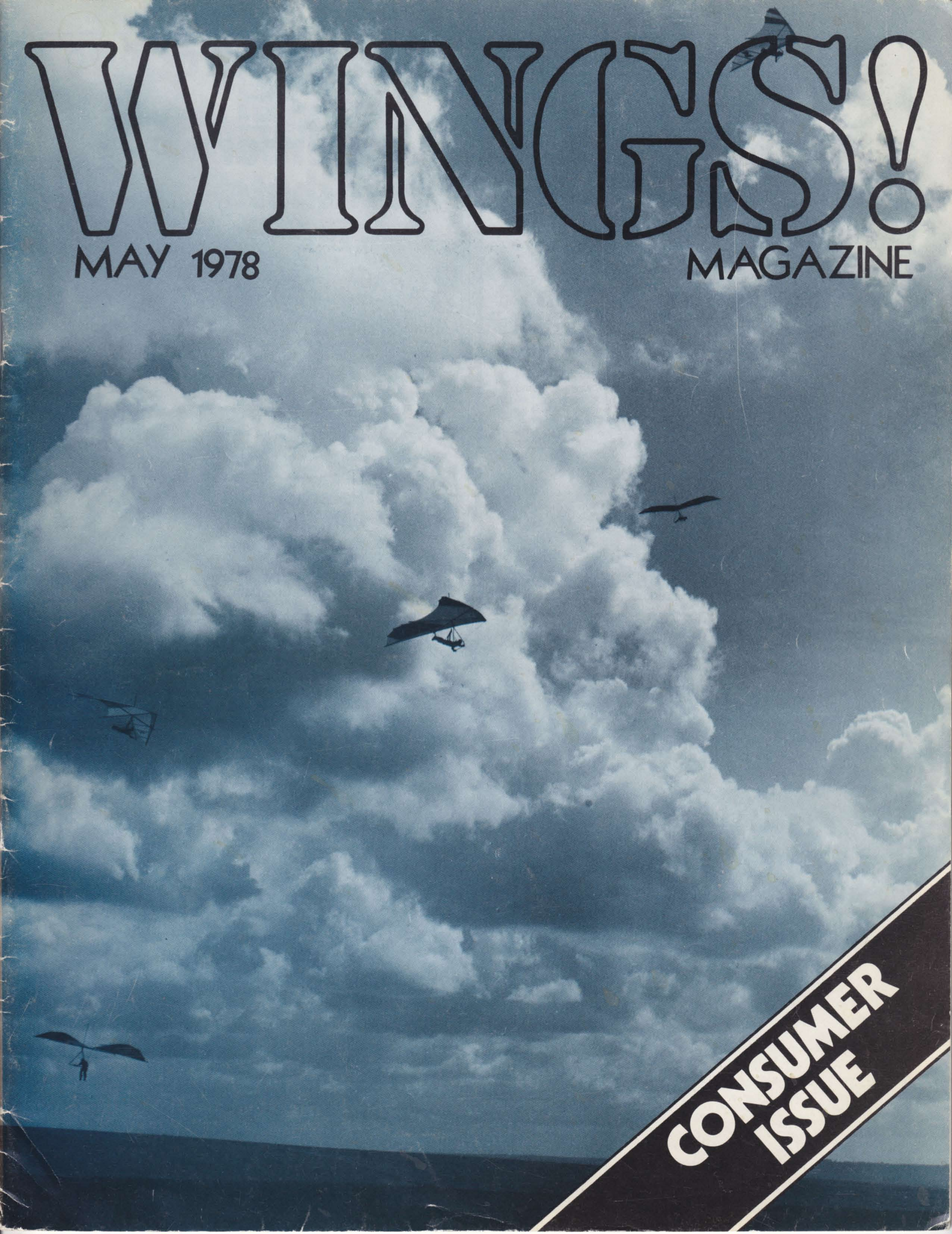


# WINGS!

MAY 1978

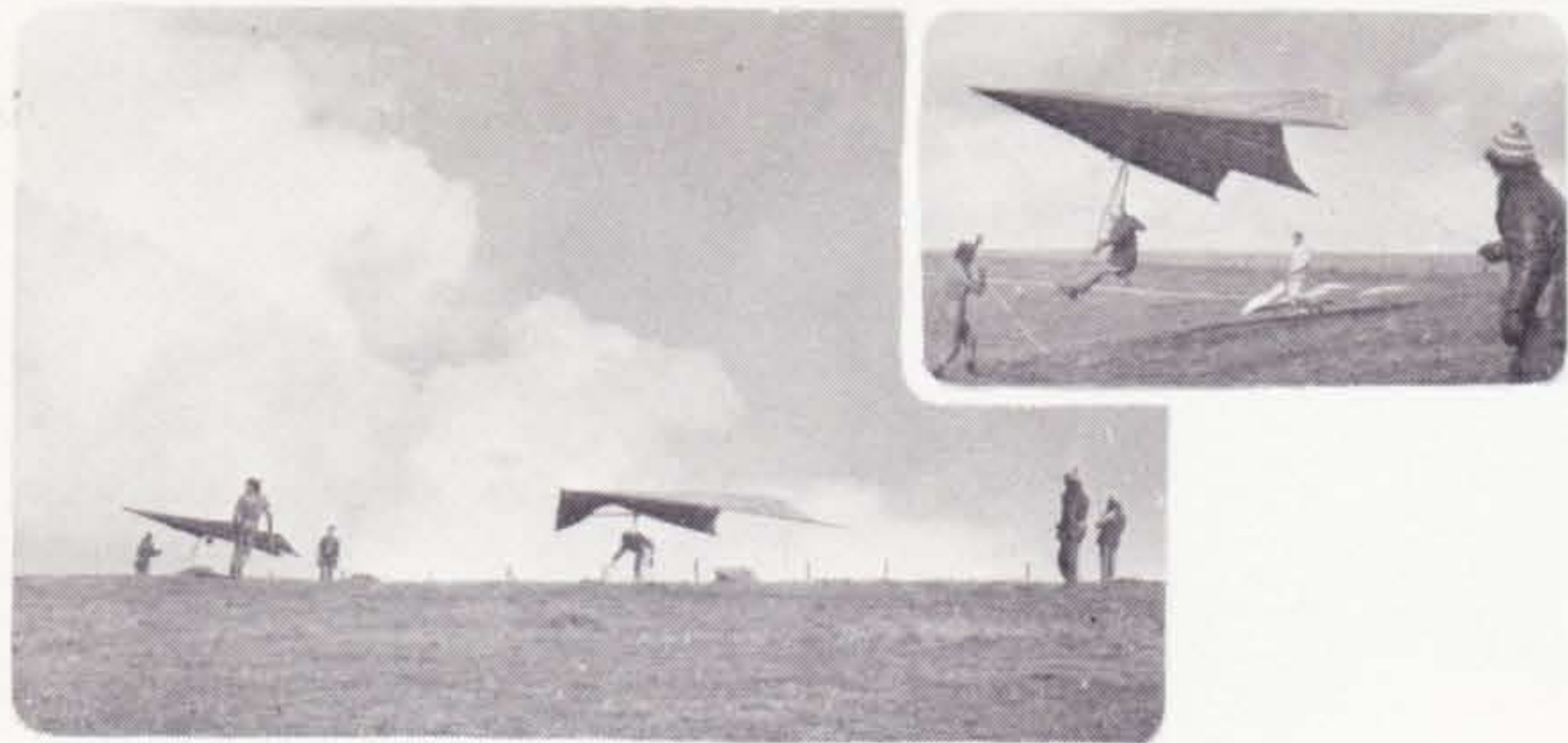
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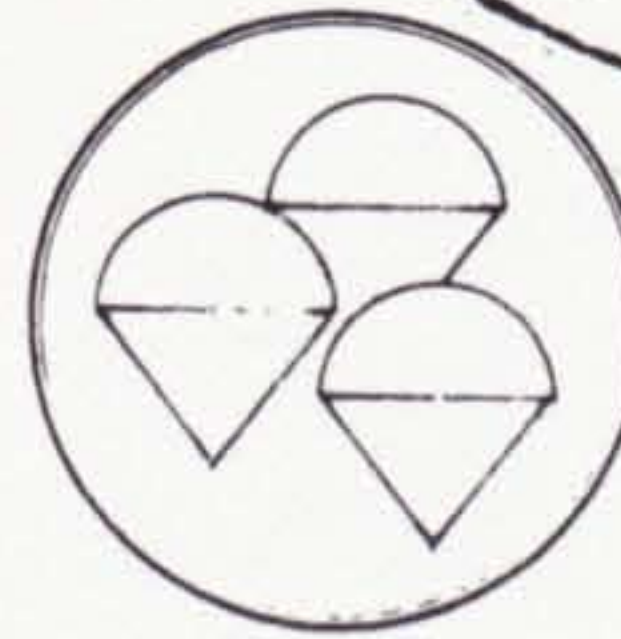
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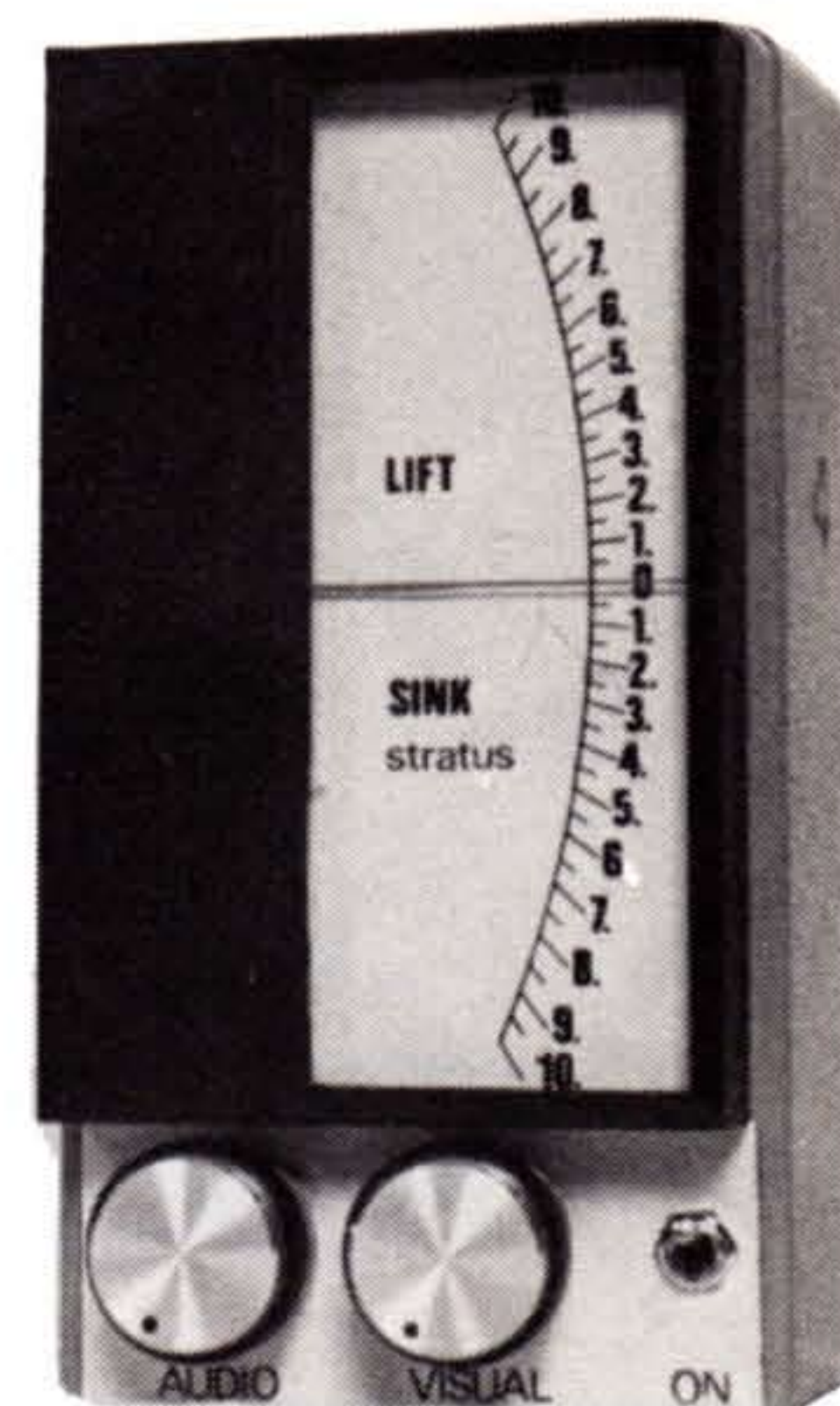
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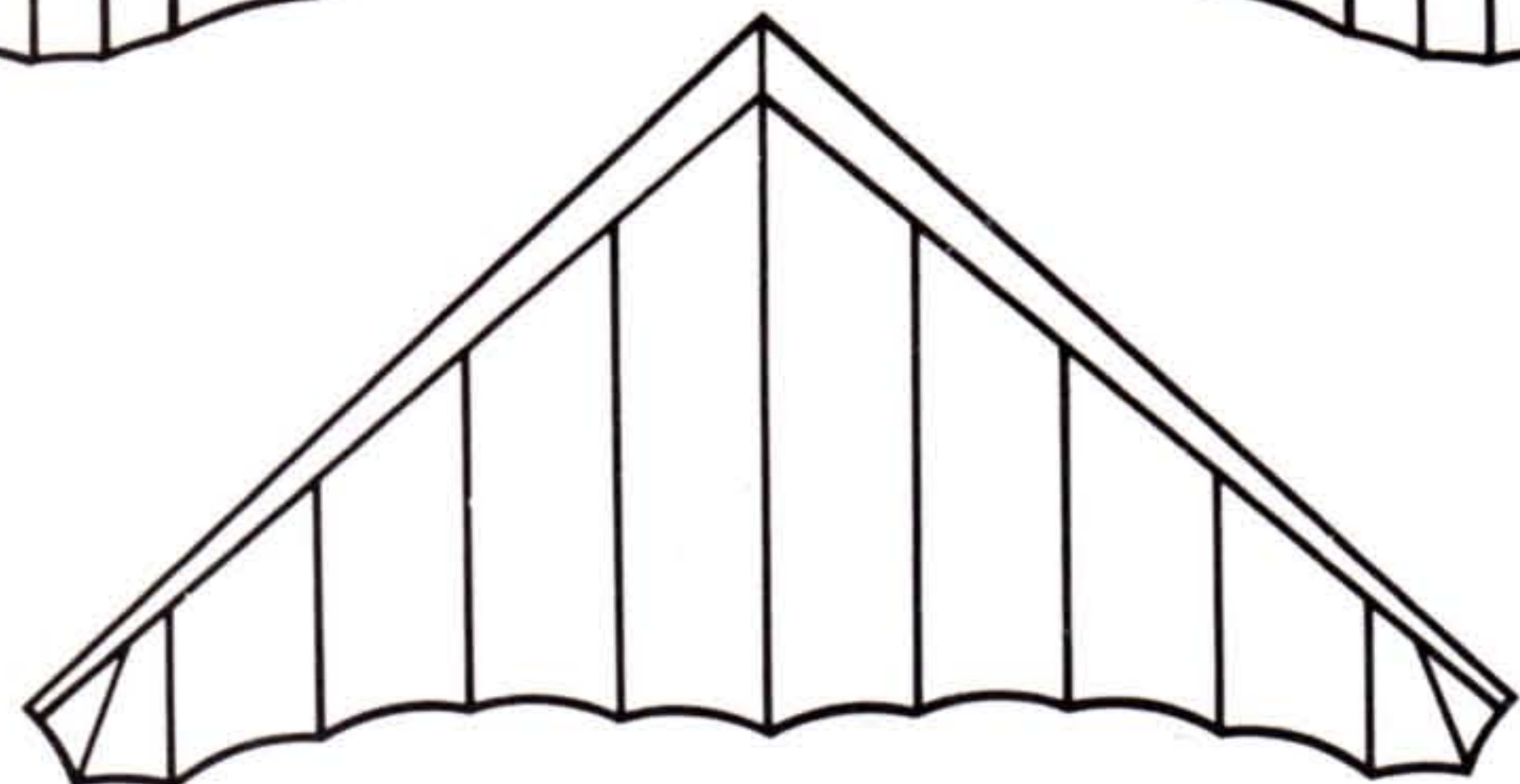
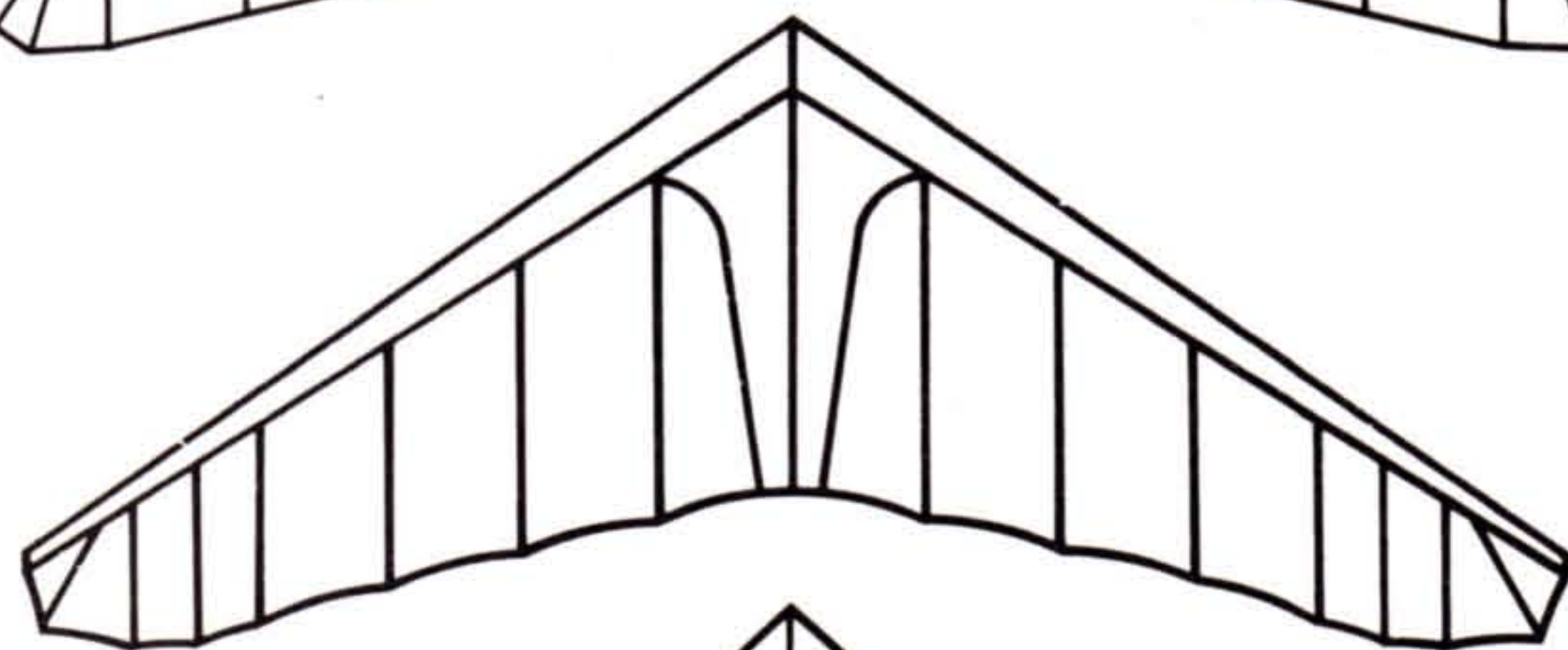
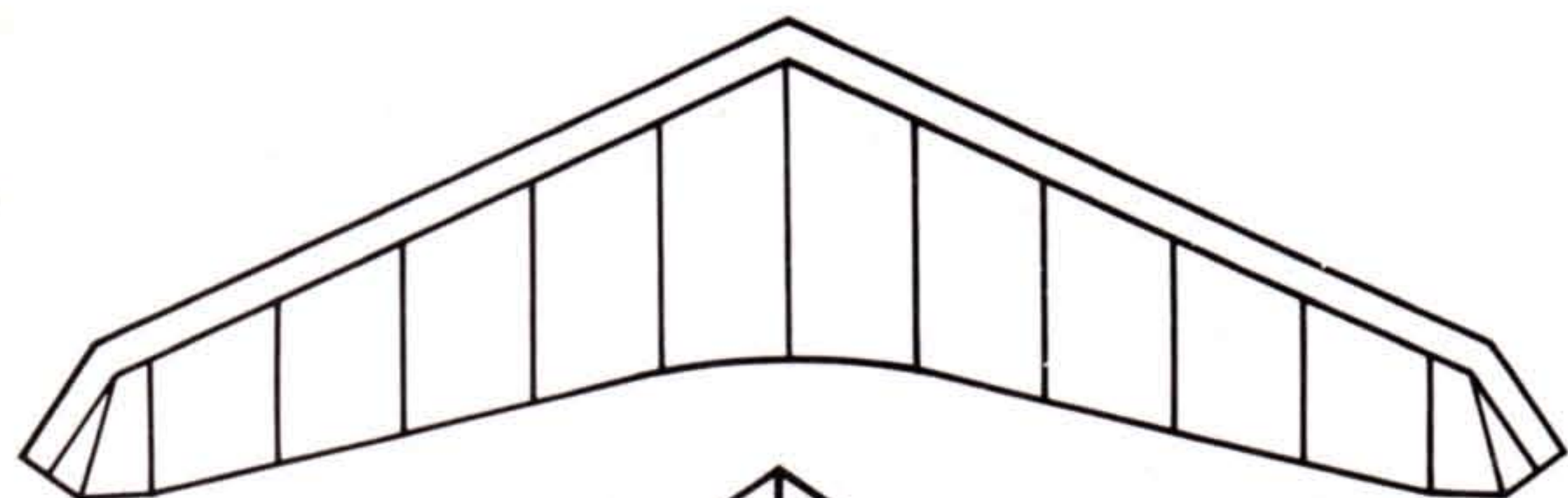
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# WINGS!

The official magazine of the BHGA

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Cover: Bettina Gray captures the beauty of hang gliding.

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# COUNCIL MATTERS

by Chris Corston

From now on I shall be reporting on Council meetings so that you know what Council decisions are taken affecting our sport. Before the report on the Council meeting of 2nd April, 1978 this month's article covers major Council decisions since the end of November, 1977, when I resumed the duties of Secretary.

In view of the large potential growth of powered hang gliding and the possibility of external control if the BHGA cannot, the Council formed a Powered Hang Gliding Committee to decide our policy. Brian Milton was elected to form and chair this Committee.

Ted Shreeve, the Technical Officer, was thanked for his services. Alan Barnard (Chairman of Devon and Somerset Condors Club) was asked to take over responsibility for Technical and Airworthiness matters. He agreed to do this working as part of a team. The Airworthiness document compiled jointly by the BHGA and the BHGMF, "Airworthiness Standards and Requirements for Hang Gliders", was accepted and plans for implementing the Airworthiness Scheme are currently nearing completion. Council feel that reciprocity on Airworthiness Standards with other countries is important.

It was decided that a public event should be run at Mere over the August Bank Holiday weekend if a sponsor is forthcoming and the site is available. Neither are certain. "Grandstand" will cover the event and the number of entrants must be manageable. Council agreed to limit entry in the main competition to 30 League fliers and 30 Area fliers.

A new Pilot Rating System will be introduced in line with improved aircraft and the greater demands for pilot proficiency in relation to cross-country flying and the expected increase in the use of power. Keith Cockroft was asked to finalise details so that they can appear in an article in *Wings!* as soon as possible. Implementation of the new Pilot Rating System is to be by 1st August, 1978.

With the centralization of the

administration it was decided to use a computer system to print address labels for the despatch of *Wings!* each month.

**Council Meeting 2nd April, 1978:** The new Council discussed targets for the coming year. In view of Council concern over a slight fall in membership Garth Thomas undertook to contact a sample of ex-Members to find out why they had not renewed.

Malcolm Hawksworth resigned as Chairman of the Training Committee and Garth Thomas was appointed to succeed him.

Chris Simmons was co-opted as a Council Member for Northern Ireland. As a co-opted Member he does not have a vote. Council decided to approach the Welsh Hang Gliding Federation to ask if they wish to nominate an existing Council Member to have a special interest in hang gliding affairs in Wales.

John Hunter was appointed as Chairman of the Airworthiness Committee. He and Alan Barnard will be concentrating their efforts on the rapid introduction of the Airworthiness Scheme.

Will Jones, Chairman of the Accident Prevention Committee, drew Council's attention to the fact that in spite of BHGA recommendations concerning harnesses, the issue of handbooks with gliders, etc., there are still manufacturers who have not put the recommendations into effect. These recommendations mainly resulted from the Coroners inquest into the death of Barbara Jones in September, 1976. It was decided to write again to the manufacturers asking for assurances that these recommendations will be followed.

Normally the press only report hang gliding when a death or serious accident occurs. We must make positive attempts to get more balanced coverage by taking the initiative and getting coverage of other, more positive aspects of the Sport. It was agreed that we adopt a high profile publicity campaign until the end of 1978, when its effects can be determined.

**Chris Corston**



## MESSAGE FROM THE CHAIRMAN

The greatest honour that our members can confer is to elect someone to the Chairmanship of the Association, calling on him to represent them — wherever and whenever it may be necessary to present our case — and to guide our Association to its rightful place.

I have accepted office with great humility — and will display some energy in taking us forward. There is however, one problem and that is to establish precisely where is our rightful place. Where do we want to be — in one year's time — in two year's time? What is our long term objective?

Reading this there will be some thousands of people, each with a different concept of what hang gliding means to them — what hang gliding ought to achieve — the form they see it taking in a few years time.

Concepts will range from individuals enjoying an undisturbed flying afternoon all by themselves on some remote hill, club meets, and Olympic Gold, through to those seeing hang gliders used as an aid to commuting, rather than as a sport. A clear policy for hang gliding must be established and it is your Council's and my, duty to define that policy.

Vital to the definition of that policy, however, is your personal input and the input of your Club.

Your views can be transmitted through your own club magazine (send me a copy, as some clubs do already) directly to any Council Member, to Chris Corston, to *Wings* or to myself. The views of your Club can be expressed likewise — and I would especially urge each and every Club Committee to put high on its agenda for their next meeting — what policies should the BHGA adopt? Exactly what Council should seek to achieve for the BHGA?

The British Hang Gliding Association is well regarded outside of the hang gliding community and is looked on as the body responsible for taking hang gliding forward to its rightful place in the community. It is for you to define that place — do let your voice be heard.

**Reggie Spooner.**



## MOTORIZED MONSTERS?

Dear Sir, We all get excited with the new advances — the new developments in our sport — and when I have seen these new fangled motorized hang gliders buzzing around over our heads, I have been no exception.

Yet now, I am beginning to have my doubts whether they will be good for hang gliding as a whole.

Consider first — most farmers viewed us with grave suspicion if not active disfavour, when we started some three or four years ago. Gradually, they have been won over as they have seen (especially since the introduction of the newer, quieter kites) that we do not really frighten their sheep or cows all that much.

This will not, however, be the case once these motorized monsters invade our slopes.

Consider second — our freedom from official interference.

When manufacturers start real production, the CAA will stop turning a blind eye to the present experimental models and could well insist on:

- (a) pilots licences
- (b) certificates of airworthiness
- (c) annual inspections
- (d) use of instruments
- (e) use of parachutes

Once these measures were introduced for our motorized colleagues, it would be a very quick bureaucratic 'tidying up' step to include conventional hang gliders.

Consider third — our comparatively low accident record.

I feel it would not be long before some pilot, experienced or otherwise, would find himself too low over some built up area when the engine cuts out.

Don't tell me he should not be in such a position: I agree — but I still say it will happen.

Look back and see how we lost some of our most experienced pilots for stupid things that should never have happened.

Consider the added dangers a motor brings — fire, vibration, fatigue, etc.

Consider then our image. We have always claimed that our sport was clean, that we did not pollute the environment, that we relied on our innate skills to compete with the birds on even terms, that we could be seen but not heard, that our gliders were ethereal things of grace and beauty.

Alas for a cherished dream that will be over once we allow these screaming high pitched monsters to shatter our peace and quiet.

These alien invaders will antagonise the public, and the authorities and frighten off would be participants to our sport.

Surely it does not require much intelligence to anticipate the reaction of the National Trust, the N.C.B., the Graziers, the landed gentry and other landowners.

Let us ban these monsters before we get banned ourselves. There is no room for these interlopers.

They are as far removed from hang



# AIRMAIL

gliders as light aircraft from sail planes, as motor-cruisers from yachts, as mopeds from bicycles.

I feel the manufacturers are thinking on the wrong lines at the present time — I submit that small, noisy, mass produced, light weight power packs ready to fix onto unmodified hang gliders is the wrong concept.

What is needed, is a powerful, heavier, quieter unit which will fit onto a specially built glider to serve primarily as a tug to tow hang gliders in flat areas up to heights where they can get into thermals.

The rate of climb should be 100ft per min at 25mph with an endurance of some 30 minutes.

When a manufacturer can produce something like this, I shall be the first to applaud and might even want to use such a machine.

In the meantime, I am asking all people who want to safeguard our sport, to lobby their council member to put some check on any over ambitious schemes of manufacturers who may be looking on this as a big wide open market.

Personally, I would be as happy to see motorized hang gliders descending on our hills as I would a swarm of tree cutting buzz saws.

**Michael Adam**  
South Wales Hang Gliding School

## INTERCLUB UNDERSTANDING

Dear Sir, I had intended to raise the increasing problem of site control and site fees at the AGM. Unfortunately, although the agenda included a final period for discussion, other topics took far too long and left insufficient time. This was most regrettable since the AGM is the one occasion each year when open discussion can be held.

I was particularly pleased to see John Hudson's article on club co-operation in March *Wings!* and would like to add my own views on the subject.

In an ideal situation it should only be necessary for a pilot to join his local club and thereby get insurance cover and inter-club information (including sites). Pilots, if suitably qualified, should then be able to fly off any site in the country.

When flying another club's site, a payment should only be made if the land owner has to be paid. A club should not use a site fee or associate membership as a means of swelling its

funds or a means of restricting the number of fliers. I am against the recent trend, particularly in Wales, for pilots to need individual membership for each area he visits.

In the same way that a Northern Association of clubs is being formed, an exploratory meeting for a Midland Association was also held recently. By such associations it will be possible to ensure that each club's site rules are understood and followed.

All clubs should have a common intent of giving all pilots access to every hill with the minimum cost and in return receive maximum co-operation.

**C.W. Freeman**  
Chairman Mercian HGC

## RIGGING EYELETS

Dear Sir, With regard to "potting" rigging eyelets in Silicone rubber.

The easily available tubes of this compound liberate ACETIC ACID as it sets — not nice to have floating around stressed metal parts!

Grades of two-part Silicone rubber that set without acid liberation are available but only in larger sizes which are expensive. I have used such compounds and harder rubbers on my glider, but with only limited success.

**J.M. Jenkins**  
Weymouth

## A SALTY 16:1

Around this time of year I find myself with a rather tricky dilemma with regard to stating performance figures for new model gliders. The problem is this. Whilst there are no really accurate ways of determining hang glider performance the methods currently in use do give over numerous flights a reasonable average idea of a gliders min. sink and best L/D figures. Good enough for us to quote approximate figures with reasonable accuracy. Naturally we regularly fly against other makes of gliders and accumulate a fairly good idea of the comparisons between ours and other gliders performances.

The real difficulty occurs when a competitor say for instance quotes an outrageous low figure for sink rates on a particular glider. We know from our own tests and flying against this machine that perhaps there is very little difference between the two and yet our tests show a figure 25% higher than that quoted. What do we do? State the figures we believe to be

correct and possibly miss out to a certain extent or exaggerate to bring our figures into line?

Ideally at some time in the future independent comparison tests could be carried out by a team of expert flyers representing the B.H.G.A. so that the club pilot has a reliable source of information. In the meantime I would advise any prospective buyer to take manufacturers performance claims with a pinch of salt and go out on the hills and closely observe the performances shown there, allowing for differing pilot skills and changing weather conditions.

**Ken Messenger**  
Birdman Sports Ltd.

## MIXING WITH THE HOT-SHOTS

Dear Sir, May I please comment about recent rumblings of mine concerning the league and competitors with class III hang gliders.

I was invited by Brian Milton to partake in the league. If I came within the top 10 then he was prepared to pay for my entry. For this I wish to thank him because it dispelled any fear of mine concerning the possibility of a 'Class 2 closed shop'.

I chose the 2nd League Competition (Southern) in which to partake at the invitation of Tony Fuell. I must admit to being very apprehensive at mixing-it with the 'hot-shot' league pilots, but I found nothing but friendliness and help from all of them. At the completion of each task (I attempted 3 out of 5 tasks) my landings were greeted by clapping and enthusiastic pilots — I was amazed! Also to have had pilots like Johnny Carr, Dave Worth and Bob Bailey giving advice prior to attempting a task was being treated like royalty.

Having taken part in the league I can now fully appreciate the reason for it and how significant the whole thing is in the development and selection of top hang gliders and pilots for Britain. The tasks are 'flying tasks' — as opposed to those silly spot landing tasks of a few years ago — and they display advantage to no one machine only nor to the disadvantage of any other.

All the league pilots will probably wonder why the VJ-23 did not attempt the cross-country task. I feel I should explain that it is stressed at only 2G whereas most hang gliders are stressed at 6G. Remember the VJ-23 was designed in 1971! Thus I do not think that it is suitable for turbulence which might be occurring in thermalling conditions. As one very experienced pilot said to me, 'You haven't got a Lester Cruse like us to explore the upper stressing limits'.

I'd like to thank Tom and Jeannie Knight for all their help and enthusiasm and also Tony Fuell for being man enough to admit he was wrong about the VJ-23 and for his apologies. It was super to have been amongst the best fliers in the country. Many thanks to the league fliers.

**Dave Cook**



# KITE REPORTS

The following kite reports were compiled by three of Britain's most experienced pilots to give the beginner to intermediate pilot some sort of idea what he might expect when flying these kites for the first time. The reporters were chosen for their expertise and wide experience in flying many kinds of glider. Keith Cockcroft, Flight Training Officer for the BHGA was the first reporter and he organised the manner in which the tests were to be conducted. Gerry Breen, expert sail plane pilot and Flight Director of the Welsh Hang Gliding Centre and Graham Slater, top competition pilot and Head of the Southern School of Hang Gliding completed the board of reporters.

Test flights were made over a period of six months. The tests were made under many different weather conditions, on kites in different states of tune (occasionally on a prototype). Different sites were flown and different sizes of kites were used. For this reason the results cannot and do not accurately predict how a particular glider will perform on a certain day.

These reports are not intended to be comparative. It is quite possible that one pilot may like a kite which will soar well in light winds, with a light roll and moderate pitch, whereas another pilot will prefer a kite which has a roll that you can get hold of, good penetration for the strong winds he flies in and a light pitch control. The preference for handling comes from personal experience and choice.

Some kites have two or more reports, some have one. This is dependent on whether two or more reporters have written about that particular glider. It is not an indication of the suitability of any glider. There may be omissions, but the omission of a glider does not mean that it is not a recommended glider. These reports are not intended as recommendations.

This article has been compiled in response to the many people who have written to *Wings!* asking for such an article. We hope that they will give valuable information to pilots about the sort of characteristics they may encounter with different gliders.

In some cases reports disagree. Obviously, the reader must draw his own conclusions about the overall 'feel' of them. For those who wish to progress to the '78 kites which haven't been written about, *Wings!* will carry similar reports on them in future magazines.

Glider make and model	<b>BIRDMAN FIREBIRD</b>
Tuning	detuned quite docile, tuned quite light and fast.
Take off characteristics	Conventional.
Pitch	Moderate - light.
Roll	Moderate.
Sink	Good - moderate.
Glide angle	Good.
Speed range	Good.
Landing technique	Will parachute when detuned. Conventional technique.
GENERAL COMMENTS	Quite pleasant to fly light, small area.
High wind	Good.
Low wind	Good.
Turbulence	Remains quite light.

Glider make and model	<b>ELECTRA FLYER OLYMPUS 160</b>	<b>DELTA WINGS PHEONIX 8</b>	<b>MCBROOM COBRA</b>
Tuning	Sensitive. Negative posts, camber and deflexors.	Sensitive but not critical.	Sensitive - but requires tuning to perform well.
Take off characteristics	Moderate airspeed required. Care must be taken as wing drop tendency exists.	Inflate sail - load sail (straps tight) watch for wing dropping, ease bar in - flying speed - ease bar out.	Inflate sail - straps tight - air speed - ease bar in - flying speed ease bar out - take off, watch for wings in wind gradient.
Pitch	Rate very good. Aerodynamic. Positive stability.	Light in normal flight.	Light, well balanced.
Roll	Rate very good. Aerodynamic. Neutral stability.	Good - requires a little pitch to improve it.	Slightly heavy, needs to be co-ordinated with pitch for best results.
Sink	200ft. min.	Good.	Not bad, picks up patchy lift well.
Glide angle	7-8:1.	Good.	Good.
Speed range	15-35 mph. approx.	Very good (when tuned).	Very good.
Landing technique	Difficult to parachute. Danger of tip stall.	Into wind - burn off high - burn off speed. Do not attempt to parachute tendency to tip stall.	Use conventional techniques for keel pocketed kites. Will parachute - tends to drop wing - slightly yaw. Not advisable.
GENERAL COMMENTS	Difficult glider to handle. Directional stability poor due to low sweep angle. Care must be taken when initiating a turn. Do not push out as bank is initiated otherwise glider adverse yaws. Very neutral in roll. Positive correction required to reduce bank. Once glider is mastered it is very pleasant to handle. Definitely an advanced glider at least pilot standard.	Requires very subtle flying skills to get the best out of this machine, but once mastered is a very nice kite to fly. Initially there is a tendency to yaw so any pilot movement has to be well co-ordinated especially in turns, 360 s etc. ie pitch roll and air speed must be correct otherwise pilot may be required to make excessive corrections whilst in the manoeuvre.	I was quite surprised at the ease of handling except in bad turbulence where excessive and prolonged weight shift was necessary. Again for best performance, ease and efficiency of turning a combination of pitch and roll had to be used. Excellent stall characteristics with good gust relieving at the tips. Tends to pitch up a little.
High wind	Good penetration.	Good - penetrates well - Picks up lift well.	Excellent - penetration, good handling. Moderate.
Low wind	Difficult to fly close to slope. Landings must be made with care as it stalls a little fast.	Although its sink is very good it requires a very skilful pilot to manoeuvre and utilise patchy lift efficiently.	Not possible on date of test, but believed to be moderate - good. Okay.
Turbulence	Experience a must before encountering turbulence. Yaw tendency apparent.	Pitch wise no problem. Tends to yaw if gust hits one wing.	Gust relieve well, bit heavy on roll, understand pulley system improves this. Little heavy but can handle it.



BIRDMAN MOONRAKER	CHARGUS MIDAS E		CIRRUS III	
Responds to tuning very well from being quite docile to ultra sensitive. Over tuning can be hazardous.	Leave factory tuned.	Should be left as factory tuned.	Sensitive. Negative posts, camber and deflexors.	Difficult – requires patience – when correct it should be locked up.
Conventional take off for pocketed kite unless highly tuned, then sail must be progressively loaded on take off and finally loaded before attempting take off.	As with non-cambered kite – sail almost “luffed” – airspeed – flying speed ease bar away –	Take off as conventional glider with non-cambered sail, low angle of attack, increase speed ease bar away.		Conventional plus a little more speed.
Quite light	Good quite light.	Fixed tips give a good positive feel.	Rate very good. Aerodynamic. Positive stability.	Good and positive. Quite light in level flight.
Moderately light, improved when co-ordinated with pitch.	Average.	Roll inputs average, roll rate fast.	Rate moderate. Positive stability.	When properly tuned quite good otherwise heavy.
Good	Average – good.	I found this glider ideal in light winds. Sink rate, average to good.	250-300ft. min.	When properly tuned moderately good.
Good.	Good.	At speed good.	6-5-7:1.	Good at speed.
Good.	Very good.	Acceleration is fast.	14-35 mph.	Very good.
Conventional landing approach, flares well, will parachute when detuned though not advisable.	Use conventional technique – into wind – burn off high – burn off speed – flare. Can be parachuted but requires excessive skill and de-tuning – may drop wing.	Not to be parachuted, conventional landing approach must be used.	Moderate parachute ability.	Will parachute with practice (dependant on state of tune).
Very easy and light to fly. As with all cambered keel pocketed kites handling and performance is improved by initiating roll and then pitching into a cambered turn. Stalls out and recovers well when moderately tuned. Pilots under 12 stone will obtain best performance.	A very pleasant glider to fly requiring average inputs. Pitch and Roll flying techniques for best performance. A little small for peak performance for anyone over 12 stone (less kit).	Roll inputs are average, not light but not heavy. Roll must be co-ordinated with largish pitch movement to get best rate of turn.	Pleasant to fly although it is now considered to be fairly heavy in roll (lack of keel pocket). When banked, glider needs positive pressure to hold in bank. Has a very good speed range. Good all round capability. Glider needs large amounts of nose up pitch in moderate bank turns (30°-45°).	A high performance intermediate glider slightly more difficult to fly than most intermediates with slightly better performance. Takes a lot of getting right but when right is very good.
Very good handling L/D – sink.	Very good – nice handling – no bad tendencies.	Good, high speed glide improves its performance in high winds.	Good penetration.	Good penetration and handling.
Moderate sink.	When specifically tuned for low winds can be ok, otherwise average.	Can be tuned to fly very well in light winds.	Good handling.	Moderate sink and handling.
Very good, slight tendency to pitch.	Tends to flex a lot and gust relieve which feels strange at first – but is soon got used to.	Handles turbulent conditions very well.	Handling good especially in pitch.	Handles well.

HIWAY SCORPION			HIWAY CLOUDBASE	
Critical, as overtuning makes glider extremely difficult in pitch control.	Deflexors and camber posts need very little adjustment.	Requires very little but if excessive, controls become over light and machine becomes less pleasant to fly for marginal improvement in performance.	Leave as factory. Make sure deflexors at 45° plus to horizontal.	Balance between keel camber wire if any and wing wires (ensure deflexor post at correct angle). When tuned kite is balanced light and positive in every axis.
Sail needs to be inflated and loaded slightly by pilot's weight for a smooth take off.	Low airspeed required, very easy to pitch nose up, therefore care must be taken in stronger winds.	Inflate sail – strap tight – air speed – load sail – ease in – flying speed – ease out – take off.	Easy take off. Fill sail, partially increase air speed and increase angle of attack gradually.	Slightly inflate sail – conventional technique. Slightly higher take off speed required for 19 ft. radial.
Pitch inputs need to be excessive to increase speed dramatically.	Rate moderate (with 'B' bar).	Light and pleasant even at speed.	Heavy, long keeled glider.	Moderate – if camber and wing wires are balanced.
Light inputs, very small when learning to fly this glider.	Rate good. Aerodynamic positive stability.	Light but slow (slight pitch and a lot of roll).	Fairly light.	Moderate – if correct camber – co-ordinated with pitch.
Very good sink rate.	Approximately 250 ft. min.	Good in thermal and light wind.	Average.	Good for 2nd gen. kite.
Glide at speed is not exceptional, slow speed glide average.	6-5:1.	Moderate.	4-5 to 1.	Moderate – good for 2nd gen. kite.
Poor.	12 - 30 mph.	Moderate.	Good for intermediate.	Good – 2nd gen. kite.
This glider cannot be parachuted, and must be brought into land in conventional manner.	Fairly easy to parachute.	Use conventional technique – can be parachuted but requires excessive skill and anticipation.	Normal landing, ie fly in at normal speed and progressively feed bar out until touch down.	Will parachute quite well when detuned but not when highly tuned.
Roll inputs very light, roll rate slow. Tuning can make the glider perform better but makes pitch characteristics critical on inputs by pilot. The stall on this glider overtuned, can catch out an unsuspecting pilot.	Very pleasant easy to handle glider. Slow speed capability due to deep cambered aerofoil. Ample twist (washout) very good directional stability due to high sweep and fin. Good roll stability due to dihedral. Altogether an ideal intermediate glider.	There is a tendency to push out too much in turns, don't! The Scorpion is very easy to fly in normal conditions it requires very small inputs in every direction, excessive inputs if not properly co-ordinated can be hazardous.	Roll input is fairly good, nose of glider needs to be kept in $\psi$ turn, in other words a good bit of pitch input is needed in turns, to make them quick and effective. Easy to pack away and rig, can be useful on cold, wet day.	There are 6 different types (ie 19ft. 20ft. 21ft. radial and chordwise battens) each has its own subtly different characteristics and each requires a slightly different approach to tuning. Generally they all handle quite lightly the chordwise better than the radials. No particularly nasty tendencies unless overtuned – light bar pressure – locks in turns.
Not a high wind kite.	Difficult to penetrate, full use of 'B' bar needed therefore poor roll response.	Poor glide. Handles well.	Very reflexed feel in strong winds, so can be hard work.	Good positive feel.
This glider excels itself in light winds with a slow speed characteristic. It is ideal for light wind soaring.	Very good handling and easy to soar close in to slope.	Handling deteriorates as stall is approached – good sink at slow speed.	Sink rate is average.	Good all round response, good sink. Radials have very slight tendency to spin in at high angles of attack in banked turns.
Can cope with turbulence very well.		Handles turbulence very well with light inputs.	This glider seems to cope very well in turbulence, perhaps because of flexible airframe.	OK.



Glider make and model	MOYES MAXI I		PACIFIC KITES LANCER IIB	SKYHOOK CLOUD 9
Tuning	Limited to deflexor and keel reflex, although should not be touched, unless knowledgeable.	Very limited, but requires very little.	Sail fit and reflex (keel).	Fixed wing wires – keel camber available not standard. Sail tension.
Take off characteristics	This glider is heavy, ie 64 lbs. therefore needs a good deal of strength to hold up at proper take off attitude, but once moving lifts easily.	Technique. Harness strap tight, load sail, direct into wind (important) 3-4 steps easing bar in – ease bar out gently – take off. If this technique is used take off is very easy.	Nose must be held high as it is a cambered sail glider.	Barely inflate sail – air speed – progressive inflation of sail until full take off speed push bar out take off ease bar in.
Pitch	Light pitch feel, and very positive.	Quite light for long keel kite.	Pitch feel is extremely light, one can be in an almost free fall position.	Quite heavy.
Roll	Inputs have to be positive, but this glider has a good all round feel.	Initial inputs light, needs holding off a little, when over 45° bank.	Roll inputs are light, and very quick.	Quite heavy.
Sink	Sink rate excellent, very slow air speed.	Excellent with excellent handling at min. sink.	average	Good for 2nd gen. kite.
Glide angle	Average.	Moderate although Maxi II appears better.	Glide at speed is good.	Good for 2nd gen. kite.
Speed range	Not exceptional.	Moderate.	Excellent.	Good.
Landing technique	This glider can be landed easily, gliding in at very low speed, with a careful slow flare out.	Must be 'flown' at all times – can be flown in very slowly but initially great care must be taken. Flares well stops fast.	This glider excellent for speed range and aerobatics. Fast roll rate and light inputs on lateral control.	Conventional technique. Will parachute with difficulty.
GENERAL COMMENTS	This glider has an excellent slow speed minimum sink, but when stalled, will tend to drop the nose or a tip very quickly, but also recovers quickly. Handling positive, but tends to be sluggish, this is a big glider (sail area), therefore a good thermalling glider.	Once conversant with the subtle difference in handling it is very pleasant and easy to fly, but the stall is quick especially in a turn where it will tend to tighten up slightly, (tip stall).	Pitch control is extremely light, and can be alarming when first flying this glider.	One of the first of the second generation kites, it has the performance, but for prone flying, the early battenless models were heavy but flown seated lighter the later semi-chordwise battens improved sail and a larger control frame has more refined handling but still requires a combination of pitch and roll in making a minimal effort turn.
High wind	Glide angle at speed tends to deteriorate.	Moderate pitch. Roll slow and heavy. Maxi II should be faster and lighter.	Can be flown in good strong winds, with no ill effects.	Okay, no problems.
Low wind	Excellent characteristics at slow speed, although will tip stall, if pushed to far.	Truly excellent but be aware of stalling.	Stall speed has to be watched, will tend to tip stall before stalling completely.	Little sluggish on turns – pull a little speed initiate roll and ease the bar out.
Turbulence		Okay, but not recommended for strong winds that are turbulent.	Handles turbulence extremely well.	Handles turbulence quite well though a little heavy at times.

Glider make and model	WASP FALCON 4		WASP GRYPHON III	
Tuning	Must have the least minimum reflex as recommended by manufacturers (3/8 in.). Can be tuned as SST.	Critical. Overtuning can be dangerous.	Wing warping via leading edge and keel. Very subtle, leave as factory tuned and tested.	Leave as factory tuned. Check pre-formed battens are shape they should be.
Take off characteristics	Inflate sail slightly – air speed – load sail – ease bar in – full air speed, ease bar out. Easy to take off.	The glider takes off in a conventional non-cambered sail technique, ie inflate sail slightly, increase airspeed and ease out to become airborne.	Wing level – into wind (fairly critical) - angle of attack so wing is just trying to lift – air speed – flying speed – kite takes you off.	Nose of glider must be kept fairly high, and under load, for a smooth take off.
Pitch	Heavy at speed otherwise moderate.		Quite light and damped.	Neutral pitch feel, therefore very light.
Roll	Moderate needs heavy initial input unless pitched down then rolled.	Sluggish, needs a lot of input.	Quite heavy to initiate (aided by a little pitch).	Average to light inputs needed depending on conditions.
Sink	Good at slow speed – at speed average.	Slow speed sink good, fast glide sink not so good.	Very good.	Sink rate at speed very good.
Glide angle	Average.	Average glide.	Excellent.	About the best at speed I have ever flown.
Speed range	Good.	Speed range is good.	Excellent.	Excellent.
Landing technique	Conventional – plenty of air speed (3-4 mph) above stall) burn off speed slowly, flare to land, stops quickly. Unless plenty of reflex do not parachute.	I would not suggest this glider be parachuted from any height exceeding 10-15ft.	Came in well back after cross wind approach, plenty air speed – burn off height – burn off air speed flare – lands well.	This glider can be glide degraded quite well, but beware, normal landing technique with a little push in no wind needed because of fixed tips.
GENERAL COMMENTS	When tuned to handbook the kite is 'well' tuned for high performance – do not exceed handbook specifications. With plenty of reflex the kite is very pleasant and easy to fly in every respect – overtuning brings handling difficulties – what is gained in performance is lost in handling as with SST.	I found the Falcon IV very easy to fly, and would think this glider would be ideal for beginners to intermediate fliers, a good glider to start on. Turns found to be easier if a roll input and then an exaggerated pitch input are used.	Flew production model, needed fine tuning. In normal flight – gentle turns etc. it was very pleasant to handle as a normal 2nd gen. kite. But in steep -45° and over banked turns it had a tendency to tighten up and required excessive movement to take off the turn. Once aware of this tendency one could compensate and fly it with ease and confidence.	Once the pilot has become used to neutral pitch feel, then this glider can be very easy to fly. At slow speeds the tendency to tip stall must be watched, this is to be expected on a wing such as this. Tendency in 360 s to lose height, could take a while to get used to thermalling.
High wind	Okay – tends to pitch a little.	Can cope with 25-30 mph winds, but in this wind found to be hard work.	Excellent.	Excellent high wind machine, good glide at high speeds.
Low wind	Good – nice handling – rolls well when pitched.	Low speed is also very good, can soar in very light winds.	Very good.	Turning in light winds takes some getting used to, also turning circle at slow speeds is average compared to some more conventional wings.
Turbulence	Bit heavy if grossly overtuned. May stall, dive and snap out of dives.	Found to be hard work in turbulence and thermals. Roll response to be slow and sluggish to inputs.	Good.	Excellent in turbulence.



SKYHOOK SUNSPOT	FLEXIFORM VECTOR	WASP FALCON 3
Requires very little – no hold on curvature on booms – overtuning can be hazardous.	Leave as factory tuned. Tuning kites with truncated tips tends to be different.	Leave as factory. Do not overtune.
Liability to run out of wind or drop a wing therefore a good run required.	Inflate nose – straps tight – airspeed – ease bar in – and flying speed – ease bar out – take off.	As a normal free floating sail kite. High angle of attack, move forward, load sail, ease bar in, and on take off, ease bar out.
Rate moderate. Positive stability.	Initially light becoming heavy at speed.	Quite light, co-ordinated and responsive.
Rate excellent. Neutral stability.	Fast. Neutrally stable (will oscillate if pilot oscillates).	Quite light and progressive. For best results needs to be co-ordinated in turns.
230 ft. min.	Very good.	Very good.
7:1.	Good.	Good glide at speed.
15-35.	Good – especially on deluxe version.	Very good acceleration.
Moderate parachute ability.	Use conventional techniques. Will parachute if undertuned but not advisable.	Not to be parachuted. Ground effects and needs a good push out.
3 people flew this glider on test date mainly intermediate – advanced pilots and all three oscillated on first and second flights. Glider is neutrally stable in roll therefore input forces tend to over-bank glider initially but once mastered glider was considered to penetrate very well. Recommended for above intermediate pilots. I found generally the glider very pleasing to handle.	On initial flights most people tend to oscillate in roll – very slight roll corrections are necessary and should be made gently and smoothly. Holding at min sink is good with mostly stall. The proportions of the deflexor adjustments are quite critical.	A very light co-ordinated kite, nicely finished. Has cross country potential for the intermediate to experienced pilot.
Good penetration.	Good penetration and handling – pitch heavy but positive.	Good.
	Excellent – good thermalling kite good on min sink turns.	Stable at min. sink, floats well in thermals.
Very good.	Good – can be a bit heavy in strong turbulence.	OK.

WILLS WING SST	WILLS WING XC
This glider can cope with a lot of tuning, depending on pilot ability, and centre of gravity position.	Can be tuned to be very docile or over responsive. If tuned slowly as per pilot ability, tuning limits can easily be recognised.
This glider tends to need a lot of pitch movement to enable proper take off, ie. bar needs a good push to achieve flight.	Slightly inflate sail before take off run.
Very positive, but heavy.	Very positive requiring moderate inputs.
Average roll rate, a very positive feel to roll inputs.	Requires moderate input.
Sink rate is good if glider is tuned properly.	Quite good, responds well at MS.
Can be excellent, again if tuned properly.	Quite good.
Above average, although tips tend to break up at speed.	Good.
Conventional landing technique, ie. ground effect and flare, or fly in and flare out progressively.	Normal landing technique. Will withstand quite high angles of attack (flare). Will parachute when detuned and ground effect when tuned.
The SST can be over flown, that is to say, affected by pilot induced oscillation. Inputs when flown in a straight line are minimal, although in turbulence can be heavy on roll inputs.	This is a very tunable kite and all its characteristics are enhanced as the kite is tuned, tip to a certain level where what you gain on performance – you lose on handling (not desirable). To obtain the best from this kite it is better to pitch and roll to obtain efficiency and ease of handling – quite good.
Tends to be very pitch positive in gusts and strong wind, not ideal as a strong wind machine.	Heavy in pitch but depends on tuning, ie. camber/reflex ratio.
This glider can be an excellent low wind glider, and safely flown near the hill.	Excellent control, good sink when tuned for low winds ie. high camber – plenty reflex.
Tends to cope well with turbulence, although inputs are heavy.	Gets rather heavy but never uncontrollable.

### OBSERVERS

The following is a list of BHGA observers as from 23rd April 1978. The list will be updated biannually. Applications for observership must be made to your member club, who may nominate you to the BHGA after committee consideration. Provisional observership ceased on 31st December, 1977. Qualifications for observership: Full observers must have a pilot's badge or Pilot Two in the new rating scheme. All observers should make a careful note of their observer number.

#### 23rd April, 1977

- |                    |                       |                      |
|--------------------|-----------------------|----------------------|
| 1. D.W. Arkle      | 63. P. Jackson        | 121. M. Lake         |
| 2. R.L. Ashton     | 64. A.G. Knowles      | 124. L. Cranfield    |
| 3. B. Bibby        | 66. H.D. Knowles      | 125. Arscott Rodney  |
| 5. A.M. Birch      | 67. P.J. King         | 127. R.W. Black      |
| 7. P. Bridges      | 69. R. (Minty) Lamdin | 128. B. Bradley      |
| 8. A.F. Ball       | 70. D.F. Lyne         | 129. E.K. Battersea  |
| 9. G. Breen        | 71. G. Leason         | 130. I.M. Beloe      |
| 11. R.E. Bailey    | 72. P. Mills          | 131. T.J. Flower     |
| 12. R. Beckett     | 73. D. Munn           | 132. D.P. Green      |
| 13. A.D. Cranfield | 74. B. Milton         | 134. T. Knight       |
| 14. M.N. Collis    | 76. P.F. Mayo         | 135. J. Knight       |
| 16. Glen Clarke    | 77. F. Threlkeld      | 136. K. Messenger    |
| 17. B. Carter      | 78. J. Northage       | 137. A.J.S. Maclaren |
| 18. J.A. Caley     | 79. R. Potter         | 138. M. Mugridge     |
| 19. F. Clarke      | 81. R.J. Pattinson    | 139. D. Raymond      |
| 20. C. Corston     | 83. S. M. Rose        | 141. M.S. Southall   |
| 21. R.G. Calvert   | 84. E. Rowley         | 143. A.J. Westcott   |
| 25. P.J. Day       | 86. M. Ramsey         | 144. R.L. Balchin    |
| 26. A. Doubtfire   | 88. B. Scott          | 145. P. Bullock      |
| 28. D.H. Ellison   | 89. Pete Scott        | 147. R.E. Fellowes   |
| 29. J.A. J. Evans  | 90. R.A. Scates       | 150. M.V. Adam       |
| 32. M.B. Fortune   | 91. M.G. Shaw         | 156. J. Hunter       |
| 33. A.R. Fuell     | 92. D.J. Squires      | 165. B. Wishart      |
| 34. G. Fischnaller | 93. J.H. Smith        | 166. R. Softly       |
| 35. C.M. Froggatt  | 94. G.A. Shine        | 167. R. Full         |
| 37. G. Fowler      | 95. R.J.S. Spooner    | 169. R.D. Christon   |
| 39. M. Foster      | 97. G. Slater         | 171. T.M. Stark      |
| 41. K.P. Gibbs     | 98. A.E. Squire       | 175. P. Donald       |
| 42. R.J. Garland   | 99. D.W. Simpson      | 176. B.C. Williams   |
| 43. A.W. Gosnold   | 100. B.W. Slipper     | 177. R.A. Horlor     |
| 44. R.D. Green     | 101. E.C. Salisbury   | 178. R. Billington   |
| 46. L. Hill        | 103. D. Tait          | 181. J.L. Thomas     |
| 47. C. Hawkes      | 105. G.I. Thomson     | 182. R. Richards     |
| 49. M. Hawksworth  | 106. D.J. Taggart     | 184. J.P. Fry        |
| 52. R. Hill        | 107. Ian Thomas       | 187. R.G. Mackay     |
| 53. S. Hampton     | 108. A.H. Trapp       | 191. R.C. Symberlist |
| 54. R.C. Hanlon    | 110. T. Taft          | 194. C. Coleman      |
| 55. H. Hodgson     | 112. D. Willis        | 195. W.C. Niblett    |
| 57. G.C. Hobson    | 113. D. Wilkins       | 196. Will Mills      |
| 59. B.K. Harrison  | 114. D. Worth         | 197. H. Heggie       |
| 60. K. Jordan      | 115. R.J. Wilson      | 198. S. Wootton      |
| 61. J.M. Jenkins   | 116. D.A. Weeks       | 200. T. Laverty      |
| 62. R. Jerome      | 117. E.M. Woods       | 201. C. Ryan         |
|                    | 118. J.R. Ware        | 202. B. Kennedy      |
|                    | 120. D.F. Yule        |                      |



# Fly Chargus and go places

## Super E by Chargus

Pilot Joe Binns

Graham Slater directing flight sequence  
for film work at Panghani, Bombay, India. April 1978

Ring Murray Rose  
Chargus Gliding Company Ltd on  
Buckingham 028 02 4321

Photograph by Ken Barker





All aircraft use instruments. A glance in the cockpit of a 747 is the quickest way to convince yourself of that. Artificial horizons, airspeed indicators, turn and slip indicators and a thousand other dials and clocks abound.

We don't fly 747's (at least, most of us) but we exist in exactly the same medium — free air.

Unlike the 747 pilot, we can feel most of what is going on from feedback from the glider. Harness pressure tells us a lot about lift and sink, and the movement of the control bar indicates the glider attitude.

Our senses however, are very dull compared to those of the birds, creatures we try to emulate. When the straps tug at our body, we know we are in strong lift, but how strong is it? How fast are we rising? How much higher are we now than we were five minutes ago. The body can also only detect acceleration. A steady 200fpm up will give no sensation of lift to the body.

Ground reference can tell us a lot, but as anyone who has flown more than 800ft. above the ground will know, any height at all will make ground references useless.

With the current range of high performance Wings, next year we'll see a huge increase in the number of pilots leaving the ridge on thermals. Not just the big booming ones which may carry you downwind for ten miles or so, but flying around way out from the ridge, flitting from thermal to thermal.

For this kind of work you will need to know just where you're at. Leaving lift at the right time and quickly quitting sink will mean the difference between a successful flight and a failure. Since our senses are so dull, this is where instruments come in.

Firstly, we should look at just what instrumentation is available for a hang glider.

There are two main ones, the altimeter which tells you your height and the variometer which indicates how fast you are rising or sinking. In addition the compass and airspeed indicator (ASI) are also useful tools. Quite a few cross-country pilots are investigating more complex instrumentation such as turn and slip indicators and artificial horizons, but it may be some time before we see these in use.

Since they tend to cost less than a variometer, most people make their start into instrumentation with an altimeter. Altimeters work by measuring the pressure of the air and converting this into a reading on a dial. They do this by utilising a vacuum-sealed aneroid capsule, and measuring the amount this capsule is compressed as the pressure increases or decreases with altitude. Since pressure changes also occur as part of our weather pattern, altimeters need to be "zeroed". Some pilots prefer to zero the altimeter at the landing field, whilst others may zero at the top of the ridge. For cross-country flying, the altimeters should be set to give a

# INSTRUMENTS

With the advent of cross-country flying, instruments are playing a much greater part in the art of successful hang gliding. John Hudson looks at what is available on the market and gives some suggestions to help make that difficult choice.



Top: left to right, Theotek, Altitechnick, Sky, Ex-Raf altimeter and front, Thommen Altimeter. Bottom: left to right, Waspair, Ball, Stratus, and Sunnto Compass. Photographs: D. Allen

true reading above sea level, so that height restrictions around towns and airways can be maintained.

There are basically three types of altimeters available. The first is the most common, the ex-RAF unit. This has a multisweep movement, with three needles, reading hundreds, thousands and tens of thousands of feet. It's cheap, easy to read and, until recently, readily available. The disadvantages lie in its size — 3½in. diameter × 5½in. long, its weight, and the fact that once damaged it's a problem to get it repaired. A heavy landing can shear a small pivot pin inside the instrument, and this stops it working.

An altimeter that is rapidly gaining favour is the Thommen Swiss-made and with a 19 jewel movement. The Thommen is guaranteed for a year and is available from all good sports shops and hang glider retail outlets. It has a multisweep single needle which records 3000ft. for one revolution, each subsequent 3000ft. being shown through a small segmented window in the face of the dial. It's small, (2in. × 2" × ¾in.) light and can be easily wrist mounted. It is, however, a bit

pricey.

An altimeter at the bottom of the price scale can be bought for between £7 and £15. There are quite a few around but they utilise a single needle sweeping anything up to 20,000ft. This means that 100ft. on the dial may be as little as 1/32in. which may be okay for flying in the alps, but is pretty useless here in England.

Variometers come in many shapes and sizes. We have seen a boom in the number of people producing variometers and, in the main, they all work on the same principle.

A chamber is open to the air and as the glider rises, the air pressure drops and air flows out of the chamber. As the glider sinks, the air flows back in, and this airflow is measured electrically. This measurement is converted into a reading on a dial, an audio tone or both.

These variometers are known as audio/visual units but there is another type which is also gaining popularity. Known as the "pellet" type, the principle of operation is exactly the same, but the air chamber is much larger — two pints or more. Instead of the air flow being measured

electrically, the flow itself moves tiny lightweight pellets up or down transparent tubes.

The airflow in or out of the chamber moves in separate tubes and it is usual to have a green pellet for up, and a red one for down. There is no circuitry, batteries, needles or wires and for simplicity of operation, they just cannot be beaten.

The disadvantages lie in the size and problems that can occur in damp weather. They are also reputed to be somewhat insensitive, but one of the newer ones seemed to me to be very good.

Naturally a simple variometer of this type cannot have an audio signal, which can be very useful indeed. However, a variometer using an audio signal only is very limited in its use.

A variometer is best used in thermal conditions, or when flying high above the ground.

Most thermals have large areas of lift and sink inside them and a good pilot will 'map' out the thermal, using the readings from the dial. Weak thermals are best found by carefully watching the needle for every fluctuation and the eye is a hundred times more sensitive than the ear, particularly when the ear is encased in a padded helmet.

A combination of sight and sound seems to suit most pilots and both come in different ways in the many variometers available.

The audio can be a sharp interrupted tone, a finer tone giving a buzzing sound, a single warble, or even a double interrupted warble! Some variometers are silent in sink, whilst others reverse the tone when in sink, giving an audio signal over the whole range of the vario.

The dial may be a 270° meter or an oblong meter. Sensitivity varies with each make.

It is essential however, that regardless of sensitivity a vario must show what it is meant to show.

The plain truth is that some of the variometers offered for sale today, do not do the job properly.

Since they work on the principle of measuring the air flowing in and out of the chamber owing to pressure changes, anything else which can cause this air to flow, will also cause the instrument to read.

As you rise in a thermal, or even enter a thermal, the temperature changes and since air density changes with temperature, it is essential that the instrument be compensated for temperature changes. It is also essential that the chamber itself is well-insulated for the same reasons, and that it is impossible for the chamber walls to be affected by gusts of wind.

There is another variometer that works in a slightly different manner to the mass of variometers available. Manufactured by an American Variometer company called Ball Engineering, this vario uses a pressure sensitive electronic component instead of measuring air flow. It still has a chamber but the



chamber is tiny, and its only task is to record pressure changes, much like the aneroid capsule in altimeters. As a result this vario is far more accurate and reliable, but this is reflected in its price.

Although a vario may not be all its makers tell you, it's likely that it will still be very useful. Most people will get great satisfaction from a vario purchased from the main stream, and faulty and inaccurate readings caused by the odd strong thermal may be well worth living with.

For the pilot who wants to go cross-country a compass is also very useful. Most cross-country flights will be downwind because of our inability to get very far upwind, with our poor speed and penetration. It's all too easy to deviate to one side of the true wind direction, and this can be extremely costly in terms of miles flown. Once you lose sight of the ridge, trying to determine the true downwind direction is almost impossible. At the end of the flight, it's also useful to have an idea of the general wind direction, although naturally the cross-country pilot will check carefully before committing himself to a set direction on landing.

Air speed indicators have not yet become popular, but they will before very long, particularly with cross-country pilots. Some people will say they can easily and accurately tell the windspeed from the feel of the wind on their faces and the bar position. This may well be true, but high flights over unknown ground in conditions one is not used to, can cause

problems. Knowing the exact airspeed at which one's glider flies further or sinks less is essential for accurate and efficient flying.

However, the key is accurate airspeed and as yet, ASI's have not been popular enough for true guidelines to be set.

The following list is meant as a guide to the equipment available. It is not meant to be comprehensive, nor does it cover all the instruments one can buy.

Each month we see new advertisements for instruments and to try to compile an up-to-date list is difficult. Not all companies have provided us with photographs or descriptions of their products, and this too makes it awkward.

Finally, a word about guarantees. Most reputable companies will guarantee an instrument for at least twelve months and this period of time is necessary to try it out in variable conditions. A three month (12 weeks) guarantee is virtually useless since there have been times recently when there has been no serious flying for eight to ten weeks.

It is also a good idea to ensure that the company offering the guarantee will still be around in twelve month's time. My advice is to buy from a known and reputable source if problems are to be avoided. ☘

Right: Top to bottom, GSI Air vario and air speed indicator, Thommen vario, Barigo altimeter, Colver vario.



MAKE	SIZE (inches)	COST	LBS/OZ	COMMENTS
<b>VARIOMETERS</b>				
Stratus	6 x 3 1/2 x 2 1/2	£85 inc. VAT	1lb. 12oz	This is lightweight vario in a plastic case Has an interrupted buzz on up only.
Sky	5 x 2 1/2 x 3 1/2	£107 inc. VAT	1lb. 12ozs	This was one of the first British varios and has been well proven. It is in a metal case and has an interrupted buzz on up only.
Waspair	Audio 14 x 3 dia. Visual 4 x 3 1/2 x 2 1/2	£118 audio only + £32 visual pod VAT inc.	2lbs	Undoubtedly one of the best British varios, this unit is very well made but a little on the large size It has a separate visual pod and seems to be one of the most consistent and well 'damped' varios around.
Altitech	3 x 5 1/2 with 10" stalk mounting	£115 inc. VAT	1lb. 8ozs	This vario is new to the UK but has been around for some time in Europe. It has a 270° meter and audio on both lift & sink. The tone is a pleasant warble and the instrument is accurate and stable. Batteries are housed in stalk which is fitted with a control frame clamp.
Ball	3 dia. x 5 1/2	£180 inc. VAT	1lb. 6ozs	This is the smallest audio visual vario around. Made in US, it uses a pressure sensitive 'chip' instead of flow measurement. It has a 270° meter and audio is a loud hum on both lift and sink.
Colver	3 1/2 x 4 x 9	\$194 plus p & p and UK VAT	2lbs. 1oz	This is the original American audio/visual vario and has proved itself well over the past few years. Dual scale with a high or low reading selection button. Supplies in UK seem a bit hap-

Theotek	4 x 4 x 5 1/2	£95 - £130 inc. VAT	1lb. 8ozs	Sold under the Electra Flyer flag, this is another US vario that has been around for a year or so. Has a strong interrupted tone on up only with 270° meter.
Makiki (Pellet Vario) from Hawaii	4 dia. x 5 1/2	\$45 plus VAT shipping and customs £35	15ozs	Since it has only a 2 pint chamber and a visual pellet block this vario should be virtually indestructible. Readings are fast and responsive & at its price a good buy
Caseden	4 1/2 x 3 1/2 x 3 1/2	£58 inc. VAT		Audio threshold control with tone on up only.
Arbee	4 1/2 x 3 1/2 x 2	£39.50		Audio only with different tone bleep for up and down.
GSI		£75 plus VAT		270° dial with bleep on rise only. 12 month guarantee.
Thommen	2 1/2 x 4	£160-£180	11ozs.	Another type of variometer is the mechanical one. This instrument has a thin diaphragm, which has a connection in the centre mechanically linked to the needle. The external air is valved to each side of the diaphragm and as the changing air pressure deflects the diaphragm, the resultant movement is translated to needle movement, positive or negative.
<b>ALTIMETERS</b>				
Ex RAF	3 1/2 dia. x 5	£20-£30 inc. VAT	1lb. 12ozs	When first produced these altimeters were very expensive. One in good condition can be a good buy, the

Thommen	2 1/2 x 2 1/2 x 3/4	£48 inc. VAT	3.2ozs	Produced in Switzerland these altimeters were very ideal for hang gliding. They are worn on the wrist and are sturdily built being made for hikers and climbers. Although the dial may seem small, they are extremely easy to read.
Barigo		£48.60 inc. VAT	3 1/2 ozs.	Has a 55mm calibrated face in either 0-3000 meters or 0-8000ft. Increments of 100ft. and clear markings allow fluctuations as little as 25ft. to be read. Comes with a velcro wrist strap.
<b>AIR SPEED INDICATORS</b>				
GSI		£75 plus VAT		0-50mph with cigar-shaped probe to be mounted on nose of glider.
Pedro	2 1/2 x 4 1/2 x 2 1/2	£30 inc. VAT	16ozs.	This airspeed indicator utilises a small fan mounted on a detachable bracket on the nose plate. A fine wire feed transfers the power output from the sensor to the oblong indicator and a needle gives the speed from 0 to 55mph. It seems accurate over the whole range.
<b>COMPASSES</b>				
Sunnto	2 x 2 x 3/4	£9 inc. VAT	1 1/2 ozs.	This compass is designed for wrist mounting and therefore has a curved back with an integrated strap. It is made for divers and the needle operates in an oil filled chamber which damps out oscillations well. It also has a rotating bezel for direction setting.





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

# SUPER SCORPION AND SPECTRUM: 'SIMPLY' MORE PERFORMANCE

The new range of gliders from Hiway marks a turn away from conventional hang glider design. As nose angles have increased and billow has dwindled, structures have tended to become more and more complicated – Hiway thinks too complicated.

Rigging wires have proliferated, battens come in all shapes and sizes, and the leading edges and keel are tortured by a succession of uppers, outers, downers, J wires and pulley systems.

## Simplicity needed

Hiway decided that a hang glider that takes all day to rig and is made of hundreds of different bits of hardware isn't really what today's pilot wants – or can afford.

A return to simplicity had to be the right route to take. This new range of gliders has absolutely no wing wires! Hiway have designed the airframe to flex in a particular way under flight loads, and then sewn the sail to fit this shape exactly. This is no easy task because, in addition to fitting the flexed frame, the sail also has to have the right internal camber distribution.

The sails are the culmination of an extensive research and development programme, and feature very advanced sail making techniques.

## Complete range

The range is composed of four machines at the moment. These are: 1) Super scorpion, an out and out cross-country hang glider. 2) The Spectrum, an intermediate machine with surprising agility. 3) The Gemini, a fully stressed purpose designed two-man kite. It's very big and very strong. 4) The Harrier, a glider primarily designed for schools and training – very robust and flies incredibly slowly.

They are all designed with a simple airframe and high technology sail. All conform to BHGA Standards of Airworthiness and have been static load tested (see figures in table below).



## SPECTRUM

This is a sporty machine designed to put the fun back into flying. The Spectrum complies with FAI Class I Competition Regulations. Although an intermediate glider with a conservative 105° nose angle, it generates a lot of lift and will give the high performance ships a good run for their money.

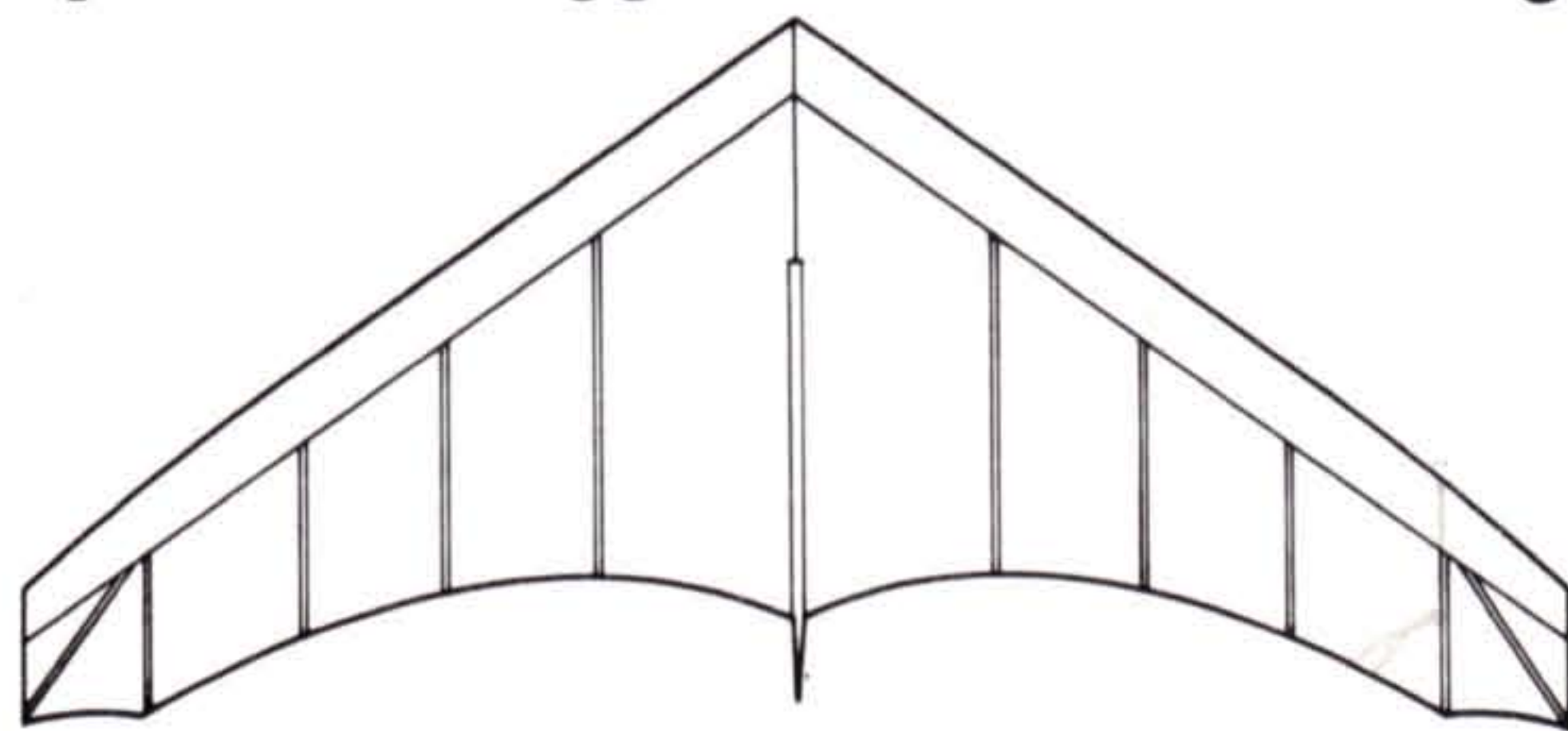
The quality of handling is one of the Spectrum's biggest bonuses. Its turning

ability is second to none and 360's are self balancing. Pitch is light and very high speeds are attainable. It also has a low stall speed facilitating top landings in light winds.

Because of its simplified frame and advanced sail, the Spectrum offers the following important advantages:

- Quicker rigging.
- Improved structural integrity.
- Price advantages.
- Lighter structure.
- Minimum adjustments necessary.
- Reduced drag.
- Improved safety (less to go wrong).

The Spectrum is available in two sizes, and can be rigged seated or prone. Alternatively a 'B' bar accessory lets you convert from prone to seated if required. The Gemini two man glider is in fact an enlarged and beefed up version of this glider.



Spectrum	Leading edge	Keel	Length packed	Knockdown length	Area	
Small	17' (5.15m)	13'3" (4m)	17'3" (5.25m)	14' (4.25m)	165ft <sup>2</sup> (15.3m <sup>2</sup> )	
Large	18'6" (5.65m)	15' (4.5m)	18'10" (5.75m)	14'3" (4.35m)	193ft <sup>2</sup> (17.9m <sup>2</sup> )	
	Aspect ratio	Nose angle	Weight	Pilot weight range	Strength rating	Span
Small	4.45	105°	45lbs (20kg)	8-12st (50-76kg)	1340lbs (608kg)	26'10" (8.2m)
Large	4.45	105°	51lbs (23kg)	10-14st (57-90kg)	1320lbs (600kg)	29'5" (9m)





**HiWAY**  
**SPECTRUM**





**HIWAY**  
**SUPER SCORPION**



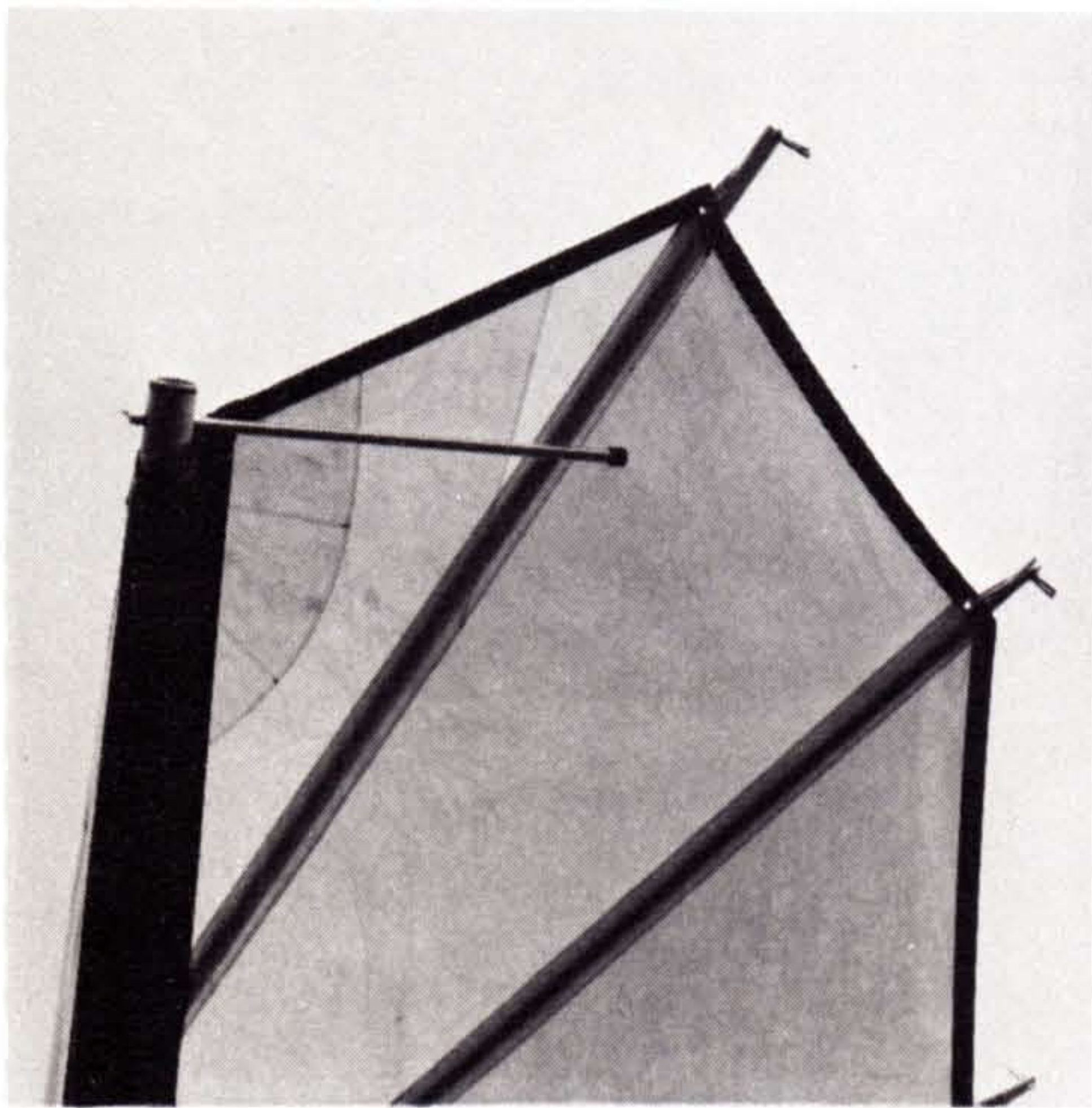
# SUPER SCORPION

A worthy successor to the existing Scorpion, this is the machine for the serious cross-country and competition flyer. The 120° nose angle and low twist values of the wing make the Super scorpion a highly efficient glider.

Incredible min sink performance coupled with an ability to flat 360 in very tight spaces, make the Super scorpion the ultimate thermal eater.

Pitch is light but positive. A new aerofoil section allows extended glides at high speed – ideal for getting out of sink or hopping from thermal to thermal.

Super scorpion is equipped with two small tip struts. These struts allow the sail to ride as high as it likes when flying at low speeds, but ensure that at high speeds or radical attitudes the keel always has a higher angle of attack than the tips, thus providing quick dive recovery.



Super scorpion (and Spectrum) have all exposed tubes bright anodised. Unlike the Spectrum, this glider is only available rigged for prone, so a 'B' bar is necessary if you want to fly seated.

## Advantages

The simplified structure allows you to rig in about the same time as a Hiway standard!

Because the tips of the wing are not connected by wire to the front of the machine (no wing wires) the frame can release excess loads by flexing. This also makes for a smoother ride in turbulent conditions.

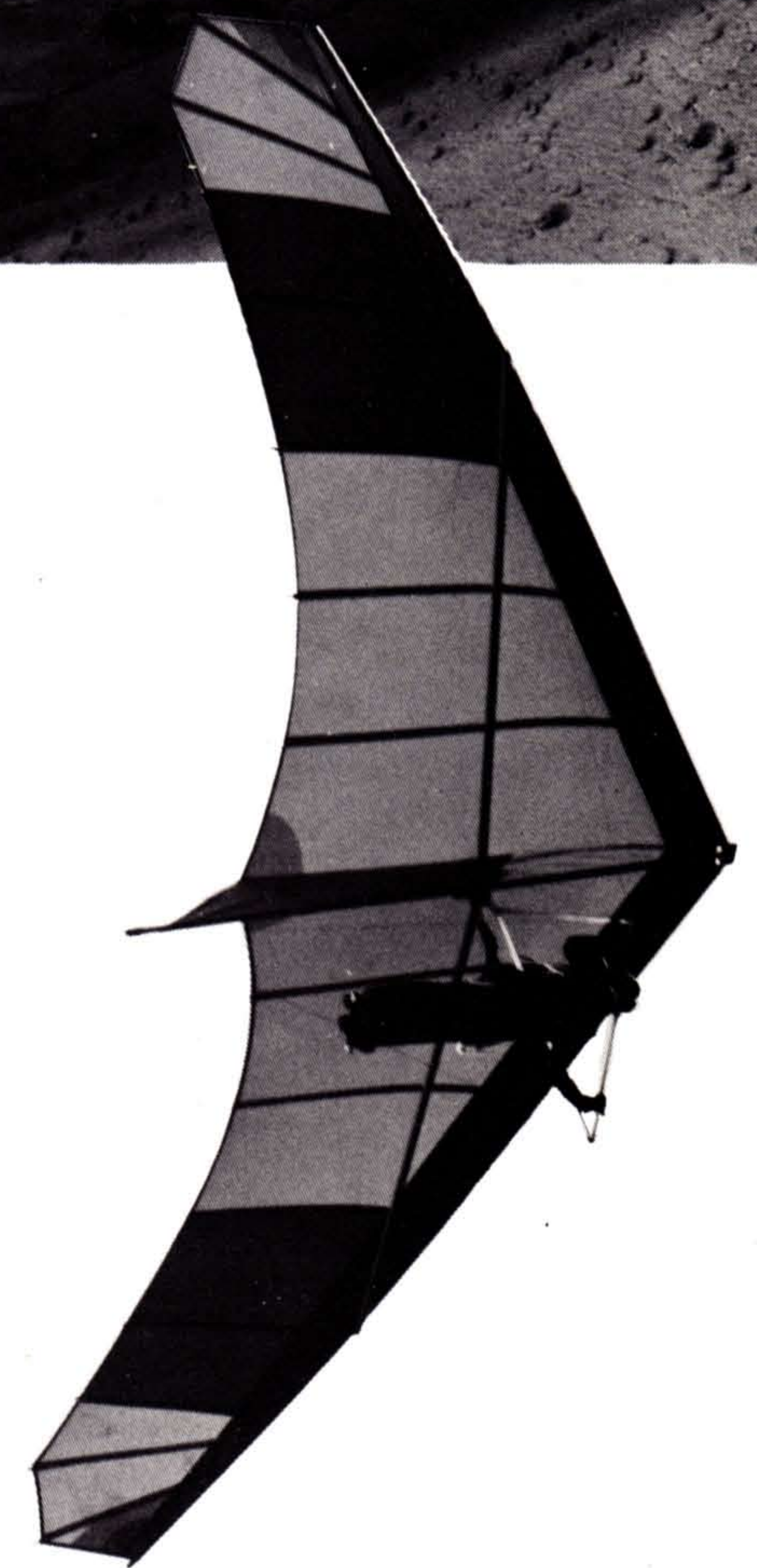
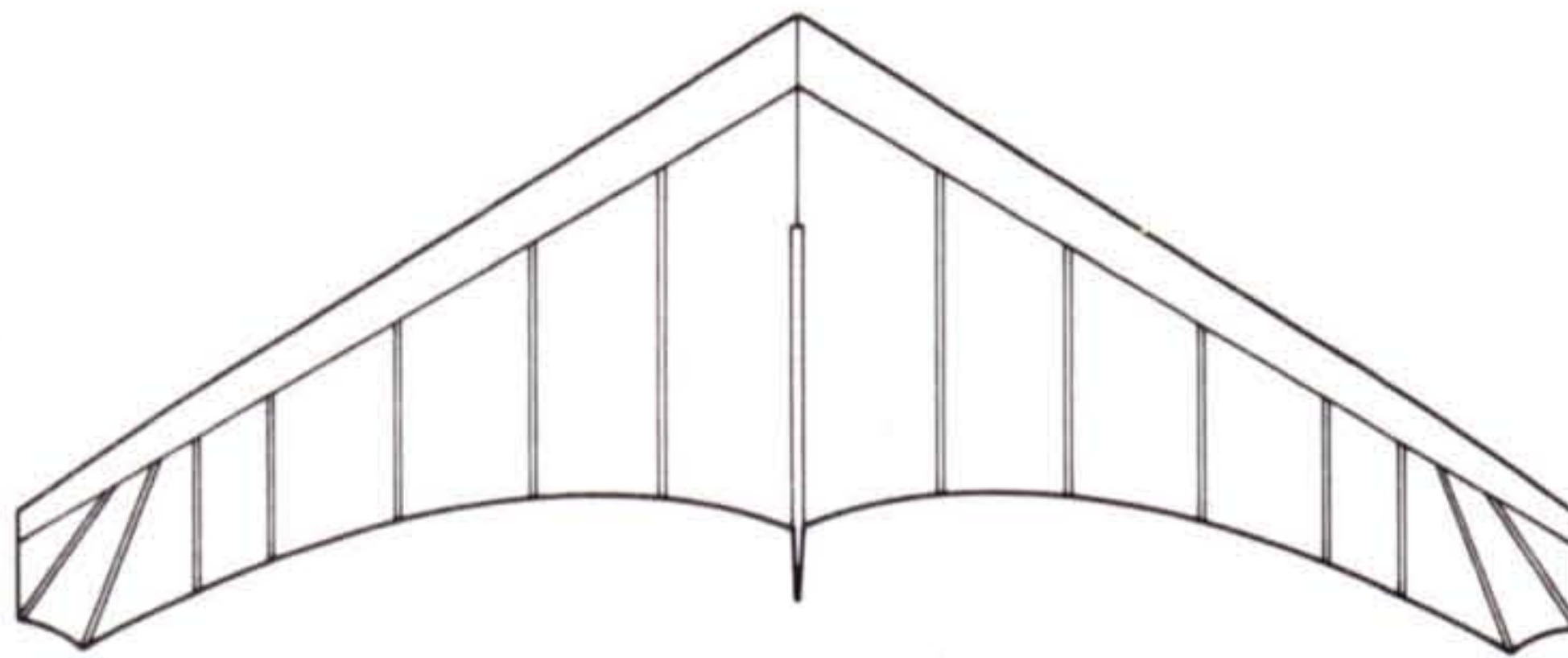
The whole frame structure is lighter



because the removal of deflexors, bottle screws and cables also means removal of the sleeving at the attachment points. Also, Super scorpion is lighter than its older brother because the short keel pocket is less cumbersome than the fin, full pocket and related hardware.

No wing wires and bottle screws means you don't have to be continually tweaking the cables to keep in tune. It's all in the sail, fully tuned and permanently tuned. No wing wires means there's less to go wrong, and the removal of all that clutter from the leading edges pays huge dividends in drag reduction.

The variety reduction of components is also reflected in the price of the machine. A supership at a reasonable price is now a reality.



Super scorpion	Leading Edge	Keel	Length packed	Knockdown length	Area	
A	16'5" (5m)	11'2" (3.4m)	16'9" (5.1m)	12'3" (3.75m)	150ft <sup>2</sup> (13.6m <sup>2</sup> )	
B	18' (5.5m)	12'1" (3.7m)	18'4" (5.6m)	13'3" (4.05m)	173ft <sup>2</sup> (16m <sup>2</sup> )	
C	19'8" (6m)	13'3" (4m)	20' (6.1m)	14'3" (4.35m)	198ft <sup>2</sup> (18.4m <sup>2</sup> )	
	Aspect ratio	Nose angle	Weight	Pilot weight range	Strength rating	Span
A	5.5	120°	40lbs (18kg)	8-11st (50-70kg)	1200lbs (545kg)	27'10" (8.5m)
B	5.6	120°	46lbs (21kg)	9-13st (57-82kg)	1260lbs (571kg)	30'7" (9.35m)
C	5.7	120°	52lbs (23.5kg)	11-14st (70-90kg)	1290lbs (585kg)	33'6" (10.2m)

Photos by Adrian Turner  
Designed by Mark Woodhams

In line with our policy of product improvement, we reserve the right to alter the specifications without notice.



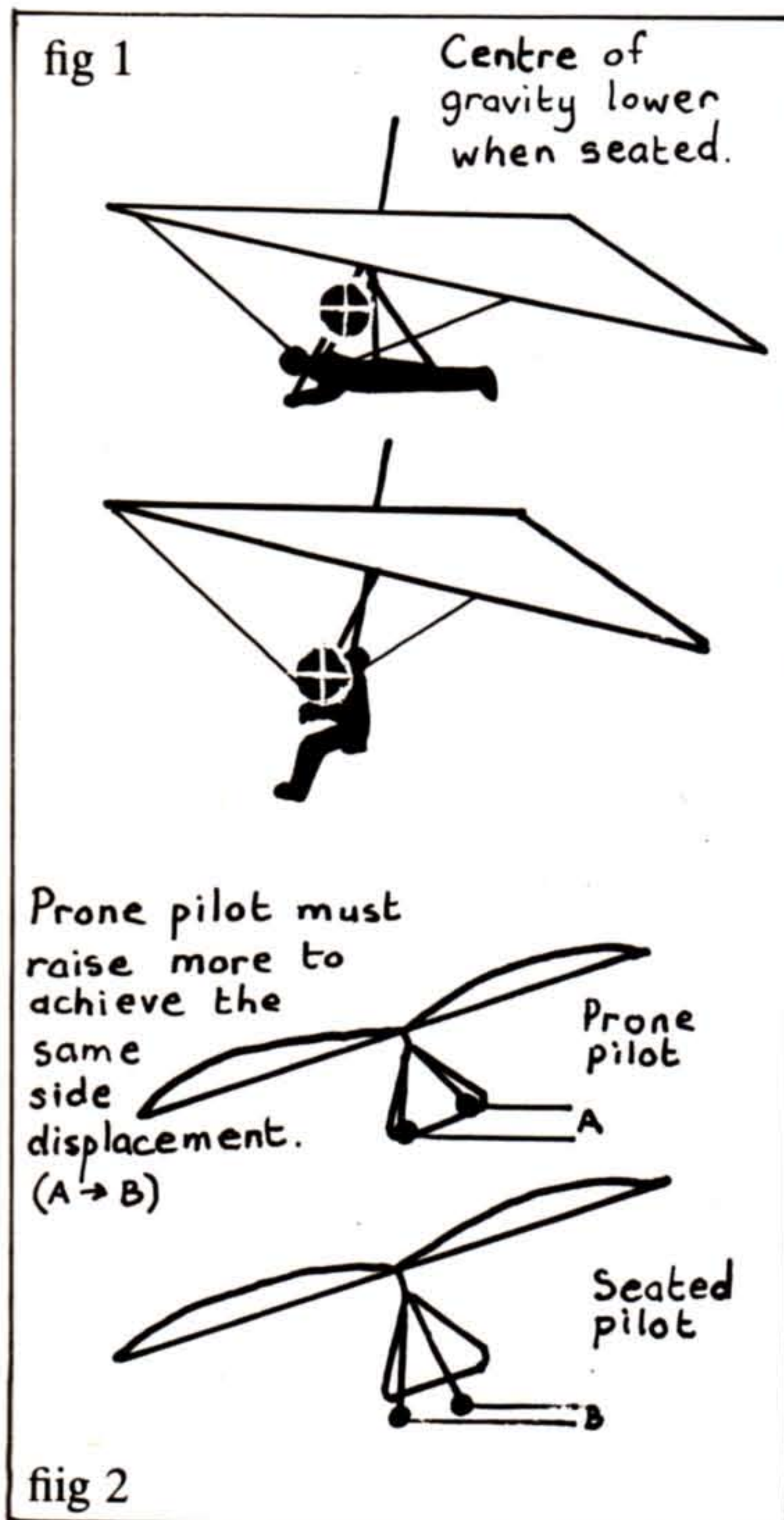
# HARNESSES

In this reprint from the USHGA magazine, Hang Gliding, Dennis Pagen describes the pros and cons of various harnesses and how to adjust them for maximum comfort on long flights

Several years ago a harness could be created out of a hank of twine and a piece of board. This was considered adequate for the one minute ground skimming flights of the past. However, the challenging flying of today requires a sophisticated harness system combining strength, security and comfort. There are plenty of harnesses available that fulfill the first two requirements. It is up to the individual pilot to find the most comfortable harness for his body shape and flying style. Nothing will shorten a soaring flight more readily than an inadequate harness. The purpose of this article is to maximise air-time by preventing pilot-harness mismatches.

## Seated vs Prone

It is time to review (not resolve) an old argument: whether it is better to fly seated (like driving a car) or prone (missionary position). There are pilots who swear by one position or the other. In order to present the arguments for the different styles most concisely, they are organised in chart form below. Note that a third position, supine (easy-chair style), is included. This is more-or-less an extension of the seated position, with a few added problems.



In view of the many factors listed above, the choice of flying mode is not easy. Often, a pilot will fly in the position used in his initial training. This should not be. Each pilot should adopt the style most suited to the type of flying he enjoys most. This could be ground skimming, smooth ridge soaring, thermalling, cross-country,

	SEATED	PRONE	SUPINE
Cost and Care	Cost is low, typically £20-30. Easy to repair, inspect, and store. Lightweight for carry-ups.	Can be expensive — £45-55 is the norm. Since there are more points of attachment, straps and rings, inspection is more demanding. These harnesses can be bulky and heavy. They must be stored separately from the glider.	Cost, care and handling is comparable to a prone harness.
Visibility	Seated allows a better view of the scenery when soaring. The pilot is in a position which seems natural for steering a craft.	The pilot is in a poor position to look out and up, but in good shape for watching the ground and judging conditions. The majority of competition pilots fly prone. Pylons and other tasks are much easier to watch when prone.	The supine pilot is in the worst position for watching the ground, whether during competition or landing approaches. Since the sail is above the pilot, this position affords the least expansive panoramic view.
Comfort	Long duration flights can be made. The back and backside give out first.	This is the least comfortable long-duration position. The back, neck and shoulders tend to be the "weak" points.	Since the pilot can alternatively sit up and lie back, flying supine theoretically allows unlimited duration. Comfort is the main reason for flying supine.
Take-off	The take-off in any situation should begin with the harness straps tight. This prevents a situation where the glider is rising and jerks the harness tight. When taking off seated, the pilot must hold the glider well over his head, making pitch control difficult. Running speed is limited by the awkward holding position and seat itself.	The prone pilot has the best control of the glider on take-off. This is due to the short attachment straps which keep the glider lower when these straps are tight. Take-offs can be the most demanding part of a flight, so this factor should be well considered.	The pilot flying supine faces the same problem as when seated, since seated is how he starts out. Pitch control is limited. This means a gust can force the nose up, leaving the glider stalled.
Performance Factors	When it comes to drag, the pilot's body is the greatest curse. Seated pilots create the most drag by far. This, of course reduces performance and penetration. On the other hand, stability of the glider is enhanced since the pilot is lower which in turn lowers the centre of gravity of the system (see fig 1). In turbulence, the seated pilot will tire less easily since his straps are longer and his body is raised less for a given side movement (see fig. 2). Turn control in smooth air is the same for all positions, since the body barely moves to initiate a bank.	Drag is minimized in the prone position. This is another reason why competitive pilots favour this mode of flying. In turbulence, the prone pilot has to work harder, since he moves to the side his body raises more due to the shorter straps. You can experience this by pushing a child on two different swings — one with long ropes, one with short ropes. In general, the prone pilot has more control since he has more available control bar travel.	A supine pilot can lie parallel with the airstream and minimise drag about as much as a prone pilot. The strength required for turbulence control is the same as seated, making this the most comfortable cross-country position.
Safety	The seated harness suspends the pilot below the control bar. Thus, the body hits first during crash landings. Injuries tend to be the lower extremities and back. Detachment is quick during tree or water landings.	The prone harness affords the most protection in mild crashes. This is because the body is padded and the control bar hits first, absorbing shock. In addition, the pilot often "pancakes" in on his stomach. The body can withstand about 10 times the impact when hitting flat, as opposed to upright. Injuries tend to be concentrated in the head and upper body. Prone harnesses are quite difficult to detach in an emergency situation. A quick release is recommended when flying over trees or water.	Supine is similar to seated when it comes to protection of the pilot. Detachment is a bit more difficult.

etc. Whatever the choice, the following sections will provide some useful pointers.

## Seated and Supine

The most common seat harness used today is made by attaching nylon webbing to a plastic swing seat. This provides a cheap lightweight setup, but has a few drawbacks. The two

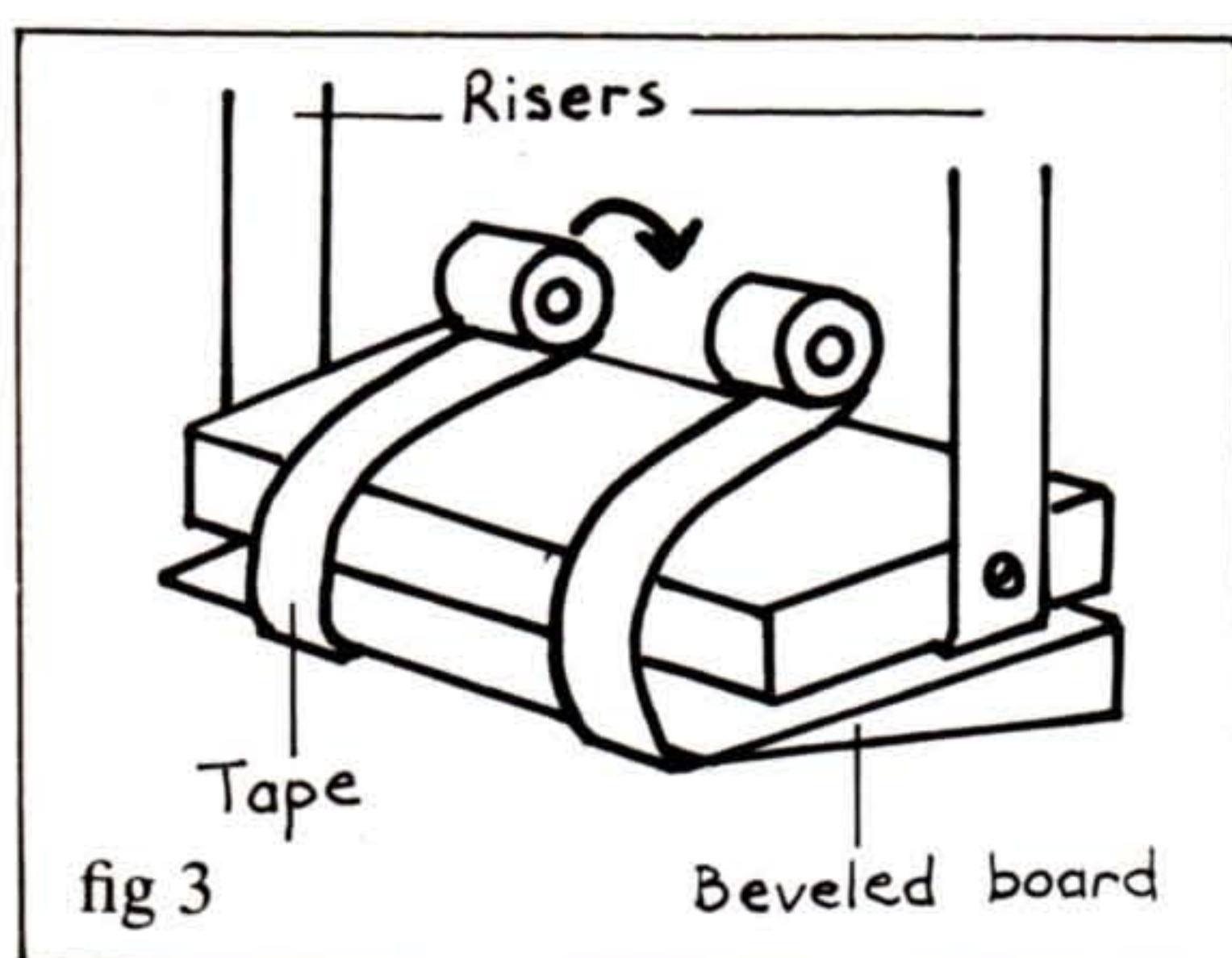
main problems are abrasion of the main support straps under the seat and abrupt stopping due to the ridges on the seat underside during tail landings.

Both of these problems can be eliminated by the simple addition of a shaped board as shown in fig. 3. Bevel the board so that it will slide readily in the event of a poor landing. High

density foam can also be added to the top of the seat to absorb and increase comfort on a long flight. A better seat can be made by molding fibre-glass to the derrier and covering the support straps. Padding and a skid plate shape are an integral part of this design.

Another common problem is the slipping up of the seat during take-off.





This prevents a truly vigorous run. The best way to eliminate this undesirable situation is to add friction tape to the top of the seat.

Adjustment of a seat harness consists of raising or lowering it. This tends to be a problem since most seat risers (straps) are not adjustable. If the seat was purchased from the manufacturer of the glider, chances are the adjustment will be correct. If this is not the case, raise the seat by taking additional wraps around the control bar top. Lower the seat by attaching it to a lower bolt on the control bar. If these measures are not possible, take the seat to an experienced parachute shop or glider manufacturer and have it changed. Do not cut and re sew the risers and never put a knot in them. The latter will greatly reduce their strength. The desired position is shown in fig 4. Here the control bar bottom is about the height of the elbows, the forearm is level.

Occasionally, when soaring, a pilot will have to pull in to penetrate a high wind. Unfortunately, the risers will limit the amount of bar travel. When in the situation, you can put more weight forward by holding your feet straight out. This will increase the dive speed. Another idea is routing the risers through curved tubing so that a gap is formed, allowing the bar to be pulled further back.

Every seat harness should have a back strap to keep the pilot from falling backwards. The more back support there is, the more long term comfort there will be. Hopefully, the harness will incorporate a quick release chest strap in addition to the back strap.

All the above points, except the last apply to the supine harness. Supine also requires a stirrup. This is a line in front of the control bar supporting the legs. It should be adjusted as in fig. 4. A seat harness can incorporate a stirrup as well as a line under the seat for resting the legs. During take-off, hold the stirrup with a finger, or drape it over the flying wires until the glider has stabilised in flight.

The supine flier has two problems. His neck gets tired and he has a hard time reaching the control bar. To alleviate the first problem, simply buy a supine harness with a built-in head support, or fabricate one using strong stiff materials. Reaching the control bar is more difficult to solve. The most common compromise is flying with the hands on the rear cables, behind the control bar. Plastic tubing on these cables will provide a good, positive grip.

There are many reasons for flying seated or supine. The primary one is

comfort. It is an ideal way to fly in mellow ridge lift conditions. Keep the harness well inspected and it will provide plenty of safe service.

### Prone

There are two primary types of prone harnesses: those with knee hangers and those with stirrups (a few designs incorporate both). Knee Hanger harnesses have lines running to the knees to support the legs (see fig. 5). Stirrup harnesses support the legs by

looks like a plate of spaghetti. Keeping things simple reduces the chance of entanglement.

A real problem with prone harnesses is binding at the shoulders. This is caused the necessity for all support lines to meet at a single point (the Karabiner). Thus, the line at the shoulder must pull back, while the knee hanger line or stirrup pulls in the opposite direction. These forces are shown in fig. 5. Some harness

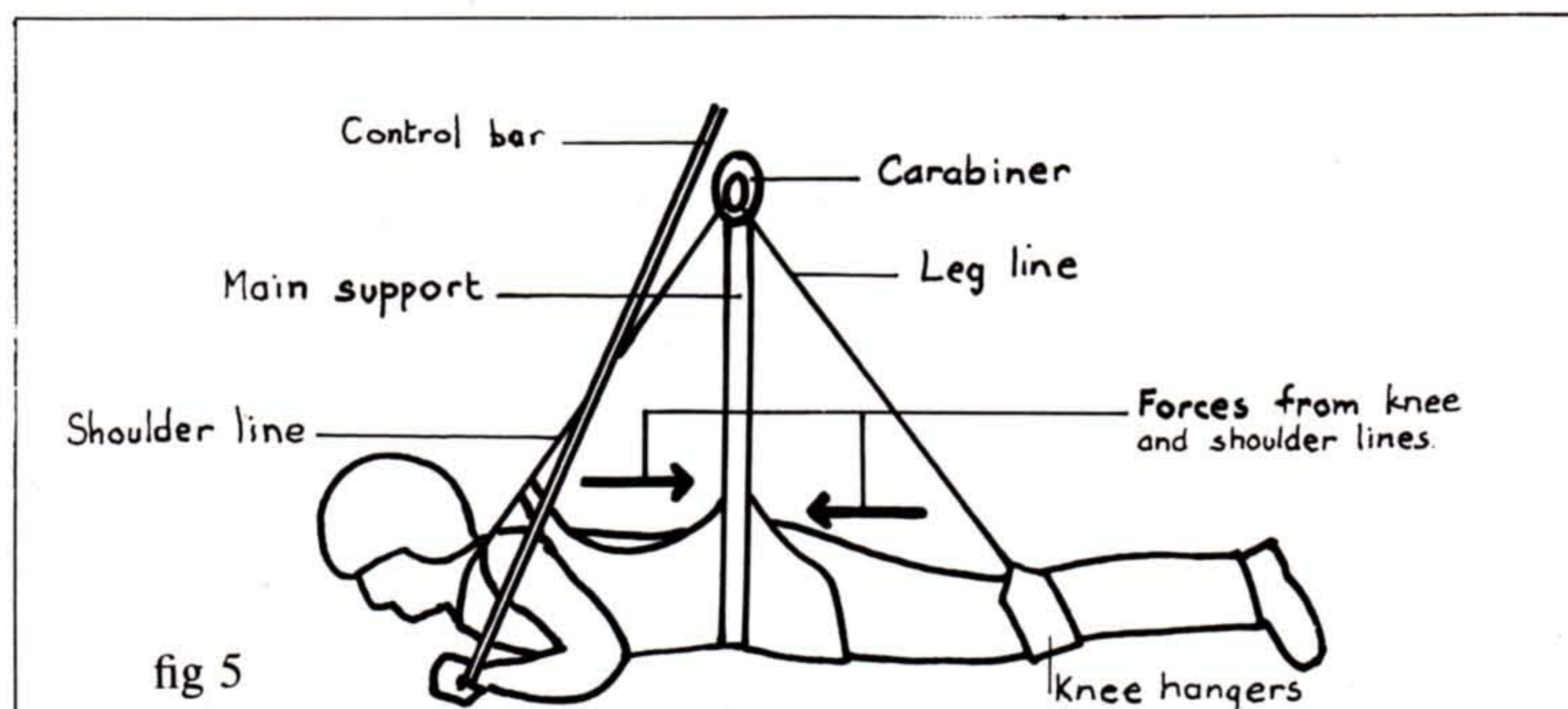


fig 5

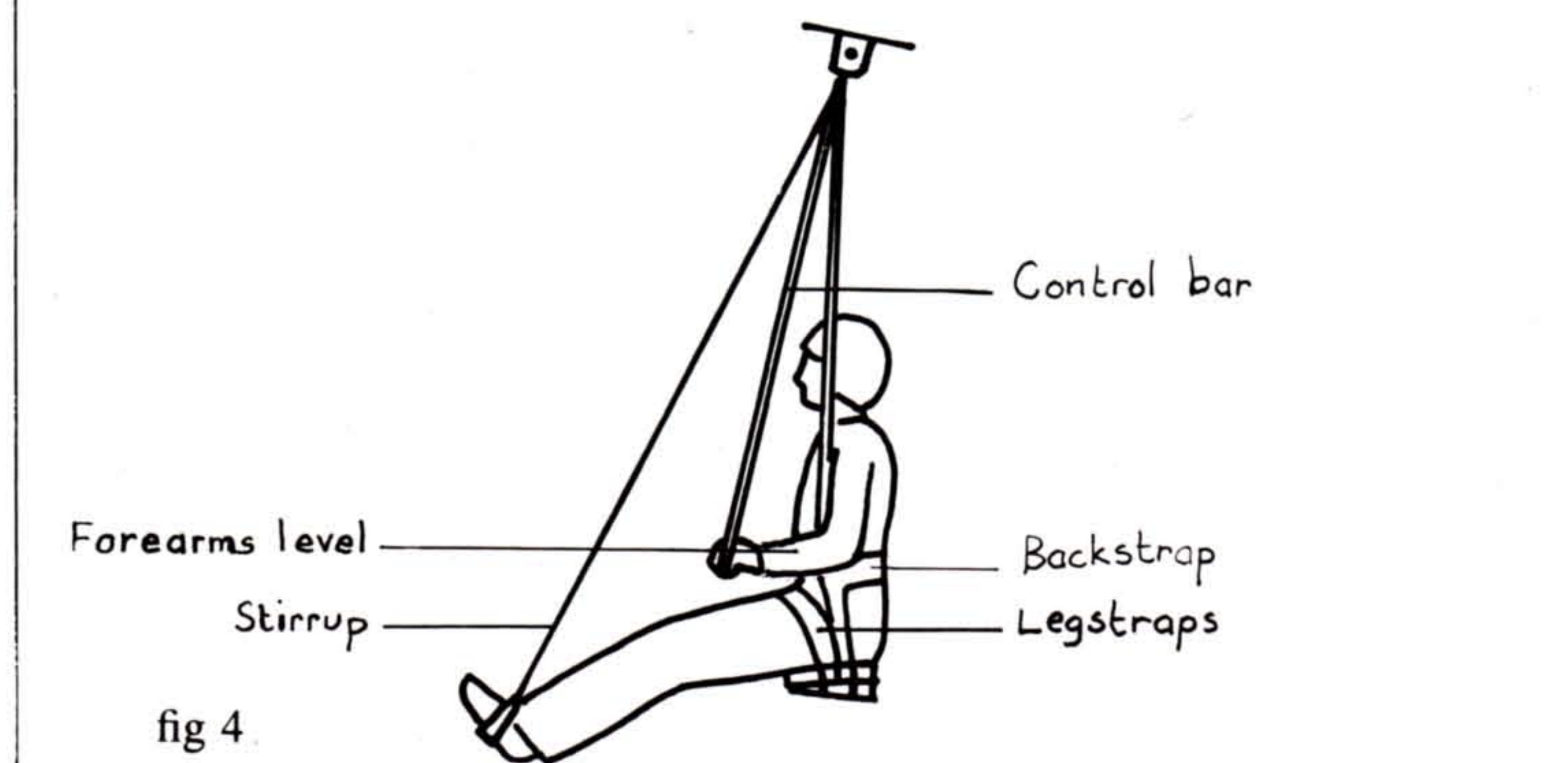


fig 4

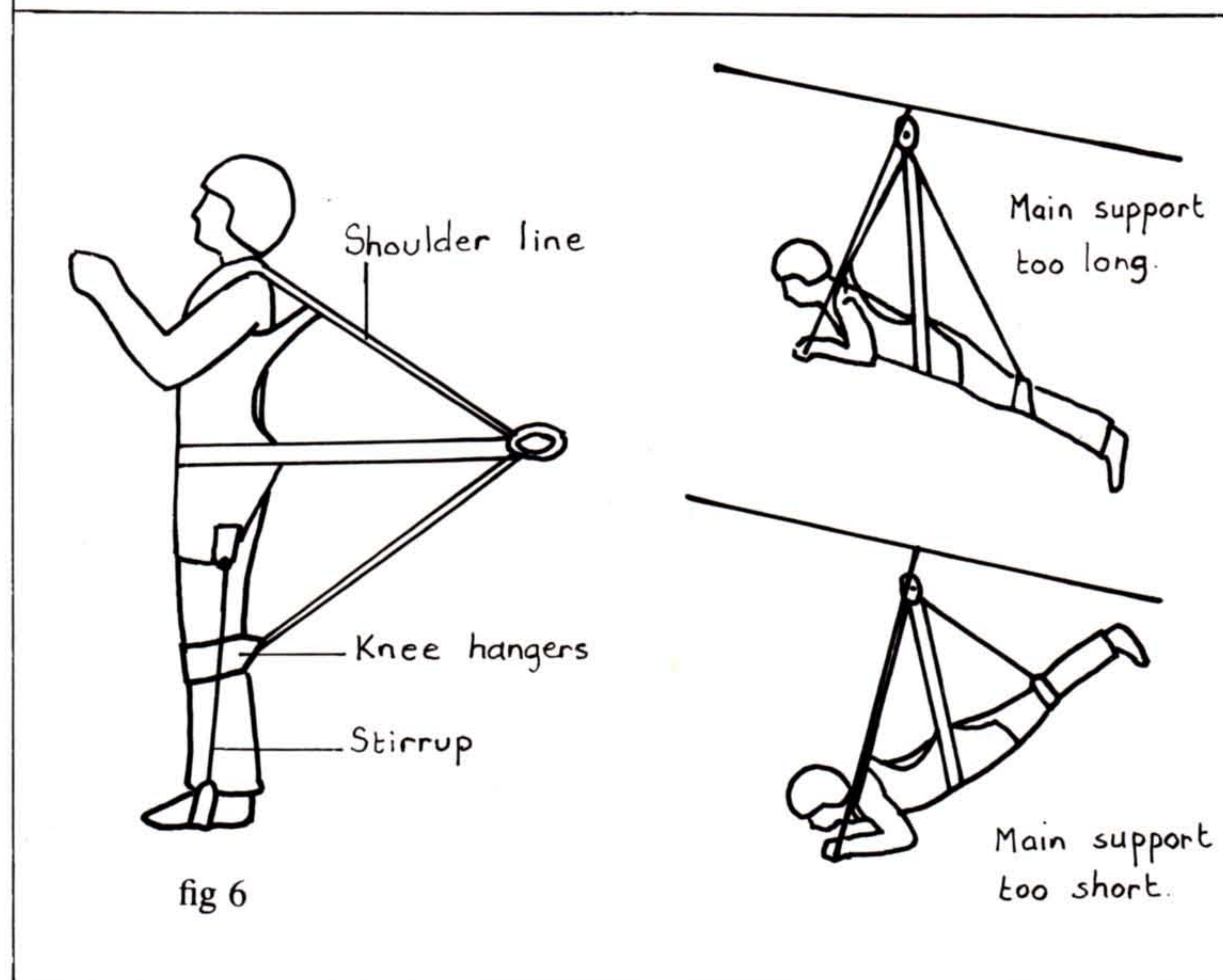


fig 6

pulling the harness down over the thighs with a stirrup, once the pilot is airborne.

The purpose of a prone harness is to provide support for as much of the pilot's body as possible, while still permitting ease of ground handling. To meet this criteria the harness must have an ample number of support lines. This usually works out to be a line at the shoulders, chest, hips and knees (if knee hangers are employed). This is illustrated in fig. 5. If too many support lines are used, the harness

designers have employed spreader bars in various configurations to hold the lines apart. These seem to work quite well. However, a harness without spreader bars can be comfortable if it fits and is adjusted properly.

The waist strap is the main support strap. This strap must be located at your body's centre of gravity. If not, your body will tilt up or down and tire your arms when you try to hold yourself level. Try this: lean over a chair back, saw horse or similar

structure and arch your back so that your feet and chest are level. Move forward or back until you find your balance point or centre of gravity. It is at this place (usually just below the hips) that the harness waist strap should fall.

Now, put your harness on, stand up and hold the waist strap at your body's centre of gravity. Have a friend hold the support lines straight back (see fig. 6). The cut-out for the neck should come just below the collarbone. The shoulders, arms and neck should have plenty of freedom. If these criteria aren't met, the harness is too large or too small.

Next, adjust the stirrup (if used) so that the legs are straight when the waist strap is in proper position. Some pilots prefer to fly with their knees slightly bent. If this suits you, crouch a little when you make the adjustment. Now adjust the shoulder line so that it is tight when the main support is held straight back (perpendicular to your body).

If you are using knee hangers, adjust the line from the shoulder to the legs so that the body lies flat. You may prefer to make it a little tighter to looser to curve the body one way or another for comfort. Do not get it too tight, or the legs will be restricted when running for take-off.

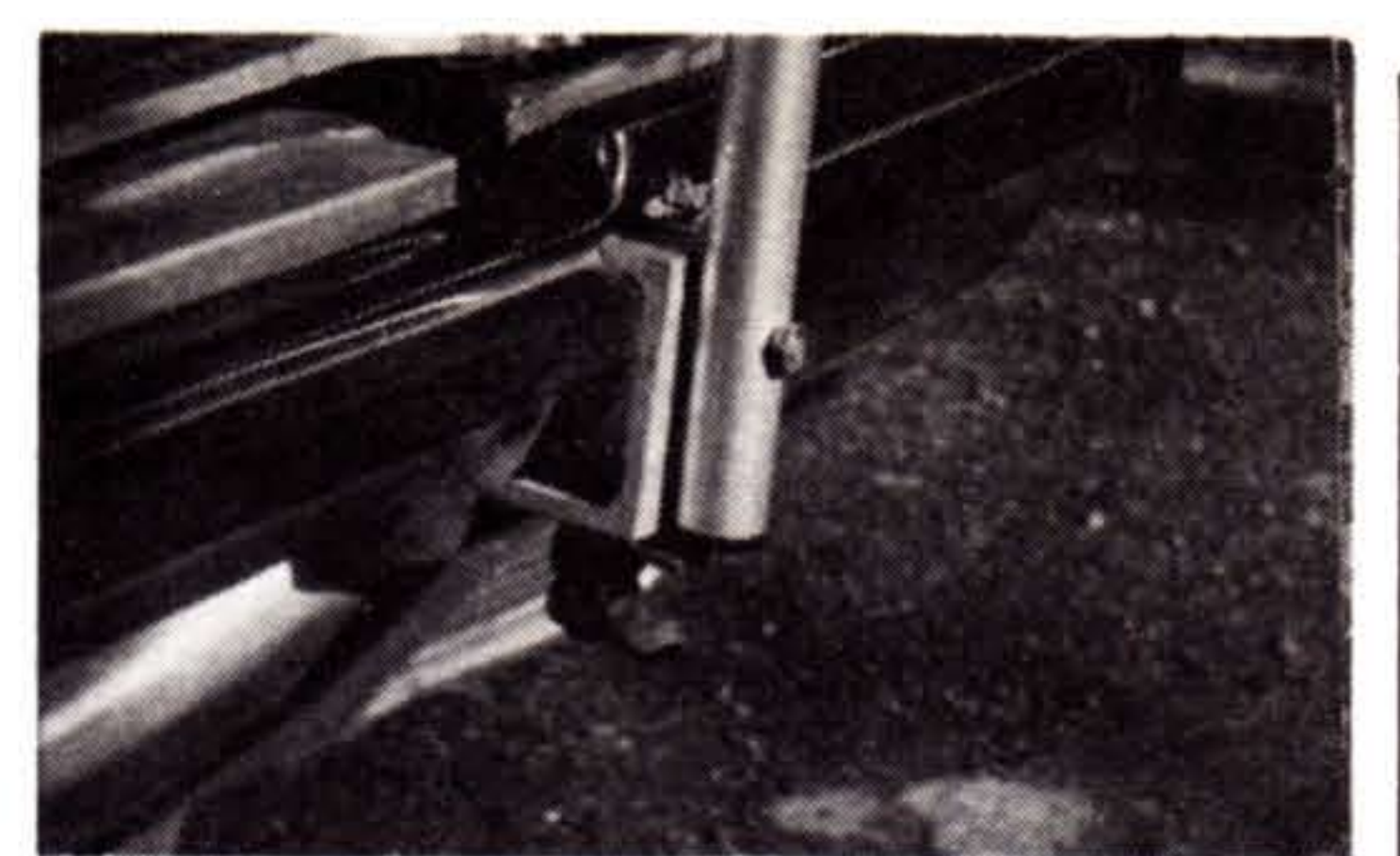
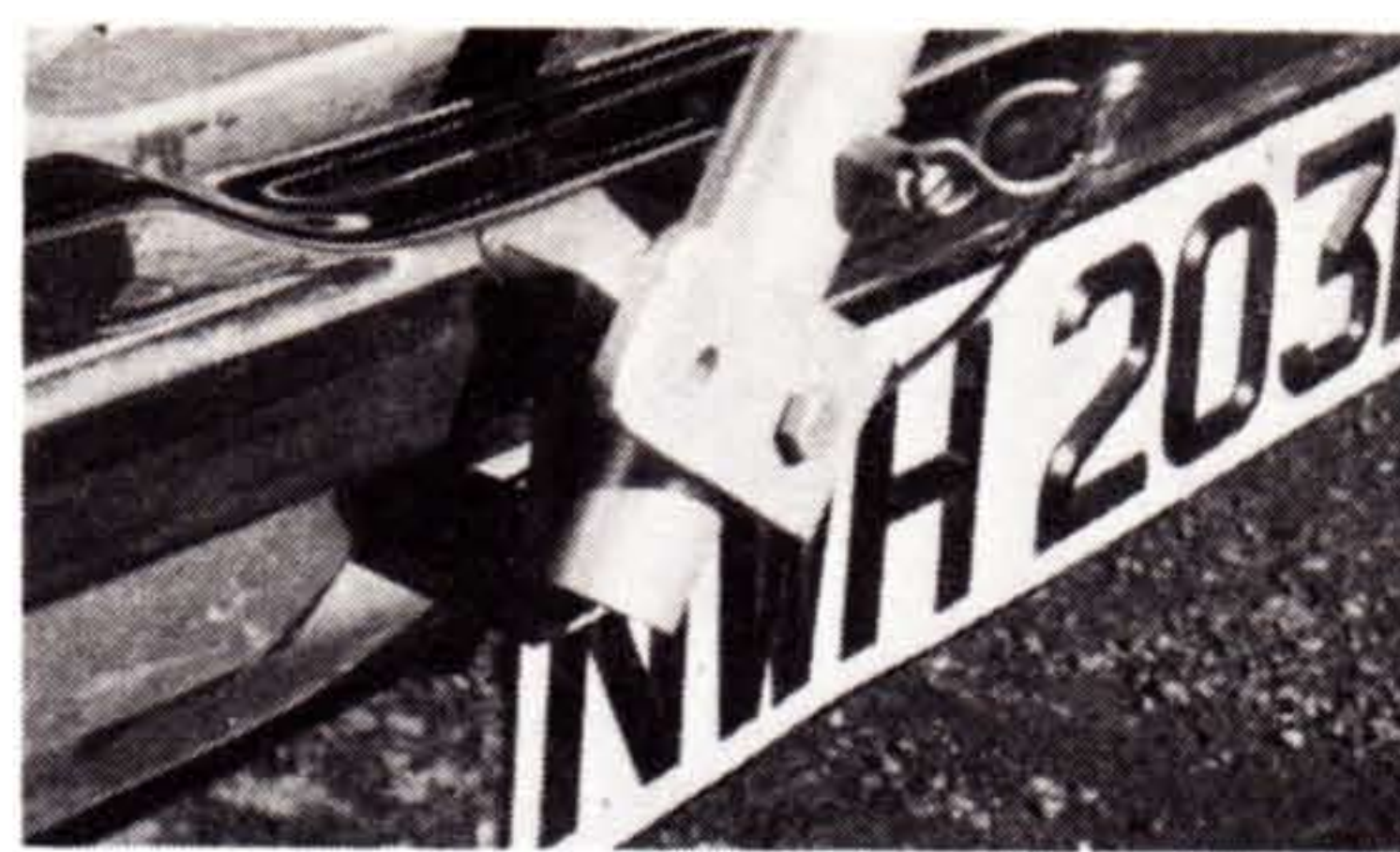
After all the lines are adjusted, hook in to a rafter or tree limb so that you can lie in the harness in flying position to test for comfort. Make any additional adjustments at this time.

The final adjustment to make is the height of suspension off the control bar. With knee hanger harness, you must shorten or lengthen your suspension rope so that your waist is 3-6in above the bar. The shoulders can move up and down, so hook in to your glider, have a friend hold the nose up and make sure you are level. Fig. 7 shows the flying position if your suspension is too short or too long. Ideally, your body should be pointed into the airstream to minimise drag. This will require a slight downward tilt. For a stirrup harness, you have to readjust the shoulder line to achieve the proper tilt angle.

Some pilot choose to fly a foot or more above the control bar. There is no real value to this other than changing the arm position (some pilots suffer from "soaring elbow" after long flights). It is detrimental in that more strength is required when flying in turbulence. In addition, the higher the harness is suspended, the lower the control bar is on take-off. This can reduce your running ability somewhat.

It should be obvious that care and proper adjustment is as important for the harness as it is for the glider. All too often a pilot comes down after an hour in the air looking like a red-faced lady in an overtight girdle. Present day harnesses are not quite as comfortable as a soft sofa, but flights of several hours should be possible without undue fatigue. The less tired you are in the air, the better you will be at making decisions, coring thermals and disappearing upwards. ☺





Firstly, why do we need a bumper rack? Ask any of the pilots who have picked up a hefty fine for illegal overhang, and they'll tell you. As far as I can make out all the prosecutions have been for illegal rearward overhang. Remember, you are only allowed 3ft 6in at the rear, but 6ft at the front. Practically every car can carry a 22ft glider within these restrictions, but it means that 50% of the glider has to protrude beyond the front roof rack support. The glider will not balance, it bounces around and so most people take the easy way out and stick double the legal length out of the back. The glider still bounces around and you can run the risk of tangling with the law. Regardless of the risk of prosecution, the overhang law is for everyone's protection, but more to the point is the huge amount of damage which is caused to the glider by the constant flexing and bouncing. The continual movement causes chaff holes to appear in the sail as if by magic, and practically all the scratch and score damage to the tubes is caused during vehicle transportation.

A simple way to eliminate a whole

# BUMPER RACKS

John Hudson describes how to make a simple and very effective bumper rack

bunch of problems is to support the glider as far forward as possible, allowing a greater overhang at the front, and reducing destructive movement.

Practically all the major manufacturers have large frames bolted to the front bumper, and this may be okay for them, but the average pilot uses his car for many other reasons and a tubular frame, permanently bolted to the front bumper not only increases fuel consumption, but can also look very unsightly.

As the photographs show, the bumper rack is a simple two-piece prop which folds away and clips neatly to bumper when not in use. The

original idea was for the junction between the two tubes to be bolted with a wing nut and bolt so that the two tubes could be folded, pivoting around the bumper fixing bolts. I found however that the diagonal tube had to be of such a length that it projected beyond the side of the car at the front, where it would be dangerous and vulnerable. I tried splitting the diagonal tube half way up but then found problems clipping the 3 pieces safely and firmly. The final solution seems ideal, and although the rack was made to fit my car, a Ford Granada, I've checked out other cars and they all seem to offer the same opportunity. It is just a matter of altering the basic dimensions to suit your own particular model.

The materials needed are typical hang gliding parts: 1in x 14swg tube, 3in x 2in control frame channel.

The channel is used to provide vertical surfaces against which the tubes can rest. The two channel brackets are shaped to suit the contours of the bumper, so that when the pivot bolts are fitted through, the tube is held firmly in the vertical plane. See fig 1.

The next step is to measure the distance from the centre of the bumper pivot bolt to the point on the vertical upright where the diagonal support

will be bolted a long tube, or piece of wood resting on your existing roof rack can be used to measure from. Add 3in to this dimension so that the tube will protrude above the diagonal support, and also add sufficient to the bottom so that it rests over the full face of the 3in deep channel. Once the vertical tube is bolted in position the diagonal tube can be bent so that it forms a level platform of about 6in wide for the glider to rest on. The ends of the tubes should project beyond the bolt to give lateral support in the case of the vertical and to act as a platform for a second glider or a spare tube in the case of the diagonal tube. It is wise to leave the diagonal tube long at the bottom so that the excess tube can be cut off as a last job.

I used a 4in piece of 1 1/8in OD x 17swg tube as a socket bolted to the 2nd channel bracket, and also cut a piece of channel into an angle clip to hold the rack when folded, See fig 2.

The channel and socket tube can now be bolted to the bumper and the diagonal tube marked off and cut to length.

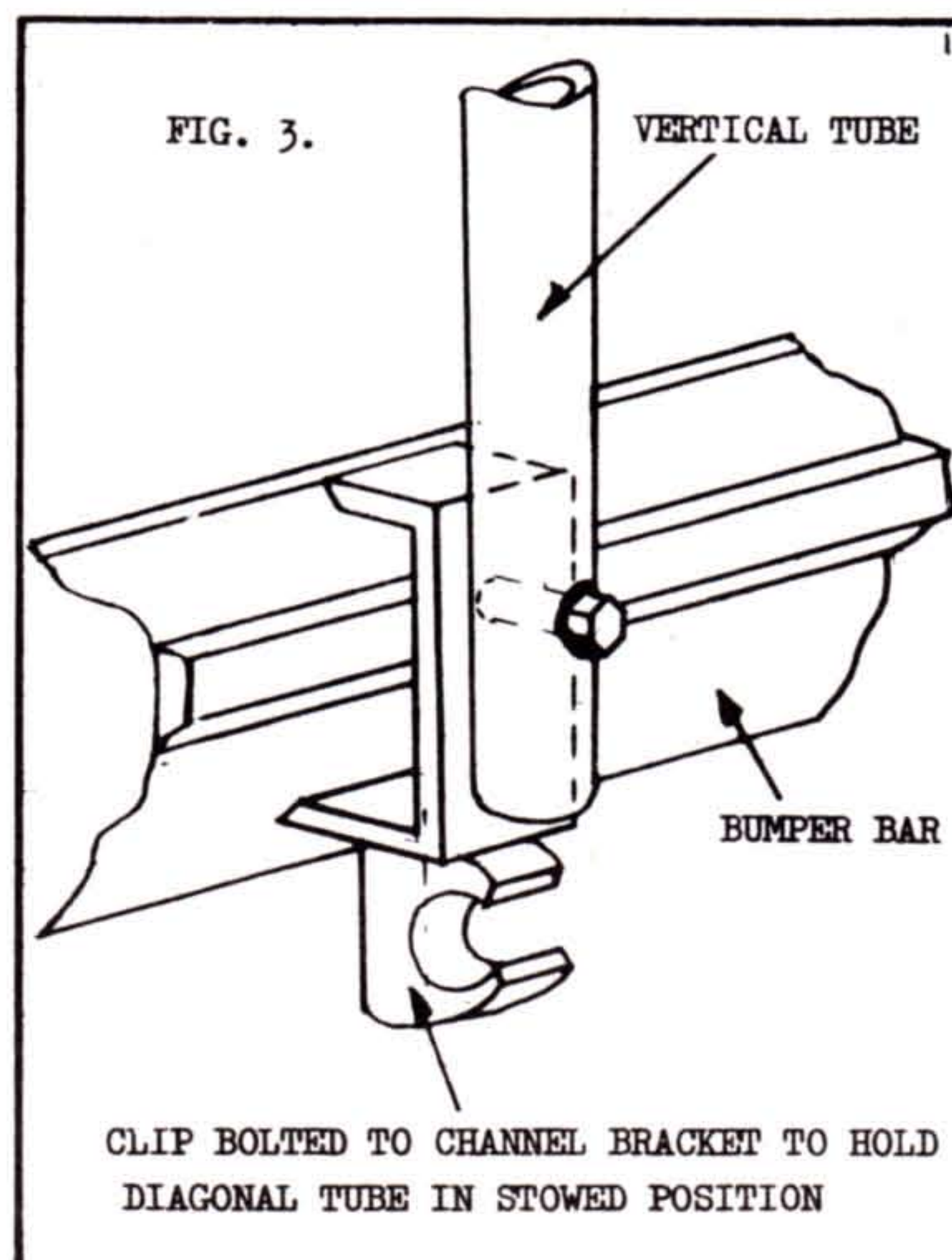
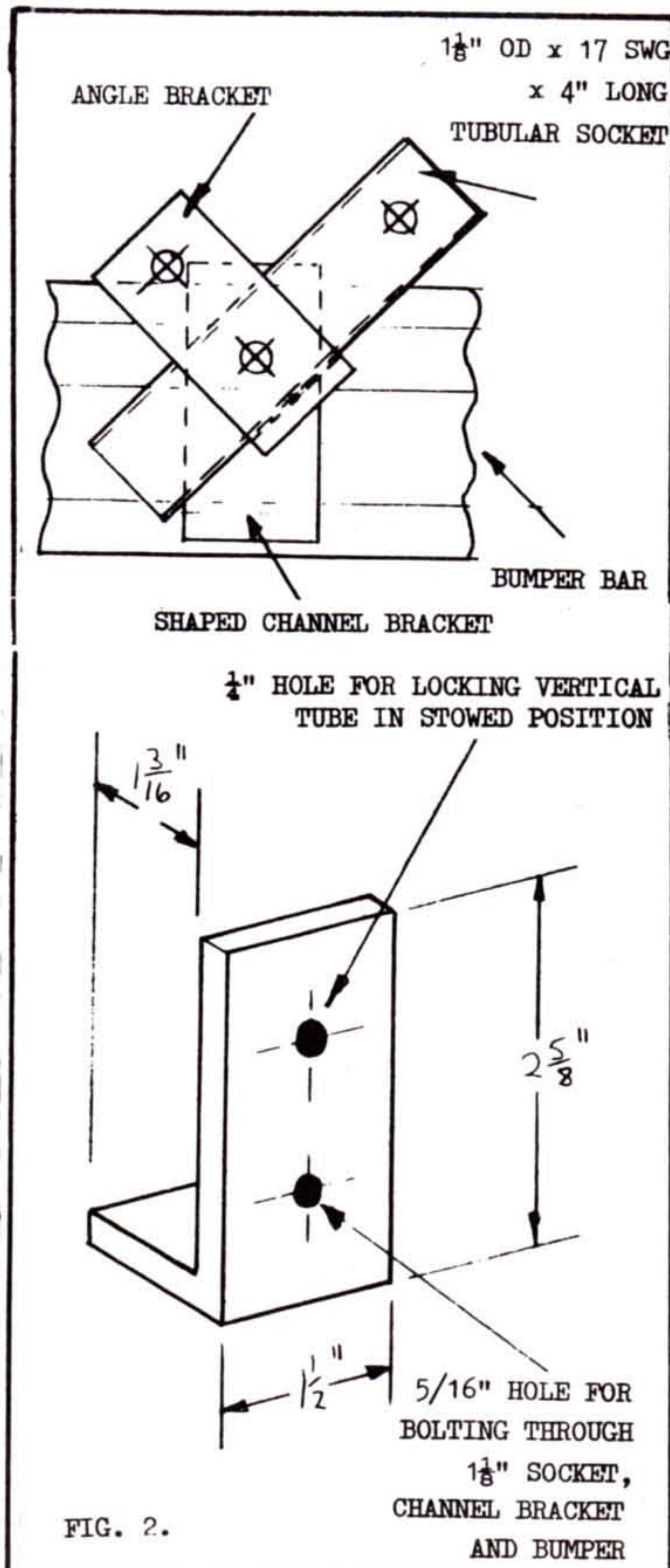
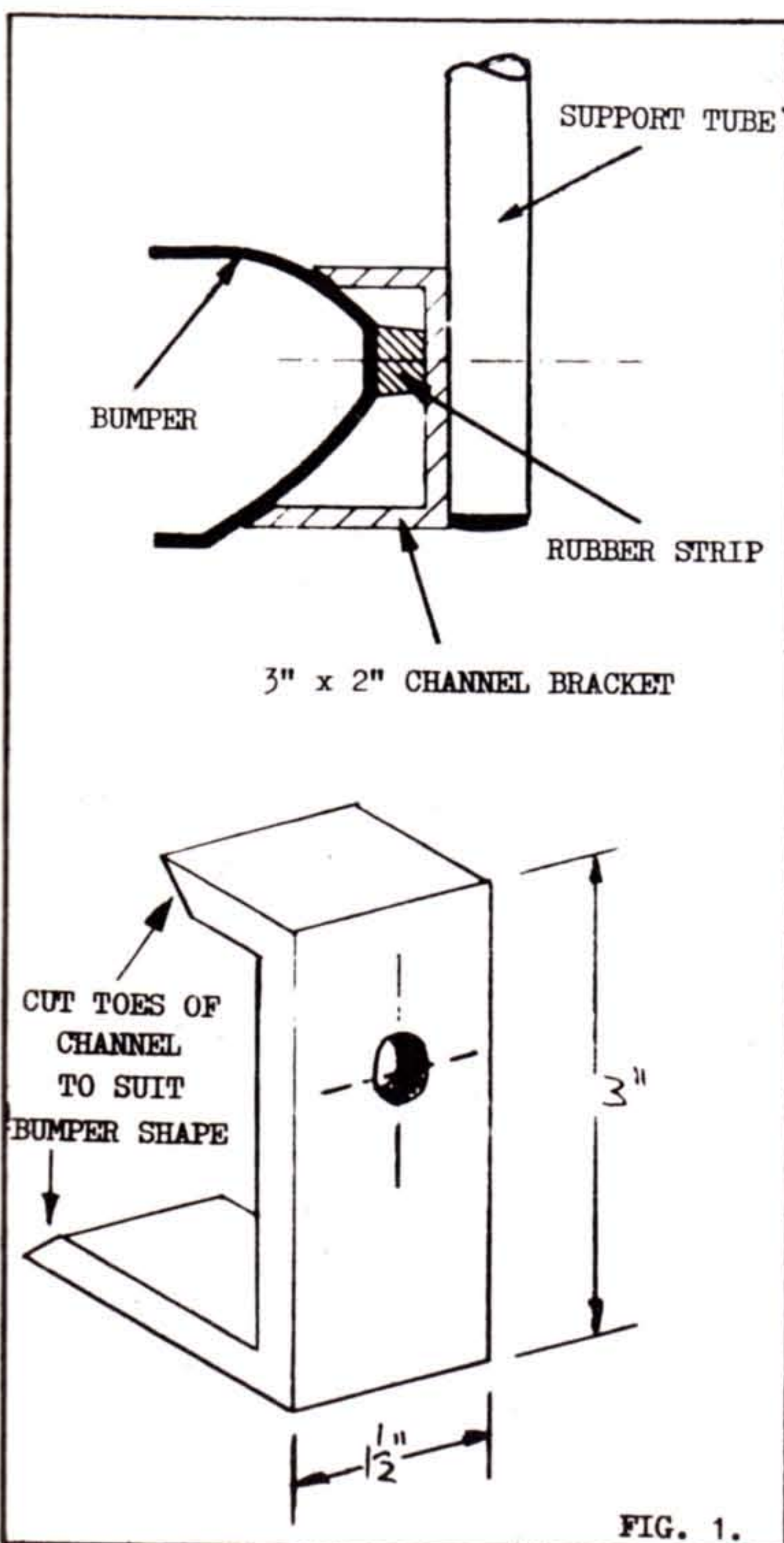
With the rack socketed in position, a 1/4in dia. hole drilled through both the 1/8in socket and the 1in diagonal tube means a pin, or wing nut and bolt can be fitted to hold the assembly together. A second hole drilled through the angle bracket and vertical tube when the rack is folded, means that the same pin or bolt can be used to hold the vertical tube firmly for stowage.

Finally the bent diagonal can be held in place by bolting a plastic tube clip to the underside of the vertical tube channel. See fig 3.

To erect the rack, simply unclip the diagonal, remove the locking pin from the angle bracket and swing the rack upwards. Twist the 1 1/8in. socket, locate the diagonal in it, and refit the pin or bolt to prevent the tube from sliding out.

It is simple, easy and neat. You may find that you have to adapt this general idea to suit your own particular car, but with a little thought the principle will work on any make of car and will achieve the same ends.

Your glider will travel safer, more lawfully and with less damage. You'll be more confident in its security, and once you have carried your glider with a front bumper support, you'll never again wish to see it unsupported.





# MEMBERS OF THE BRITISH HANG GLIDER MANUFACTURERS' FEDERATION

## Hang glider manufacturers and/or suppliers

Birdman Sports Ltd. Overtown House, Mildenhall, Marlborough, Wiltshire  
 Chargus Gliding Co. Wagland Engineering, Gawcott, Buckingham  
 Eclipse, 7 Exbridge, Dulverton, Somerset  
 Flexi-Form Skysails, 8 Chequers Road, Manchester M21 1DY  
 Hawksworth Skysports Ltd. Upper Hulme, Leek, Staffordshire  
 Hiway Hang Gliders Ltd. 27/35 Bernard Road, Brighton, Sussex  
 McBroom Sailwings Ltd. 43 Canford Lane, Westbury-on-Trym, Bristol  
 Miles Wings (Engineers) Ltd. Unidev Works, Croydon Road, Elmers End, Beckenham, Kent BR3 4BP  
 Ridge Rider Aviation, 22 Sir George's Place, Steyning, Sussex  
 Sailwings (Scotland) Ltd. Craigview, Comelybank Lane, Dumbarton G82 4JA

Skyhooks/Sailwings Ltd. 4 Thornlea Avenue, Oldham, Lancashire  
 Scot-Kites, 19 Camphill Avenue, Glasgow G41 3AU  
 Waspair Ltd. Restmor Way, Hackbridge Road, Wallington, Surrey.

## For Insurance Purposes —

John Spooner (Cowes) Ltd. Exmouth House, Bath Road, Cowes, Isle of Wight

## Aluminium and Component Suppliers

Main Welding Co. Ltd. Shawclough, Rochdale, Lancashire

## Component Suppliers

Wingard Ltd. Chichester, West Sussex PO19 2UG

## Aluminium Alloy Seamless Drawn Tube

Alex Alloy Ltd. 29 High Street, Tooting, London SW17 ORG

Officers: Chairman Reggie Spooner  
 Treasurer Len Gabriels (Skyhooks)  
 Secretary Jillian Handley (Miles Wings)

NOTE: Membership of the Federation does not signify that any or all of that member's hang glider models are approved or registered. Ask about this point when you contact any manufacturer.

(A stamped, addressed envelope would be much appreciated with your enquiry to any manufacturer)

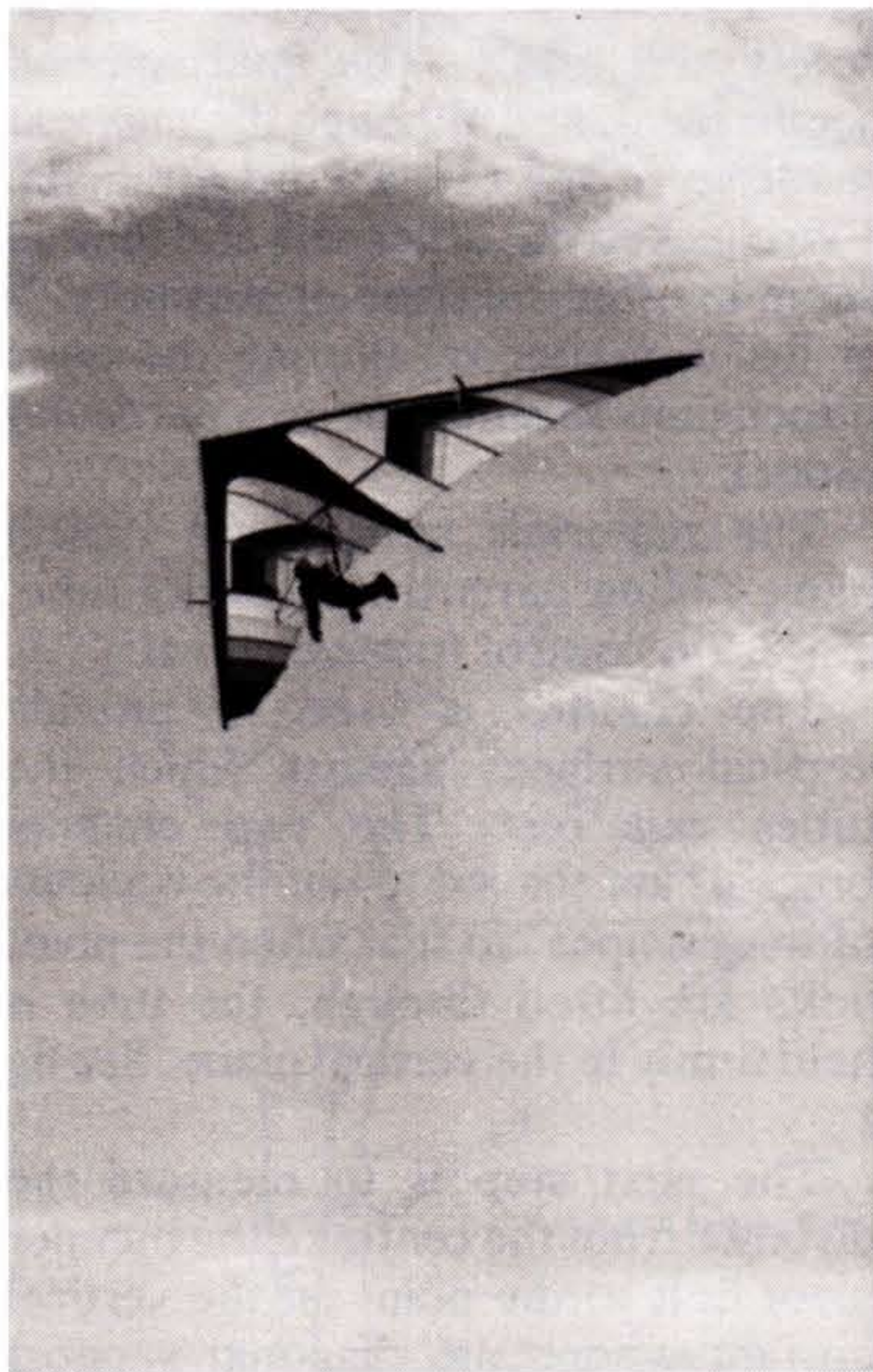
## BIRDMAN SPORTS LTD.

### Firebird 'S'

An intermediate glider suitable for E.P.C. holders fresh from schools. Built in two sizes, 190sq.ft. and 215sq.ft. Notable for its extremely low drag fully battened sail.

*Brief spec. (190sq.ft. model)*

Leading edge 19ft., root chord 14ft., nose angle 96°, aspect ratio 4.12, Approx performance L/D 6.5-1 min. sink 280 F.P.M. Price: excluding V.A.T. £363.



Firebird S

### Moonraker

Well known high performance glider suitable for more experienced pilots. Very light to control with a wide speed range. Winner of several speed and speed range tests in the 1977 British League. Has a very 'clean' sail even at max. speed.

*Brief spec.*

Leading edge 20ft., root chord 10ft., nose angle 108°, aspect ratio 5.38. Approx performance L/D 8-1 min. sink 200 F.P.M. Price: excluding V.A.T. £440.

Moonraker



### Moonraker '78

The ultimate machine for experienced pilots with cross-country flying in mind. Will be available for the 1978 'thermal season'.

*Brief spec.*

Nose 130°, Aspect ratio 7, Span 35ft., root chord 7ft., area 175sq.ft., also available in 210sq.ft.

The glider has diffused fixed tips, a deep subventral fin, fully battened sail. Airframe is very strong in 2ins. O.D. x 18 G tube. The sail is 3.8oz. Howe and Bainbridge Dacron and can be built to customer colour choice. The glider will fold down to approximately 12ft. as standard.

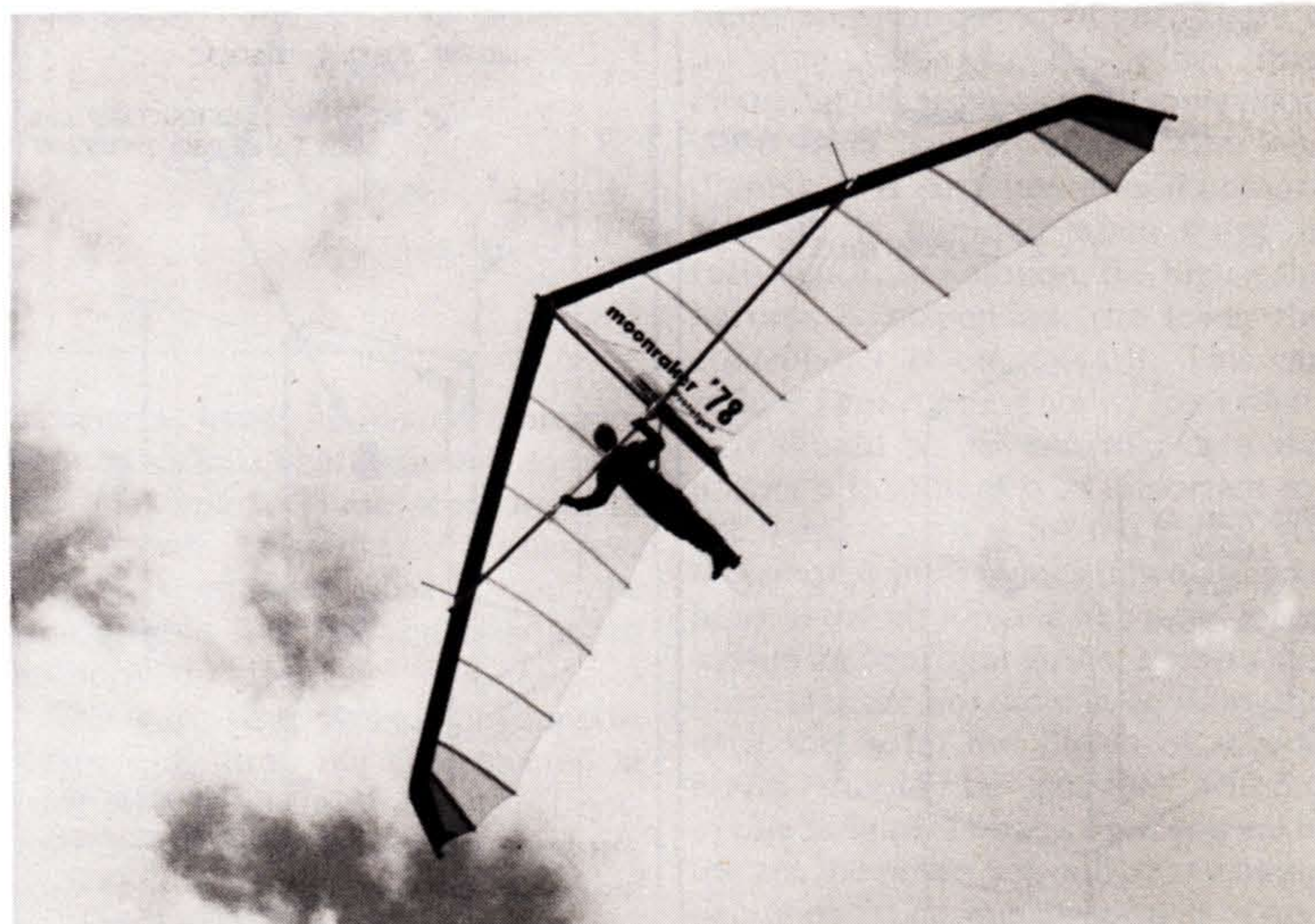
Common to all Birdman gliders is the following:- Howe and Bainbridge Dacron sail

Breakdown facility: enables the owner to easily transport the glider by air or sea and also saves money in the event of damage.

Available from our harness shop is an excellent stirrup-type prone harness @ £45, also seated harnesses, glider bags, instruments, etc.

The Birdman Flight Training School also operates from our premises. Flight Director Ashley Doubtfire.

We are unique in offering under one roof everything a hang glider enthusiast or beginner could wish for from basic tuition to the purchase of some of the most sophisticated hang gliders available.

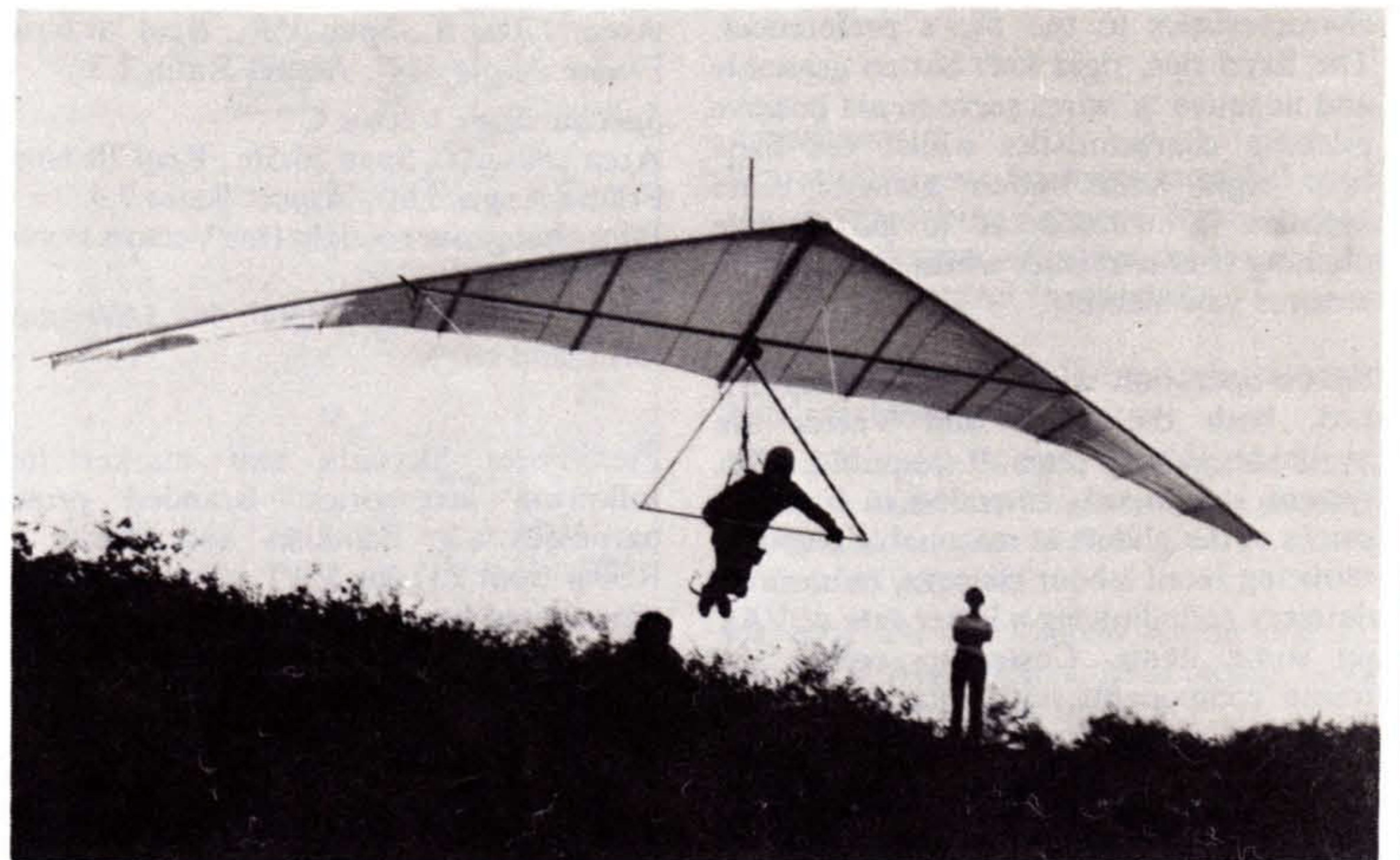




# CHARGUS GLIDING COMPANY LTD.



Vega II



Midas C

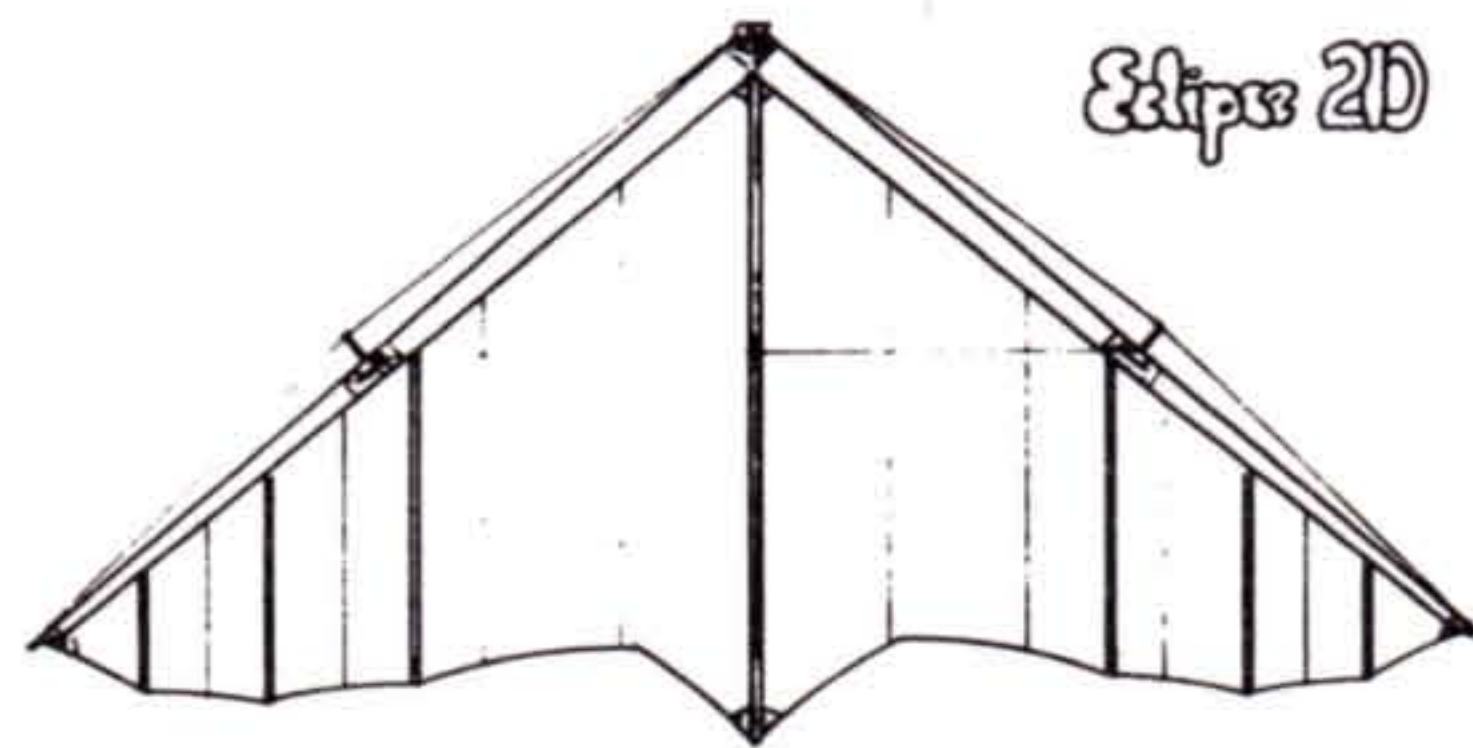
The Chargus range of hang gliders includes the popular range of the Vega IIA, Vega IIB and the Midas C. Also added to these gliders is the Midas Super E. Special features of the Midas Super E are: Adjustable C of G strop, large diameter cross boom, and short or long keel options. Triple Tubular Wing posts giving greater

strength to the airframe and more control to the canopy shape. Aircraft push pins for uncomplicated and rapid assembly. Floating truncations, which greatly contribute to its incredible speed range, L/D ratio and sink rate. The Midas Super E is constructed only of top grade materials with American Dacron sailcloth.

Specifications: Leading edge 19ft.10in. Root chord 8ft. Wing area 188sq.ft. Nose Angle 110°. A/R 5.7. L/D better than 9.5 to 1. Mean Chord 5.74ft. Span 32.75ft.

	Midas 'C'	V IIA	V IIB
L/E	19 ft. 3 in.	18 ft. 6 in.	19 ft. 8 in.
Keel	8 ft. 3 in.	14 ft. 7 in.	15 ft. 7 in.
S/A	166 sq. ft.	195 sq. ft.	220 sq. ft.
N/A	110 degrees	100 degrees	100 degrees
Billow	1.6 degrees	2.25 degrees	2.25 degrees
A/R	6.0	4.16	4.09
L/D	8 to 1+	7 to 1+	7 to 1+

## ECLIPSE



### Eagle 210

The 210 is a glider with a completely natural feel, and is ideal for training, but is also a good performer for experienced pilots.

### Eagle II

This glider is intended for the more experienced pilot, but is still very easy to fly and has no nasty characteristics. The unusual cambered keel pocket gives the sail a graduated dihedral effect across its chord, which helps to give good stability and light positive control. The glider has three wing posts, folding 'A' frame and reversible rigging for seated/prone conversion. Rigs quickly without tools.

### ESE

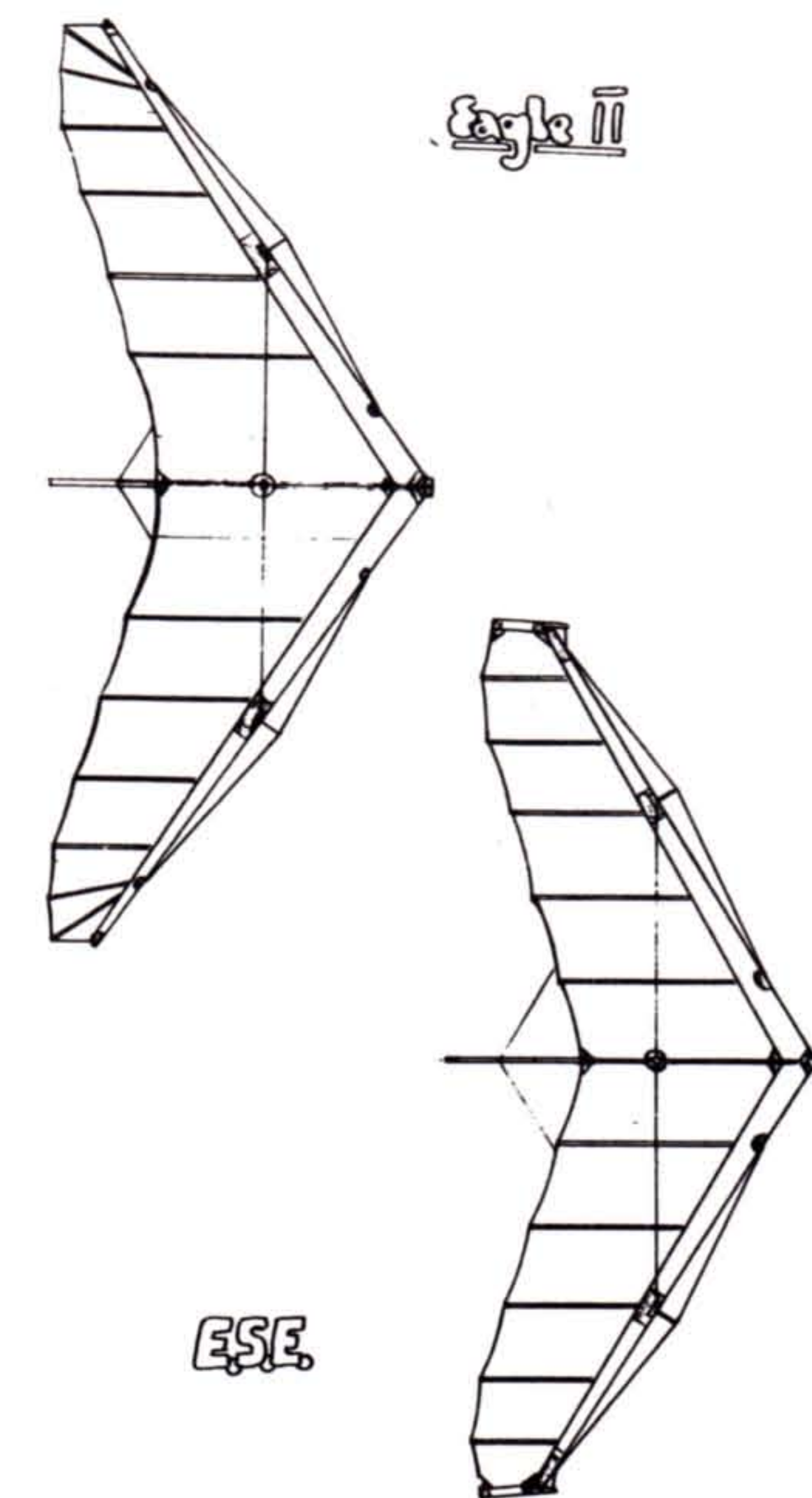
This is the 1978 model which is still undergoing tests and should be released sometime later this year.

### Kite Bags

Made to measure kite bags. The standard bag is 21ft x 14in with one zip and two runners, so that should the 'A' frame not fold completely, the zip can be done up to the bracket from either side. The bags are light, strong and completely waterproof. Price £18.00 plus £1.50 p+p. Special sizes can be done at a little extra.

### Eclipse 210 Trainer

Ledge	19' 8"
Keel	15' 6" preformed
Sail Area	221.5 <sup>2</sup> ft
Nose Angle	99°
Billow	1.75°
Aspect Ratio	4.395
Span	31.2'



### Eagle IIs

Ledge	20' 0"
Keel	10' 0"
Sail Area	193 <sup>2</sup> ft
Nose Angle	109.2°
Billow	0.4°
Aspect Ratio	5.574
Span	32.8'

### Eagle II m

Ledge	20' 6"
Keel	10' 0"
Sail Area	199.3 <sup>2</sup> ft
Nose Angle	109.2°
Billow	0.4°
Aspect Ratio	5.664
Span	33.6'

## FLEXIFORM SKYSAILS

Flexi-Form Skysails are both hang glider manufacturers and independent sailmakers. The sail loft supplies several other manufacturers with a proportion of their requirements, caters for 'one-off' sail work and build Spirit and Vector sails.

The Spirit was the first Flexi-Form Skysails hang glider to be marketed in any quantity and was unique in bringing a controlled system of kit assembly to British hang gliding. The Spirit features a fully battened roached tip sail with scope for glider tuning by double wing wires and keel camber. The glider is sold across the whole spectrum of flier abilities, but increasingly (in mild tune) to EPC newcomers to the sport.

### Spirit Large

Specification: Area 210sq.ft., Leading Edge 22ft., Keel 11ft.6ins., Frame Angle 102°, Aspect Ratio 5

Pilot changeover weight for Spirits Medium and Large is 12st.

Price: ready to fly £400, kit £330 (inc.VAT and bag).

(All kite prices include sail colour choice, either size, kite bag and sail ties).

### Spirit Medium

Specification: Area 190sq.ft., Leading Edge 20ft.6ins., Keel 10ft.6ins., Frame angle 102°, Aspect Ratio 5.

### Spirit



The Vector went into production at the beginning of the year after nine months of development and proving. The Vector differs substantially from the Spirit and is specifically intended for the flier who has gained ridge soaring experience (to 'Pilot

Wings' level) and is looking for a glider which will extend his flying pleasure and offer the potential for cross-country work. The glider is (in Flexi-Form's opinion) both lighter and faster to fly compared with its competitors. The sail is tightly stretched



across the entire span and is cambered to provide an airfoil section. The wing wires function primarily to tune the handling characteristics to the flier's preferences. The fixed tips, rigid keel batten assembly and negative 'g' wires serve to aid positive pitching characteristics whilst the fixed tips, rigid keel batten assembly and negative 'g' wires serve to aid positive pitching characteristics whilst the fixed fin ensures yaw stability.

By co-operation with Main Welding Co. Ltd. both the Spirit and Vector are available in kit form if required. This system is primarily intended to hold the prices of the gliders at reasonable levels by reducing retail labour charges, minimising delivery and allowing a lower rate of VAT on some items. Customers collect the frame components and plans from Main Welding Co. Ltd. (or a Flexi-Form Skysail dealer), cut, drill and prepare the leading edges, keel and cross tube(s) and return these to Flexi-Form Skysails (or the dealer) for checking, assembly, rigging,

test flying and tuning of the finished glider.

**Specification: Vector B**  
Area: 170sq.ft., Span 35ft., Keel 7ft.6ins, Frame Angle 114°, Aspect Ratio 7.3

**Specification: Vector C**  
Area 180sq.ft., Span 36.5ft., Keel 7ft.6ins, Frame Angle 114°, Aspect Ratio 7.4  
Pilot changeover weight (for Vectors B and C) is 12½st.  
Price: Ready to fly £500, kit £430 (inc. VAT and bag).

Flexi-Form Skysails also market the following accessories: Branded prone harnesses e.g. Scotkites and Hiway at RSP's from £37 inc.VAT. 'Total Support' type seated harnesses at £22 inc.VAT. We allow part-exchange on good seated harnesses taken in exchange for a prone harness. We also carry hang gliding variometers, 'Trevalen' Skysuits, helmets of various sizes, ratings and types all suitable for hang gliding, from £9.50., Velcro sail ties, bungees, and roof racks.



## HIWAY HANG GLIDERS



Scorpion. Photograph © Bettina Gray

Scorpion	Leading edge	Keel	Length packed	Area	Aspect ratio	Weight	Pilot weight range	Knock-down size	Ultimate strength rating
A	19' 2" (5.86m)	9' (2.75m)	19' 6" (6.00m)	160 ft <sup>2</sup> (15 m <sup>2</sup> )	6.0	42 lbs (19.5kg)	up to 8st (50kg)	10' 9" (3.30m)	1280 lbs (580kg)
B £437	20' 2" (6.16m)	10' (3.05m)	20' 6" (6.3m)	190 ft <sup>2</sup> (17.5m <sup>2</sup> )	5.6	46 lbs (21kg)	8-11st (50-70kg)	11' 9" (3.60m)	1280 lbs (580kg)
C £464	20' 11" (6.38m)	10' 9" (3.29m)	21' 3" (6.5m)	220 ft <sup>2</sup> (20.5m <sup>2</sup> )	5.3	56 lbs (25kg)	11-14st (70-90kg)	12' 6" (3.77m)	1280 lbs (580kg)
D £480	21' 8" (6.60m)	11' 6" (3.53m)	22' (6.7m)	245 ft <sup>2</sup> (22.5m <sup>2</sup> )	5.0	59 lbs (27kg)	14-16st (90-102kg)	13' 3" (3.95m)	1480 lbs (670kg)

Cloudbase model	Pilot weight (stones)	Leading edge length	Keel length	Sail area (sq ft)	Aspect ratio	Overall length packed	Total glider weight (lbs)	Price
19	7-12	19ft 2in	17ft 4in	200	4	19ft 4in	40	£357.00
20	10-15	20ft 2in	18ft 2in	220	4	20ft 4in	43	£378.00
21	13-18	21ft 2in	19ft 0in	240	4	21ft 4in	46	£399.00

## HIWAY HARRIER

18ft leading edge, 13ft keel, 195 sq ft sail area, 4.25 aspect ratio. Designed primarily for teaching, the Harrier has excellent take-off and landing characteristics. Its sink rate is superior to that of the Cloudbase, but it does not have the high speed glide angle of the intermediate machine. First time buyers may be suited to this type of glider, and indeed, many experience pilots find the Harrier enjoyable to fly.

The Harrier is supplied with a special trainer triangle, which, though dimensionally exactly the same as that of the standard production glider, is designed to withstand the wear and tear encountered in schools, and which can be easily repaired. Rigging of the glider is very simple as it has no deflexors, fin or other complications.

## CLOUDBASE

Cloudbase is a quite exceptional intermediate rogallo. Safety and ease of control have not been sacrificed to performance — indeed the lightness and speed of response make this machine one of the most manoeuvrable we have seen.

The soaring pilot will welcome the degree to which Cloudbase can be slowed down without nose or wing dropping. On light marginal days this will give you time to put it back on the top when the wind drops momentarily, instead of having to go down. On stronger days the higher aspect ratio ensures that you can use parts of the sky that other machines simply cannot reach.

All alloy parts are anodised. The structure and folding system is the same as the time proven standard Hiways. New techniques in sail fitting have been used and the top rigging and wing wires are supplied with integral bottles screws.

## SCORPION

**Performance.** Scorpion has an extremely low sinking rate and can be flown at very high angles of attack. This enables you to circle more easily in small thermals. Cross-country thermalling flights on Scorpions are a common occurrence. The low stall speed makes take-offs and landing a delight, and top landing can be made in lighter winds.

**Handling.** The horizontal wing wires are connected via a pulley. This coupled with the floating keel pocket produces a differential billow shift that makes roll light and quick. Pitch has a moderate feel, and thus avoids

pilot tiredness caused by continuous pitch correction.

**Structure.** Uprated airframes as a result of airworthiness Standards and load testing to destruction. A and B Scorpions have 1¾in cross spars, and C and D have 1⅞in. Wing posts are tubular to give most effective resistance to load, and the hinged joints at the bottom of the triangle are double slotted for clean fit and distortion resistance. All booms, triangle and king post are anodised.

**Stability.** A fin gives lateral stability in both inflated and deflated sail conditions. Positive pitching in all situations is assured by reflexed centre sail and keep pocket, and the back of the keel pocket is permanently jacked up on the top keel wire.

**Sail technology.** The deep keel pocket has an airfoil section that is spread uniformly along the wing towards the tips by tailoring each seam when constructing the sail. The tips are rearranged in cloth direction and made of heavyweight dacron cloth.

**Convenience.** Scorpion has a totally folding triangle with a removeable bottom bar. The cross spar is split, facilitating storage and carriage. The usual Hiway quick-release nose catch is retained, and the wing posts simply push into bushed apertures in the leading edges. Knock-down versions are available where the leading edges fold. Scorpions are available as either prone or seated. Additionally a seated conversion bar is available whereby a prone Scorpion can be converted to seated or supine in about 5 seconds!

## HARNESSES

Hiway seated harness to suit Cloudbase or Scorpion. £20.00

Hiway stirrup prone harness — the most comfortable prone harness. The pilot takes off standing up and when flying he places his feet in the stirrup and lifts himself into the prone position where his weight is supported at ten separate attachment points, all merging into the apron front. The plastic seat that rests just above the knees is used because it slides over clothing more easily than an extension of the apron and never crushes the pilot's knees in flight. Before landing (or during a long flight) one can swing into the seated position by letting go of the stirrup, enabling better descent control by use of the higher drag and pendular stability in this position. £40.00

Apron knee-hanger harness, developed for Alpine and some types of competition flying, is now available on the home market. £40.00



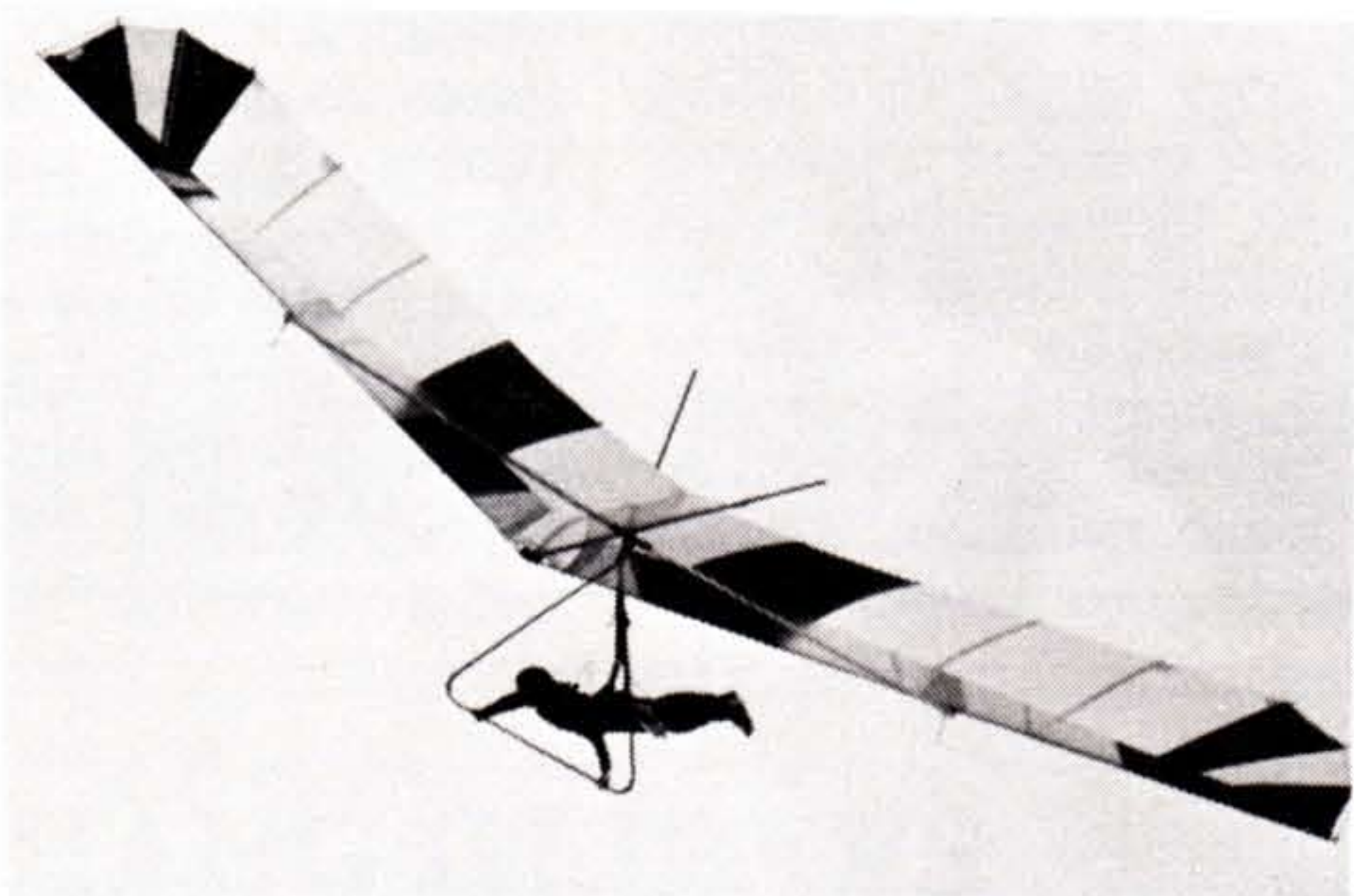




## THE OLYMPUS

Now in full production at Scot-Kites, the Olympus is fast gaining in popularity amongst skilled pilots and already has been chosen by several pilots for this year's British League Competition. Pilot feed-back is extremely encouraging and both Graham Slater and Gerry Breen, whilst reporting highly satisfactory ridge soaring capability, have stated that the glider displays a very high degree of 'thermal awareness' this probably accounting for the fact that in June 1977 the Olympus took a cross-country

world record of 62 miles and recently a new American East Coast record of 54 miles. The swivel tip system of washout control affords the pilot an exceptionally light response which can be disconcerting to a new owner. However, all pilots have reported that the light response is quickly overcome and becomes an asset in minimising physical effort in duration flying. The Olympus is simply a thoroughly proven world class 'Super Ship' and skilled pilots are invited to test fly the demonstrators currently in the hands of dealers throughout the country. The price of the Olympus is currently extremely attractive.



## ACCESSORIES

We market a range of accessories to support our dealers and customers. These include the well-proven Proneweb knee-hanger harness which is produced to very high quality standards and is filled with a special closed cell foam providing both comfort and floatation. At least one life has been saved in Norway, after a water landing, by the floatation qualities of this harness. The Proneweb is particularly suitable for novice prone flying and European competition.

Originally introduced at Mere the Proneweb 'S' has undergone some further small refinements before going into full production. This is an exceptionally comfortable stirrup harness featuring foam filling in both the thigh straps and the thigh role at the bottom of the body web. The Proneweb 'S' is particularly suited for duration and cross-country flying.

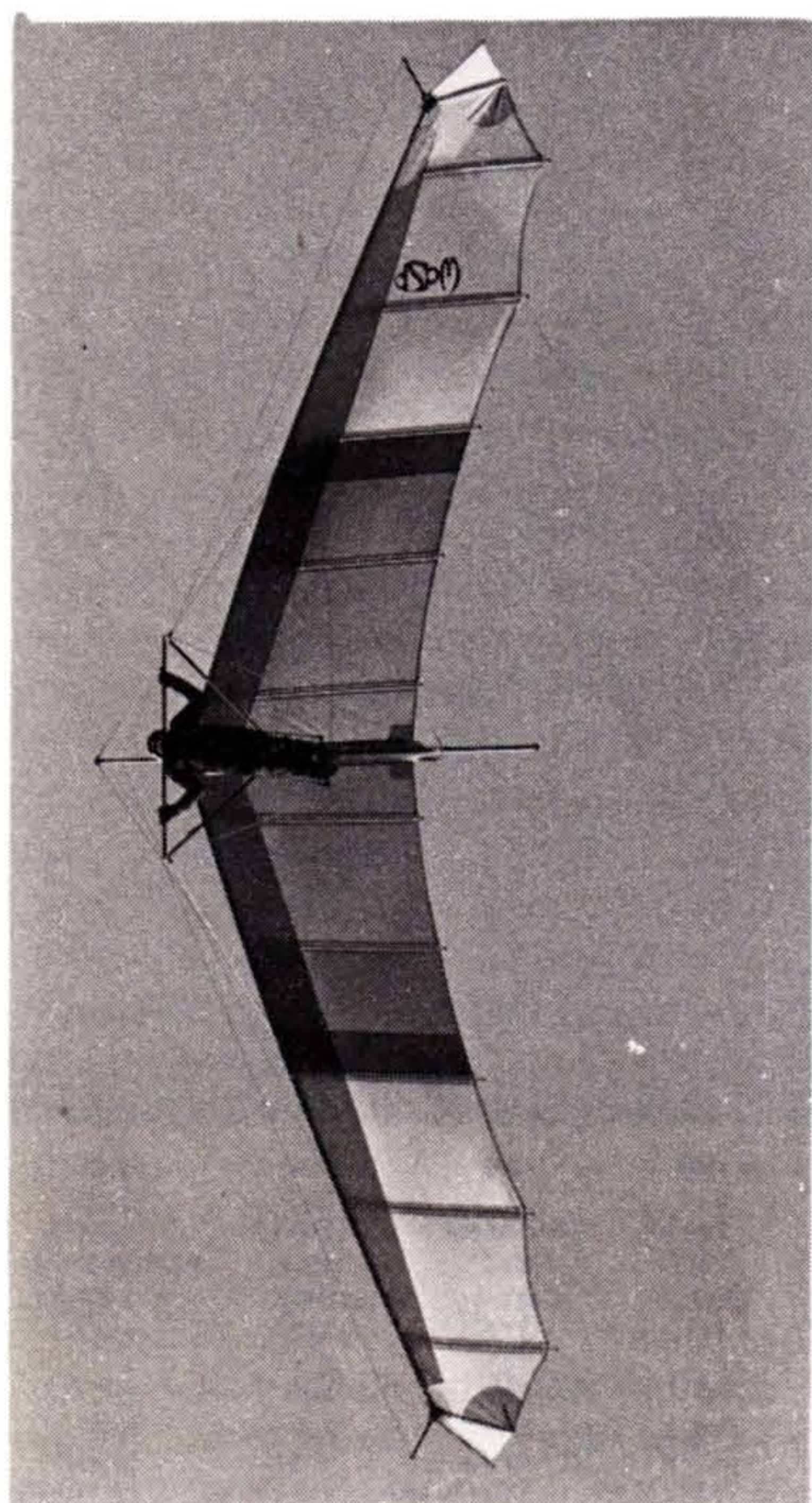
**Drogue-Chute.** A professionally made keel deploying drogue-chute has now been designed, tested and manufactured by us. We have been aware for some time of the difficulties which can be presented to pilots of high performance gliders at the end of a cross-country flight when, having selected an apparently suitable landing field, it is found

that on final approach to have a slope which, together with the ground effect, will result in the already committed pilot being unable to land as planned. By simply pulling a cord the Drogue-Chute can be deployed and safe landing effected. The Drogue-Chute is not expensive and in one landing alone can repay the investment by saving a glider damage, not to mention possible injury to the pilot.

**Carry Strap.** The heavier high performance gliders are making greater demands on pilot fitness and there is a distinct possibility of physical discomfort caused both by the sheer weight of the glider on the shoulder together with the higher weight above the body's centre of gravity whilst climbing. Our newly designed carry strap substantially reduces fatigue and greatly increases the pilot's stability during climbing, even to the extent of the pilot having both hands free. The carry strap can also be used whilst carrying a fully assembled glider simply by attaching it to the base of the control frame. The fully benefit of this carry strap will not be fully appreciated until it is tried by a potential user.

**Vario.** The Theotek audio vario is now available.

## WASPAIR LTD.



Top: Falcon VI Left: Gryphon III  
Above: Falcon III

## WINDCRAFT CO. HANG GLIDING ACCESSORIES AND WINGS

### PHOENIX SUPER 8 170, 185

Basically similar to 1977 Phoenix 8 but with several improvements. Improved camber distribution for even better sink rate and glide angle. Pulley system on wing wires. Applied leading edge standard. Coated cables (at last)! A really good sports machine with excellent vice free handling for the intermediate/advanced pilot. The fact that we have sold so few spares in 1977 proves how easy it is to fly — and experience has shown that any reasonably competent prone pilot can fly and 8 safely.

### PHOENIX MARIAH, 150, 170, 190

The 1978 Phoenix Glider with a host of new and unique features. 45% double surface with cross bar enclosed in sail. Fully floating cross bar braced by wires from control bar and king post with struts to leading edge. This allows, in conjunction with pulley system on both vertical and horizontal wing wires, for an enormous amount of billow shift. 120° nose angle. Droop tips. Interior floating truncations to maintain washout at all times. 16 aluminium cambered battens with positive location points on leading edge. Fully certified to USGHMA specs. Outrageous glide angle and sink rate! Threaded wing post system for easy adjustment of wing wires. Thread king post for tensioning cross bar wires. Reasonable weight (52lbs for 170). A complex but ultra high performance wing for the serious cross country pilot.

### DYNASOAR HELMET

Still priced at £18.00 as it was when it was introduced 3 years ago. Certainly the most functional of all hang gliding helmets, being light and comfortable, and giving total protection and unimpaired hearing. As used by all the top pilots.

### WILLIS VARIOMETER Audio/Visual

Certainly the most popular vario of '77, by virtue of its small size and excellent performance. The only vario of its sort with individually matched thermistors for accurate readings. Audio on up only adjustable threshold. £95.00 inc. VAT.

### BENNETT B.U.S. PARACHUTE

Surely all serious thermal pilots will be protecting themselves with a B.U.S. this year — so why not go for a tried and tested unit? Weight 6lbs, canopy dia. 25ft, sink rate 20ft per second. Comes with complete instruction book for repacking, in normal flying conditions, you will not notice you have one on your harness.

### AIRSTREAM PRONE HARNESS

We have a new harness for the coming season that is simpler and cheaper than its predecessor and by far the most comfortable harness we have ever tried. It gives totally even body support from shoulder to knees with minimal stirrup pressure, without employing pressure point inducing plastic seats or wooden supports. It is finished to the same high standard as the previous Airstream and features the same quick adjustment system with buckles rather than knots and the unique sliding stirrup strap system for easy running and swinging into prone. The prototype is at present being tested for strength on a centrifuge. This harness with its long 3in wide leg loops is also extremely comfortable in the seated position with the stirrup on, which makes for easy landings. Available in 2 sizes in all terylene sailcloth. Colours. £45.00



# MAIN WELDING CO. LTD.

Main Welding's stock is continually changing and customers are strongly advised to telephone before ordering or arranging collection. All prices include VAT but not postage, packing or transport. Any items not listed can usually be obtained. The Main Welding Co. is also responsible for the Kits for the Spirit and Vector series of Gliders.

We supply individuals mainly but can also supply bulk orders to clubs for distribution to their members. We also supply practically all the manufacturers with various components. We have a reputation for good service. Minimum order £2.00. Minimum tube quantity for despatch 3 lengths. These conditions do not apply for collection from works).

**Notes:** All threads U.S.S.F. All 1/2" dia. All 1/2" dia. All 1/2" dia.

**Notes:** Bolts drilled for locking pins are not always available. Please state if drilled bolts are required and we shall try to supply. The bolts of course, be drilled quite easily.

Size	Grp	Grp	Grp	Ref	Price	Size	Grp	Grp	Grp	Ref	Price	
dia.	inch	inch	inch		each	dia.	inch	inch	inch		each	
3/16"	1"	1.13/32"	1.13/32"	AN3-15A	.15	5/16"	1.11/16"	2.7/32"	AN5-21A	.40		
3/16"	1"	1.21/32"	1.21/32"	AN3-15A	.15	5/16"	1.15/16"	2.5/32"	AN5-25A	.40		
3/16"	1 1/2"	2.21/32"	2.21/32"	AN3-29A	.20							
3/16"	2 1/2"	2.29/32"	2.29/32"	AN3-29A	.20							
1/4"	1 3/16"	1.9/32"	1.9/32"	AN4-12A	.20	5/16"	2.15/16"	3.15/32"	AN5-35A	.50		
1/4"	1 3/16"	1.13/32"	1.13/32"	AN4-13A	.20	5/16"	3.3/16"	3.27/32"	AN5-35A	.50		
1/4"	1 3/16"	1.21/32"	1.21/32"	AN4-15A	.20	5/16"	3.9/16"	4.3/32"	AN5-40A	.60		
1/4"	1 9/16"	2.1/32"	2.1/32"	AN4-20A	.30	5/16"	3.13/16"	4.11/32"	AN5-42A	.80		
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# HOME BUILDING

Dave Cook gives some tips for homebuilders on tracking down those elusive materials and also gives hints on coping with kits

There is amongst our hang gliding fraternity a minority group desiring to build and own a hang glider that is cheaper and of better performance than the 'off-the-shelf' manufactured types. These solitary types have a tiresome time locating material source references; find no training schools and at competitions are seemingly treated with a degree of contempt.

Usually 'homebuilts' are higher performance machines and whilst recognising that things are improving in this field, may I endeavour to outline some of the problems and how best to solve them.

Being a draughtsman and having built six various types of rigid gliders, varying from alloy tube construction to wood; cantilever to wire braced structures; obtaining all plans and much material from the U.S.A., I found plans varying from the very good to the outright hopeless. Basically it pays so much to have a good working knowledge, similar to a draughtsman's, to understand all. Some producers provide photographs, these proving especially helpful where plans are indifferent.

The following I feel sure will be of help:-

**Aluminium Tube:** via Blackburns, Alcan or refer to 'Wings' Main Welding Co. These have proved to be very helpful.

One cannot always obtain thin gauges as in the States. The alternative if you have to raise thickness is to drop the O.D. size e.g. 2in. O/D x 20G = 1¾in. O/D x 18G = 1½in. O/D z 16G. By so doing the weight/strength is usually on a par with original design. If in doubt, err on the heavier side. Most glider tubing needs to be of drawn quality HT 30TF.

**Fittings:** K.R. Whiston, New Mills, Stockport produce a small handbook covering masses of stuff including bearings, pulleys, pop rivets aluminium sheet, tools — almost everything.

**Wood:** With the scarcity and astronomical price of Spruce, use Yellow Pine. Select your requirement from a merchant. No knots, the straightest grain (say 1mm. apart) possible. The pine is stronger than Spruce and approximately of same weight. My VJ-23 is made of Yellow Pine which after four years of frequent usage has had no fractures.

**Glues:** Aerolite 306 or Cascamite for

wood. Araldite 5 Mon — epoxy for metal to wood or other combination. Bostick (D') No. 229 for Styrafoam. Cascophen does the lot.

**Other materials:** Use styrafoam blue insulation board, 1in. thick from builders' merchants. (Don't use Polystyrene White). (We do not appear to have PVC foam of correct density in the U.K.). Dacron made from Ceconite Incorporated is available. Dope from any modelling store — 1 litre cans required for sealing fabric pores. Shrink coverings with warm/hot iron — don't overdo, otherwise structure can be distorted. Clevis pins, cable and talurites, nico press sleeve in U.S.A. via any Yacht Chandler. H.T. bolts etc. for glider manufacturers or garages. Nylok nuts via garages.

**Rigging and Setting:** On this, pay great attention to symmetry. Both wings to have same sweep, dihedral, washout, etc. Quite often a degree or two more matters less than general symmetry. Obviously it is essential to have everything correct.

**General:** Building one's own machine is a cheap way to fly, none of my own efforts have cost more than £150 each. True, a homebuilt is costly in time but the reward is finally of top performance without the rut of a new model each year. How many glider pilots can say that they have spent less than £150 over four years.

With a rigid homebuilt a great deal of maintenance is required with regular inspection. As such you are relying on your own technical prowess, rather than the manufacturer's. You will find that you take much more care for several

## PROPELLER MAKING FOR THE AMATEUR

by Eric Clutton

Available from: 92, Newlands St, Stoke-on-Trent Price: £2.50

The book is clearly for the genuine amateur in so much as it does not frighten one off with masses of technical/mathematical computations. All relevant aspects of propeller making are covered and a very good insight of 'what it is all about' can be gained. As the author infers, 'There isn't as much Black Magic about it as is generally thought'.

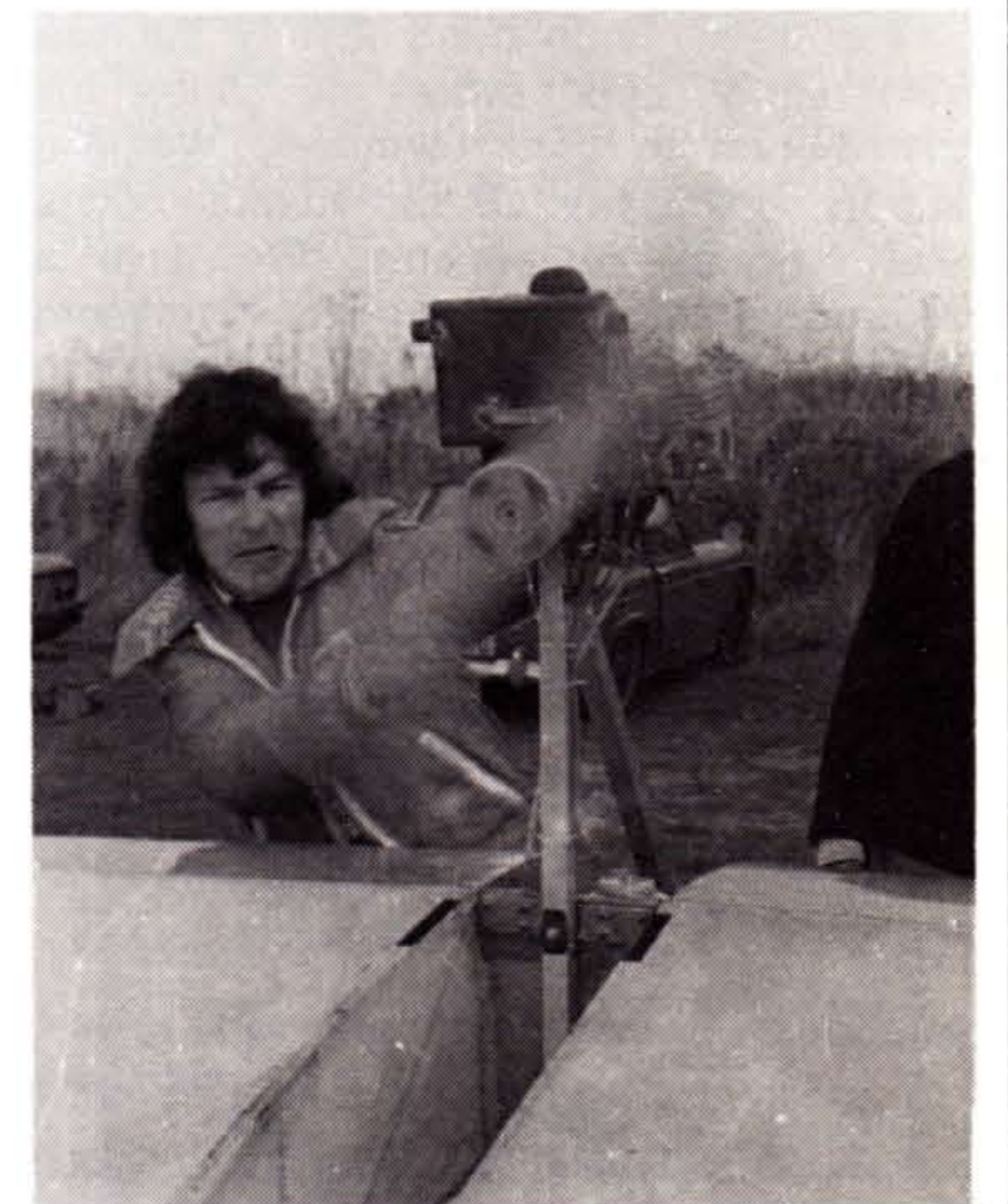
The major problem with this book is that it is for light aeroplane applications. The author writes of 'small propellers rotating at high R.P.M.', he in no way is referring to the size and outrageous R.P.M. that is required for the engines and propellers fitted to hang gliders e.g. the book quotes 4ft.-6ft. diameter propellers rotating at 18000 to 4000 R.P.M. Hang glider engines usually have 25in.-30in. diameter propellers rotating at 6000 to 8000 R.P.M.

My experience with propellers shows that a sharp leading edge is necessary for high thrust figures — not as suggested by the author — a blunt leading edge. Also we can use a thin trailing edge because it is doubtful if hand starting our type of engine could be contemplated. I think

hundred hours of endeavour than for several hundred pounds of value — money loses value rather fast, the value of time and effort does not.

As stated, there are no schools of training for high performance homebuilts so go out to learn slowly by ground skimming. You do not need more than a 100ft. slope to soar, even less will do. We have found that a 1:9 slope has given a glide of 100yds. time and time again from only 20ft. high. From this to bigger sites with the basics of knowing how to take off and

Dave Cook finds out about this prop!



it is generally accepted that laminated props of our size are unnecessary.

The nomographs shown in this book don't get anywhere near the hang glider airspeed, B.H.P. or R.P.M. figures but these could be helpful for persons contemplating geared down propellers. If you don't understand what a propeller is and what it does — I mean really understand — then this book is a very good introduction for persons interested in building/designing their own propellers.

David Cook

how to land. Have help available, rigid wings, fly all the time, even on the ground. Take care of your machine — one cannot prang it too often without damage. Use an A.S.I. — the first principle any qualified flying instructor will tell you.

Now, you 'would-be builders' it is my wish to boost the interest in rigid gliders. This means that if I can help you on Icarus V, Fledgling, VJ 23, Sunseed Valkary or Mitchell B10 building, you have but to write with sae. and I will do all I can to assist. ☺

## Peachy

BY HARDMAN





# INFORMATION



## IRISH OS MAPS

Ignore that item in *March Wings!* quoting 97p PLUS 10p postage for Irish Ordnance Survey maps, writes Roy Hammond. Stuff and nonsense.

The young lady in *APCK Bookshop*, 37 Cook Street, Cork, was in error — she included Irish V.A.T. when she shouldn't have as maps sent to Britain would count as an export order and therefore zero-rated.

The price is 97p alright, but this includes postage. Write to Miss Russell and she'll oblige. I've been round to see her this very day and she told me so.

## MEMBERSHIP RENEWAL

Memberships numbered 7324-7572 are due for renewal on 1st June, 1978.

## FLEXIFORM VECTOR

Paul Maratos of Flexiform sails wishes to point out that the Vector featured on the front cover of February *Wings!* was not a production model, but an early '77 prototype. Production Vectors differ considerably in that they have a fully raised floating keel, no exposed tip metalwork and an increased aspect ratio.

## C.A.N.P. PROCEDURE

This procedure is now no longer available to us to warn military pilots our our flying activities during the week.

All responsible for organising competitions should contact the Secretary for information on how to use NOTAM procedure. This must be used for all competitions whether they are held during the week or at weekends. This is the only sure way of keeping other aircraft away from your venue.

## MIDNIGHT SUN CUP

The Norwegian Bodo HGC are again holding their Midnight Sun Cup Competition from 17-24th June in Bodo, a town North of the Arctic circle. The site is a 1,000ft mountain which faces out to sea. Participants must have an FAI sporting license and Hang III or similar. Further details can be obtained from Chris Corston, Secretary BHGA. Please include a stamped addressed envelope with enquiries.

## MEDICAL ADVISORS

The Medical Advisor for Northern Ireland is:  
Dr. M.W. Hebden MB. BS.,  
48 Fitzroy Ave,  
Belfast 7  
Northern Ireland.

## FLYING IN THE VICINITY OF TRANSMITTER AERIALS

The I.B.A. have written pointing out that if any of their equipment got damaged by a hang glider they would hold the person concerned responsible for the cost of repairs and revenue lost while a station is off the air.

## APOLOGY

The editor wishes to apologise to Bettina Gray of California, for not crediting her with the photographs which appeared on Page 9 of September 1977 issue (Structural Integrity, top left hand corner) and the picture of Bob Bailey in his cross country record breaking report (October Issue).

## STOP PRESS

There are still seats available for the Americas Cup 'Wing Ding'. Latest reports from America describe 25-mile ridge runs (50 pilots in the air and you can't see anyone) and several

thousand foot height gains as usual. Send £25 deposit to John Hudson, Labrican, Healy Dell, Rochdale.

## THE EGER CUP

23-30th July, 1978.

The meet is aimed at giving the chance to pilots to fulfill the conditions of the FAI proposed silver badge /100m gained altitude, 50km distance, 5 hours duration flights/. To certify the pilots' achievements official NAeC observers will be present. It is the pilot's obligation to produce authentic record /e.g. barograph/ of his altitude flights. Cups will be awarded to pilots with the longest distance, duration and the highest altitude flights. Besides these there will be other tasks for cups.

Launch point is the top of the Nagyeged mountain near Eger. Altitude difference 300m, start places at right angles to the ruling wind directions. Lorries will carry pilot and kite up to the top, the pilot may start at any arbitrary time.

The deadline to receive entries in 10th June, 1978. Those entering the meet will be given receipt until 1st July, 1978. The organizers ensure hotel accommodation for payment for the competing pilots each with maximum one non-competing companion. To cover the expenses of the organizing work competitors should probably 500 Forints / 25 dollars / as entry fee. Only skilled and

ensured pilots' entry is accepted. Pilots are requested not to bring old time standard gliders. Entries send to: Edit DARANYI H-1012. Budapest Marvany u. 1/b. Hungary with the next data

- name
- date of birth
- address
- number of companions
- number of hours airborne
- biggest distance, height, duration



Top: one of last years 'plastics'. Above: kick the barrel and receive a glass of wine on the spot!

## NYLON RIPSTOP and TERYLENE

(P.U. coated) for sails. All weights and colours. For Hang Gliders. Hot Air Balloons. Stunt Kites. Largest retail stocks in England.

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)

Hawksfold House,  
Fernhurst · Haslemere · Surrey · (Established 1928)



# 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.**

**Disappeared** on Good Friday, brand-new red, Skyhook prone harness (large) — straps, 3ins. shorter than normal. Removed, after X.C. shortie, from a bush outside Bainbridge, Wensleydale, Yorkshire. Please ring Bob Harrison on Beeford (026288) 537.

**Wasp C4 221.** Black/white sail, new large anodised control frame for prone or seated flying. Good condition. £115. Tel: Radlett (01-779 or 9276) 6388.

**Wasp CB240** in excellent condition, with bag and seated harness. All for £130 o.n.o. Contact Wells, 29 Elsham Road, London W14. Tel: 01 602 0130 (evenings)

**Cloudbase 19ft.** Radial, orange and yellow sail. Seated harness and bag. £220. Alan Ponting, Maidenhead 21385.

**Cloud Nine 17ft.** in excellent condition, almost as new. A very attractive glider, really pleasant to handle. Complete with bag and seated harness. Suits smaller pilot 115-156lbs. £190. Tel: Coventry 451110.

**Avon Hustler**, virtually unused, 2 months old, large size. For sale only due to owner being too light for this superb glider. £395. Tel: Leeds 657899,

**White**, 220sq. ft. Standard. Good condition. BHGA registered. Flies prone or seated and soars well. Complete with seated harness and bag for only £135. o.n.o. Tel: D. Royle at Ellesmere Port 051 355 5378.

**Kestrel Windover.** Complete outfit, seated harness, carrying bag

and helmet, plus *Wings!* magazines. £50. Tel: Mike Wills, Lytchett Minster (Dorset) 3945.

**Hiway 200** with seated harness plus bag. Good condition, black and orange sail. £140 o.n.o. Reason for sale, buying house. Contact Mike Gibbings on Farnborough (Hants) 513489 after 6pm.

**Super Sunspot** (Skyhook). Excellent condition, no prangs, all white. £395. Tel: Newquay (Cornwall) 4629 day, 5898 night.

**Olympus 160.** Shoot down some English fliers on the Red Baron glider. Red and white with Maltese Crosses. Real cross-country machine. £410. Tel: Kilmarnock 27816 and ask for Potty.

**Miles Wing Gryphon I**, good condition, £150. British Para Venture flying suit, blue, suit person 5ft. 6ins. tall £8. Tel: Collingham Bridge 2796.

**Breen Custom Kite** 18ft. good condition, no accidents. Mauve/green sail. Seat, bag and spares. £125. J. Sealey, 25 Western Hill Close, Astwood Bank, Worcs. Tel: Astwood Bank 3297.

**Soarable** strong 2nd Generation rogallo. 240sq. ft. 3.803 terylene blue & amber sail. Built 1976. BHGA registered. No major prangs. Suit elementary pilot. Many spares, seated harness and bag. £100 o.n.o. Tel: Frater, Corfe Castle 634.

**Propeller making for the amateur.** The complete do-it-yourself book for propellers of all types. £2.50 inc. post. Eric Clutton, 92 Newlands Street, Stoke-on-Trent ST4 2RF.

**Ventus A-Frame Handles** take the aches and pains out of kite ground handling. £5.95 per pair, state lins. or 1½ins. tube size. C.W.O. to David Shaw, 357 Devizes Road, Salisbury, Wilts.

**Peak School of Hang Gliding.** Open 7 days per week, and offering courses to suit all your requirements. For details 'phone Burton (0283) 701130 or write 36 Main Street, Milton Derbyshire.

**T Shirts, Clearance sale.** Sky-riding hang gliding motif around picture of hang glider. Printed in royal blue on white shirt. Small/Medium/Large £1.85 inc. p. & p. Judson, 28 Hawthorn Road, Woking, Surrey.

**Come Fly Caton Bay** — Bed and breakfast available, one mile from Cayton Cliffs, six miles from Scarborough, Yorks. Tel: 0723 582385.

**Instrumount** — vario mounting stalks — fully anodised — “kick up” feature — secure instant fixing. Send sae. for information or £8 inc. p. & p. and VAT. Money back guarantee. Main Welding Co. Ltd. Shawclough, Rochdale, Lancs.

**Pellet Variometer.** We are the UK agents for MAKIKI ELECTRONICS. Self-contained variometer model 2 is only 4ins x 5½ins and weighs 15ozs. Just as sensitive as electronic variometers. £36 inc. p. & p. and VAT. Dealer enquiries invited. Main Welding Co. Ltd. Shawclough, Rochdale,

**Spirit.** Suit pilot 9-11st. Hardly used, 4 months old, as new. Seated or prone. Soars in very low winds. £310 o.n.o. Buyer collects from Cheshire or Peak District hills. Tel: Mike, Holmes Chapel 37334.

**Phoenix 6.** Excellent universal kite. Two-tone blue and white. Converts prone/seated. Only £225 including carrying bag. Tony Burgan, Shrewsbury 61791.

**Midas E.** Six months old in excellent condition. Blue and white sal with pulley system. Flies really well. This is a bargain at £350. G. Burton, 4 Avon Road, Keynsham, Bristol. Tel: Keynsham 3447.

**For sale.** Moonraker, 9 months old, very good condition, with bag. £420 o.n.o. Also prone web knee hanger harness, £25 as new. Tel: Terry, Leiston (Suffolk) 831027.

**Midas E** with adjustable C. of G. blue, gold and white sail, in good condition. £385. Buying Midas Super E. Tel: Workington 0900 3503 (Cumbria).

**Wanted** second-hand Hiway 260, must be in good condition. Also sail and bag, for intermediate flier. Rigged seated/prone/dual. Reasonable price offered for good safe flier. Tel: Warrington (Cheshire) 812187 any time.

**SST 90 Universal.** 9-11½st. pilot. Superb condition, never bent, 8 months old. A really good kite to sit anyone from beginner to expert. See it fly any weekend. £395. Tel: Dave, Beeford 537 (N. Humberside).

**SST 100B.** Collapsible type frame, excellent machine with beautiful white sail. Suit competent EPC holder or intermediate. Advanced tuition given free, if required. Bargain at £390. Tel: Dave, Burton Latimer (053672) 4340.

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**Skyhook 3A.** Good condition, blue and white sail. Variable wing positions, clip in seated harness. £100. Tel: Doncaster 23493 (Peter Hanson).

**Skyhook IIIA.** variable geometry. Ideal for beginners, very little used, 15 months old. Complete with harness and bag, £120 o.n.o. Tel: Brian James, Kidderminster 66916 (evenings).

**Phoenix 6B.** Beautiful white glider in excellent condition. Reversible wires for seated or prone. With strong bag. £350. Mike Roberts, 28 St. Andrews Drive, Tividale, Warley, West Midlands, or c/o Bilston 46939.

**Cloudbase 20**, radial. Sail is pretty, aesthetically dirty but aerodynamically clean. Airframe in good condition. Offers over £220 to Ian Trotter, 1 Trinity Court, Edinburgh EH5 3LE. Tel: 031 552 7736 at 6pm. Meet you half-way (miles not money!!!).

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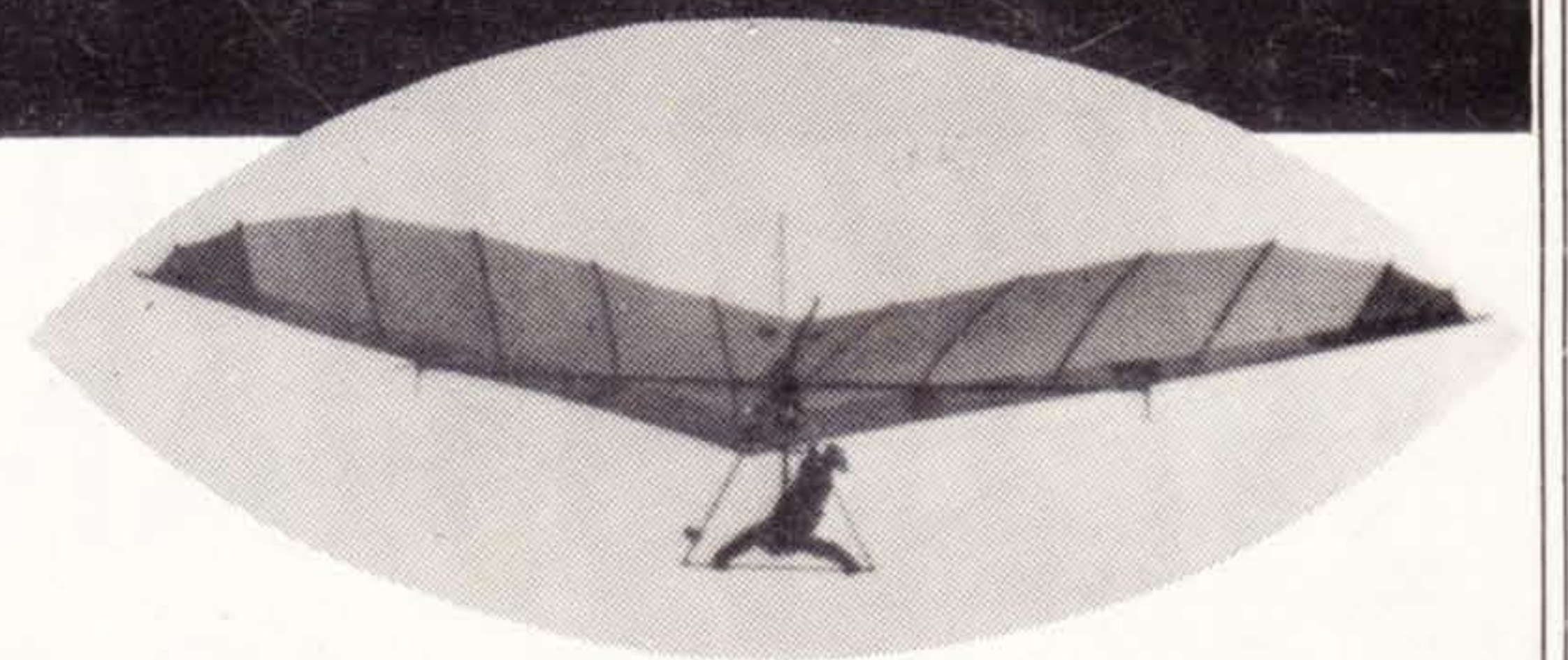
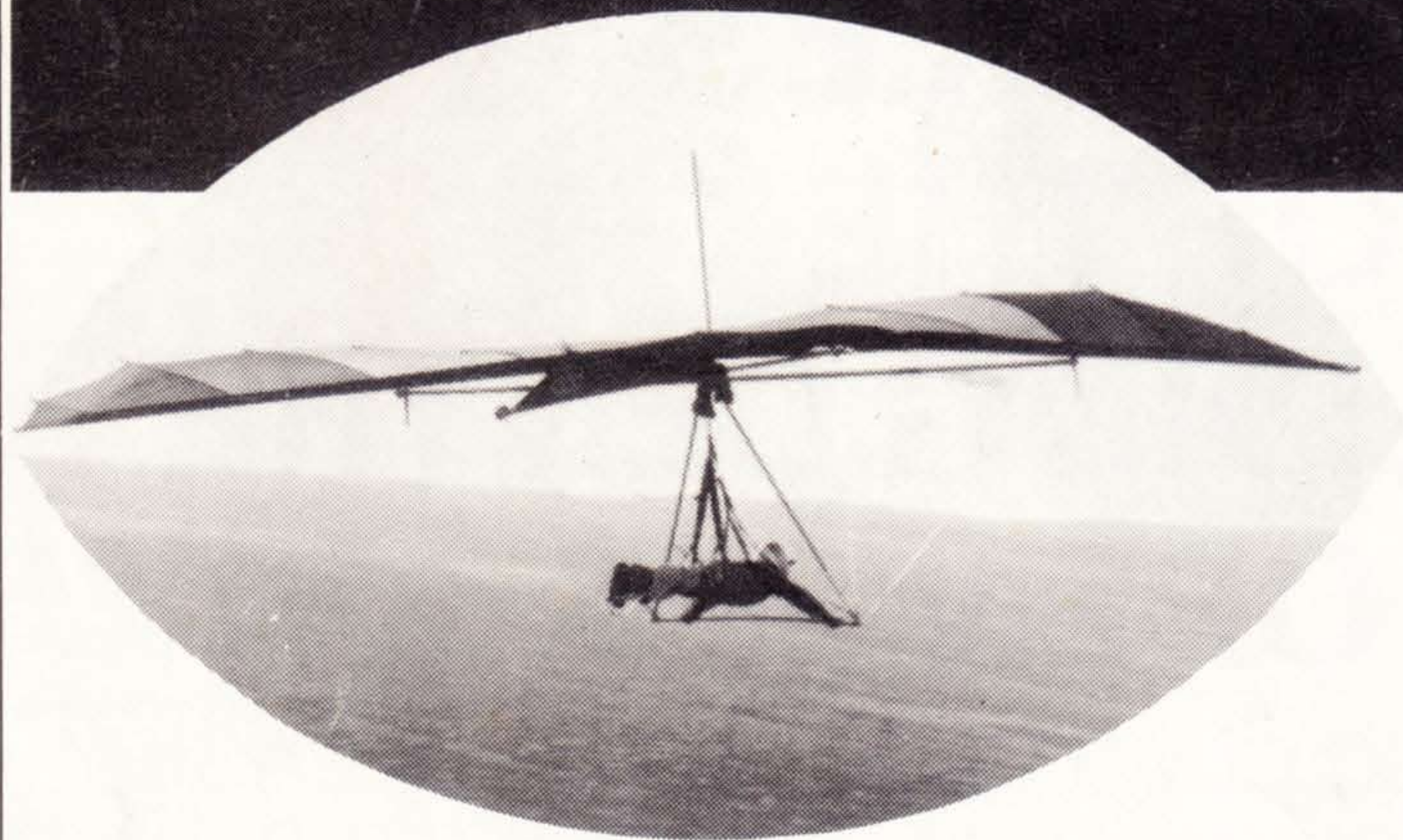
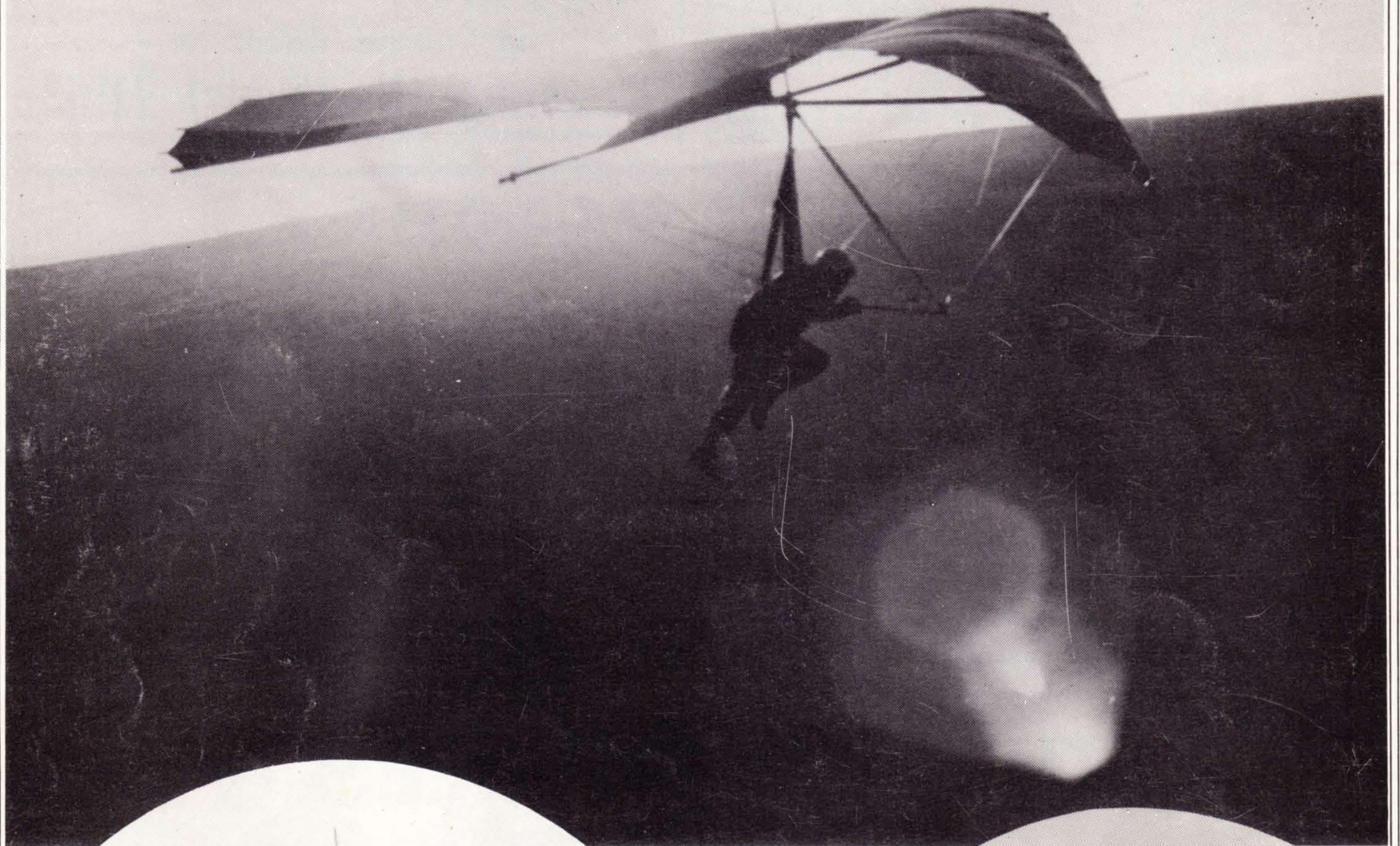
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