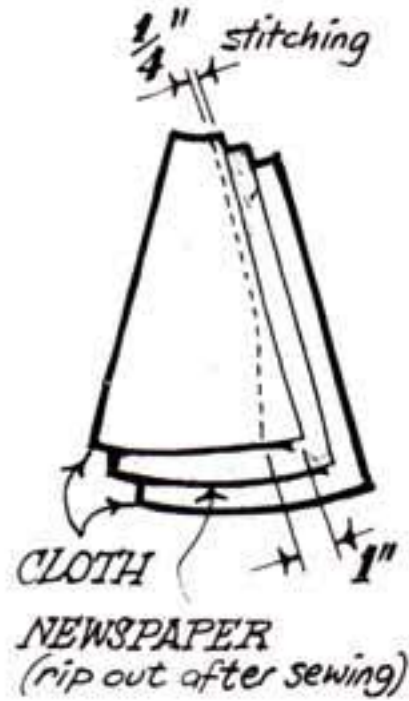
The chute is made from twelve panels of 1oz. rip stop nylon (Spinnaker Cloth). The strings are attached to holes cut in the seam of each panel and then to a small carabiner which clips over a rear flying wire. In flight the folded chute sits in a "Squezy" bottle, taped to the control frame. It is pulled out and thrown back, so that its own drag pulls it up the rear wire where it deploys.

The glide angle of the glider is then reduced making the landing field effectively bigger. I have only tried it out twice and there was a noticeable slowing feeling. Landing is slightly different, requiring a hard flare later than usual, but there are no stalling problems.

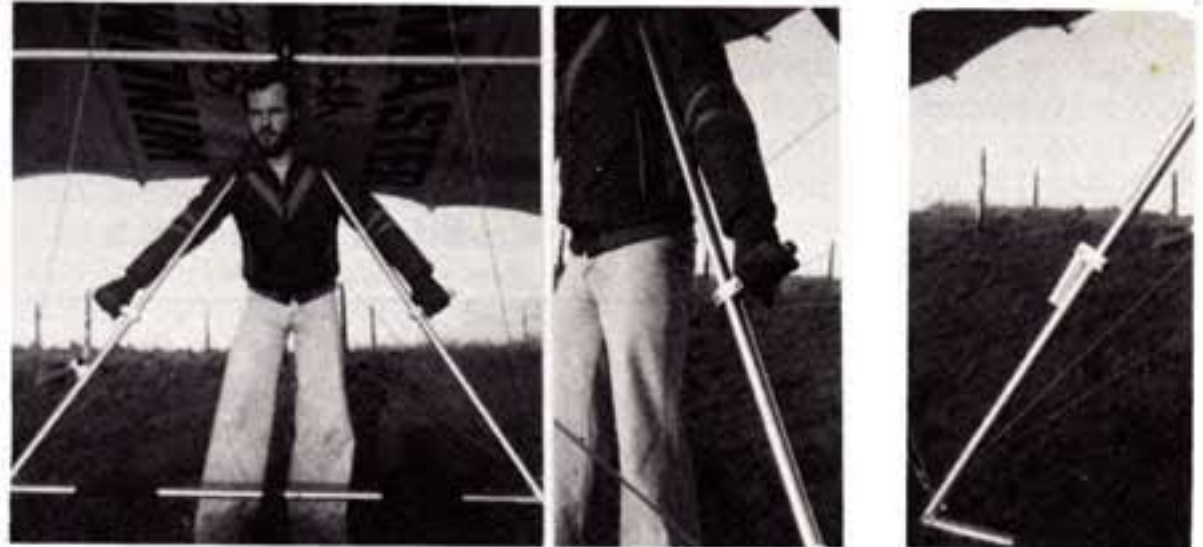
Materials cost is under £5.00. Panels are placed together with a sheet of newspaper between them. This helps an ordinary domestic sewing machine to catch the fine cloth. They are sewn

together with a taper inwards to give the correct shape.

Strings are attached at each seam and to the small karabiner.



VENTUS A-FRAME HANDLES



CARRYING

FLYING

Cure that hang gliders shoulder!

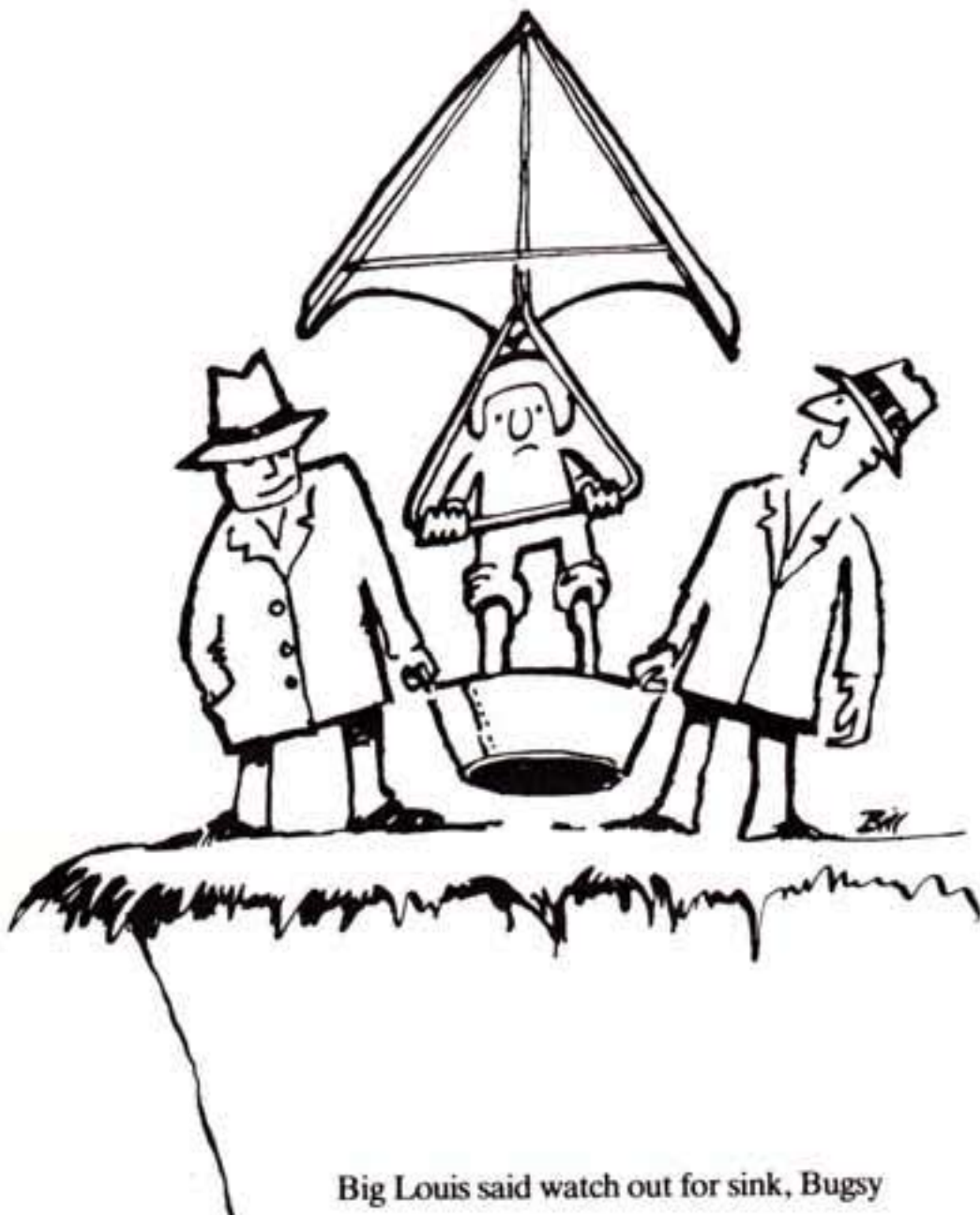
VENTUS lightweight foldaway handles take the backache out of kite ground handling.

£5.95/pr. post free, (state tube size, 1 or 1 1/8).

C.W.O. to: D.J. Shaw,

357. Devizes Road, Salisbury, Wilts.

Tel. 0722 25001, evenings.



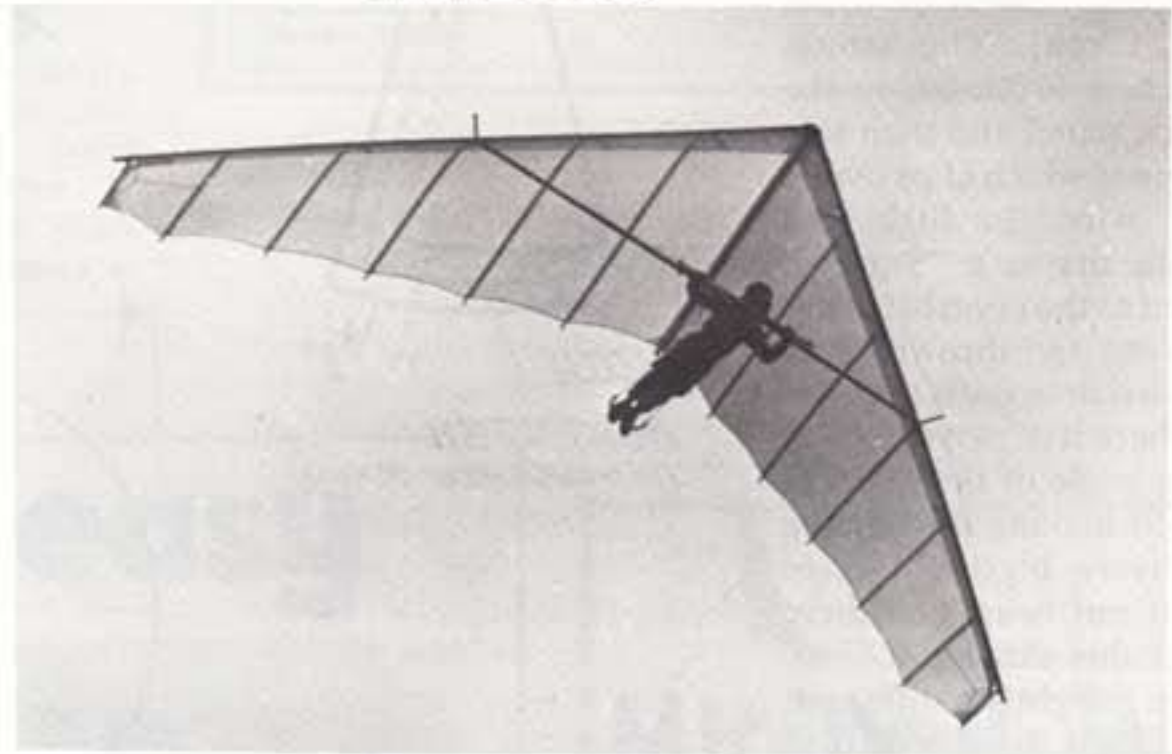
Big Louis said watch out for sink, Buggy

**CHARGUS GLIDING CO. LTD.,
GAWCOTT, BUCKINGHAM
TEL. BUCKINGHAM 4321**



VEGA II

MIDAS



	MIDAS 'C'	MIDAS 'E'	V IIA	VIIB
L/E	19 ft. 3 in.	19 ft. 11 in.	18 ft. 6 in.	19 ft. 8 in.
KEEL	8 ft. 3 in.	8 ft. 3 in.	14 ft. 7 in.	15 ft. 7 in.
S/A	166 sq. ft.	188 sq. ft.	195 sq. ft.	220 sq. ft.
N/A	110 degrees	110 degrees	100 degrees	100 degrees
BILLOW	1.6 degrees	1.6 degrees	2.25 degrees	2.25 degrees
A/R	6.0	5.7	4.16	4.09
L/D	8 to 1 +	8.5 to 1 +	7 to 1 +	7 to 1 +

AGENTS

GRAHAM SLATER,
Southern School of Hang Gliding,
11c Denmark Terrace,
Brighton, Sussex.
Tel. Brighton 25534

DEREK SIMPSON,
9 Leckhampton Close,
Warndon,
Worcester,
Tel. Worcester 51781

PAUL WINTERINGHAM,
Long Orchard,
Alderbrook Road,
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Tel. 021 705 4248

DUNSTABLE SCHOOL OF HANG GLIDING,
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Great Horwood,
Bucks.
Tel. Winslow 2086

RICHARD WARE,
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North Yorks.
Tel. Sherburn 333

GUY BURTON,
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Keynsham,
Bristol.

3-4 WEEK DELIVERY ON ALL MODELS

As we move into another new year, let us take a look at some of the things which have appeared in *Wings!* and its forerunner *Flypaper* in the past.

SOARING THOSE THERMALS

Wings! No.7 July 1975

Before I continue, I would like to say that I don't know exactly what a thermal is and the lift, which I am referring to as a thermal, is that one which one can get whilst soaring beneath a passing cloud; suddenly the control bar pulls strongly and the ground drops away rapidly. Often this lift is quite spasmodic and accompanied by a considerable amount of turbulence, but if the pilot can 'hold on' (and I admit it can be quite frightening) and then work his way away from the ridge, then some fantastic altitude can be gained enabling some dynamic manoeuvres such as 360's and 'figure of eights' . . .

With this spell of hot weather we had been having, my friend Bob Calvert and I have had more than our fair share of this type of flying. On one notable day, we were soaring a small

150 ft. local ridge in a 22mph. wind with clouds forming on the other side of the valley three miles away, and when they arrived often hefted us up to about 1,000 ft. After realising what was happening, we patiently buzzed up and down the ridge waiting for the next cloud to come so we could, hopefully, catch its thermal. It must have been amusing to see first one kite pop up to become just a small triangle in the sky and then, when it came down again, the other . . .

Probably there are people who would say that flying thermals is too dangerous because thermals are unpredictable and turbulent and such flying should be discouraged, particularly now that the public eye is on us now more than ever. My only answer to this, ironically, is to ask another question: 'Why do we fly hang gliders?' Think about it and see if you can blame some of us for adventuring. You may think it is a little weak but it is all the answer I need.

Graham Hobson

FLYPAPER No.13

Points from Tony Fuell's letter

Accidents — Isn't it time we had a pilot's licence system for NHGA members?

Sites — I'd like to suggest that the NHGA produce a site manual, with info on sites, who to contact, possible hazards, wind conditions, etc. I would be prepared to have a go at compiling material for such a publication.

SPOT LANDING LEAGUE

Wings! No.2 February 1975

For future events it would be a good idea to have a grading system to ease the burden of any selection committee — a sort of league table. Of course we all know that it isn't always the league winners that take the cup, so there will be a need for a selection committee, who may base their choice on more subtle factors like consistency, diplomacy and sportsmanship. Well, we already have a ready-made selection committee, but what about

the grading system. Taking a clue from 'Groundskimmer', we suggest that the landing area of all club sites be marked out with a target, cut or painted in the turf. According to the Groundskimmer report, fliers will be attracted to this like moths to a candle. Then there is an easy way for club secretaries and BHGA area representatives to assess the performance of fliers . . .

Fliers can nominate their league flight at any time before take-off and results can be averaged and passed to the BHGA. We will be pleased to publish the table each month.

do
you
remember?

OTTO LILLIENTHAL 1895

(the first account in history of an aircraft crash by the pilot)

During a gliding flight taken from a great height, this was the cause of my coming into a position with my arms outstretched, in which the centre of gravity lay too much to the back, at the same time I was unable to — owing to fatigue — draw the upper part of my body again towards the front. As I was sailing at the height of about 65 ft. with a velocity of about 35 miles per hour, the apparatus, overloaded in the rear, rose more and more, and finally shot, by means of its vis a viva, vertically upwards. I gripped hold tight, seeing nothing but blue sky and little white clouds above me, and so awaited the moment when the apparatus would capsize backwards, possibly ending my sailing attempts forever. Suddenly, however, the apparatus stopped in its ascent, and, going backward again in a downward direction, described a short circle and steered with the rear part again upwards, owing to the horizontal tail which had an upward slant; then the machine turned bottom upwards

and rushed with me vertically towards the earth from a height of about 65 ft. With my senses quite clear, my arms and my head forward still holding the apparatus firmly with my hands, I fell towards the greensward; a shock, a crash, and I lay with the apparatus on the ground.

KING POST AND UPPER RIGGING

by Gerry Breen

Wings No.2 February 1975

Although most manufacturers now fit king posts (that pole on top of the rogallo!), I am surprised at the number of people who still ask, 'Is upper rigging still necessary?' I think the time has come to dispel the mystical aura that surrounds the king post. The answer to the above question is an emphatic YES . . .

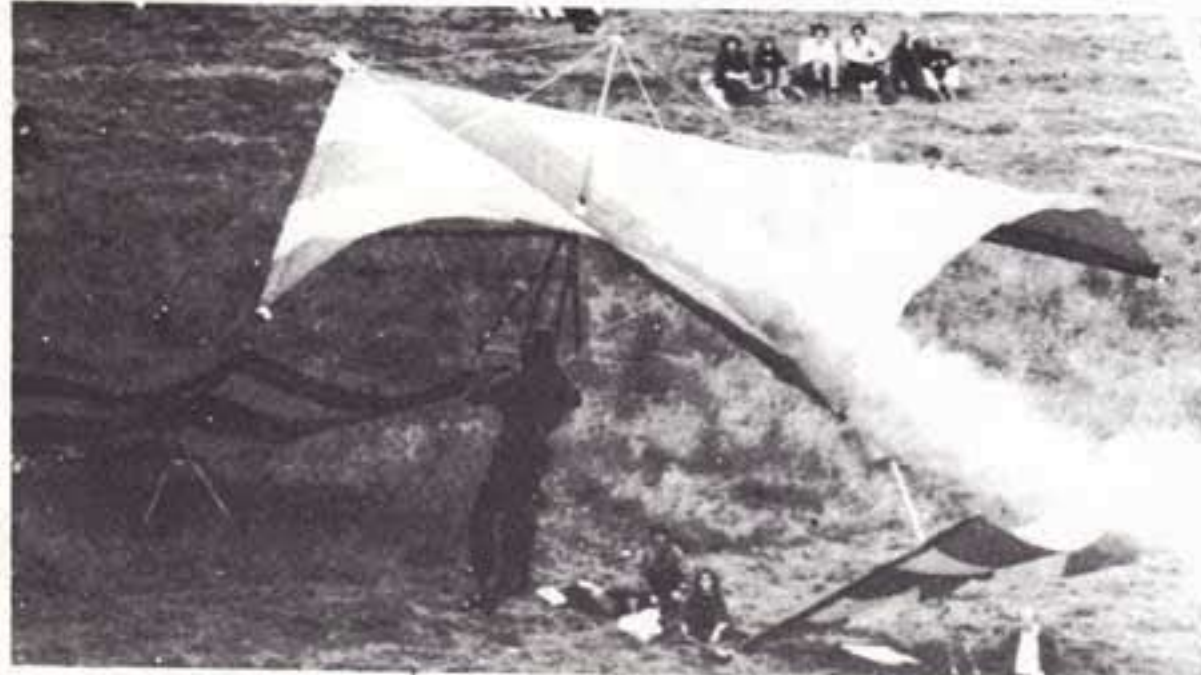
Wings! No.5 May 1975

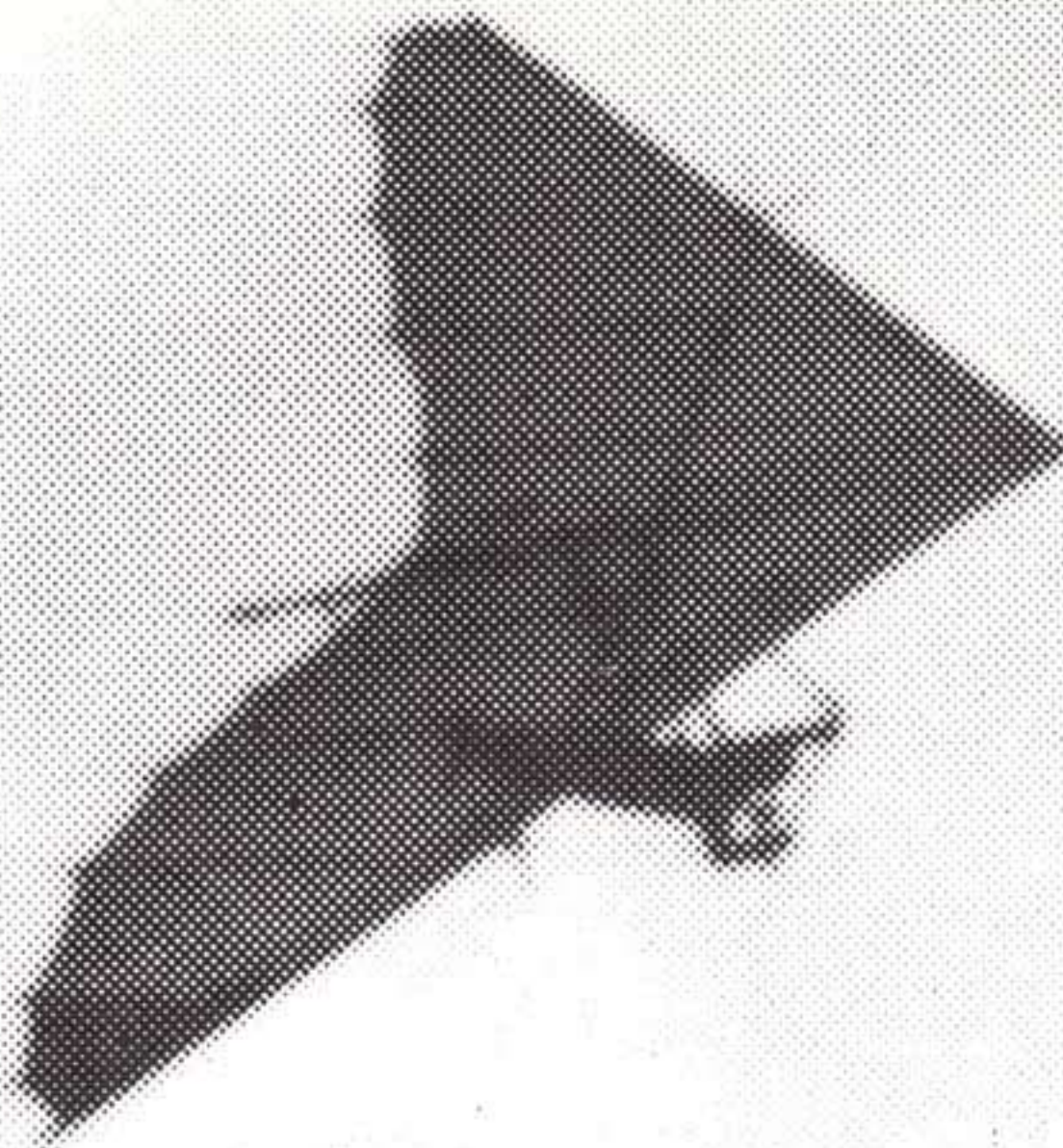
For sale: Wasp 229 B3 4oz. red and white rip stop, home-made carrying bag plus soaring bar . . .



*John levers at the start of a clear run on a Hiway 5.3/80
Cam Long Down International, August 1975*

Steyning Bowl Championships June 1974. Eric Woods puts on a spectacular smoke trail display. Note chin level A frame!





skyhook power

We at Skyhooks got into powered hang gliding almost 4 years ago when a standard 18ft Skyhook 3A was flown with a McCulloch 101A engine.

The engine was attached to the glider about 3ft behind the control frame and well below the keel to give clearance for the 30in prop. Wire braces and struts steadied it in all directions and the whole thing took about an hour to assemble. The hang point and control frame was moved forward about 6in to compensate for the engine weight and as a result it was impossible for the pilot to pick it up and take off without assistance because it was very tail heavy until airborne. We needed an army of helpers to hold the kite up and run with it until it got off the ground.

The resulting flights were from the top of the hill to the bottom albeit with an extended glide angle of about 1 in 8 or 10 and this meant that we still had to climb up the hill carrying a very much overweight glider.

Interest soon flagged but we had learned one or two valuable

lessons. Firstly we determined that in future the addition of an engine would have to be done so in such a way that we didn't shift the CG, otherwise the pilot wouldn't be able to take off unaided. Incidentally we gather that some crashes involving powered hang gliders which have bunted (done outside loops) in the USA have been due to hanging the engine at the rear which necessitated moving the hang point forward to use the pilots weight as a counterbalance. In level flight everything goes OK but when the glider hits a severe downdraught and the pilot goes weightless, the heavy tail end tries to overtake the nose, rather like trying to throw a dart feathers first.

The second thing we learned was that the torque of the engine introduced no noticeable turn effect nor did the low thrust line pitch the nose up. In fact the glider handled just like an ordinary hang glider in all respects once it was airborne.

We didn't know what the attitude of the CAA would be to this sort of thing but suspected the



worst so we kept it quiet and supposed that it would be OK as long as we didn't start to climb.

All we had was a glider with a good glide angle which made a noise.

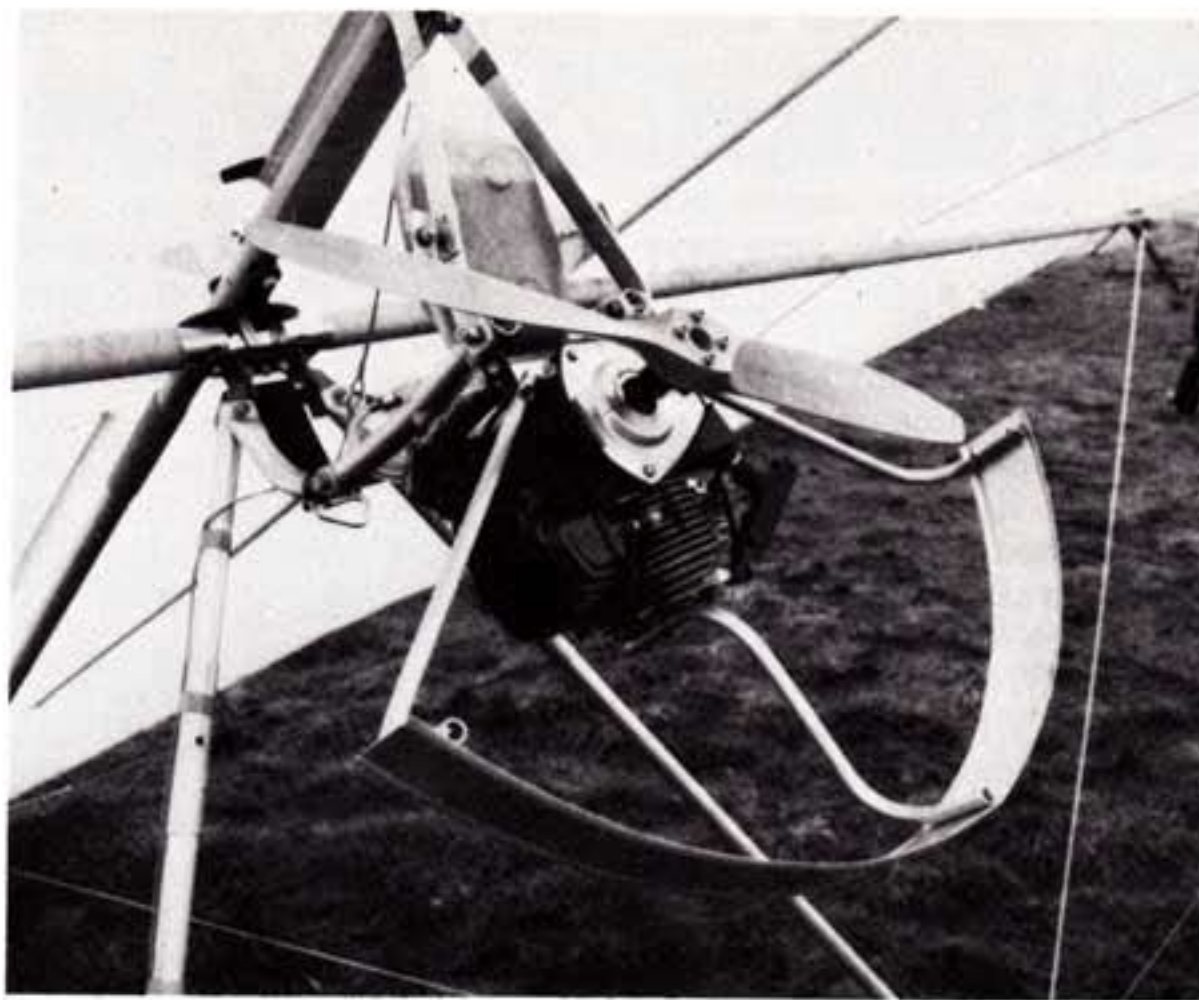
For all these reasons we put it into mothballs.

Then in the middle of 1976 we read Martin Hunt's notes in *Wings!* to the effect that CAA would probably allow self-sustaining powered machines without any licencing requirements so we dusted off the engine again and mounted it on a 19ft Cloud 9. We now had big control frames and had plenty of space to put the engine up in the apex leaving plenty of room below for the pilot, seated or prone. This eliminated any CG shift problem but had the disadvantage that prop. dia. was somewhat restricted. We used a 21in prop which at about 9500 rpm produced about 35lbs of thrust, barely enough to sustain flight. However this was all we were aiming for at that time.

The glider flew, climbing in very small amounts of lift. We took it to Mere 1976 and hoped to fly it there, however after a lot of debate backwards and forwards it was decided that we couldn't be allowed to fly it.

Just after that the Pennine Club Chairman issued an edict (unsupported by the committee) that anyone caught flying powered machines would be drummed out of the club, refused permission to use their sites for ordinary hang gliding and the BHGA would be asked to drum them out of that organisation too. In other words out of hang gliding altogether. Once again the engines were put into storage. It's a hard life trying to do something different.

Some time later with the old Chairman resigning and the committee prepared to allow



Above: The clip on unit showing the built in silencer. Bottom: Take off in nil wind is helped by ground crew, but unnecessary with the slightest breeze. The unit is hardly visible in flight.

some limited prototype powered flying to be done, our interest revived.

We tried a couple of 10cc model aero engines on a 22ft 'Sunspot' and got about 20lbs total thrust, leaving about 12lbs residual drag. In other words we had a machine with a glide angle of about 1 in 20 and a sink rate of just over 1ft per second. With that performance we took off very close to the bottom of the hill and climbed using the lift off the hill.

It's an interesting and relatively easy and cheap way to semi-power a hang glider but we now wanted to actually take off from flat ground.

We put the McCulloch 101A on to a 22ft 'Sunspot' with a shaft drive to the prop which was now on the end of the sting. This had enough power to take off from flat ground and climb at a very low rate and was demonstrated at the

Pennine HGC competition some time before Mere 1977. At that time I was able to take off at our Lobden car park and fly across about half a mile of flat ground and then up and over the top of the hill to eventually land on top. Whilst everyone envied the method of getting up the hill without physical effort, the noise was considered to be unacceptable. Most of the noise was due to the very high speed of the prop tips which were really operating too close to sonic-speeds. Incidentally, to me as the pilot the noise was OK not unlike riding a motor bike.

Of more concern was the vibration produced by the single cylinder engine and obviously with a shaft drive in bearings to the rear end it was not practical to do much about anti vibrational mountings at the engine.

Anyway it all worked fine if a

bit noisy and we took it to Mere expecting again to fly it. We had problems with the engine which refused to run properly and which continually shattered the shaft drive. About a week after Mere the reason for this was discovered when we found that we should have used 4 star petrol and had inadvertently put 2 star petrol into our container. The engine was simply pinking and the detonations were enough to shake the drive connections to pieces in about 2 seconds flat.

By now our thoughts had begun to concentrate on producing a specification for what we considered to be the ideal engine. We wanted twin cylinders to give smooth vibrationless running with less noise. We were becoming more concerned about noise than any other problem. We wanted the best horsepower at lower revs. say 5-6000 per minute.

Fred Walton who has been with me from the beginning is a wizard at ferreting out information about who makes what and one day he arrived at the works with a beautiful little twin cylinder engine which was just what the doctor ordered and exactly as we had specified plus a bit.

Light in weight, 17lbs all up weight including prop, tank, silencer and all fittings to attach to the 'Sunspot' or any similar machine.

Built in muffler which takes up no space at all and which is highly effective.

Three bearing crankshaft so you don't have to worry too much about crankshaft failures due to overhung load.

Chrome bore and ball or needle bearings throughout for long life. Pull start (which because you are only pulling against half the capacity at any one time, is easy to pull).



Diaphragm carburettor for consistent fuel flow regardless of attitude of engine, position of tank or fuel level variation. Capacity is 110cc and power is about 7½hp at 5500 rpm. We run it at 6000 rpm driving a 24in prop which gives 45lbs of static thrust measured on our test rig. With more work on props we eventually expect to exceed this but even now it is enough to take us up from flat ground. This is with our present machines and as gliders develop further we expect a single engine of this power to be adequate.

However as an experiment we have flown a 'Sunspot' with two engines, one at each side of the control frame. This is as far as we know, the worlds first practical twin engine hang glider. The engines clip on (as does our single engine version) in a matter of minutes which brings us to another point. We went off built in engines because it seems to us that the clip on unit is better for various reasons. For one thing you don't need to put it on when conditions are soarable, only when you could not otherwise fly. You can have more than one glider and use the one engine for each. We have flown two different gliders is less than half an hour with the same engine. You don't have the hard work of lifting an extra heavy glider onto your car when the engine is in the boot.

However, back to the twin engine job. There are no CG problems because the engines are on the CG. The control frame is completely unobstructed. The props are in a place where they are extremely unlikely to be contacted by any onlooker or the nose wire man on take off. They are guarded from the pilot.

Take offs are very interesting with the twin. The best method seems to be to stand with the glider resting on your shoulders and the sting resting on the ground. The glider nose is then almost vertical. You open up both throttles (we use separate throttles) and the 90lbs of thrust takes the weight off your shoulders. You then simply run forward holding the nose as high as you can and it just lifts you off the ground at a jogging pace with only a very light breeze. Just like a fully flared out landing but in reverse. You are going up instead of coming down.

Once in the air, climbing at quite a good rate, synchronisation of the engines is easily done by ear and it isn't even necessary. I have flown with one engine shut down

and the other going full belt and there was only a very mild turn, easily held off by a couple of inches of weight shift. No problem at all. The single engine twin cylinder job is really very quiet and the twin engine job is no noisier at all.

I haven't said anything about rates of climb because frankly we haven't found a good way of measuring it yet. It's the same problem that everyone has when estimating min. sink rate, you can never know if you are in still air, lift or sink. This is more difficult to know with a powered hang glider because although you may know that there is no wind even on your normal high hill, you don't know what is going on to say 1000ft higher. Inevitably we are going to hear optimistic claims of rates of climb based on what happened on a good day or on theory. A vertical air movement of as little as 100 fpm is going to make a lot of difference to the performance of a glider with a still air r.o.c. of say 200 fpm according to whether the air movement is up or down.

Another factor which will affect performance is altitude above sea level and normal atmospheric pressure changes superimposed on top of that. In the Pennines we are already starting at about 1,500ft above sea level and a climb of say 1,000ft which is hardly enough to take us up out of the downwash of other hills upwind, means that we are already at 2,500ft ASL. At this height the air is 92% as dense as at sea level and the glider must go 4% faster to lift the same weight. The engine should increase its revs to provide the same thrust in the thinner air at a higher forward speed but engine performance is worse at altitude so thrust will be less. Performance rapidly suffers with height.

What it all boils down to is that flatland fliers operating not much above sea level, out of the way of turbulence and downdraughts or nearby hills, are going to get acceptable results from marginal power, but the hill flier starting well above sea level fighting against turbulence and sink, is often going to be disappointed even with apparently ample power to spare. The would be cross country flier will have to plan his route so that he avoids the downwind side of hills and makes use of areas where lift could be expected. If he hits 1000 fpm sink he is still going to be going down at 800 fpm even with full power giving what would in still air be a

fairly good rate of climb of 200 fpm.

Having done a fair bit of powered hang gliding I'm convinced that its here to stay, and that it will lead to development of better gliders which will benefit unpowered flying. It will enable some people to fly where they cannot do at this time e.g. for flatland fliers or for soaring on otherwise inaccessible hills. It will enable us to fly when the wind is too weak or in the wrong direction.

Competitions are going to have another line of development e.g. pylon races on flat airfields or 20 laps around the bowl at Mere with limited fuel capacity so that everyone has to land at least one or twice to refuel. (Imagine the pilots dilemma, does he land often at his base to refuel or does he try to stretch it out with the risk of expiring way out in the field away from his ground crew).

If the working man is ever going to have his motor bike of the air as I have always believed he would one day, this has to be it. Using a thin layer of air just above ground level, say to 500ft, useless to other fliers, why should this not be a means of travel especially in difficult country areas. Farmers could visit or inspect their property easily. Civil engineering projects could use them. Recently on our local moors a team of

about 12 Mountain Rescue workers tramped the moors for days on end looking in vain for a missing person. A powered hang glider could have patrolled the whole area in hours and possibly save the persons life. Regrettably we didn't offer our services because we didn't realise the possibilities soon enough.

There must be dozens of ways in which powered hang gliders could be used quite apart from the basic one of just having fun. If powered hang gliding is done sensibly having regard to other air traffic and air law, using systems that have acceptable noise levels, we should see it all develop without undue regulation.

As with unpowered hang gliding when it started this is a completely new branch of aviation which won't go away nor can it be treated as just an offshoot of hang gliding. We feel that time will show it to be something else again even though control will probably be through the BHGA.

Subject to the satisfactory information as to the experience of the pilot concerned we will soon be in a position to supply powered gliders, engines, props, tanks etc. in order to help powered hang gliding to develop safely. Anyone wanting to be put on our mailing list should let us have a S.A.E. to our address. ☺

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NEWS ROUNDUP



WHAT'S ALL THIS FALCONRY

Paul Renouf, the new editor of SHGC's Windsock, seems to have found a new following for the sport. These school children were delighted

when Paul demonstrated how a hang glider flies. We hope he has got the hanging bit wrong!



SPIRIT MODIFICATION

Paul Maratos of Flexiform Skysails has announced a modification which can be fitted to the Spirit range of gliders. This involves replacing the fixed deflexor wing wires with a pulley system, utilising a single wire, in place of the two separate ones.

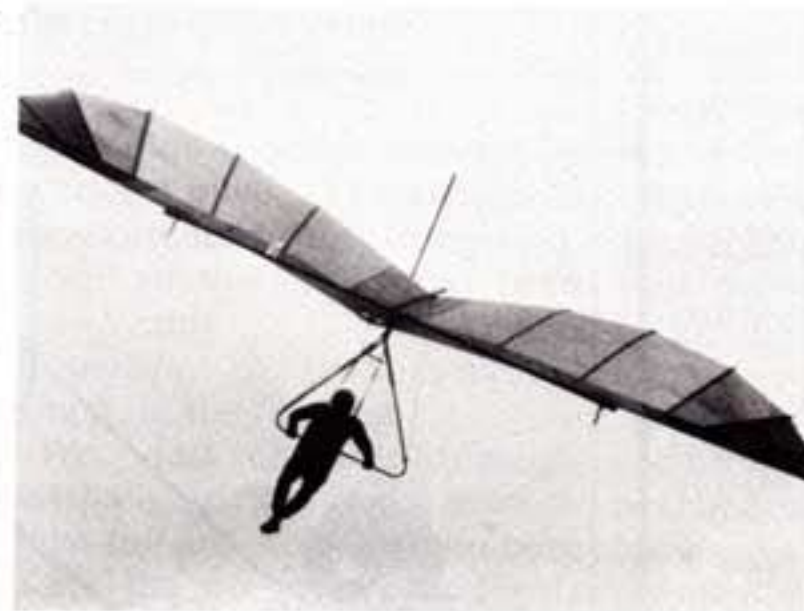
This is said to give great benefits in the handling of the glider, as well as simplifying the tuning.

Anyone interested in this modification should contact Flexiform Skysails.

HANG GLIDER CRASH

A hang glider pilot was treated in hospital yesterday after crashing on take-off from the Great Orme at Llandudno. Brian Birch, 42, of Hanwood Road, Wolverhampton, had been caught by a gust of wind.

Daily Telegraph,
Monday, December 12th, 1977.
(Front Page)



Dr. Michael Glanville and his Lynx

Members of the Devon and Somerset Condors should have no problems with medical assistance.

Recently, one of their pilots with a broken collar bone looked up to see three gentlemen converging on him, all shouting "It's all right, I'm a doctor".

THEY'RE OFF AGAIN

7 members of the Pennine HGC are again going to try to find the magic thermals in the Canary Islands. This time we hope we'll succeed, since we're going for two weeks and to the island of Gran Canaria — there are 3 Scorpions, a Sunspot and a Vector. Take off is in January and a full report to make everyone green with envy will be sent to *Wings!* on return.

ARE YOU ONE

The following appeared in a recent edition of a Canadian journal and has a familiar ring.

Are you an active member
the kind that would be missed,
Or are you just contented
That your name is on the list?
Do you attend the meetings
And mingle with the Flock,
Or do you stay at home
And criticize and knock?
Do you take an active part
To help the work along,
Or are you satisfied to be
The guy who just belongs?
Do you work on committees
To do this is no trick?
Or leave the work to just a few
And talk about the "Clique"?
So come to meetings often
And help with hand and heart
Don't be just a member
But take an active part.
Think it over Member
You know right from wrong
Are you an active member
OR DO YOU JUST BELONG?

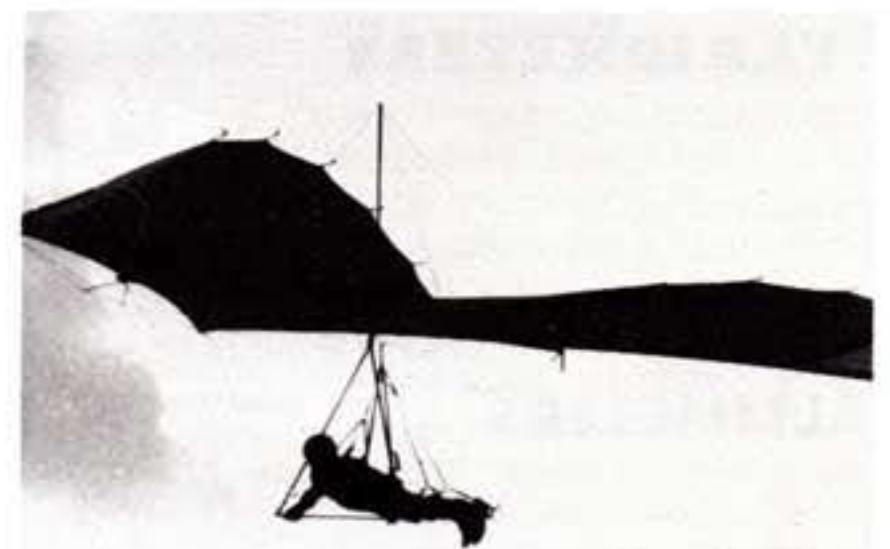
If you have some news or photographs of current interest, send them to: News Roundup Editor, Derek Stacey, 59 The Horseshoe, Leverstock Green, Hemel Hempstead, Herts. Tel: 0442 55344.



BILLY WASP

Merseyside and North Wales Hang Gliding Club held a competition for its thirty pilots during the summer of 1976. Three events were planned, but only one took place. It consisted of a target formed by two kite bags and the other usual accessories, all in accordance with B.H.G.A. rules.

The pilots' wives placed bets on the outcome, and the eventual winner, Bill Bibby, chairman of MANWEB, 5-1 odds on favourite, landed on the 'bull's eye'. He was flying a modified Wasp C4 221 with an unusual cut to the sail, hence his new name of 'Billy Wasp'. The club decided to invest the proceeds in a suitable trophy, but had great difficulty in finding a manufacturer willing to produce less than 20,000. However, one of their members, Jim Blackwell, an engineering designer, came to the rescue. Six months later, the beautiful trophy proudly displayed by its owner in a photograph taken by Bill Gaywood, was presented by Len Gabriels.



Dr. John Mantle on his Midas at Freshwater Bay

FLYING DOCTORS!

The photographs taken by Pete Glanville show Dr. John Mantle and Dr. Michael Glanville in full flight over the Devonshire countryside. The latter, as a matter of honour, plans to graduate to prone flight in the near future. One wonders what the reaction of their

more sober and critical colleagues would be if one day they appear in Casualty.

Unlike most of us, they enjoy a wide choice of south — south-west coastal sites and overcrowding does not appear to be a problem.

DRAWN SEAMLESS TUBE to BS-1471-HT-30-TF

1 3/4"	O/D x 18 swg x 22'0"	—	£11.00 length
1 3/4"	O/D x 18 swg x 20'0"	—	£10.00 length
1 1/2"	O/D x 18 swg x 23'0"	—	£ 9.00 length
1 1/2"	O/D x 18 swg x 22'0"	—	£ 8.50 length
1 1/2"	O/D x 18 swg x 21'0"	—	£ 8.00 length
1 1/2"	O/D x 18 swg x 16'0"	—	£ 6.50 length
1 1/2"	O/D x 16 swg x 18'6"	—	£ 9.50 length
1 5/8"	O/D External Sleeve	—	65 pence per foot
1.39"	O/D Internal Sleeve	—	65 pence per foot
1 1/8"	O/D x 17 swg x 16'0"	—	£ 7.00 length
1"	O/D x 14 swg x 16'0"	—	£ 7.00 length
1"	O/D x 16 swg x 16'0"	—	£ 5.50 length

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Check our list for stainless tangs, rigging screws, plastic-coated rigging wire, pip pins, over centre levers, saddle washers and a host of other goodies.



We now carry a stock of Hiway hardware, nuts, bolts, deflexor blades and tubes.

SPIRIT—

Contact us or Flexi-Form Skysails for full details of the construction package for this fine, customer assisted manufacture glider. Soar with ease at a price you can afford.

VECTOR

Sky out with this latest glider from Paul Maratos — the Vector is a high performance flying wing, featuring truncated tips and a fully-cambered floating keel. Available as a ready to fly glider, or on the C.A.M. scheme.

VARIOMETERS—

We are agents for all the leading Variometer manufacturers and currently have in stock (September) Sky, Wasp and Electra audio/visual units, plus the H.S. of H.G. pith ball vario. We also handle the superb Ball audio/visual variometer for those who want the very best.

ALTIMETERS—

A must for the serious flyer. 'Thommen' wrist mounted, fully guaranteed, complete with velcro wrist strap. 'Handy' Japanese inexpensive units and reconditioned ex R.A.F. Altimeters are all currently in stock.

INSTRUMENTS

Barragraphs, wrist compasses, strobe lights, airspeed indicators ventimeters and anything else you may need.

Please write (enclosing stamp) for our latest stock and price list to:



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Shawclough, Rochdale, Lancs.

SKYDART SKYHOOK SKYDART

The Boogie Machine with real sensitivity — that's the 'Skydart' from Steve Cohen, Australia's leading hang glider manufacturer. Put the pleasure of flight back into your flying — fly a 'Skydart'!

Skyhook II — the high flying cross country and competition machine — also available.

Contact: Colin Bennett on (01) 727 3093
35 Stoneleigh Street, London W11.

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Immediate delivery. Safety webbings. Sewing threads. etc.

First send S.A.E. for full range of samples, before calling.

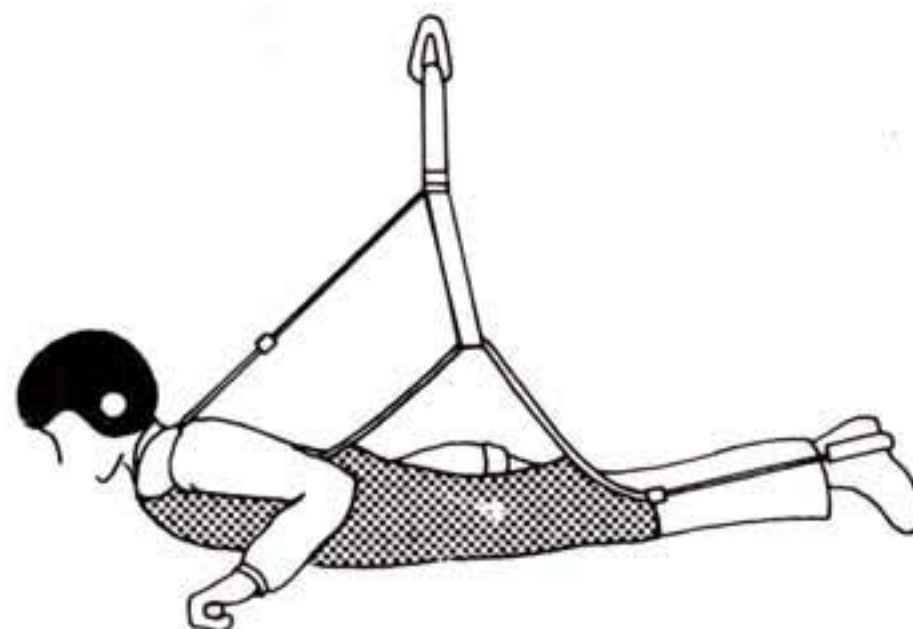
Free sewing instructions.

Edward Barnes (wgs)

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THE 'BRUNEL' HARNES

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KO KO'd

Bob McKay reports on the Welsh Hang Gliding KO Distance Trophy that very nearly wasn't.

A huge wave hits the backside of The Worms Head and the spume rises 200ft in the rotor to be whipped off the top away to the North — it's blowin' "a hooley" — the coastguard is relaying the forecast to me — South south west 5-7 increasing to storm force 9. Not much point in going up to the top but we do. We gather in Rhossili ridge. The wind is almost south straight off the Pimple. I start to walk over to Rectory Ridge round the back of the Bowl — nobody follows — nobody believes we are really going to fly. I arrive to find Tony 'Bullet' Fletcher (our pathfinder) already rigging his brand new Gryphon. The Ventimeter reads 26-30-28-34-26 . . . The wind is about 10⁰ off Rectory Ridge which faces south west but away goes Tony (like a ruddy bullet) climbing steadily but not penetrating much, sliding away sideways to get over the beach, no lift once he's out, he hits 'orrible turbulence over the ledge and drops about 100 ft., smooths it out and turns into wind over the sand, lands, kneels and gives thanks . . .!

A couple of pilots detach themselves from the bunch on Rhossili ridge and start to carry across. It's tough to make a ruling so we leave it like this; if both competitors agree to postpone O.K. If one is prepared to fly and the other not, he must withdraw and let any willing reserve take his place (I know, I know, "Bob Mackay is a bastard") but nobody has to fly if they don't want to.

Two Gryphons go up for a five minute soar, several more pilots detach themselves from the bunch gathered on Rhossili ridge, like a scene from "Apache Pass". The beach party set the mark so that the first leg is a cross-wind due west to about 100 yards out from the ledge, then turn straight into wind along the beach. It's blowing! Never below 25 at the top, never below 18 along the beach. Bob Calvert and Jo Binns are ready. Hiway have brought seven prototypes ("Yor bloody competitions cost me two hundred parnds in overtoim larst week" — guess who!) and it speaks volumes for the design ability of Steve Hunt, John Ievers and the Hiway team that their fliers are ready to go in these conditions with only one, or at most two, previous flights on the machine. Each pilot is allowed five minutes in the air. Jo Binns is away first, his wing flexes a bit as he is whipped up from take-

off but he turns away a little too soon and is losing a lot of height getting to the mark. The turbulence has increased, the wind has shifted a little further south.

Bob is in the air, staying with the lift a bit longer than Jo, penetrating more forward across the bowl and gaining height before breaking for the mark. It's obvious half way down he's got it

Brian Wood withdraws and in goes Heinz Dorler (Gryphon) to beat Simon Wooton (Chargus) after a very hairy ride.

We are all confident it's going to ease off as the day wears on — it doesn't. The wind is inching round to dead south, Jim Pedroza (Gryphon) makes it look easy penetrating well into the bowl and never allowing himself to get downwind of the mark. R. Lewis-

RESULTS	
Lester Cruse (Wasp)	Lester Cruse
Bob Bailey (Wills)	Paddy Munroe
Mark Southall (Birdman)	
Paddy Munroe (Hiway)	
Ian Grayland (Hiway)	
Keith Reynolds (Wasp)	Keith Reynolds
Ashley Doubtfire (Birdman)	Ashley Doubtfire
Mick Evans (Wasp)	
Brian Harrison (Hiway)	
Len Gabriels (Skyhook)	Steve Goad
Ken Messenger (Birdman)	Ken Messenger
Mike Robertson (Hiway)	
Trevor Birkbeck (Wasp)	
Greanam (?)	Trevor Birkbeck
Jo Binns (Chargus)	Bob Calvert
Bob Calvert (Hiway)	
Simon Wooton (Chargus)	
Heinz Dorler (Wasp)	Heinz Dorler
Johnny Carr (Miles Wing)	Johnny Carr
Steve Goad (Wasp)	
Dick Heffer (Birdman)	
Roy Richards (Chargus)	Dick Heffer
Dale Clothier (Hiway)	(Postponed)
Bob Wisely (Wills)	
R. Lewis-Evans (Birdman)	
Jim Pedroza (Miles Wing)	Jim Pedroza
Chris Johnson (Hiway)	(Postponed)
Tom Knight (Skyhook)	
Dave Weeden (Birdman)	
John Ievers (Hiway)	John Ievers
Tony Beresford (Wasp)	Tony Beresford
Jan Katelaar (Birdman)	



Trevor Birkbeck smiles triumphantly

won and when he turns his penetration is better, he wins by "a cricket pitch". The distance is foreshortened by the strong wind. In still air this would have been considerably longer. Groundspeeds are about 5-10mph. in the final leg.

We just haven't enough marshalls or time at the start to make full notes, we are too busy to see the whole of each flight. The wind is shifting further south but not getting any stronger. Turbulence is increasing.

Lester beats Bob Bailey by a good few yards and puts up the longest distance so far. The Wasp-built Gryphons are demonstrating their undoubted superiority, a brilliant design and the full year's development is paying off.

Evans (Birdman) does and loses out to Jim.

Miles Handley gives his place to Trevor Birkbeck who wins in fine style putting up the longest flight of the day even passing Lester's mark.

Ashley Doubtfire does it again and brings his Moonraker down to beat one of the Gryphons flown by Mick Evans who hit bad turbulence and got downwind of the turning mark.

Dale Clothier and Bob Wiseley postpone, so do Chris Johnson and Tom Knight, the wind shifts east of south, we can't really go on much longer but we do, pilots are still coming to the line.

Paddy Munroe (Hiway Prototype) hits such bad turbulence with the wind scrubbing right along the ridge

and screwing into the bowl, that his "droop tips" actually partially retract with each buffet and he ornithopts to victory over Mark Southall. Mark has made a fair recovery from his recent accident but says he still feels it a bit in one shoulder.

Nobody gets far along the beach after turning the mark. Only Lester and Trevor approach the 200 yards mark.

Well, that's all who are going today, gone! The wind is still 25-30 but almost south east. It's too bad so we have to call it off and hope we can get the rest of the competition through tomorrow. It can't be any worse than today.

It is! Sunday morning on Rectory finds us all cowering in a hollow, it's south south west 40 on the crest and 25 on the beach where the sand is streaming along like ice crystals in Scott of the Antarctic.

O.K. says I, we'll keep the course open till 4 p.m. Anyone left in the competition can go at their own discretion, the longest flight wins.

The day drags on, nobody rigs, — wrong, Trevor Birkbeck rigs, he's going to try it. Down the face it's about 25-30, he lies in prone, the nose is raised a "midge" and he hurtles into the sky. Working hard but seemingly relaxed he is torn away from the ridge and downwind. He's not going to make the mark but is steady, he lands about 20 yards short but a little further out. We accept it as a "distance".

Nobody rigs, a gust is recorded at 45, we adjourn to the pub for a glass of lemonade and a pie. 2 p.m. back at the top it's still 40+ and "heather lobbing" competitions are the order of the day. Down on the beach it is 22-26. Ashley Doubtfire rigs and leers at everyone, Lester rigs and carries down for a take-off half way. 50 is registered at the top. Trevor's solitary marker stands unchallenged. 4 p.m. is the deadline, it's 3.45 p.m. The beach party are writing something in big letters in the sand. "Merry Christmas, Trevor. We get the message, Ashley de-rigs, Lester de-rigs, the tide comes in and gently washes away the greeting. It's over!

Well, it may not have been much of a distance competition but it was a magnificent testimony to the design and construction of british hang gliders and the skill and the discretion of our leading pilots. Do you ever get the feeling nobody loves you?

THOSE MAGNIFICENT MEN & THEIR....

by Paul Renouf

During the 1939-45 wars, jeeps were towed experimentally through the air beneath free wheeling rotors and in post-war years, strange Disney-like pumpupable, portable planes clattered the skies, as if to prove what ever Michelin could do with its men, Goodyear could do with its aeroplanes. It is hardly necessary to add that many of these strange happenings were with our less inhibited transatlantic cousins. It was early in 1960 that certain people began to give some further thought to the possible uses of flexible wing craft, or as we know the Rogallo wing, named after the man who first thought of using three tubes, a piece of cloth and a protractor as the basis of flight.

Its a pity that we lack the adventure and funding for such developments. We've banned aerial advertising so our aviation system would keep to the straight and narrow, although the hang gliding fraternity, together with a few sponsors, I feel will put that to the test, should our flying ability continue to improve at the prodigious rate we are becoming accustomed to. However back to the land of plenty, that spent billions of dollars putting the first coke cans on the moon and now is too chauvinistic to really declare themselves on Concorde.

The Marshall space flight centre in Alabama thought that a collapsible wing based on Rogallo's concept could be used to bring back to earth the Saturn Rockets which at the time were being thrown up from Cape Canaveral. To pursue this idea two experimental evaluation contracts were placed; one with North America,



Some pretty odd things have taken to the air since aviation first got off the ground. It was said that Moore-Brabazon decided to take a pig as a passenger in his short biplane back in 1909, just to prove that pigs COULD fly. Then somebody said you could make a barn door fly if you put enough power behind it, the race continued. The Russians flew a printing press, the Germans a grand piano (in the Hindenberg).

and the other with Ryan Aeronautical. It is the work of the latter that is the subject of this text.

Ryan really went to town with the triangular umbrella idea, and conducted numerous and spectacular tests over a period of five years. In the design and test programmes that followed, Ryan sought application for his flex-wings in a variety of ways:- transporting equipment, an auxilliary wing to assist the take-off of

heavily loaded aircraft, to reduce the speed of supersonic aircraft, emergency wings for vertical take-off aircraft, and as a re-entry vehicle capable of gliding to a chosen site and accomplish a slow-speed landing, perhaps the most important one of them all was in the potential of increasing the normal cargo capacity of helicopters by several times, using a tower flexible-winged cargo carrier.

In the summer 1963 ramped-launched powered flex-wing models were being tested in the Arizona desert, experiments were also carried out on a large scale model of a cargo carrier, a four wheeled box-like vehicle with triple fins, this was towed by helicopter and was the precursor of trials, which in the following year used a jeep. Ryan also saw its military and the strategic support potential of the flexi-wing, visualising accurate placement of equipment and vehicles in a front line situation.

The US army took to the idea and used Ryan's gliders in exercises in 1964. The gliders were dropped from fixed winged aircraft and helicopters carrying fuel, medicines and ammunition. The drops were made from altitudes of up to 9,000ft.

Could it be argued that Ryan invented the first practical hang glider (or individual drop glider as he preferred to call the contraption). His original idea was to use it as a conventional replacement for the parachute, although its obvious disadvantage over the parachute was its bulk.

Concurrent with experiments with towable glider, Ryan developed a Flying test-bed. This structure supported a sail-like wing on a cat's cradle of structural tubing. A large vertical fin was mounted between the wing trailing-edge and car. It was completed with four wheels on outriggers, a rudimentary nose or fairing and an engine mounted in the "Fuselage" at the rear.

From this experimental work and US army funding, Ryan developed a machine which was



The pilotless air cargo tow glider had an automatic device to flare the machine for landing.



A powered Flexwing.



Flexwing with cowled engine and no rudder.

nicknamed the 'Fleep'. The Fleep undertook test flights in 1963 and was powered by a 210hp engine. Flights were made to altitudes of 9,500ft and weighing up to 2,300lbs.

The wing structure comprised of three aluminium alloy spars, made rather like the masts of a sailing dinghy, although tapered at each end. The nose angle was in the region of 50°, the sail was made from plastic coated dacron and could be pivoted up and down on its framework by means of

control wires, (there's a thought). Normal incidence of the wing to the horizontal floor of the suspended car was between 22 and 23°. The pilots control in pitch was from 0 to 26°, left and right control was by conventional use of a rudder stick, the whole column moved back to climb, and forward to dive, to further achieve this control two elevators were placed at the rear.

Completing its features were a butterfly tail, tricycle landing gear and streamlined nose or fairing

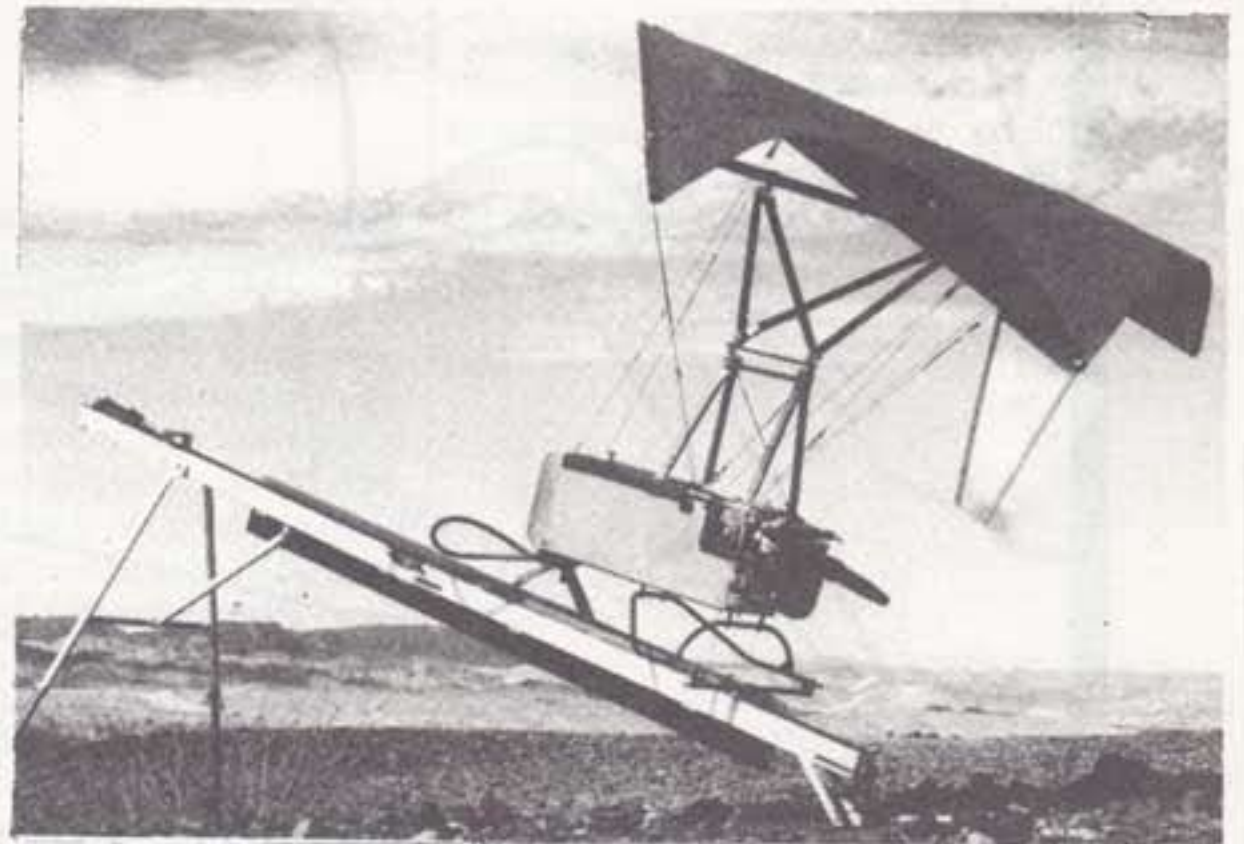
which gave a measure of protection to the high seated pilot. It was flown similarly to a light aircraft and looking perilously like an accident seeking somewhere to happen. On completion of its trials it proved itself capable of controlled sustained flight, and functional as a low cost freight carrier.

With the trials concluded, no further funding was available and the Fleep and its related family of floppy-winged fliers faded from the scene. Ryan's technology

wasn't altogether in vain, however, for the science of the flexible wing was advanced considerably by his work, and the rebirth of hang gliding as a popular sport stemmed in some measure from his evaluation. Not that Ryan ever claimed to having flown the first flexible wing — they had already been around for quite a while. What they did do, though was to set the official seal of practicability on flexible wing gliders. ☺



The first full size powered Ryan Flexwing during trials in 1962.



A ramp-launched glider designed to carry reconnaissance package.



The US Army's first XV8A in flight.

UNIVERSAL

The Uni — is an SST development which has schools in mind. It is the perfect beginner kite being strong and stable, yet with its light controls and low sink rate, it is no plug, and will give a pilot pleasant, safe flying right through from novice to expert.

L/D — 7/1, Min. sink — 290 f.p.m., stall speed — 12 m.p.h.
Complete with bag, harness and V.A.T. — £461.25

SST.

The SST — possibly the best loved kite in the world, the SST has been continuously developed from its original form of 2½ years ago. Stories of turbulent days when pilots have landed and said 'I could *even* feel the turbulence on the SST.' are legion. Even though the SST has been around for 2½ years, there is still nothing made in England that can compare with this kite for all round performance, stability, and forgiving ways. Remember, 2 of the 3 league competitions that made Brian Wood the top pilot in 1977 were flown on an SST 100B.

All SSTs are now fitted with triple deflexors and a nose pulley system.

If you are 'Mr. Average' and you just want safe, enjoyable flying on a really well proven kite, test out an SST — you will like it.

L/D — 8/1 plus, Min. sink — 200 to 250 f.p.m. Comes in four sizes. Complete with bag and V.A.T. — £560.25

CROSS COUNTRY

The Cross Country — the hot ship to beat all hot ships. L/D — 10/1, Min. sink of under 200 f.p.m. and a proven ability to hold a good high speed glide. In the later part of this season, with Bob Bailey, the XC has proved its ability by coming in first at the fourth league competition, and second in the fifth league competition to place fourth overall, first in the Pennine competition, and most important, is the current holder of the British Cross Country record.

If you have aspirations to fly cross country, high altitude or top level competition — look no further — this is the kite for you.

Complete with triple deflexors, pulley system, hinged floating tip tubes, pack down control frame, bag and V.A.T. — £652.50 (available in 2 sizes)

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UPS

Kevin Jordan makes an interesting investigation into why and whereof of staying airborne in the air flowing over a ridge or any other large obstruction.

AND DOWNS

Over the past few years the hang gliders' vocabulary has expanded beyond recognition and more familiar phrases of "is it soarable?" or "no scratching today lads!" has become a well established part of our heritage as soaring has become commonplace.

The state of the art of 'staying up' for long periods of time is, thank goodness, at last regarded as a pretty futile and useless experience and no longer captures the imagination of the average pilot. Anybody can soar at Rhossili in a 25 mph westerly wind; but the skill comes in much lower winds.

The wind speed at which a site becomes 'marginal' or 'soarable' depends on several factors:-

1. Pilot Weight — the heavier the pilot, the greater the sink rate will be.
2. The Glider — the min. sink rate for the particular pilot.
3. Pilot Experience — having the ability to fly efficiently in areas of optimum lift.
4. Geometry of the site.

Other factors may also apply — whether or not the pilot is flying seated or prone; thermal activity may be present, etc.

To most people the fundamentals of soaring are obvious, likewise are the reasons *why* they stay up. The most basic way of expressing it is to say, "if the vertical component of the air flow is greater than or equal to the sink rate of the glider; the glider will maintain or gain height (as long as it is not blown back)."

From this statement it follows that "The highest altitude a glider may reach is the point where the vertical component of the air, and the sink rate of the glider are equal." This last statement dependent on the horizontal component as shall be described later. So the predominating factor is the vertical component. Consider the three following cases:-

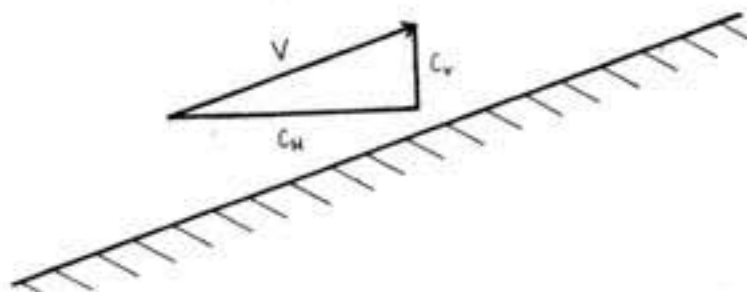
1. Shallow hill constant gradient (infinity long, infinity wide).
2. Average ridge.
3. Cliff.

1. The shallow hill with a gradient of, say, 8 to 1 will produce a special case. Assuming a glider is flown which has a glide ratio of 8 to 1 at 20 mph (min. sink speed).

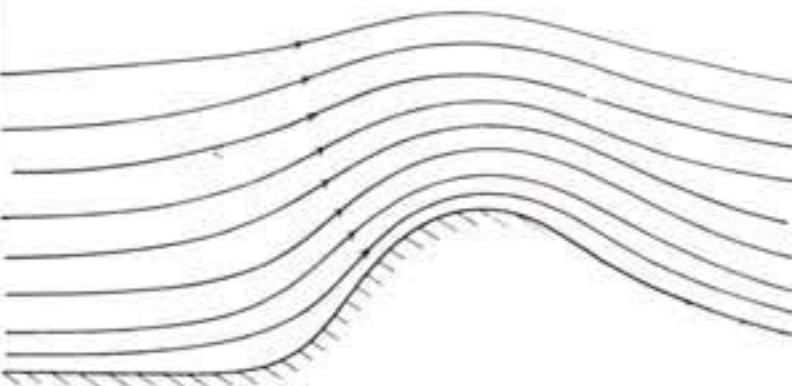
(a) If flown at min. sink speed, the glider will skim down the slope. If flown a best L/D speed, it will slowly rise away from the slope. This is because the glider reaches a peak performance for glide ratio at a different speed than for sink rate.

(b) With a 20 mph wind the glider will remain absolutely stationary at constant height.

(c) If the wind is slightly stronger the glider will rise to infinity.



2. Unlike the shallow hill, the ridge has a varying velocity profile as shown below by the streamlines.



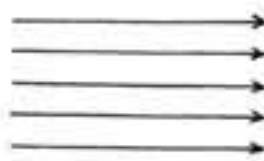
N.B. A streamline denotes a flow where the air travels purely tangentially to the flow i.e. no air passes across the streamline. As can be seen, the air coming towards and going away from the hill is, to all intents and purposes, parallel, therefore, *assuming* that the wind at four times the height of the hill is unaffected, in order for a certain block of air to pass over the hill, it must be accelerated to pass through the constriction and decelerated again afterwards.

It is for this reason that the wind on a hill is stronger than the wind at the same height, away from the hill. Of course the ground effect does play a significant part but it shall be neglected here.

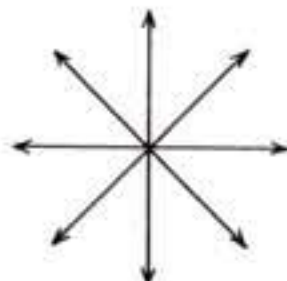
Going back to the diagram, a vector analysis can be made at any point in the flow to calculate the vertical and horizontal components in the air flow.

As a proof, one must go back to the very basics and consider a mathematical model:-

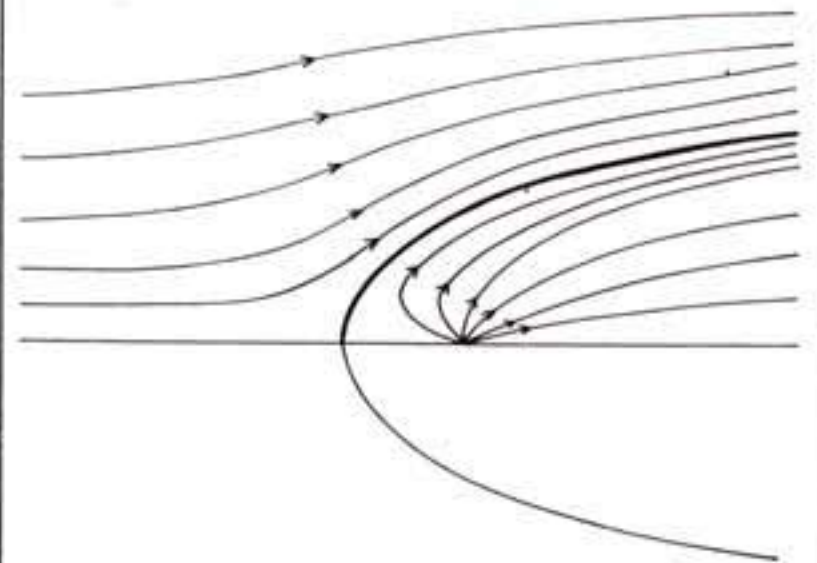
Consider a flat river bed, infinitely long and wide, and very shallow.



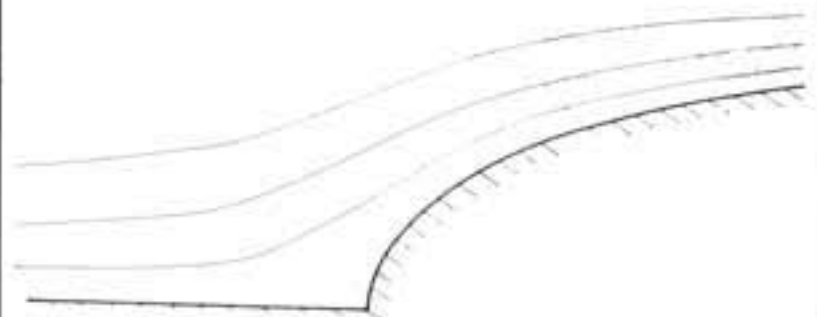
Now consider the flow from a tap striking a flat plate.



When adding the two, there is a point where the upstream flow from the tap is equal and opposite to the flow of the stream. The water then stops, forming the stagnation point, and a parabola emerges.



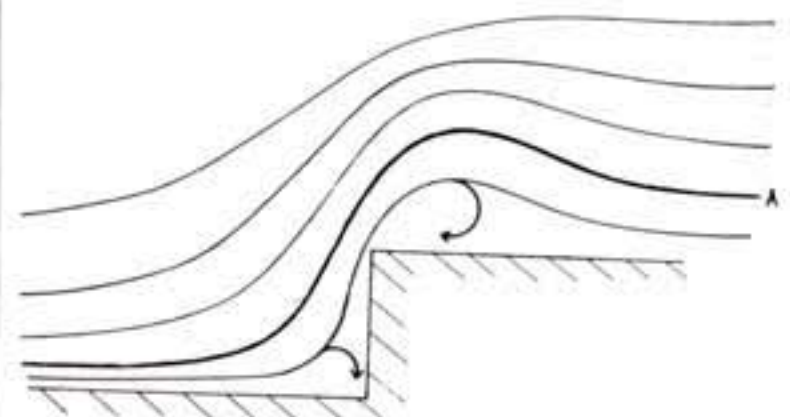
Going back to our definition of a streamline; if air flows purely *along* the streamline, any streamline could be substituted with a solid boundary e.g. a hill. So the above diagram becomes Fig. 4.



Any point in the free space above the solid boundary can therefore be expressed as a co-ordinate, and its respective vertical and horizontal vectors calculated.

The proof of the analysis is beyond the scope of this article.

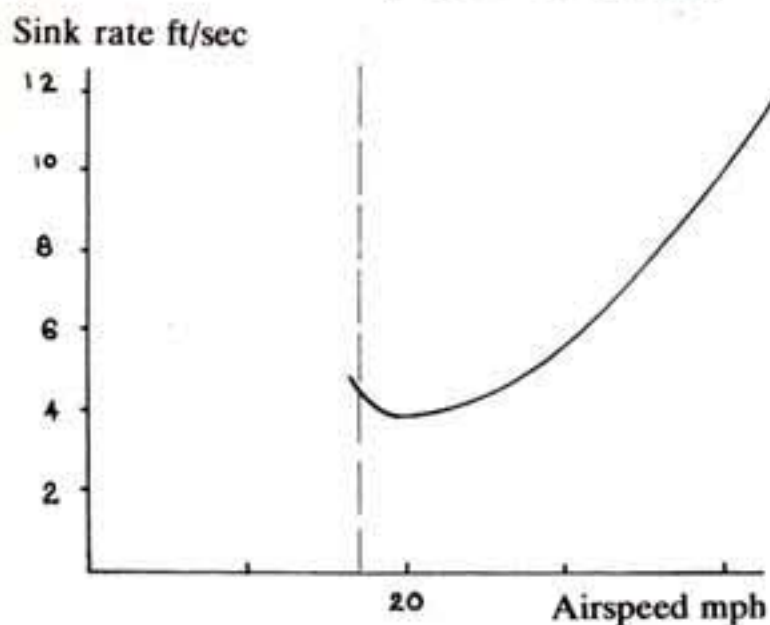
A model can also be constructed for a cliff.



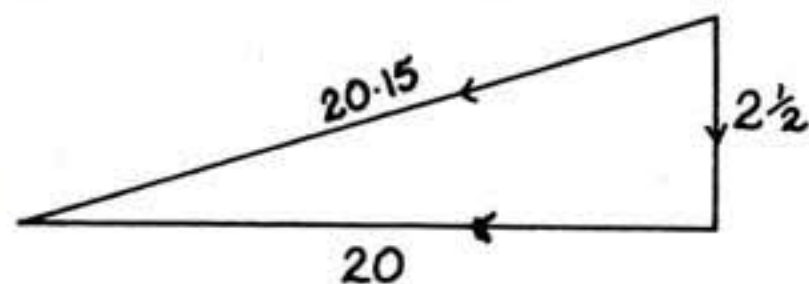
In the case of the cliff, the area directly behind the crest is normally turbulent during soarable conditions, but the theory relating to streamlines still exists which means that line 'A' could in fact be substituted for a solid boundary, closely resembling that for an average ridge.

Sink Rate Analysis

Every glider has a sink rate/airspeed curve which will obviously vary from glider to glider. Such a curve may be as follows.

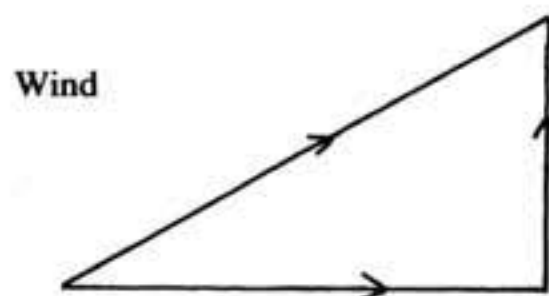
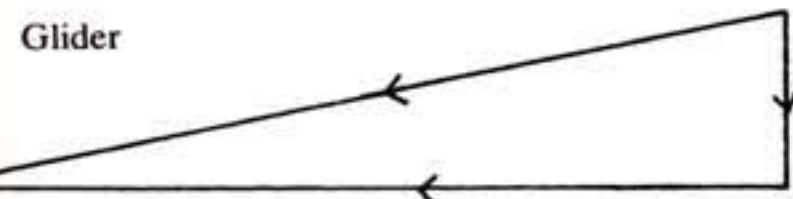


Therefore any single point on the curve can be illustrated as shown in Fig. 7.



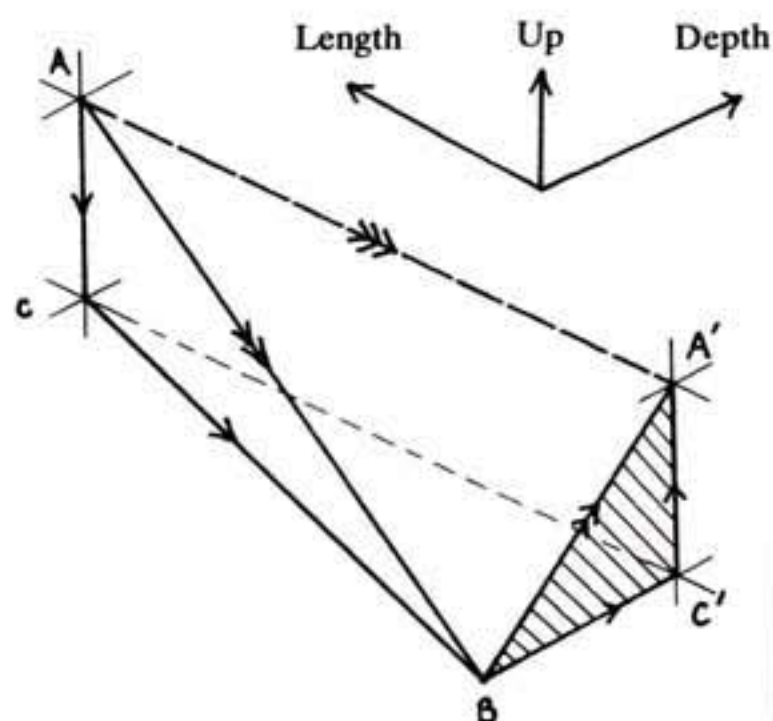
This one graph covers the whole of the performance figures normally quoted.

Consider the region of airspace the glider is flying in and their respective vectors.



In this case, the vertical component of the wind is greater than the sink rate of the glider, so the glider may rise, however, the glider's horizontal component is greater than that for the wind.

If the glider flew directly into wind it would fly out of this particular region and into a different area. For this reason the glider must tack crosswind, thereby reducing his forward motion and move along the ridge.

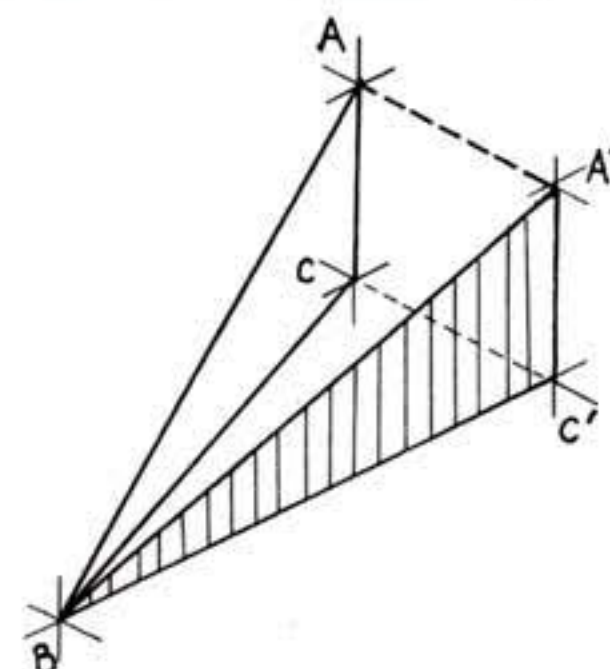


AB represents the normal flow of the glider and BC' the flow of the wind.

In this instance the glider is flying very much crosswind and the actual movement of the glider is along AA'. The lines AC and A'C' represent the sink rate of the glider and the vertical velocity of the wind respectively.

As the wind becomes stronger, both the horizontal and vertical wind components increase, thereby allowing the glider to gain more height. As the glider rises, the angle at which the wind travels becomes more shallow. In other words for a given vertical component, the horizontal one increases with height.

The result of this is shown in Fig. 9.



Like the previous diagram, the suffixes are the same. In this case the gradient of BA' is much shallower meaning that the glider must fly more into wind. As a result the actual movement of the glider, AA', is decreased.

We've been away from the advertising pages of "Wings" for over a year and consequently many of our old friends and customers wondered if we were still in business. The truth is that we are very much alive and kicking, but since we moved to larger premises and launched our "Sunspot" a year ago, we have been loaded to the limit of our capacity, selling entirely by demonstration and recommendation. Mostly our sales have been in the North and in some areas our products are not well known. Our agents would like us to tell you about them.

For those who don't know, "Sunspot" — originally a floater — is a high performer which has been refined until it is considered by many experts to be a hot ship equally at home in strong or light winds, yet having extremely good handling characteristics and no bad habits. It is a confidence inspiring machine, enabling the EPC holder or well taught beginner to soar easily in the lightest winds, seated, with no landing problems at the end. It parachutes well.

As experience is gained, conversion to prone flying is relatively easy with no complicated rules to remember. No need to pull on excess speed before initiating a turn. Just lean into it and round you go fast or slow. Consequently, 360's are done with little loss of height and thermalling capability is as good as you are. Rigging is a dream, no tools required, no wing nuts, and no loose parts to lose apart from battens.

Ask our agents for a demo.; you'll be surprised at the quality, performance and price. Have a look at our prone harnesses too, extremely comfortable and with large lap pocket for your grub, cross country maps, hot water bottle, etc.

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If the wind increased further, the glider would still rise and the length of AA' would decrease until it became zero. If the wind increased yet again, the glider must also increase speed to compensate. This means that as well as the winds vertical component increasing, the glider's sink rate will also increase. Therefore the actual gain is less. Bringing this towards a limit, the sink rate will deteriorate to such an extent that the increase in wind speed has a detrimental effect and the glider must descend until it reaches a level of similar vertical velocity. It is at this point that the top of the lift is 'cut off'.

The geometry of the site is of prime importance as the vector profiles can change so radically. It is for this reason that one can get higher, and penetrate higher winds when flying a cliff site than a ridge. The 'steepness' of the flow generates an increase in lift for a given wind speed so the pilot is less likely to get blown back.

The use of mathematical models to determine site characteristics, although it would be useful, are so complex that huge computer programmes would have to be constructed to illustrate even a simple profile. Adding a three dimensional problem to this, the work required is hardly worth the time or money.

Probably the best method to use is called 'Finite Element Theory' which again entails a great deal of work and would probably be inaccurate anyway.

There is no substitute for flying the site yourself. ☺



ONE OF BRITAIN'S LEADING HANG GLIDING CENTRES

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INFORMATION



THE CORK FLY-IN 'CORK '78'

The Annual Cork Fly-In is being held on March 18th/19th next — the St. Patrick's weekend! St. Patrick's Day is of course on March 17th.

As last year it will be simply a get-together of hang gliding enthusiasts, with a simple competition like a spot landing and a few nice trophies. And Irish hospitality.

Special rates for accommodation, from luxury hotel to guesthouse, have been arranged.

As the I.H.G.A. Annual Fly-In takes place the following weekend (at Easter) at Achill Island, Co. Mayo, the Cork Club has also arranged a special Irish Sea rate with B + 1 Line of £51.80 return, for car, kites and four people. Either Swansea-Cork or Liverpool-Dublin, or over by one route and back by the other. This latter is to facilitate those visiting both fly-ins, to make their return journey easier if they live in the English Midlands or the North.

WINDSOCK

Paul Renouf has been elected as the new editor of the Southern Hang Gliding Club's magazine, WINDSOCK. Letters, adverts and up-to-date manufacturer's information will be gratefully received and should be addressed to: 21 Danum Close, Hailsham, East Sussex. Tel: Hailsham (0323) 844 820

HANG GLIDING WITHIN MANCHESTER CONTROL ZONE

Further to the information published in the September issue of Wings regarding hang gliding at Shining Tor, Cats Tor and Whaley Moor, the CAA have at last replied but unfortunately they cannot give any dispensation to hang glide at any of these sites. If the CAA can be persuaded to change their mind details will be published in *Wings!*

Roger Green, Secretary
Peak Hang Gliding Assoc.

ANNUAL GENERAL MEETING

Venue: Matrix Hall, Fletchamstead
Highway, Coventry.

Date: Sunday, 19th March, 1978.

Starting at 1.30 p.m.

Doors open at 12 Noon.

Secretaries of Member Clubs are reminded that they or a representative from their Club will be able to vote on behalf of their members who cannot attend and who have entrusted their voting slips to them. Voting slips will be sent out to Members with *Wings!* at the end of February. Nominations, accompanied by a written statement by the nominees showing their willingness to serve will be accepted up to the start of the meeting.

We will again be using the single

transferrable vote voting system. There are vacancies for at least three Council Members and for the post of BHGA Chairman. During the current year Council appointed Colin McCormack to the Council on the resignation of Fred Ashion and recently appointed Jeff Marvin to the Council on the resignation of Robert Wiseley. Both Colin and Jeff have to be elected if they wish to continue to serve after the A.G.M. To date no nominations have been received. We hope that those of you who are prepared to work for and represent the Association are ready to come forward. Your nominations, please to the Secretary, 167a, Cheddon Road, Taunton, Somerset.

NEWS FROM WALES

A Meeting of all the Hang Gliding Clubs in Wales was held at Newtown, Powys, on Sunday 27th November.

Representatives of the North Wales HGC (formerly the Merseyside & N. Wales) met officers of the existing branches of the Welsh HGC. Unfortunately Gerry Breen could not be present to represent the Crickhowell Centre Club, so a preliminary meeting between Gerry & Secretary, Hugh Hutchinson was held to discuss problem and two members of the Centre Club attended the Sunday meeting to ensure its views were heard.

On the advice of the Sports Council it was decided to revise the structure so that separate clubs, areas, or branches of the Welsh HGC would become locally autonomous and be titled clubs in their own right. We felt strong enough in numbers and organisation to delineate areas bearing no gaps so that the whole of Wales was covered by virtually four clubs. N. Wales H.G.C., Mid Wales H.G.C. South West Wales H.G.C. (formerly West Glamorgan) and South East Wales which we hope will resolve itself between the Crickhowell Centre and the Heads of the Valleys, clubs. Again, at the suggestion of the Sports Council, the Welsh Hang Gliding Federation was formed to represent the whole Principality in dealing with similar bodies such as The Forestry Commission, NCB, National Trust, Parks etc. The Federation will be funded by the clubs at 50p per member up to a maximum of £25 per club per annum. Special levies will have to be agreed, if major expenditure is incurred.

One thing that stood out a mile — areas such as West Glamorgan which have been well organised for some years and maintained a fairly tight control on sites and visitors, were actually gaining sites — yes actually being invited by authorities to "come and try our site and see if you like it!" (You don't believe me do you). Either areas, e.g. South East, were suffering badly and losing sites through lack of cohesion and pressure of visiting fliers. Now we are getting it together it is hoped that there will be better control and no more sites will

be lost.

Visitors will have the options of becoming "Visiting Members" of clubs (like the Rhossili Membership offered in the South West HGC area) or Full Members. "Visiting Membership" restricts you to the area of the club you are visiting. Full membership of an area club, means you can fly anywhere in Wales subject to the usual notifications and adherence to site rules. Full details of all sites etc. will be available in due course.

A Whitsun "Fly-In" will be hosted by the South West Wales Club (since they have sites covering all wind directions). If you are coming from England or Scotland make sure you've got your membership paid up. Overseas visitors (including our Irish buddies) will be accepted as "Guests" provided they are members of their own National body. There will be no competitions just come and enjoy some good flying. (Bring films).

The North Wales HGC are in the middle of delicate negotiations for the following sites.

Penmaen Bach SH 750 780

Great Orme SH 760 830

Please do not fly there until we get an agreement which will be announced in *Wings*.

South West Wales HGC — Two new sites are in negotiation and are open for limited flying. Aspects are SW and NNW. Visitors should contact club members (with both BHGA number and Rhossili membership details) and they will be taken to the sites. Sorry but there are too many snags as yet to make details public.

The South East Wales HGC was formed on January 1st 1978 by amalgamating the two clubs, previously operating in this area. Because of severe overcrowding on certain sites, site control will be tightened up beginning with Abertyswg (near Tredegar). Any visitors wishing to fly this site must now contact the Site Officer, Gerry Breen, 'phone 0873 810019 (giving BHGA number) who will supply details. If you come without prior arrangement YOU WILL NOT BE ALLOWED TO FLY. We in Wales have a difficult task but with your help the number of sites available will continue to increase.

Dai Kite

Welsh HG Federation reporter

HANG GLIDING IN NORTH WALES

At a recent meeting of the Council of the Welsh Hang Gliding Federation it was agreed that the administration of hang gliding in North Wales will be the responsibility of the North Wales Hang Gliding Club.

So if you want to fly in North Wales please first contact their Sites Officer, John Evans on 051 336-2681 or Secretary Ray Hanlon on 051 652-5918. The Club has already done a lot of site negotiation so flying there without prior contact will not only be discourteous but may do positive harm

on delicate sites. Five minutes of your time on the telephone could help to ensure years of flying for you in the future.

**Hugh Hutchinson, Secretary
Welsh Hang Gliding Federation**

SUBSCRIPTIONS

Members with the membership numbers 6094-6440 are due for renewal on 1st February 1978.

LAST MONTH'S MISTAKES!

The photographs of the Pennine Club Competition were taken by Jeffrey Hunt not Geoff Hunt as printed. Apologies also to Jeff for the lack of captions to the photos. These fell off the artwork somewhere in transit.

Apologies to Bob McKay whose poem in the Editorial emerged slightly re-arranged with the title not clearly separated from the rest of the verse.

The Book Review of Mark Leslie's sites guide was written by Roger Willbourne from Scotland.

Observers list:

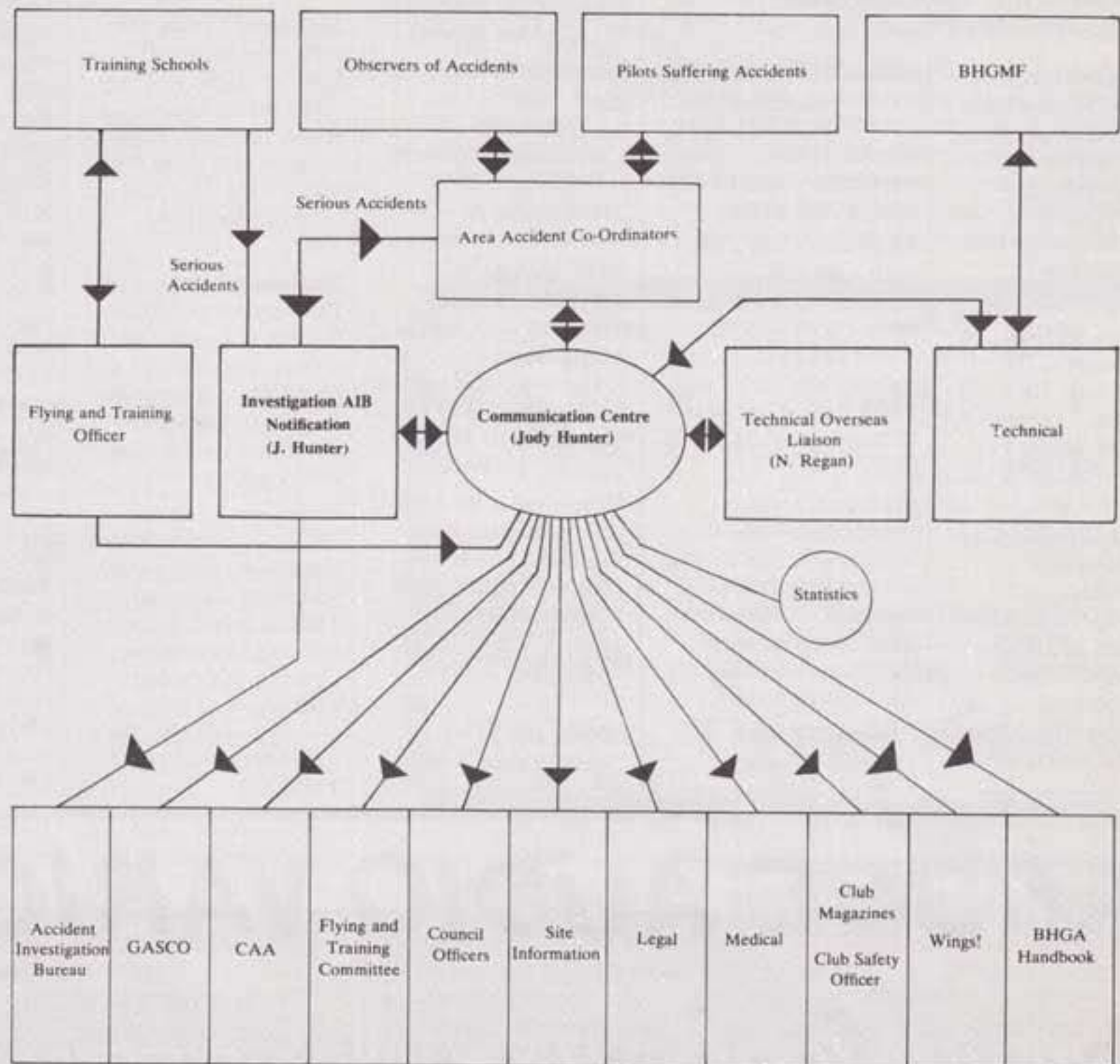
Omit no. 6 — P. Bridges is no. 7
52 is R. Hill and S. Hampton is 53
282 is spelt Birkbeck
299 is spelt Oram

FAI LICENCE

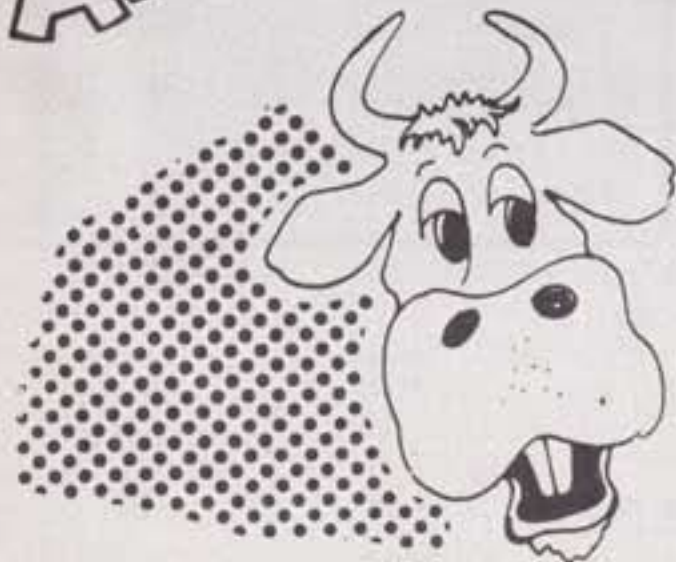
The FAI Delta Bronze badge is the minimum qualification for obtaining the FAI Licence. The two are not the same thing. All applicants who have completed the task for the badge will be notified through *Wings!* when it is available and the cost is known. All applicants for an FAI licence must hold a Pilot's badge or a minimum of FAI Delta Bronze standard. The licence is obtainable from Keith Cockroft on receipt of a cheque or postal order for 50p and a SAE (annual validation costs a further 50p) This licence will be necessary to compete in HG competitions in GB or abroad.

Accident Reporting

The flow chart below shows the inter-communication between various bodies during the investigation of an accident. If one link fails the system cannot function properly. For this reason make sure those accidents don't go unreported.



ANNOUNCING



CORK '78

ANNUAL FLY-IN OF CORK HGC, March 18/19th. Details from ROY HAMMOND, 40 Beaumont Cres., Cork

small ads

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

Small Spirit for pilot under 10 st. Just been checked and test flown by manufacturer, fly seated or prone. Delivery possible. Tel: Heidi Brogan, 041 644 4540 (Glasgow).

Skyhook 3A. Excellent condition, red sail, seated harness and carrying bag. Ideal for beginners. £125 ono. C/o Peter Scott, Tel: Seaview (Isle of Wight) 2334 evenings.

Chargus 18/50 two-tone blue and yellow. Exceptional rogallo with stiffened leading edges and adjustable nose angle. With seated harness and zip-up bag. £120. Ring Tim Meager (Cheltenham) 0242 39555

Wasp 221 C4. Red and yellow sail. In excellent condition, with bag and seated harness. Good performer. Tel: Lesley, Linley 322. £130.

McBroom Cobra 188 with new stiffened leading edges and new cross boom and A frame uprights. Prone harness and vinyl bag. £180. Ring Tim Meager (Cheltenham) 242 39555

McBroom Lynx. Immaculate condition, Vectus sail, one careful owner. Purchase of a second kite forces sale. £330 ono. For more details contact Woking 63755 any evening.

Proneweb Prone Harness £20 ono. Contact Simon

Mitchell, Wolverhampton 732255
Simpson Prone Harness for sale. £25 ono. Graham Driscoll, Telford 55216

Wasp 229 B3. Red, White, Blue and Orange sail. Spare wing boom and harness. Ideal learner's kite. £75 ono. Tel: Brierley Hill 71412 (Alan Wood)

Scorpions in stock and good condition Scorpions and Cloudbases. Contact Bob Calvert, 390 Preston Old Road, Blackburn, Lancs. Tel: Blackburn 21615.

Kestrel 'Windover'. Standard with seated harness and bag. Well-maintained, and suitable for beginner. £75 ono. Tel: Lytchett Minster 3945 (Mike Wills)

Hiway super de luxe 20 ft. Cloudbase. Excellent condition complete with zipped bag and seated harness. £240. Tel: Southend on Sea (0702) 527902 evenings.

Hiway 220. Seated/prone with seated harness and bag.

£75 ono. Peter Tindley, 51 Brackendown Ave, Weymouth. Tel: Preston (Dorset) 832758.

Chargus Vega I. Black, white, yellow, blue) Very good condition. (Approx. 40 flights) £270. Ring Mike Buck, Oxford 42090

McBroom Cobra 188 with new stiffened leading edges and new cross boom and A frame uprights. Prone harness and vinyl bag. £180. Ring Tim Meager (Cheltenham) 242 39555.

McBroom Lynx. Immaculate condition, Vectus sail, one careful owner. Purchase of a second kite forces sale. £330 ono. For more details contact Woking 63755 any evening.

McBroom Lynx. 6 months old in excellent condition. Well-tuned with very clean sail. This underrated glider will suit intermediate onwards. Complete with seat and bag. A giveaway at £290. Ring Eric Morgan, Cardiff 733813

Midas 'C'. Immaculate coloured bainbridge sail. Works maintained at Chargus. Kept in tune and has never been damaged. £350 plus excellent prone harness at £25. Tel: Buckingham 4321 (Office Hours)

Birdman Moonraker, in excellent condition. Very attractive sail. Flies very well. £400 ono. Ring Graham Bracknell (0344) 27316 (evenings)

Skyhook 18 ft. Mk. 4. Multi-coloured sail, nearly 2 years old but hardly used and stored indoors. Complete with bag, seated harness, helmet and ventimeter. £135. Ring Mike, 061 624-9961 (Oldham)

Wasp C 4221, Blue/white as new, with seated harness and bag, a really good standard. £165. Tel: 0480 65027

Vertical Speed Indicator, just overhauled £17. Also latest transistorised unit A.S.1. (16 hr. battery life) accurate and adjustable £25. Reason for sale of both

instruments, buying new twin unit. Tel: Eddie Horsfield 01 684-4772 (Croydon).

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.

Instrument Clamp (Aluminium) with singlebolt which rigidly and neatly holds tube at right angles to A Frame. Quickly removed with Allen Key (supplied). Contact Tony Elsdale, Ickford 298 (evenings)

Scale Hang Glider Kits. Hi-Fly, SST, X-Country, Phoenix 6B & 8, Midas E. Precut boms and sail including battens and rigging. Only 55p each (including postage). Dave Mudie, 124 Cliff Rock Road, Rednal, Birmingham B45 8QG

For Sale. Skyhook III, ideal for beginners or Club trainer. Top rigging, excellent flier,

ARBEE AUDIO VARIO - £39.50 INC. P&P

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Arbee Developments, 18 Stephens Crescent,

Horndon-on-the-Hill, Stanford le-Hope, Essex. SS17 8LZ.

any demonstration. R. Grundy, 34 Avon Crescent, Romsey, Hants.

Wasp Nova II, Closely related to Falcon series. Hardly used. Prone harness, bag. Foldable to 12 ft. Great performer. £250 ono. Sennen (Lands End) 246.

Avon Swift complete with bag and seated harness, also old Wasp knee-hanger harness. Ideal for learner — right up to intermediate stage, at an ideal price — £180. Tel: Gloucester 31198.

Cloudbase Super de luxe 21 ft. Red and blue sail. 10 months old. £270 ono. In good condition (never bent) and with seat and bag. Tel: Paul, at Church Stretton 2884

Swift 20 ft. 9 months old. Excellent condition. Purple, gold and red sail, complete with bag and seated harness. £300 ono. Tel: Ken Ryder, Cinderford 23171

Wasp 221 C4 excellent condition, flies well. Seated harness and bag. £180. Tel: Glyn Kilsbv 01 360-4352

Ridge Rider Pinto. Red and white sail, seated harness (rigged for seated or prone). Carrying tube. Good condition. 18 months old. £150. Laurence Bourne. Tel: 01 427-6148 (evenings).

20 ft. Cloudbase Radial. Very good condition, never kragled, multi-colour, half panel sail, seated harness and carrying bag. £250. Ring Thatcham (0635) 62529 after 7 pm.

For Sale. Wasp Falcon 4. In excellent condition. £350. Also Wasp prone stirrup harness, hardly used. £40. Tel: 01 692-9767

17 ft. Argus. Red/yellow/blue, anodised cross boom, ideal for beginner, up to 11 stone. Complete with bag and seated harness. £90. Tel: Neil Arnold, Minehead (0643) 2392.

Breen Kustom Kite 18 ft. Orange. Seated. Quiet, smooth and responsive. Ideal for

beginner. Price £115 ono with bag. Hugh Quarendon. Tel: (Home) Brockenhurst (Hants) 3045 or (Office) Southampton 771450

If you want genuine performance with effortless and forgiving handling, try flying Dave Roberts' record setting, pulley special, **Phoenix 8 Junior**. Ideal for 9-11 st. pilot. £480. Tel: 079 78 416.

Competent, reliable pilots required for instructors, full and part-time, during 1978. Generous rates during and after training. Apply, initially in writing to Dave Simpson, Dunstable Hang Gliding School Ltd. 18 Chase Close, Arlesey, Beds.

Wings! First Edition. Mint condition copy of this historic document. (January 1975) available. Offers please, to Tony Fuell, 74 Eldred Avenue, Brighton. Tel: B'ton 502952 (evenings).

Spirit 22 ft. Great intermediate kite. Fitted with latest pully system. £275. Tel: John Bridge on Hesketh Bank 3186 (Near Preston).

Wasp CB240. 2 years old. Post-Kossen model. Excellent condition especially the orange terylene sail. Very good beginner's to intermediate kite. Also prone harness and seated (long straps) harness and bag. Some spare parts. £170 ono. Write Ian Ferguson, 73 Dale St, Lancaster, Lincs, giving your 'phone number.

For Sale. One year old Falcon III in immaculate condition. £300 ono. Stirrup prone harness available.

Home-built 'Argus' also in excellent condition. Seated harness. £100 ono. Contact Dougie Short, Harrington 830255, or write to 22 High Close, High Harrington, Workington, Cumbria.

SST 100C for 9½ to 11 st. pilots. Dark blue, light blue and white. Complete with streamlined crosstube

and kingpost. A real "eater" for only £375. Tel: Eric Gibson, Cramlington 712220.

Falcon IV.B. Wasp. 4 months old. Excellent condition, tasteful sail design. See photo in this copy. £400. P. Renouf, Hailsham (0323) 844820.

The High School of Hang Gliding, Bristol, have the following used machines for sale, test flown and in excellent condition:-

Electra Flyer Cirrus 3, £350; Phoenix 6, £340; Phoenix 6B Jnr. (with raised keel pocket) £420; McBroom Cobra, £150;

Free day's conversion course with every machine, contact C.F.I. Glenn Harvey at Sutton Veny (09854) 571

Scot Kites Firefly. Well cared for intermediate. Suit 11 st. plus pilot. With seat and bag £220. Delivery possible Scotland/North England. Contact Steve Cuttle, 11 Temple Park Crescent, Edinburgh, EH11 1JF (031 667-1081. Ext 2680 (Daytime).

For Sale. New Australian Design/built Cohen 'Skydard' II and 'Skyhook' II. Tel: Colin Bennett 01 727-3093 (evenings).

Wasp CB240 in excellent condition with bag and seated harness. All for £150 ono. Contact Wells, 29 Elsham Road, London W14. Tel: 01 602-0130

For sale now. Class I Moyes Stingray 185 sq. ft. Plenty penetration, 28 ft. 6ins. span, no deflexors, land on any blade of grass. £485. Phil Mathewson, 01 673-0401

CB 240. Seated and prone harness, carrying bag, little used, condition as new. Would exchange for C4 221, Falcon or any more advanced glider. Cash adjustment or sell £180. Tel: 01-476 2655.

Old Faithful Wasp 229B, flown over 300 hours, good condition, making way for SST. £80 to good home. Harness, cover. South London. 870-0368

Second Hand Wasp Falcons for sale. A few to choose from. Mostly IV's, some III's. All in perfect condition and tested. £300 to £395. New Gryphons now available. Contact Lester Cruse Tel. Downland 54322.

Midas E new at Long John. The beautiful 'National Panasonic' machine flown so successfully in the distance event by the equally beautiful Jo Binns. £400 notes or terms. John Long, Isle Brewers 537 (Somerset).

Cobra 188. One year old. Red and white sail, seated harness, in good condition. £150 ono. 'Phone Graeme Baird 0480 68882.

Falcon 4 flown once, only 6 weeks old. Immaculate condition, multi coloured sail. £380.00 Tel. 01-848-4527, Hayes.

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 month preceeding publication.



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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.

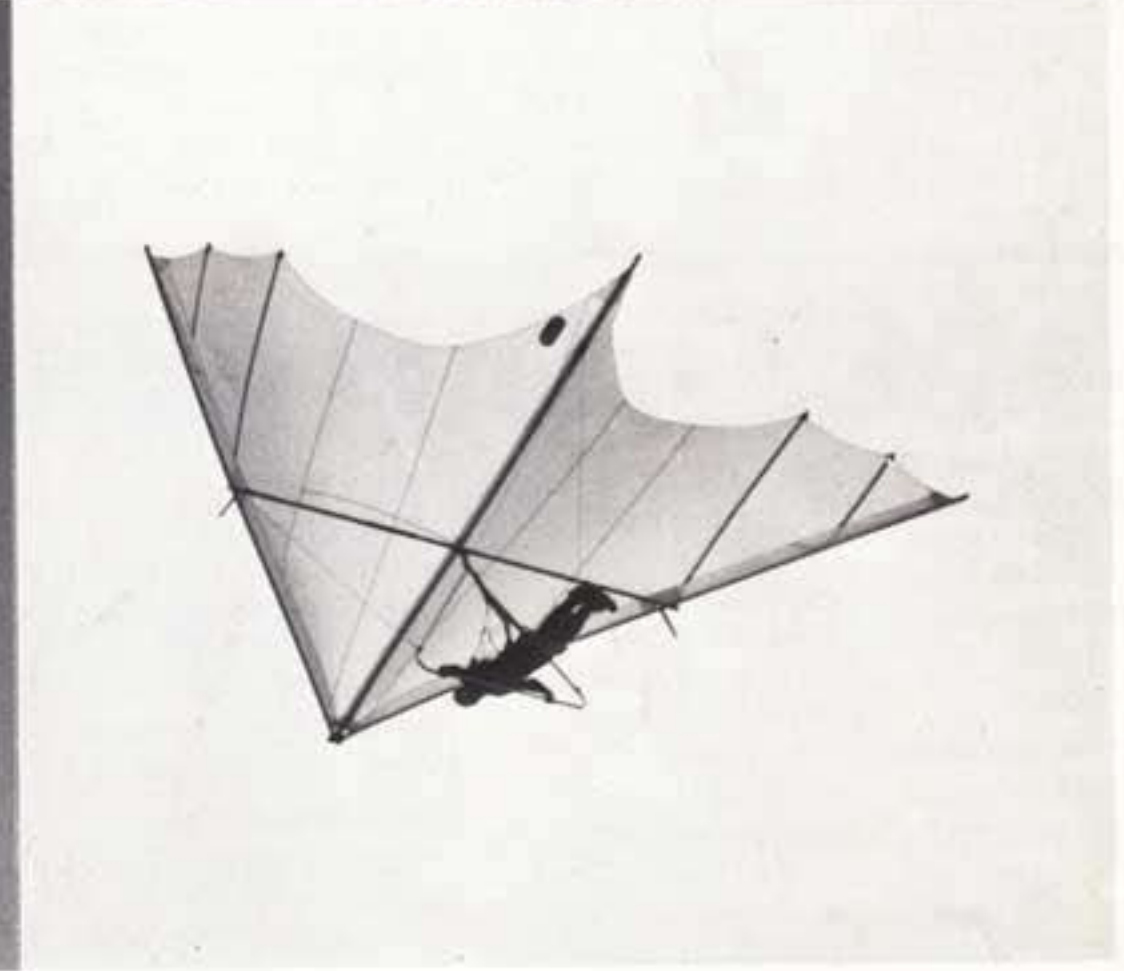
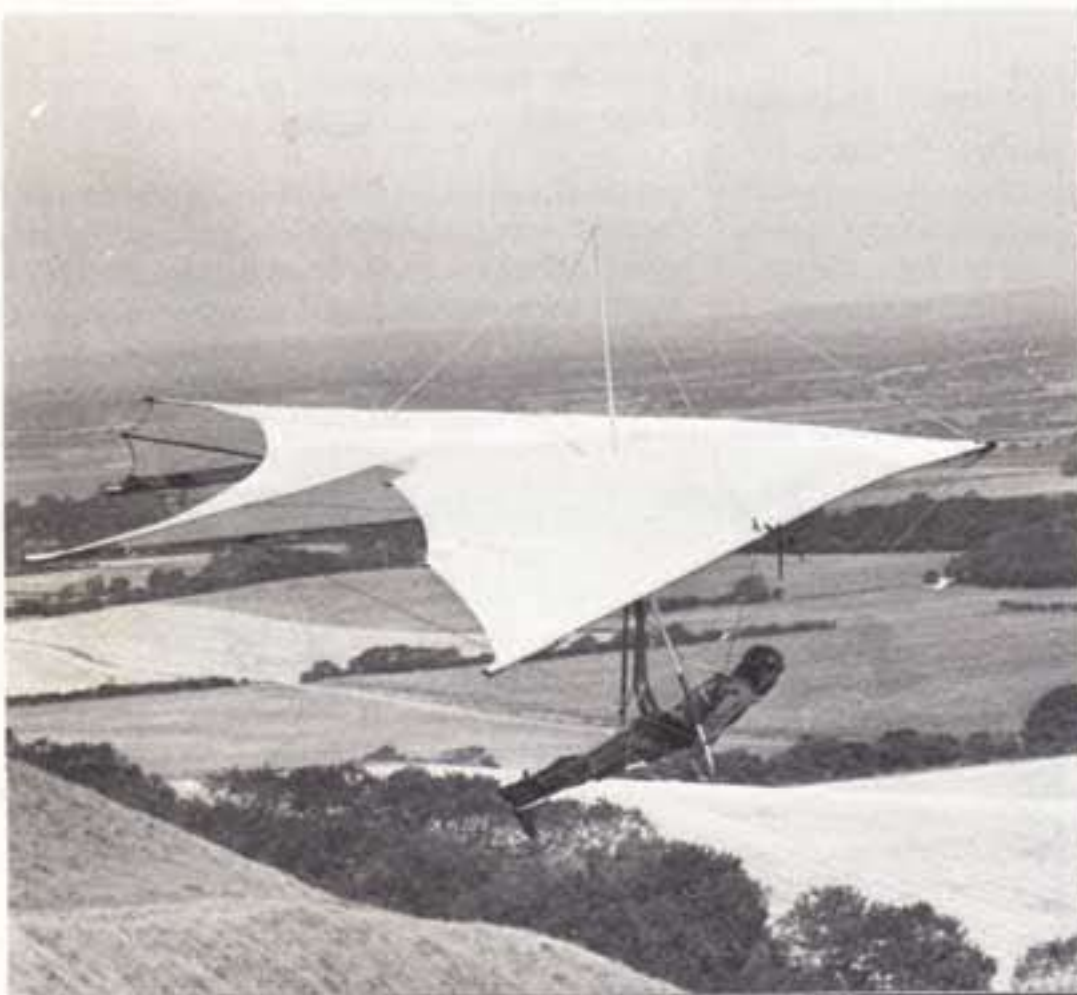
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(If above three ordered together)	£1.00
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Keyring and chain with BHGA Badge in acrylic "teardrop"	60p (can be used as a pendant)
"HANG GLIDER PILOT" — by Ann Welch & Gerry Breen	£2.75
An excellent 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.

Monksilver, Taunton, Somerset.

Cloudbase and Scorpion Class 1 and Class 2



In the British Hang Gliding League 1977, a Scorpion was the top placed British production kite. Also in the '77 League, in a 'no limit, go for it' cross-country task, Bob Calvert flew his Scorpion literally miles further than any other machine. If you want highest performance with light and predictable response, Scorpion's the ship for you.

If you're new to hang gliding or want to concentrate on an F.A.I. Class 1 glider, the Cloudbase is the ideal novice/intermediate machine. It handles like a dream and is very often up with the higher aspect ratio kites.



Hiway Hang Gliders, 27/35 Bernard Road, Brighton BN2 3ER. Phone: Brighton (0273) 681278.