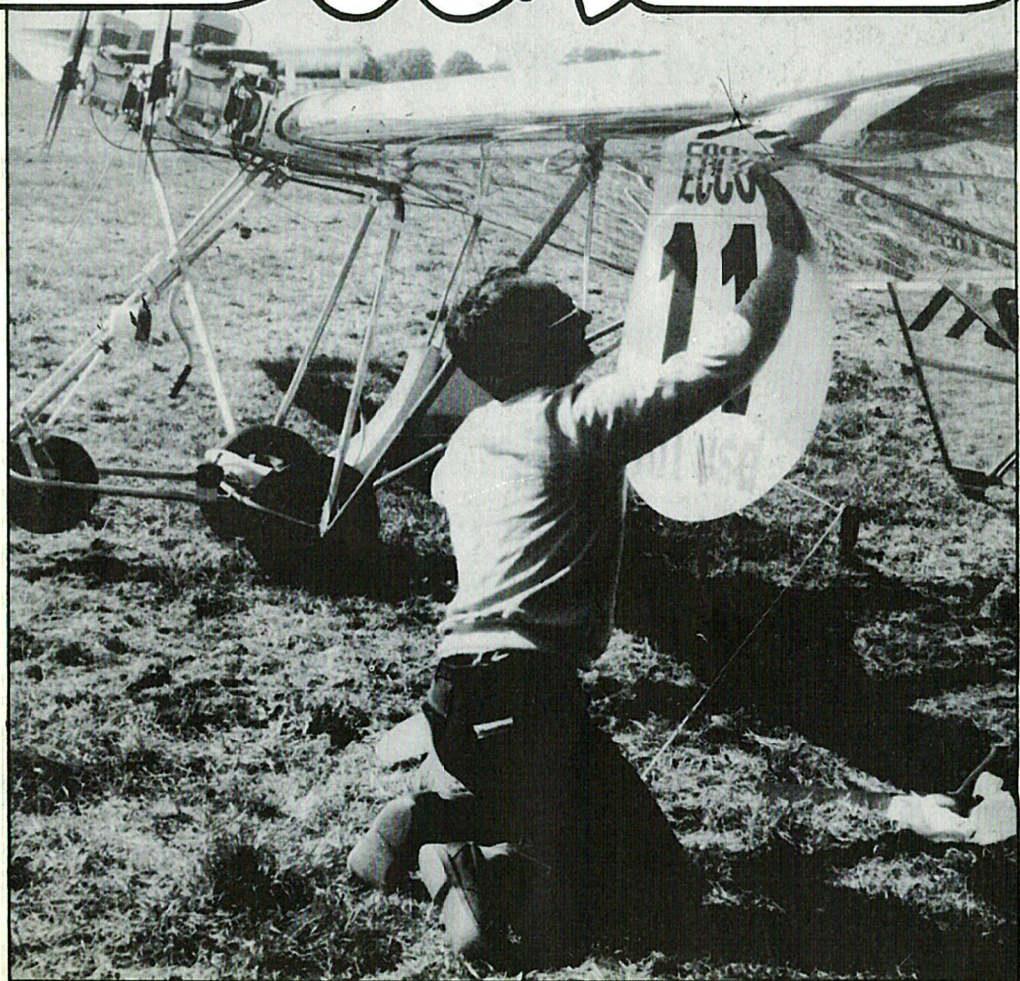


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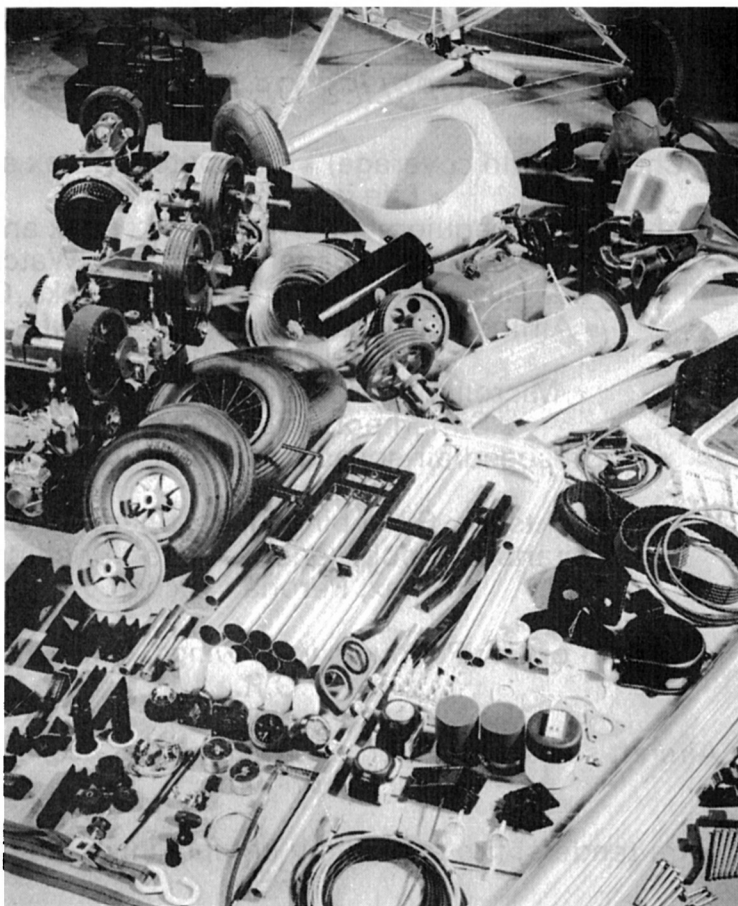
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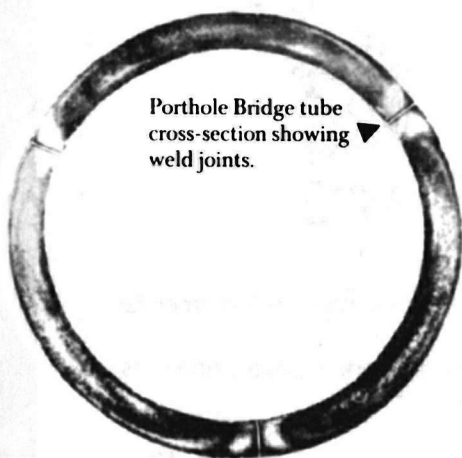
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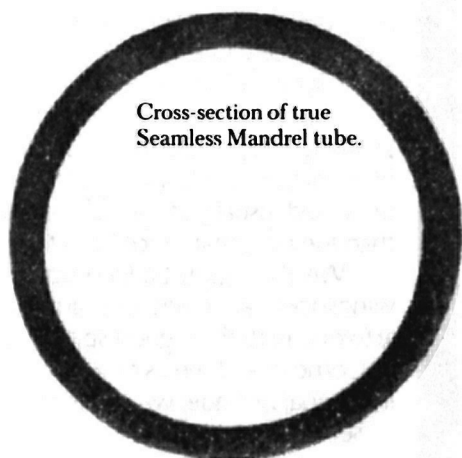
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COVER: Angus Fleming prepares his Lazair for London-Paris. Full story p26.

Comment

Norman Burr 8

Chairman's airwaves

Graham Andrews 8

Whistles in the wires

10

Election addresses

12

Letters

12

'83 newcomers

Part 1 of a report on the latest aircraft 20

Cover story

(see above) 26

'Joe BMAA' - a portrait

Questionnaire results 34

Events

Long Marston's swansong? 40

Leicestershire rally 41

Gower fly-in 41

Norfolk air race 42

Popham fly-in 42

Technical

Peter Lovegrove analyses the Weedhopper B 48

Eric Brind explains how to set up a prop 52

Carb tip for Rotec owners, by J F Bishop 56

Watch over your wings, says Brian Hayes 56

Peter Lovegrove on how not to build aircraft! 58

Oshkosh '83

Glenn Brinks from the US microlight mecca 63

Safety notes

By BMAA Safety Officers, including 1982 accident summary 68

Flight test

Paul Bennett tests the Quicksilver MXII 70

Training

Training notes, by Brian Powell 75

Tim Williams' guide to flying and the wind 76

Airworthiness progress

Bruce Giddings, Tech Committee Chairman 78

BMAA Registration & Approval Scheme

John Wincott explains what it's all about 81

Secretary's letter

Ron Bott 82

Contact

84

Calendar

84

Small ads

85

Flight Line is published by the British Microlight Aircraft Association

Editorial and Advertisement Office Oak Cottage, The Green, Wennington, near Lancaster LA2 8NW (tel 0468 21166 any time)

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Opinions expressed by the authors and correspondents are not necessarily those of the Editor or the BMAA.

Advertising BMAA does not guarantee or endorse any product or service offered through advertising in this magazine. We invite constructive criticism and welcome any report of inferior merchandise.

Next deadline for advertising and editorial 1 December (all contributions should include home and work telephone numbers)

BMAA VAT No. 371 7533 45

Printing and typesetting Knight & Forster, Water Lane, Leeds LS11 9UB

British Microlight Aircraft Association 20 Church Hill, Ironbridge, Telford, Shrops TF8 7PZ. (Membership Secretary and Sales: Ty Dysynni, Abergynolwyn, Tywyn, Gwynedd LL36 9YR)

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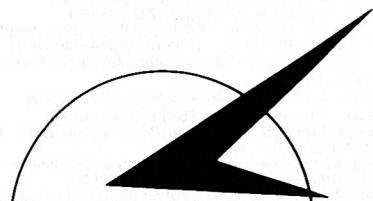
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Chairman's

By Graham Andrews

By the time you are reading these words, there will only be a few days to go before the AGM, so principally for the 50% of you that have joined BMAA this year, here is a brief outline of the day (*more details in Secretary's Letter — ed*). The morning will be devoted as usual to seeing what is new on the various trade stands, meeting friends, discussing problems etc. At 1.30pm the meeting itself will get under way, with statements from the President, from each of the officiating members of Council and from the chairmen of the various committees.

The meeting will then be thrown open to the floor. I intend that this most important part of the day should not be wasted and ask that you direct your points through me. However, it is *your* meeting and your chance to influence the direction that the BMAA should follow in the future, so do not hold back! There follows the voting part of the meeting with first of all the adoption of the constitution then the election of officers. Most of this year's Council are prepared to stand again, including myself, though for the record I must state that by the time of the AGM I shall be commercially involved with a new microlight company.

Next year's work is likely to be just as vital and demanding as this year's. Airworthiness will be the major problem but considerable work will also be required to co-ordinate the calendar of events and at the same time organise some

Comment

By Norman Burr

Airborne!

You are now reading the writings of Britain's most inexperienced pilot. With just 35min in my log book, flying dual with Len Gabriels in his twin-engined two-seat trike, I've still got a long way to go before I can claim to be a competent pilot.

Still, on 10 October at Pilling Sands on the Lancashire coast, I made a start. I can take-off and I can steer — at least in the silk-smooth air which we were blessed with on that day — but I've yet to learn how to land. I hope to remedy this rather fundamental deficiency as soon as possible, though my training is bound to be a rather long-drawn out process, as it has to fit in not only with my schedule and Len's, but also

airwaves

BMAA events. It is proposed that a new post for this purpose is created on the Council.

On the international scene, FAI have recognised the International Microlight Committee (CIMA) as a permanent committee. The CIMA meeting last month, attended by Ann Welch (as President of CIMA), myself as delegate and John Wincott as alternate delegate, saw Ann Welch re-elected as President and myself elected as Secretary. There will be a full report in the next issue.

Since this column was last written there have been a number of happenings concerning airworthiness. On 1 September the Light Aircraft Committee of the Airworthiness Requirements Board (ARB) met to discuss microlight airworthiness amongst other items. CAA were present and I represented BMAA. This committee comprises distinguished nominees from the world of light aviation and its advice is usually heeded by the official bodies. At the end of the day after much discussion some rather lengthy recommendations were made. Here is a simplified version:

1. Aircraft which do not exceed 70kg dry weight, have only a single seat and are not flown for hire or reward should not require an airworthiness standard for the time being.
2. Standards of design and construction are required and the BMAA draft based on JAR 22 was thought likely to be appropriate (see p78 — ed). There would probably need to be two levels of airworthiness:

with the weather and the tides. You'll read all about it in due course, and I've promised Len that his comments will not be edited!

We Are Not Amused

I regret to announce that the oil evaluation scheme mentioned on p22 of the last issue has been abandoned, Shell having lost interest in the idea.

The basis of the article was what we understood to be a quite definite agreement in principle, albeit a verbal one, to conduct an evaluation scheme. Indeed it was Shell's idea, not ours. Contrary to our initial impression, however, Shell has now made it clear that it is not interested in any arrangement which involves it spending money.

Since it is not *Flightline's* function to provide free publicity for oil companies, there the matter rests, which is most unfortunate because for all I know their new product might be just what two-strokes have been waiting for.

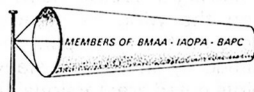
(a) A certificate of airworthiness in the transport or aerial work category.

(b) A permit to fly

3. CAA should approve organisations that manufacture or deal in microlights so that they may apply for type certificates. A C of A would then be issued to aircraft that conformed to the type certificate.
4. BMAA should do the same for aircraft that would require a permit to fly.

It is now up to CAA to make a policy decision after further consultation with other interested parties. I have done my utmost to push both for a 'light touch' and for complete BMAA involvement in C of As and Permits to Fly but there are vested interests which do not wish to see us thrive. In the end I believe CAA will realise that we are the only experts in the field and certainly the more capable we are, the more we will be given to do. This brings me to my final point. We are searching for funding to enhance our capabilities as an organisation but first we must look to our own pockets. At the next Council meeting we will be formulating proposals for discussion at the AGM. I believe that the least we can do is to raise the annual subscription from £12 to £15 and create an initial joining fee of £5. You will still be getting excellent value for money.

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Whistles in the wires

Twinflight Registration Withdrawn

Following the double fatality at the company's Headcorn base in August, the BMAA has struck off the registration of the Twinflight company — details in *Chairman's Airwaves*.

Twinflight's CFI and managing director, John Salt, has since resigned from the BMAA Training Committee.

Scorpion update

By Bruce Giddings, Technical Committee Chairman

Scorpions have been grounded by CAA until they can be shown to be airworthy. To this end, various people are working on modifications which may be retro-fitted to these aircraft to render them airworthy.

The weakest point appears to be the rear spar. Ground tests and in-flight failures have shown that this is prone to failure by buckling under compressive loads.

The loads are higher than would be expected, perhaps in part due to the geometry of the rigging, which is attached to the rear of the fuselage frame. Thus flight loads in the wires add to drag loads on the wing to induce high compressive forces on the rear spar. The rear spar can be modified by an external sleeve.

Other weak points noted are: torsional rigidity of empennage—modifications include additional strut and wire bracing between the four tail longerons; tail-boom attachments to rear spar (single bolt in bending) and fuselage wing-root fixings.

A great deal of very useful work on these and other areas is being done by one pilot in particular, Joe Thomas of Ham Street, Kent.

He will shortly be finishing a schedule of modifications carried out on his son's Scorpion, and these together with additional notes will be submitted by the Technical Committee to CAA in an effort to gain a permit to fly or similar for any Scorpion so modified.

Progress will be reported next issue, but any interested owner should contact Joe on 023 373 2464, or the Technical Committee.

Editor's note: readers who feel they have any claim against the assets of the erstwhile Scorpion manufacturer, Southern Aero Sports, should contact the company's liquidator. He is Mr P W J Hartigan of Booth White & Co, 1 Wardrobe Place,

Carter Lane, St Pauls, London EC4V 5AJ (tel 01-248 5971). In a further repercussion of the Scorpion affair, Robert Freestone of Scorpion dealer Flylight South East has announced that his company is now in liquidation. The good news, however, is that his partner Graham Hillier, who was seriously injured in a Scorpion, is now expected to make a complete recovery.

Tripacer Tip

Eric Craven of the North West Microlight Aircraft Club has a tip for all users of the Tripacer 330 Robin trike unit. On his Tripacer, he recently noticed that the tubular spring pin which holds the reduction-drive unit in place had worked three-quarters of the way out of the reduction-drive unit shaft.

Fortunately, he was practising a dead-stick landing at the time, otherwise an accident could have resulted. He recommends that the pin is either wired onto the shaft or held by a counter-balanced Jubilee clip.

Cumbria Problem

Microlights are no longer welcome at Cark Airfield in southern Cumbria. This follows an 'invasion' by seven uninvited microlights who, according to the North West Microlight Aircraft Club's newsletter, landed in a disorganised manner and forced a parachute plane to delay its take-off.

Cark is in regular use by parachutists and microlight pilots are requested to keep well clear of it. NWMAC hopes to renegotiate landing facilities at some future date, but success is obviously greatly dependent on there being no further incidents.

Aerolite Thinks Big

Massive plans for expansion have been announced by the UK Quicksilver distributor Aerolite Aviation Co.

The company has budgeted £1M 'to make microlight aviation readily accessible to the public', in the words of the company. Some £1M will be spent on advertising, using a major national advertising agency, with the campaign starting in early 1983. Over 100 exclusive dealerships are planned across the country and 12 flying schools are being selected to operate Aerolite Flight Parks, which will provide demonstration flights, pilot training and aircraft servicing.

According to Eipper statistics, Eipper currently holds over 30% of the US microlight market, with monthly sales of the Quicksilver now standing at 325. Clearly, its UK distributor is aiming for a similar dominance on this side of the water. According to Aerolite's recently appointed marketing director John Bartram, the Aerolite 1983 UK sales target is 2500 aircraft.

A flight test of the Quicksilver MXII appears elsewhere in this issue.

Kasper Convert

Adam Jefferson spent some of last summer touring the USA and came back so impressed with the Kasperwing that he has set up a company to act as UK agent for the aircraft. Adam's company is Sunrise Aviation, 42 Blake Dene Road, Lilliput, Poole, Dorset BH14 8HH (tel 0202 700322).

Repair and Maintenance Log

Dave Simpson has recently introduced a *Microlight Aircraft Repair & Maintenance Log*, a useful little book covering owners' list, running log, accident/incident record, maintenance and modifications, fault record and notes.

It is possible that the forthcoming airworthiness regulations will require each aircraft to have such a log, and even if they don't

it is still a good idea. Quite apart from its obvious value for accident investigation purposes, such a record is also a great help to the second-hand buyer.

Although there is one way that the book could be improved — it would benefit from a section for recording the results of tests such as engine trials, thrust measurements, static-loading and flight-envelope evaluations — it is nevertheless worth having. Copies are obtainable from Dave Simpson, 13 Portman Close, Bedford Road, Hitchin, Herts SG5 2UX (tel 0462 52103).

Microlights at Farnborough

With four manufacturers taking stands, microlights on display at this year's Farnborough airshow attracted a lot of public interest. Aircraft on display included the Quicksilver MX, which was shown in various versions, the Goldwing, the Dragon and the Sunburst.

The Sunburst is new to the UK and was shown in single and two-seat forms. Another item of interest was the long-awaited Normalair-Garrett WAM 342C. Although one of these lightweight flat twins was on display, *Flightline* understands that first deliveries are earmarked for export to the US, with British supplies coming through not earlier than spring 1983.



Election

The following election addresses have been submitted by candidates seeking Council places at the forthcoming AGM (venue, see *Calendar*). Submission of an address is entirely voluntary and no doubt further candidates will come forward between the time of going to press and the meeting itself. More AGM news, see *Chairman's Airwaves* and *Secretary's Letter*.

Bruce Giddings

Having spent nearly two years on the BMAA Council as Technical Officer, I find the demands of Soleair mean I am no longer able to spare the large amount of time necessary to continue as Chairman of the Technical Committee. Further, having instigated the airworthiness standards to date, as a manufacturer it becomes increasingly difficult to retain objectivity in their implementation. I am sure there are more suitable persons available within our ranks, and I sincerely hope for the sake of our sport that the right person will come forward to offer his services. We need that person in this key post, because microlight aviation has come of age, and the eye of the establishment is now upon us.

Ultimately the future of our sort of flying lies with our membership. So be responsible — fly safely, aeroplanes are not toys and they bite if you let them.

You will also live longer if you buy carefully. Look beyond the slick advertising, through the shiny anodising. Seek out quality, and having found it, look after it.

I would, however, hope to be of service to next

year's Technical Committee as a member; similarly I am prepared to serve as a Council member on the BMAA should our membership feel I can be of assistance in furthering the wider aims of the movement.

R C H Russell CBE MA FICE

Any bid that I might make for the votes of members is based less on a long and intimate knowledge of microlights than on being typical of BMAA members. I started flying only in July '81 and my PPL Group D dates from July '82. I am perhaps atypical in having a flight radio operator's licence as part of that PPL Group D.

I took up microlighting aged 60 on my retirement from the directorship of the government's Hydraulic Research Station, in a search for new experiences and in the expectation that some of my professional expertise in fluid mechanics and engineering and my expertise in sailing might come in useful.

I am extremely aware of the extent to which we are technologically in uncharted territory. I, for example, fly out of a MATZ, and out of courtesy to the RAF fly with a radio whenever the ATC is on watch, but interference from the engine electronics is a serious problem. I have been able to find no one who has successfully suppressed a two-stroke fitted with electronic ignition and an unprotected plug lead permanently implanted

Letters

The Scorpion Saga Continued

Sir, I feel I must protest at the slanted reporting in the last issue of *Flightline*, when both the Chairman Graham Andrews and Dave Thomas were guilty of misrepresenting the facts.

Graham pleaded that the offer of an evaluation of the Scorpion by a so-called BMAA technical representative came too late since the company had already gone into liquidation. He fails to mention that a request from Southern Aero Sports Ltd, for such an evaluation immediately after the fatal accident in June was ignored! He goes on to refer to a meeting at Twinflight to discuss the situation, but fails to mention that the Scorpion designer Mike Smith and I were at that meeting, the impression being that we had

washed our hands of the whole affair. He refers to modifications that had been carried out by John Salt of Twinflight, inference here being that John had taken a bad design and done his best to rectify it. In fact John had altered nothing in the basic design except to add such things as lengthened steering arms on the nosewheel for ground handling, mirror fitment to observe fuel level etc; the basic structure of the aircraft had not been altered in any way!

The final insult is that Graham has the gall to ask in print were any exported, and if any owners are still unaware of the grounding. We have not left the country, why does he not ask us? To put the record straight here, yes Scorpions were exported, and we, liquidated or not, being honest people, informed all overseas owners of the situation, and advised them not to fly.

The current position is this. Because we feel a moral obligation to our customers, Mike Smith and I are still working with the Accident

addresses

inside the engine with epoxy resin.

We amateurs need good professionals to advise us on repairs, modifications and so on; professionals moreover who stay in business. My own experience in this regard is unfortunate: in acquiring my microlight and learning to fly I dealt with three companies, all of which folded.

Finally with a Certificate A but no Certificate B, I was rescued by Julian Doswell of Breen Aviation who saw me to the end of my PC of C.

My present view of any conflict, real or imaginary, between amateurs and professionals within the BMAA is that their interests may well not be identical, but that safe flying by amateurs is wholly dependent on the continuity and professionalism of the companies.

Ian Stokes

My main concern is the safe training of pilots up to and beyond a standard where they are competent to be let loose in our crowded skies.

This led me to become a founder member of the BMAA Training Committee when it was formed early in 1981, and as such I played a fairly large part in helping to form the guidelines for the A and B Task Forms which have become the backbone of the approved BMAA training syllabus, and were accepted wholly by the CAA

when trying to formulate a system of their own for the new PPL Group D.

After last year's Council elections the Training Committee went through a very disorganised period, just when it was needed most. However, it was resurrected in July by our own President and I was asked to take the chair, which of course led to my being co-opted onto the Council and to four months of very hard work, as this was the transition period when all pilots had to become licensed and all instructors rated by the CAA.

I have developed a good working relationship with the CAA and I am now in the process of organising the appointment of FIC instructors and a Panel of Examiners, both of which are urgently needed for the training and appointment of new instructors.

Having now become totally engrossed in this job I am more than willing to continue and expand on it should I be elected to do so by you, my fellow BMAA members.

John Wincott

My election last year as Treasurer was, I think, quite a surprise, not least of all to me. After all, I am just a guy who flies a trike and enjoys it — how did I get elevated to these lofty heights? It's a long story, but suffice to say that a certain P Bennett has a lot to answer for.

Anyway, 12 months later I have learned a lot about our sport, about flying and about book-keeping! I, like most of your Council, have worked bloody hard in the last year, but I have also enjoyed it enormously. Hence, I would like to do the job again next year if you want me to. See you at the AGM.

Investigation Board to try and determine the cause of the failures.

I should now like to inform all BMAA members of the truth of the present situation regarding microlight flight, the AIB and the CAA. The so-called doubtful engineering features on the Scorpion are common to most if not all current microlights, and the AIB have told us directly that they feel that on *all* the microlight aircraft they have examined the engineering is not acceptable as aircraft standard. One inspector involved in the Scorpion investigation took the opportunity at the Farnborough Air Show to stroll over and give the microlights on show there a lookover to see if it would help him in his deliberations, and he was horrified! He said that in his opinion some of the exhibits were positively lethal. This same inspector had been involved in other microlight investigations and he stated that in *each* there was evidence of structural failure!

So where are we? There is still no answer to

the Scorpion crashes, and it is now doubtful if there ever will be. One can only presume that if the aircraft are modified to meet the forthcoming certificate of airworthiness regulations they will be allowed to fly again; I might add here that if I understand the situation correctly from working with the AIB, it is most unlikely that any current microlight design will meet those requirements without modification, although the CAA is the final arbiter on this point.

Dave Thomas asks if there is any common link in the Scorpion accidents. Yes Dave there is, and you should in your investigations have found it. Each of the aircraft had previously been involved in accidents, some causing severe damage, and I just wonder if, as the hours pile up and the structural integrity of the airframe is subject to the strains and knocks of rough field use and al fresco repairs, whether we have a steady departure from the designer's intent — perhaps aided by the effect, currently unknown, of high

frequency resonance from engine vibration, until the day arrives when we end up flying an 'accident looking for somewhere to happen'. I personally now view the whole scene with a very jaundiced eye, and at least until I can get some answers I have flown in my last microlight, whatever the make!

**Rick Stuart, ex-director
Southern Aero Sports (in liquidation)**

(Editor's note: The inference of this letter is that all microlights are dangerous, that the Scorpion is no worse than any other, and that the AIB supports that view. Before publication of this letter I discussed these points with the AIB, a spokesman for which assured me that this is not a correct interpretation of its views. AIB was unwilling to make any detailed reply in advance of the publication of the Bulletin on the last two Scorpion accidents, but the spokesman told Flightline that AIB believes the Scorpion's standard of engineering design and construction to be significantly lower than that of other microlights it had examined. AIB also pointed out that all decisions concerning microlight airworthiness matters are the responsibility of the CAA and that the AIB's function in these cases has been solely to provide as much factual

information as practicable by analysis of the wrecks.

Whether or not even the better designs come up to the forthcoming airworthiness requirements is, of course, another question — one which cannot be answered until those requirements are finalised.

For the latest news on the Scorpion situation turn to p10.)

Distinctly Unhappy

Sir, According to Norman Burr we should passively accept the failure of the BMAA to act adequately on our behalf because the Swiss and Aussies are worse off. You then go on to say that 'all good people fill in BMAA Questionnaires'! A lot of good people are fed up with B* questionnaires. Collate that!

You then exhort us to put our organisation 'on the map' etc, etc. But the BMAA has already eschewed so many of us because we don't produce monthly newsletters or have Officers A B C D & E appointed. Not to mention suspecting us of not operating in a fair and businesslike manner.

Regulations are a fact of life and some are indeed necessary, but the BMAA management seem hell bent on regulating us not only out of the skies but out of our own right to exist and be

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known as clubs as well. Notwithstanding they would like the use of our landing fields!

Finally, having only six days between receipt of current issue and deadline of the next seems a bit thick. But thanks anyway for editing a jolly good magazine.

David Walters
Secretary, Arthro Flying Club
Rio Turvia, Park Road
Barmouth, Gwynedd

(Actually you haven't quite quoted me correctly, but never mind. Glad you like the mag—ed).

Totally Unjustified

Sir, We can no longer hold our anger and frustration at the totally unjustified critique given to *The Microlight Aviation Handbook* in Flightline by Brian Powell our 'Training Officer'.

The book was carefully prepared and subjected to scrutiny by several people including a qualified aerodynamic engineer and a PPL flying instructor before publication. It has been sold to hundreds of microlight pilots and student pilots as well as the majority of training establishments in the UK. Not only has there been no criticism of the book, but many customers have written back *specifically* commending its clarity, layout and content.

On reading the review in *Flightline* I was amazed that anyone could have such supposedly impartial harsh views on a book welcomed with such enthusiasm elsewhere; I tried immediately to contact Brian Powell with the humble intent to find out specifically where he thought there were errors. After some difficulty in getting to speak to him, and then after a long telephone conversation, it became clear that he had some trouble specifying where the 'errors' were. However after some struggle and pressure from me he came up with the following:-

1. 'Magnetic deviation is not dealt with in the book'. Wrong. A full explanation of deviation (and variation) is given in sect. 1.7.3.
2. 'The navigation section does not instruct the pupil to fly over his take off airfield on track before a cross country flight'. No, we certainly don't! This practice is totally unnecessary and we have not found a single student (light aircraft or microlights) nor flying instructor (light aircraft) who finds a need for it, leading as it does to wastage of time and fuel and additional congestion of airspace. Microlights turn easily and quickly and the track error introduced by turning on to heading immediately away from the airfield is negligible.
3. 'The triangle of velocities given on page 35 is

not a proper triangle of velocities; what on earth is meant by pilot's expected flight time'? It is not intended to be a triangle (it only has 2 sides!). It is merely a graphical representation of drift. No one else I have asked has any difficulty understanding what is meant by 'Pilot's expected flight time' here.

4. 'You suggest at one point landing down-wind'. I do indeed Mr Powell, where the wind is light and the alternative is landing down-hill. Most microlights don't have brakes; I got the impression you didn't know that.

The critique seems even more unjustified and biased when compared with the glowing review of Brian Cosgrove's *Microlights and the Air* on the same page. I know this sounds like sour grapes, but Brian's book *does* contain errors I'm afraid, eg explanation of the effect of dihedral in producing roll stability.

Please may I take this opportunity to assure past and future readers of the *Microlight Aviation Handbook* that it contains *no* errors and that it is frequently commended for its clarity.

I might also suggest that Mr Powell gains some microlight flying experience (apart from piling in an MX) before he sets himself up as God's gift to the student pilot.

Dave Simpson
13 Portman Close
Hitchin, Herts

(Just for the record, Brian Powell has not crashed an MX—ed).

A Worried Man

Sir, My name is Graham Hobson. I have been flying hang gliders for nine years, have run a hang-gliding school for seven, and have been flying microlights for three years and operating a microlight school for trikes for six months. I am an officially 'qualified' CAA instructor for microlights, and I am a very worried man!

I was dismayed to hear that the BMAA have now lost control over microlight licensing to the CAA. I think this is sad, because I believe there is now a danger that the BMAA will be reduced more and more to an impotent body that microlight flyers will not need to join.

More than this, though, I am very worried that things will now move, with frightening acceleration, in a direction that we, as microlight flyers, don't want. I mean a direction whereby microlights will merge with conventional aviation and lose completely their identity as a 'different' aircraft. With this will come the heartbreaking mire of bureaucracy and officialdom that will remove all joy from our sport. I imagine that we have been teetering on

the edge of the abyss, but have now fallen in!

Having said this, I am now wondering if the committee of the BMAA have sufficient understanding of microlight flying as I understand it, to represent the interests of the people at my end of the sport satisfactorily. Judging from present developments I doubt it.

It is 'my end' of microlighting that is going to suffer most from this change of affairs. My friends and I are trike flyers who originally flew hang gliders, and as such are used to freedom from bureaucracy. Whilst appreciating that we cannot continue with this degree of freedom, and being aware that in what we *need* to know we must be as expert as any, I am exasperated that as things now stand a person who wants to fly a trike legally must pass (to all intents and purposes) the same examination as a person who wants to fly a conventional aeroplane, even though much of the knowledge to do this would be *totally* useless to him.

It seems to me that the BMAA and the CAA, for the sake of simplicity and expediency, have contrived a system of licensing which is not in tune with the needs of microlight pilots and have, inadvertently, overlooked an important anomaly which, I believe, could possibly lead to an increased accident rate. The crazy anomaly that I mean is that a hang glider pilot, who is the only person capable of flying a trike without instruction, is not allowed to do so without further qualification, whereas a PPL (A) who hasn't the faintest clue of how to fly one, is!

I suppose what I am saying is that I don't want to see the microlight movement used as a convenient and cheap means to a PPL (A) (and legislation designed with that in mind) but as a movement for people who want to fly microlight aircraft as machines distinctly different in capability to conventional ones, who have no intention or desire to 'move up' (and legislation specific to *their* needs as microlight flyers'.

I don't know if the BMAA negotiators have not appreciated the differences between trikes, three-axis microlights and conventional aircraft, or have not cared about trikes, or if they simply have been dictated to by the CAA, but the end result is that we are now subject to a system of licensing which is unfair and not entirely relevant to the requirements necessary to produce microlight flyers with sufficiently good airmanship to stay out of trouble, which is *all* that the CAA have a right to expect.

Is it not possible for us to prevail upon the CAA to re-examine the licensing scheme and change it to a more practical and relevant one, even if it means sub-dividing microlights themselves? (In my opinion this would be the only way, as the real difference between weight-shift and three-axis is vast).

I have stated the above emotionally out of a deep feeling of frustration, as people who don't 'seem' to really understand my sport are laying down lasting laws to govern it, and to my mind are making a mess of it. With this in mind I would like you to appreciate that I intend these criticisms to be constructive and not aimed at individuals or on a personal level, but are made of the committee as a body.

Graham Hobson
8 Brencon Avenue
Brooklands, Manchester 23

Support for Huntair . . .

Sir, Regarding the article *Vector Incident* published in *Flightline* July/August p61, in my experience the Robin power packs of the type supplied to Dave Turley are quite OK. The only problem we had was the correct rigging of the pack, ie applying the correct pressure to the Picador rubber unit.

I suppose that the conversion from 250 to 330 was done correctly and that the steel tube entering the upper keel was changed. The steel tube needed for the twin cylinder is much longer and extends about 14in (55 cm) into the keel, reinforcing it to counteract the increased weight of the engine.

Assuming this has been done (and if it has not, there is no point in going any further), here is the correct rigging procedure, which gives us a normal life-time (mean time between failure) of 40hr.

Two main forces are acting on the engine. First, under full static thrust the base of the engine moves right, so the holes used to fit the power pack to the keel should be drilled and reamed as precisely as possible to prevent this movement.

Second, under full static thrust the engine also moves upwards—and here is the critical point and certainly the reason for failure. The pressure holding the two aluminium halves of the Picador unit together is supplied by a 3/16in (4.8mm) stainless-steel cable attached at one end to the black engine mounting plate and at the other to the main transmission unit. The collar attached to the latter allows pressure to be regulated, thus avoiding separation in flight. Believe me, that pressure must be very high, so high that it is hard to connect the cable while assembling.

To check this pressure, run the engine at full static load and look sideways through the Picador unit. The clearance should never exceed 0.12in (3mm). You can watch this gap open up as you take the engine from idle to full throttle. This should be a mandatory check for all Vector Robin owners!

Being a pusher aircraft, some vibration is inevitable with the Vector, as the upper blade

bites in the free airstream and the lower one is partially shielded by the pilot's seat. If the Picador-unit pressure is not high enough this vibration will start to wear out the rubber, which in turn will permit more vibration, which will wear the rubber faster, and so on.

After a lot of testing in France—I have to fly there because microlights are still illegal in Luxembourg—I have made two modifications to my machine. First I have removed the cooling fan, because it blows against the direction of flight! At 6500rpm, the fan is blowing at 40mph (65kph) and the cruise speed of the aircraft is about the same. It's foolish, you see!

Second I have mounted two two-blade propellers from a Chrysler twin at 90°, giving me a four-blade prop eliminating all shielding-induced vibration and improving performance about 50%. Compared to my friend's standard 250 Vector, climb went up to 590ft/min (3m/s), speed went up 6mph (10kph), fuel consumption went down 1 litre/hr.

Thanks to these changes, my Vector was able to land in the terrible wind conditions at Bagatelle at the end of the London-Paris race, unlike other Vectors. And incidentally, a 330 Vector won the three-axis class outright, so the Picador unit, *correctly rigged*, has proven itself.

Jean Peters

60 boulevard Robert Schuman
L-8340 Olm, Luxembourg

... and Criticism

Sir, I am appalled at the abysmal quality of service in the microlight business. This is not just bad customer service but sheer ignorance of trading legislation. A new horror story appears in these columns every issue.

My own gripe concerns the Panther power unit. Using the 244cc Robin engine, this module, built by Huntair and supplied through such distributors as Mainair (how long must we put up with this monopoly?), must be the most popular unit purchased. It has more than adequate power for most solo applications and is small and simple. However the silencer is fortunate to hold together for 10hr. At a replacement cost of £75, this makes conventional light aircraft flying seem cheap!

The two above mentioned concerns both chorus how stupid I must be for flying a 'single' when *everybody* now flies 'twins' with much less vibration. I can't believe they can neglect their responsibilities in this way. The average pilot does most of their 'development' anyway, surely they must do their part, even if it is only observing normal trading standards. They can divorce themselves from flying risks by all means, but not from sheer poor quality.

Come on, you average weekend pilots, put pressure on these concerns to honour their

responsibilities. Also, with all those Huntair silencers around, someone must have an answer to the fatigue problem. I'm working on it but we need to get our heads together. Is the Technical Committee looking at it?

David J Smith, 15 Ridgeway Close
Farnsfield, Newark
Notts

Steve Hunt writes: *Noise is definitely the microlight movement's worst enemy, and early on, low power was the pilot's immediate problem. Responding to these priorities was highly important when Huntair produced its first Robin engine units, and while every effort was made to build reliable exhaust systems, only time in the field showed design weaknesses. At every opportunity these were rectified, by repairs to existing units and by the implementation of design and manufacturing improvements in production. It is noticeable that with twin-cylinder engines—particularly the 330—which are now the state of the art, the increased smoothness of engine running has meant very few failures in the exhaust systems.*

At present, many of the exhaust systems in use in Britain are obviously manufactured by Huntair, but several OEMs have to date chosen to purchase either exhaust systems or whole engine units from Huntair for installation on their own products; sometimes 'specials' for these applications can lead to problems outside our own experience—toothbelt systems, for example, seem to lead to more tailpipe failures, while more remote 250 mountings suffer more broken exhaust stubs. Despite my article early last year divulging details of my silencer design work, I don't know that anyone else offers bulk supplies of a comparable compact silencer giving good power and low noise levels.

If anyone has difficulty with a Huntair silencer, please do not hesitate to contact the relevant OEM or Huntair direct. We will repair where possible, often without charge, and will always supply a new exhaust upon exchange, at half price (eg £35 + VAT for an exchange replacement 250 silencer).

Chrysler Seizures, Continued

K W Clark (*Flightline* July-August p15) clearly makes a very good and essential point when he emphasises the importance of throttling back to free the centrifugal clutch of the dying engine of a Chrysler Twinpack. But it cannot be *half* power that you then get, for the propeller is designed for the power of two engines. With only one engine, it will run slower and thus prevent the remaining engine from attaining the revs at which it develops its full power.

So engine-out power is less than half. Assuming engine power proportional to shaft

speed and propellor power proportional to speed cubed, we get 35% power with one engine out.

Actually, thanks to angle-of-attack reduction with speed, prop power will be more than the cube of prop speed, but against that the engine's tuned exhaust etc will ensure that engine power is more than proportional to shaft speed, so 35% is still probably about right.

Members with more detailed knowledge can perhaps refine this arithmetic, but however you look at it the proportion is definitely less than half. However, if you're 20ft off the ground and it happens, please do just as KWC says, because 35% is a lot better than almost nothing (unless you're very heavy).

Wishing everyone a good climb-out...

*Dave Campbell, 14 Derby Road
Borrowash, Derby DE7 3HA*

Float Follow-Up

Sir, It was good to see a seaplane microlight on the front cover (*Flightline* July-August) and good to see also that it is being responsibly operated with due respect to other vessels on the water.

At the end of the article was a small query concerning 'power giving way to sail' etc. Well, the answers to these questions are covered in the *Merchant Shipping Collision Regulations &*

Distress Signals Order 1977, SI No. 982. This is the statutory instrument governing the operation of seaplanes on the water, and is the basis of the written examinations completed by applicants for a Group A PPL Seaplane Licence.

Rule 18, paragraph (e) states: 'A seaplane on the water shall, in general, keep well clear of all vessels and avoid impeding their navigation. In circumstances, however, where risk of collision exists, she shall comply with the rules of this Part' — this part being Rule 18 'Responsibilities between vessels'.

In short, seaplanes give way all other vessels!

It is also worth pointing out that from 1 September it became illegal to fly a microlight on floats without at least a Group D seaplane licence. Holders of a PPL Group A seaplane licence can of course fly microlight seaplanes on their existing licence. Things seem to be dragging their heels somewhat, but hopefully by the time this is published we will have an approved training syllabus for the Group D seaplanes and at least one approved instructor.

Anyhow, it is good to see float flying in the ascendancy in the UK — it's been in the doldrums for far too long.

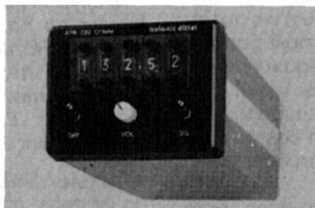
*Philip Newell, Room 10
LEO 1, College of Air Training
Hamble, Hants*

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Lines on Licencing

Sir, Now that the 1 September deadline has come and gone we have been issuing PPL Group D's in large numbers. There have been a few snags but nothing that we have been unable to sort out with a bit of commonsense and goodwill. The problems which have arisen have been concerned with certification of flying by CFI's and late entries into the 'grandfather' requirements for licences. We have done our best to accept these out of date entries and issue the licence if most of the training had been done before the 1 September deadline. Now that it's well into October, we will have to insist on the requirements being met.

Just to remind readers, when you apply for your licence, we need your logbook (duly certified correct by your CFI), and your application form completed by you and a CAA authorised examiner (there are 44 of these at the time of writing with more in the pipeline). He must have completed your flight test details, and he or another CAA examiner must have set, invigilated, marked and signed up on the form, all the details of your written examinations and oral exam. The internal breakdown of hours must fit the syllabus, you must remember to include your medical certificate (form 150/AB) and your written exam paper answer sheets together with the licence fee (£45) — and all

should be well.

We normally take about two days between receiving an application and posting the licence off. We send them by recorded delivery so make sure that there is someone there to sign for the licence.

*Rufus Heald, Flight Crew Licencing
CAA, Aviation House
129 Kingsway, London WC2B 6NN*

Sir, Hard Covers Please

Like many microlights I have been forced to work towards, and eventually gain, a PPL. In doing so it became apparent that one's log book is a most important and useful document. I personally find it a good reference book and a record of one's experience, so it is probably something one will keep for life.

Because of its importance, the BMAA should change the general format and give this book a hard cover. Many flyers use log books purchased from flying schools, books which are usually of better quality and more worthy of the important role they play. Some hang-glider pilots continue to use the BHGA book for this reason.

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By Norman Burr

Soleair Aviation's Phoenix was developed to fill what director Bruce Giddings believes is the most pressing need in the microlight world today—that of a safe, sturdy two-seat three-axis trainer/tourer.

To this end he has designed it from scratch as a two-seat microlight, and selected a trailer format for transportation. This gives several advantages: a less complex folding structure, with fewer moving parts to wear; quicker rigging time (25 mins); greater stiffness and strength for a given weight, and reduced cost of manufacture resulting in a lower price.

He is particularly proud of the undercarriage—often sorely neglected. This has been developed over a series of prototypes to give what he believes is an extremely robust system capable of forgiving the most inept student, or operating from very rough terrain.

Since many microlight students want to progress to a PPL Group A, the controls are totally conventional: push-left go-left rudder bars, roll and pitch on central stick, large lever type throttles. Except for the 'shared' stick, all controls are ganged together, allowing full

instructor override. Turns can be made on either rudders or spoilers, and the rudder bars are also linked to the nosewheel steering.

With Bruce being current BMAA Technical Committee Chairman, it is not surprising that detail design and construction throughout is to the new BMAA Microlight Airworthiness Requirements standard, which in some shape or form will soon become law (see elsewhere in this issue). Much thought has been given to longevity and fail-safe design, with redundant members and over sized primary structure featuring strongly—eg three bays, 3mm wire rigging.

He claims this has not, however, detracted from the flying qualities, with a comfortable cruise speed of 65mph (104kph), mush stall at 32mph (51kph) and approximately 400ft (2m/s) climb. So the solo performance should be impressive, to say the least!

At the time of writing, structural tests to destruction are in hand to confirm the calculated acceleration values of +7g -4g, and these together with full specifications and flying impressions will be published next issue. Production is in hand of proven areas, leading to series manufacture by the end of November.

Bipe at last

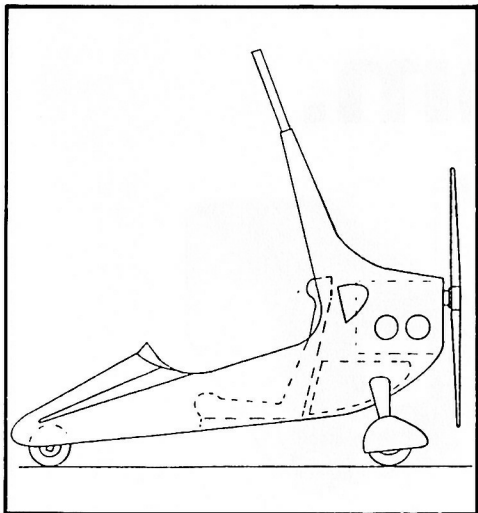
The Micro-Bipe is going into production at last, several months and many frustrated would-be customers after its initial launch in March.

The Tiger Cub, as the little biplane is now called, is a very different aircraft from the prototype featured in the March/April *Flightline*. The 440 Robin is now standard, as are screen, side panels and cowling. Also, the wings have

been made bigger to bring them inside the microlight wing-loading criterion. Wing span is now 22ft (6.7m) against the prototype's 18ft (5.4m).

Designer Tom Wright told *Flightline* that he will be selling only kits, not built-up aircraft, though there is an MBA-approved build and test service starting up at Soleair Aviation, for those who don't fancy tackling the construction work themselves. The kit comes with all holes ready drilled, however, so it sounds well within the scope of the average enthusiast.

Part 2 of this feature will appear next issue and include four UK-built aircraft...



Mainair's X-700: scheduled for spring.

X-citing!

Mainair Sports has announced two new up-market trikes to supplement its well known Tri-Flyer, which remains in production.

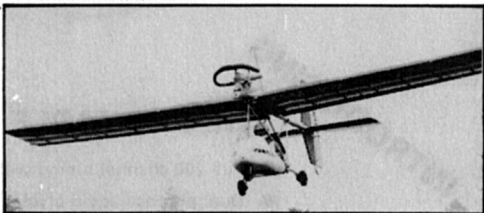
The first to be available will be the Skydart, a joint venture with Airwave Gliders to produce what it is hoped will prove the ideal trike unit/glider combination. Though based on the Tri-Flyer airframe -- with a few modifications -- the Skydart will be sold complete with wing, fabric and fibreglass pod, ASI, altimeter and nose-wheel brake. The cockpit folds for easy glider attachment.

The most intriguing part of the Skydart, however, is that it will feature a new type of glider connector, based on the hang-gliders' French connection, to 'make flying control pleasant and light' in the words of Mainair director John Hudson.

Development has only just started of the second project, the X-700, which should be on sale in the spring. The X-700 is derived from the Tri-Flyer Challenger featured in Sept/Oct p62; the Challenger itself will not go into production but will be a one-off aircraft specially for competition, record attempts etc. Composites will be used fairly extensively in the X-700, 'to eliminate the struts and wires which currently clutter up the average trike', as John puts it, and instrumentation and a high-performance wing will be standard. 'It won't be cheap', he said, 'but we think there are a lot of people who want this type of aircraft'.



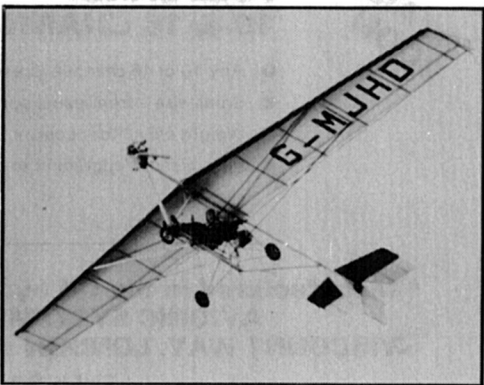
Ladybird ...



Phantom ...

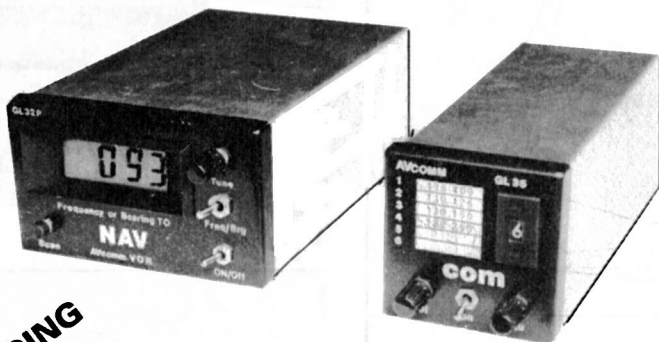


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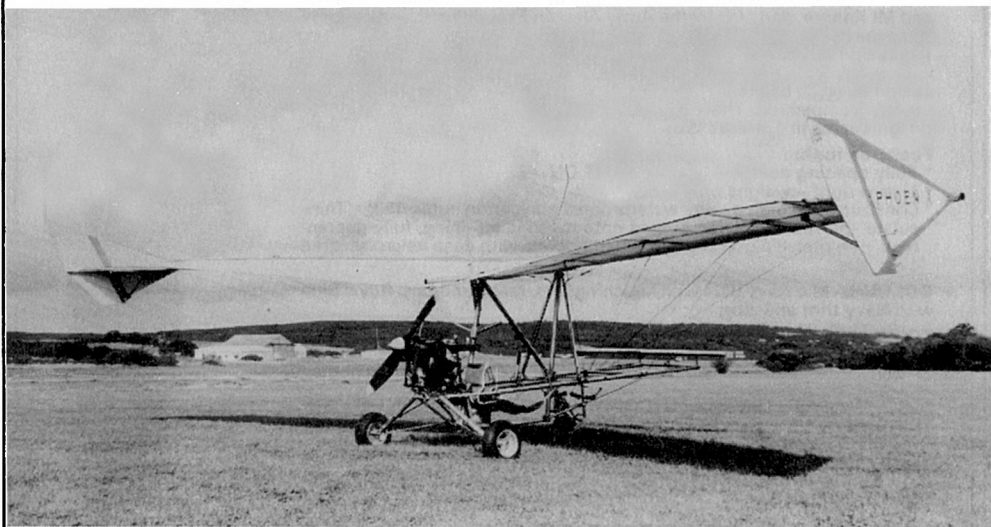
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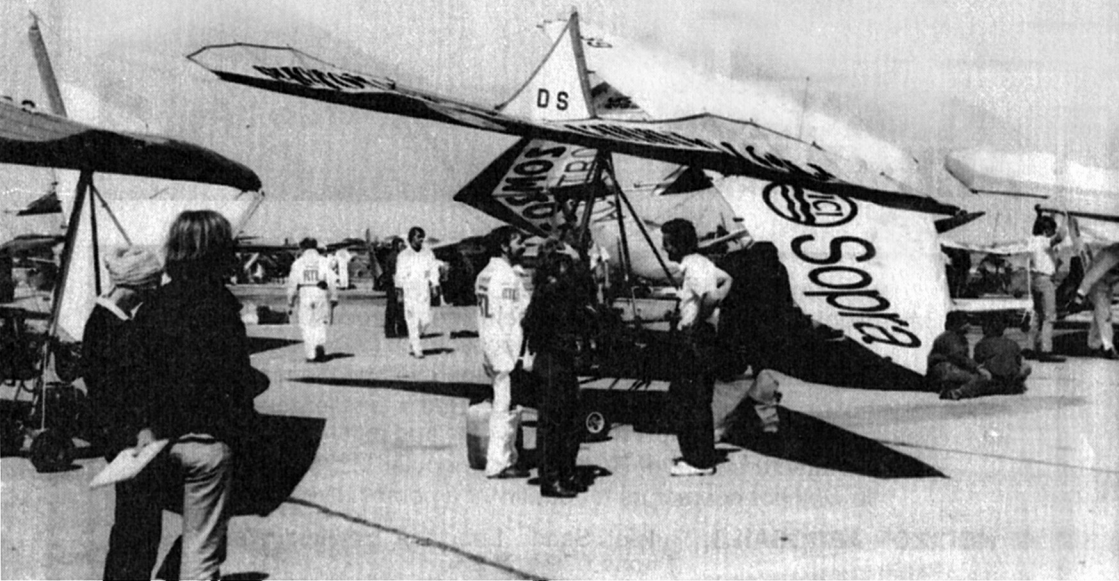
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Paris here we come!

Despite all the last minute problems, the first London-Paris race became a reality as microlights from nine countries gathered at Biggin Hill for the start. NORMAN BURR and ALAIN-YVES BERGER report.

The smell of Gauloises was thick in the air as we gathered at Biggin Hill on Thursday 2 September for the start of the London-Paris race.

It wasn't hard to work out why — most of the competitors were French! The organisers, the Paris based firm Fenwick General Medias, had got their promotional machine into top gear and had raised something like £180,000 in sponsorship money from labour agency Ecco, television company RTL and the VSD corporation. Individuals were allowed to display advertising from their own sponsors provided it didn't conflict with that of the overall backers, and the prospect of generous airtime on French television ensured that there was no shortage of backers for French pilots. French entries poured in, but pilots of other nationalities were less fortunate, so the final breakdown of 68 starters was: France 44, Britain 8, Belgium 6, West Germany 3, Luxembourg and USA 2 each, Switzerland, Australia and Colombia 1 each.

Although everyone continued to call it a race, by the time the rules were published the London-Paris was officially demoted to a 'competition', possibly to reassure the authorities. It was divided into six stages (see *Flightline* July/August p52-3) and two classes — weight-shift and three-axis.

These classes ran independently as far as results were concerned, each being subject to the same three-part formula, with the winner being the man with the lowest points total from:

- 1 Fuel consumption (litres) $\times 100$
- Engine power (HP)
- 2 Difference between actual and estimated flight time Lydd-Le Touquet (minutes) $\times 10$
- 3 Time to cover Stage 3 (minutes) $\times 1$.

There was originally to have been a precision landing contest in Paris, but as things turned out this never figured in the results.

Perhaps it was just as well, for even the three factors listed above made it quite difficult for a pilot to work out a winning strategy. For instance, to go all out for a win in the speed section, Stage 3 (Le Touquet-Abbeville), could jeopardise the fuel consumption figures overall

and possibly cancel out the advantage in the final reckoning. Most pilots, however, realised that the contest was weighed towards good fuel consumption and flew accordingly, which was just what the organisers had intended. As race manager Bernard Lamy put it, the formula was arranged 'to encourage careful flying and good navigation'.

Everyone developed their own pet theory about who would win. Some fancied the beautiful AN 21R of Klaus Richter, undoubtedly the most immaculate aircraft present. Its closest rival in this respect was the Lazair of Angus Fleming. If there'd been a prize for effort, Angus would have won hands down, for most of us has written off his chances of starting, following an accident the previous weekend (see *Long Marston report* —ed) when an inexperienced pilot had nosedived the Lazair. The pilot walked away, but the aircraft was a mess. Angus wasn't saying how much sleep he'd had that week, but it can't have been much.

However the aircraft which attracted most attention was way out at the other end of the aesthetic scale. The Dohier III, a homebuilt weight-shift machine constructed by a father and son team and piloted by son Raymond Dohet, was a massively constructed trike which weighed in at just under the magic 150kg and which had the kind of ground clearance a Land Rover would be proud of. It also boasted the only four-stroke in the race, a flat-twin air-cooled unit of 850cc which had previously seen service in a Daf. On top of all this was a wing which looked barely large enough to lift it all up.

One cynic remarked that if this was the Dohier III, he'd hate to see numbers one and two, but in fact the machine flew surprisingly well, even if it did sound more like a Harley Davidson than a microlight. Its climb rate was hardly likely to make Jack McCornack eat his heart out, but it was adequate.

Another rare machine was the Daedalus Apex 2 piloted by the only Swiss entrant, Marco Broggi. Despite its 'conventional' wing shape, it

is actually a weight-shift aircraft and is also unusual in that its undercarriage has only two wheels. A rather flimsy looking tailskid is substituted for the third wheel, which makes the pilot appear distinctly vulnerable in the event of a rough landing. We nicknamed it 'the bum-scraper'.

Quite the noisiest aircraft there was the direct-drive Butterfly. Not to be confused with the Aero 9 Butterfly (a trike), the Butterfly is a development of an old design called the Flying Flea. The Flea, with its staggered biplane arrangement, developed a fearsome reputation for tucking, but Belgian pilot René Thierry was confident he had got the thing under control now.

Another front runner was likely to be Jacques Breuvart, one of four Vector pilots entered but the only one with 330cc Fuji-Robin power.

Most numerous machine was the MX. Invariably immaculately finished with their distinctive blue anodising, ten Eipper aircraft arrived from three countries, including the MXII of Californian Jerry Sanderson, one of only two US starters. Making up the other half of the American duo was John Massey with the Sunburst.

Almost as numerous as the Quicksilvers were the Pathfinders, seven from France and two from Britain. Steve Hunt was clearly taking the race very seriously and arrived with a truckload of spares, intending to follow his customers through by road and ferry.

Standing a little apart from everyone else were two Danis trikes — a Mercure dual seat for factory test pilot Jean Pierre Danis and a Sabre 23 single seat for François Thovex, who is also a professional microlight pilot and makes his living from crop dusting. While everyone else was rushing around getting rigged, the Danis team stood ready to go, their businesslike approach typified by their very neat instrument housings and, in Jean-Pierre's case, drag-reducing plastic fairings on the frame tubes.

continued overleaf

Noisy but effective: the Butterfly took second place in the three-axis class.



There's an old adman's adage that says: 'the tighter the brief, the better the ad'. After looking at the sole Australian entry, the Resurgam, I concluded that the principle also applies to the business of designing aircraft. Despite Australia's ultra-stringent microlight laws, what has come from Gordon Bedson's drawing board is a purposeful Konig-powered machine which looks right from any angle. The Resurgam is no gussied-up showroom special but a machine designed simply to fly, and fly well. We marked it down as one to watch.

With accurate navigation playing so large a part, the more experienced pilots were clearly going to be at a great advantage, whatever their mounts, and British hopes were pinned largely on Gerry Breen and Len Gabriels.

One of the best known names from France was Alain Dreyer, president of the French Microlight Aircraft Association, FFPLUM. He had one of the two monocoque KDA trikes, neat machines sporting a curious little vertical fin beneath the rear of the polyester fuselage and powered by the increasingly popular Italian Hiro 125cc water-cooled engine.

It wasn't just the stars though who were making their mark on the event. The sole Norwegian competitor, BMAA member Odd Johnsen, entered the race to prove a point and earned everyone's respect in the process. Trikes are illegal in Norway, so Odd, who is a diver by profession and lives north of the Arctic Circle, has to fly his Demon 175 Tripacer clandestinely on floats and skis as and when weather permits and officialdom looks the other way. 'My brother can fly all over Europe in his Cessna' he complained, 'so why can't I do the same in my trike?'

Aircraft registration and pilot licenses were compulsory for the race, yet he could get neither from the Norwegian authorities. So with the active connivance of Bernard Lamy and the

Raymond Dohet sits proudly aboard his 'microheavy'.

BMAA, Odd cooked up a plan. Lamy organised for him a Parisian registration, while the BMAA arranged for a British pilot's license. Not only was he now eligible to enter the race, but he was also fully legal from an air-traffic point of view and could not be prevented from flying in his own country!

This was a solo effort — no back-up crew following by road, virtually no spares, originally not even anyone to take his car across to Paris to meet him — just one man trying to confound the bureaucrats in Oslo. With a Norwegian flag on his aircraft and a big smile on his face, Odd symbolised what microlights are all about — freedom and fun.

The Build-Up

Thursday night brought a compulsory conference for pilots and press, with Lamy hammering home the safety theme, again and again. With the Scorpion grounding happening only a few days before, everyone was desperately hoping that the race would give the sport some badly needed positive publicity. But it would only take one serious accident . . .

The organisers did all they could. Crash hats, ASI, altimeter, watch, signal mirror and flares were all compulsory, augmented by wet suits, a CO₂ inflatable life jacket and a radio beacon for the Channel crossing. Helicopter and seaborne rescue was on hand, the coastguards had been alerted and pilots would be sent off in groups of three or four to keep an eye on each other on the way across.

Lamy had slides showing the various landmarks, or in the case of the cross-Channel leg, the lack of them. To minimise the risk, the second stage had been divided into two parts — firstly the shortest route across the Channel from Lydd and then a flight along the coast to Le Touquet. Flying direct to Le Touquet was taboo: 'Please do not cheat' urged Lamy, pointing out





The Baroudeur team, with Gui Gavard's aircraft in the foreground.

that even on the proper route pilots would be out of sight of land for some time if visibility were less than perfect. If their navigation was out, they would drift into the wider part of the Channel and might run out of fuel without ever sighting land.

Stay between 500 and 1500ft (152m and 456m), urged Lamy. The lower limit was particularly critical, since if someone dropped into the water 'the helicopter will fly like hell at 300ft' — and helicopters and microlights don't mix.

If you do end up in the water, 'faire pipi', he advised. Cold is what kills in such circumstances and anything which helps keep your clothing warm can save your life.

Spirits were riding high, but the tension was mounting. As Lamy had remarked earlier in the day, 'they are asking themselves what the hell are they doing here . . .'

Friday Morning: Biggin Hill

After all the build-up, the start was almost an anticlimax. Miraculously the weather was holding — a 10-15mph (16-24kph) west-south west wind and bright sunshine — and the conditions ensured that take-off dramas were few.

With no ceremony and no attempt to follow number order, it was a case of whoever is ready can go. First away were the distinctive ICI-sponsored trikes of Jean Pierre Danis and François Thovex; with perfect, almost formation, take-offs, long before most of the other competitors were anywhere near ready, this pair clearly meant business.

Rather less in business was Alain Requi in one of the four Baroudeurs in the race. We were rather surprised to see Alain flying one of these JPX-powered three-axis machines, since he works for the French Rotec distributor. He probably regretted the switch: he just couldn't gain any height and after coming uncomfortably close to various airfield buildings he finally came

down in some trees on the far side of the airfield, fortunately with only minor injury.

Alain was one of the race's less experienced pilots, but in fairness to him none of the Baroudeurs 'looked' impressive. His team mate Pierre Lambert had just the same problem and had two attempts at take-off before he finally gained enough height to venture through the sink area over the trees. The Baroudeur is advertised as having a 400ft/min (2m/s) climb rate, but these four came nowhere near that and looked as if they desperately needed a decent reduction drive.

And the Dohier III? It puttered happily away. Sixty-eight aircraft had taken off and as far as we knew 67 were still airborne. It was time to head for Lydd.

Friday Lunchtime: Lydd

At Lydd, teams of marshallers and handlers, led by Ted Battersea and Joe Thomas of Kent Microlight Club, had been at work since 8am, raising a windsock, laying out a landing T, wheeling the trolley full of fuel cans into place, positioning fire extinguishers and generally making themselves useful. Joe and Ella Jordan were in the team, and take up the story:

The designated landing area was a large mown patch of grass between the disused runway 14 and the hangar. The tower couldn't see this sector, so 'Lookout 1' was in contact with them on a portable VHF.

Everything was ready when the first three microlights appeared around 8.50am. First man down was Raymond Broome in the Resurgam, who circled three times and then landed in rough grass out of the landing area, saying he couldn't see the T so he aimed for the windsock. The Danis trikes were next and landed cross-wind in what was by now a fresh breeze.

The next three aircraft landed in odd places, accompanied by much arm waving from the marshallers. Clearly, pilots were confused about



One of only three West German competitors, Alfred Grass flew this CGS Hawk.

the landing area, so Joe repositioned the T while Ella scrounged a second pair of extra large (naval) bats, which Ted put to good use. Up to eight microlights were approaching simultaneously, with later arrivals flying over the main runway (one landed!) and over the hangars (strictly taboo), which had the controllers tearing their hair.

About this time we heard of several forced landings near Maidstone and at Ivychurch, 5 miles (8km) distant. Two took off again and made Lydd, but we never did see the jolly restaurateur's Rotec, which rather disappointed us, as we have been flying a Rotec for over a year.

The tarmac beside the hangar was fast becoming covered with machines and Ted was coping amazingly with the pressure, no doubt helped by the sunshine and the atmosphere of entente cordiale.

As things calmed down over lunch we got to know some of the pilots and their machines. The AN21R's German pilot said his machine had used less than 5 litre of fuel so far, while for sheer beauty the Lazair took some beating. Glinting in the sun, it looked like a transparent butterfly. Septuagenarian and former pilot Rupert Cue was proudly walking about with a tandem-winged mahogany-framed rogallo-type model under his arm, which he explained flew very nicely back in 1966.

As pilots ate, refuelled and went through customs, the windspeed was approaching no-go at 15kt (28kph) but air-traffic controller Lori Williams' anemometer apparently jammed at 14kt (26kph) . . .

By 11.30am the first Mae-West clad pilots were strapping in. The taxi track to runway 22 was dead into wind, so competitors were assembled in batches of four along runway 14 at the intersection with the taxi track.

Things went slightly wrong at this stage, as the radio of Bernard Lamy's assistant, Alain Merceron, went on the blink and the tower was not getting race numbers to check off. Some of the numbers had blown off anyway, while others were rucked up and hard to read, so checking became a slow job. Lockout 1 was pressed into service as a link with the tower.

So far, the airfield firemen, led by Ken Bailey, had been looking rather glum. They had expected at least half a dozen prangs to play with, but they showed renewed interest as the microlights leapt into the gusty 15kt wind.

Then came the first hold up, as several Cessnas came and went while microlighters sat sweating in their wet suits. Despite some 'anti-anglais' muttering by French microlighters, most of the planes were actually full of French TV crews and press. After this another dozen or so got away, before a French helicopter started up and stirred up the air for five minutes before shutting down because his radio was faulty.

About this time customs let it be known that a number of competitors hadn't been cleared. One of them was Marco Broggi, who had to switch off and sort the matter out, not a little annoyed.

With the benefit of hindsight, the most amusing incident was probably when the tower picked up a radio message saying conditions were very gusty and recommending that take-offs proceed as quickly as possible, before things got worse. This message actually came from a rather frustrated Gerry Breen waiting in the starting queue, but the tower thought it was a warning from a pilot in mid-Channel and had it relayed down the queue. What Gerry said when he got his own message back is not recorded.

The main thing though, was that not one mishap happened to man or machine at Lydd. The press and TV may have been disappointed but we certainly weren't.

As Jeff, Ella and the other helpers watched the last man away, John Massey in the Sunburst, the same question was uppermost in everyone's mind. How many of the 61 who had left Lydd would make Cap Gris Nez?

Glory of glories, the message came through that 61 aircraft had been checked in over Cap Gris Nez and were proceeding on course for Le Touquet.

While the ghouls of the national media muttered disconsolately and set off back to their studios and newsrooms to make what they could of the Baroudeurs' difficulties at Biggin Hill, the rest of us heaved a huge sigh of relief. The hardest part was over and we knew that, thanks to the notorious insularity of the British popular media, nothing short of a major disaster or a British win would bring the competition back to their attention. The sport had stood the test.

For the competitors of course, it was far from over.

Friday Evening: Le Touquet

By the time the pilots approached Le Touquet, the crowds were out to meet them at the airport. In Britain, spectators had been few, but in France the race became something of a festive occasion, not only because of the amount of advance publicity in the French media but also perhaps because the French public have a long-standing love affair with aviation in a way that the British do not.

With 61 pilots accounted for, the festivities began. The mayor of Le Touquet presented trophies to the joint winners of the flight estimation contest, Jacques Breuvart and François Thovex. It wasn't at all easy to estimate the right flight time, because the organisers' met briefing at Lydd had been way out. It predicted a west wind, which would have been a tailwind right across the Channel, but in practice the wind over the water was south south west, which not only slowed the crossing but had a considerable effect also on the coast run.

In sharp contrast to the arrangements at Lydd, the catering at Le Touquet was excellent and the wine flowed in copious quantities.

As if to emphasise the historic nature of the occasion, the organisers introduced the great-granddaughter of Louis Bleriot, the first man ever to fly the Channel. The idea was to fly her into the finishing point in Paris as a kind of symbolic grand finale.

Next morning pilots refuelled before take-off. Most of them probably didn't realise it, but the fuel on offer was regular grade, hardly the thing for a high-compression two-stroke, and you had to make a nuisance of yourself to get anything better.

With mechanical problems intervening for two

pilots, only 59 aircraft took off for the speed contest to Abbeville. With this part of the contest having a relatively low weighting, some pilots elected to cruise economically rather than try for the speed award, but there was no doubt about the intentions of the Resurgam pilot, Ray Broome. He roared off and was only rivalled for speed by Gerry Breen in the Pathfinder, who had the edge over rival Pathfinders thanks partly to a non-standard fairing around the aircraft's nose.

Saturday Morning: Abbeville

At Abbeville an additional element was introduced into the contest — hunt the officials, as officially your flight ended not when you landed but when you checked in at the desk. However any doubts that the whole thing was a fiendish French plot were dispelled when it was confirmed that Gerry and Ray were joint winners of the speed contest.

So as they started the longest overland stage, the 50 miles (80km) to Beauvais, the French pilots had something to think about — it was obviously not going to be a Gallic walkover. Strictly speaking, Beauvais was an optional stop, but after 50 miles pilots were ready for a break.

The competitors now entered on the last competitive stage of the race, the 27 miles (50km) to Pontoise, where they were to spend the night.

Sunday Morning: Pontoise

After three days of glorious weather, the previous one virtually windless, the weather stopped co-operating. It was still hot and sunny but there were now awkward thermals and a very strong headwind.

This placed the organisers in a quandary. The competitive part of the race was now over and the results were being worked out, but the last stage of the event was the most important from the public's — and the sponsors' — point of view. Some 60,000 people were gathering in the Parc Bagatelle on the edge of Paris, complete with fairground festivities and saturation media coverage. It seemed a cruel blow to have to halt the event just 19 miles outside the city.

At first Lamy decided to press on with the event, and 12 pilots were allowed to leave. Then he thought better of it and a car was parked across the runway to prevent further departures. To add to the confusion, some of those who did leave thought that the precision landing contest at Parc Bagatelle still counted towards the final reckoning, whereas in fact this element of the contest had been abandoned.

By now it was lunchtime. For the pilots left at Pontoise, they could laze around in the sun, listening to sometimes hilarious reports on the radio from seemingly totally ignorant reporters

desperately trying to explain the likely whereabouts of the missing competitors. Some of these 'missing competitors' meanwhile, decided not to wait for the weather to relent and simply packed up and went home.

So there was great jubilation at Parc Bagatelle when a pilot finally landed. The media men swarmed round, all firing questions simultaneously in French and were quite taken aback when the pilot peeled off his leather helmet and said something to the effect of 'I'm dreadfully sorry, chaps, but I don't understand you. My name's Gerry Breen . . .'

The presentation ceremony was scheduled for 5pm but only a handful of pilots had arrived by then. Another batch set off from Pontoise around 6pm, by which time the wind was still strong though much more predictable, and eventually around 30 struggled into the park, battling against 35mph (56kph) headwinds and taking anything up to two hours to cover the 19 ground miles (30km) into the finish. Some of the later arrivals found the place virtually deserted by the

time they got there, while others ran out of fuel en route.

As their time cards had been taken away at Pontoise for results calculation, anyone unlucky enough to find himself stranded on the outskirts of Paris had no emergency contact phone number — it had been written on the back of the cards! Nor was there any obvious rallying point, for there was no accommodation arranged for the visiting pilots. One way and another, the ending at Paris was quite unworthy of the rest of the organisation and spoilt the event for many competitors.

However, we do have the official results (see table) which make interesting reading.

In the weight-shift class, French pilots made a clean sweep of the first five places, with two teams standing out — Véliplane and Danis. Véliplane Samourais occupied third and fifth places, which should compensate them for the problems with their three-axis machine, the Baroudeur. For the Danis team, it was a great personal victory. Jean-Pierre Danis won special

Starters and Results: 1982 London-Paris Microlight Race

Sponsors or company affiliation are included where known.

NB: These results differ from provisional results published in last issue.

Rank Number	Name of Entrant	Country	Aircraft/Sponsor	Class	HP
1	Denis Maurel	F	Baroudeur	2	24
3	Jacques Antoine Breuvart	F	Vector 610	2	32
4	Edmond Aupy	F	KDA	1	22
5	Christian Lherault	F	Rithner Piranha Mosquito	1	12
6	Alain Dreyer	F	KDA/FPPLUM	1	22
7	Jean Claude Armaing	F	Agriplane Condor 2090	1	45
8	Alain Marzan	F	Agriplane Condor 2090	1	45
9	Alain Pochet	F	Pipistrelle	2	28
10	Patrick Rebeyrol	F	Solar Wings Typhoon Magic	1	22
11	Angus Fleming	GB	Lazair/AMF Microflight	2	32
12	Raymond Dohet	F	Dohet III	1	32
14	Jean Pierre Roos	F	Aero 9 Butterfly	1	40
15	Jean François Perard	F	Pathfinder	2	32
16	Régis Lemaitre	F	Quicksilver MX2	2	30
17	Jean Peters	L	Vector 600	2	18
18	Georges Kany	F	KDA	1	22
19	Alfred Grass	D	CGS Hawk	2	34
20	Jean Guerreau	F	Véliplane Samourai	1	18.5
21	Jacques Toulorge	F	Patrilor	2	42
23	Pierre Boutemy	F	Demon Hiway	1	18.5
24	Jean Lou Krzepicki	F	Sherrer Kontakt Microstar	2	25
25	Patrice Sautereau du Part	F	Pathfinder	2	32
26	Charles Vandermeulen	B	Fulmar Rival	1	20
27	Gui Gavard	F	Baroudeur	2	24
28	René Thierry	B	Butterfly	2	25
29	Patrick Dupont	B	Fulmar Astral	1	25
30	Len Gabriels	GB	Skyhook Sabre/Skyhook Sailwings	1	25
31	Mark Durcel	B	Fulmar Astral	1	20
32	Joris Mees	B	Fulmar Proto	1	20
33	Hervé de Bizien	F	Rotec Rally 2B2	2	35
34	Gérard Lacaze Masmonteill	F	Quicksilver MX	2	30
35	Serges Varsat	F	La Mouette Dragster Aile Azur 17	1	18
36	Alain Requi	F	Baroudeur	2	24

awards for economy — interestingly, in a two-seat machine — and for being the youngest pilot in the race, while his team-mate François Thovex was outright class winner and joint victor of the time contest at Le Touquet.

'Best of the rest' in the weight-shift class was none other than Odd Johnsen, a popular result and one which is sure to cause some head-scratching in Oslo.

Jacques Breuvart showed his skill in winning the three-axis class outright and sharing the time contest with Thovex. While his performance is obviously a good result for Vector, the three-axis manufacturer with the most to smile about is Steve Hunt. His Pathfinders filled three of the first five places and seven of the first ten, Breen managing fourth as well as taking the speed award.

Surprise result is number two in the three-axis class — Rene Thierry in the Butterfly. He said at Biggin Hill he'd mastered it now and he proved his point beyond dispute.

Feeling quite pleased with himself was Marco

Broggi, who had the honour of having the quietest aircraft. That may not sound very exciting, but in environmentally conscious Switzerland where the sport is on strict probation at present, it's just what the local enthusiasts need.

Indeed the whole race was just what enthusiasts need the world over. Nobody dropped in the sea, nobody got seriously hurt and a decent proportion of the entrants made the finish, which for practical purposes was Pontoise.

True, there were organisational problems, but they can be sorted out next year. The FAI has now accepted the race as an official event and Lamy has confirmed that Fenwick will be organising it again next year. What is more important is that, long after the problems have been forgotten, the 1982 London-Paris will be remembered as the event which showed Europe that a new sport was here to stay. Thank you Bernard, for turning a dream into a reality and for writing a page of our history along the way.

37	Odd Henrik Johnsen	N	Demon 175 Tripacer	1	25
38	Georges Kunegel	F	Vampire II	1	*
39	François Thovex	F	Danis Sabre 23/ICI	1	42
40	André Fournel	F	Quicksilver MX	2	30
41	Daniel Zuckerman	F	Quicksilver MX	2	30
42	Guy Wardavoir	F	Quicksilver MX2	2	30
43	Jerry Sanderson	USA	Quicksilver MX	2	30
44	Jean Claude Chagnol	F	Quicksilver MX	2	30
46	Daniel Lepeu	F	Véloplane Samourai	1	22
47	Fernand Muller	L	Vector 600	2	18.25
48	Carl Edouin	F	Edouin I	1	15
49	Klaus Juergen Richter	D	AN 21 R	2	25
50	Alain Gerard	F	Motodelta G11	1	22
51	Yves Chemla	F	Quicksilver MX	2	30
52	Michel Guegan	F	Pathfinder	2	32
53	Victor André Massena d'Esling	F	Pathfinder	2	32
54	Gilles Pernet	F	Pathfinder	2	32
55	Jean Cosnard	F	Pathfinder	2	32
56	Patrick Poulet	F	Pathfinder	2	32
57	Pierre Lambert	F	Baroudeur	2	24
58	Marco Broggi	CH	Daedalus Apex 2	1	22
61	Keith Dickinson	GB	Puma 2-seater	1	32
62	Richard Clegg	GB	Puma Triflier	1	32
64	Gérard Starck	F	Weedhopper JC 24 B	2	25
65	Raymond Broome	AUS	Resurgam	2	24
	Jeremy James	GB	Mirage Mkl.	2	30
67	Gerry Breen	GB	Pathfinder/Breen Aviation	2	32
69	Horst Storzum	D	Hauser Libre	1	22
70	Arthur Moureau	B	Weedhopper JC 24 C	2	20
71	John Massey	USA	Sunburst	2	30
72	Gilles Desheulles	F	Quicksilver MX	2	32
73	Jean Pierre Danis	F	Danis Mercure	1	48
74	Jacques Gardin	F	Vector 600	2	18
75	Andres Botero	Colombia	Quicksilver MX	2	30
76	Richard Holland	GB	Pathfinder/Sunday Times & RAF	2	32

Overall — Class 1: 1st 39 (158pts); 2nd 10 (183pts); 3rd 20 (206pts); 4th 35 (207pts); 5th 46 (237pts); 6th 37 (273pts); 7th 7 (279pts); 8th 26 (280pts); 9th 6 (298pts); 10th 29 (322pts).

Overall — Class 2: 1st 3 (160pts); 2nd 28 (161pts); 3rd 55 (171pts); 4th 67 (172pts); 5th 56 (194pts); Equal 6th 11, 25, 53 (209pts); 9th 15 (216pts); 10th 76 (222pts).

Time Estimation Award: Equal 1st 3 and 39.

Speed Award: Equal 1st 65 and 67.

Quietest Aircraft Award: 58.

Special Awards: Economy 1st 73, 2nd 49; Youngest pilot 73; Oldest pilot 30; Fair play 6.

Class 1 = Weight-shift
Class 2 = Three-axis
* HP not known —
late aircraft change

'Joe BMAA' — a portrait

By John and Helen Wincott

Those of you with a long memory will recall the questionnaire sent with the March/April issue of *Flightline*. At long last we can now give you the results; these are published in the panel.

We would like to thank the 396 of you who took the time and trouble to reply. Also, our thanks go

to the 2500 or so who did not, because if everyone had sent a reply back, we probably wouldn't have got these results for another six months!

These results are published without conclusions at present, with a view to provoking some lively discussion at both the AGM and through *Flightline*. The results are certainly very enlightening.

Questionnaire results

Personal Details

Age 16–25 – 20 people, 25–35 – 108, 35–45 – 125, 45–55 – 90, over 55 – 53.
Married – 235, single – 87.

What Attracts You to Microlights?

Pioneering spirit – 132, low cost of flying – 330, ability to fly without a crew – 158, ability to store at home – 194, other reasons (various) – 181.

Previous Flying Experience

Some previous experience – 296, no previous experience – 91.
Previous experience in hang-gliding – 106, gliding – 144, light aviation – 195, commercial aviation – 12, service pilot – 35.

Ownership

Own their own machine – 216, have a share in a machine – 38.
Excluding these respondents, 76 people said they would like to contact others who wish to purchase as a group.

Type of Aircraft Owned

Hang glider/trike unit combination – 92, three-axis – 94, Eagle – 57.

Aircraft Registration

Aircraft registered and letters affixed – 103, aircraft registered but letters not affixed – 51, aircraft unregistered – 74.

Aircraft Storage

Stored at home – 151, at an airfield – 32, elsewhere – 38.

Where Do You Fly?

From a local field – 139, unlicensed airstrip – 56, licensed airstrip – 61, other (eg beaches) 46.

Would You Be Willing to Share Your Site?

Yes – 74, no – 84.

Estimated Annual Flying Hours

(of those who felt able to give an estimate)
Over 25hr/yr – 138, 10–25hr/yr – 52, less than 10hr/yr – 48.

When Do You Fly?

Midweek – 24, weekends – 57, both – 200.

Medical Declarations

Have submitted medical declaration – 135, have not – 164.

Club Membership

Belong to local club – 129, do not belong but would like to – over 200, do not belong and don't want to – 54.
Would be prepared to help organise events in their area – 248, would not – 97.

Area Safety Officers

(respondents were asked whether they knew that BMAA was – and is – looking for volunteers for these positions)
Did know – 130, did not – 216.
Members with some medical qualification – 17.

Regulations

Did know that current noise limit is 68dB at 300m – 179, did not – 205.
Did know that microlights must be registered and letters displayed – 329, did not – 55.
Felt that third-party insurance is essential – 379, felt it is not – 10.
Knew that landowner's permission is needed before flying – 363, did not know – 20.

Flightline

Not satisfied with the content of the magazine – 57, satisfied – most of remainder.
Would like more technical items – 149, would like more club information – 59.
Gave suggestions for future items, improvements and general comments – 143.
Most common comment – can we have less of the cowboy 'how I did it illegally' articles please?

Cost of PPL Group D

Felt that £45 is a fair charge – 257, felt it is not – 121.

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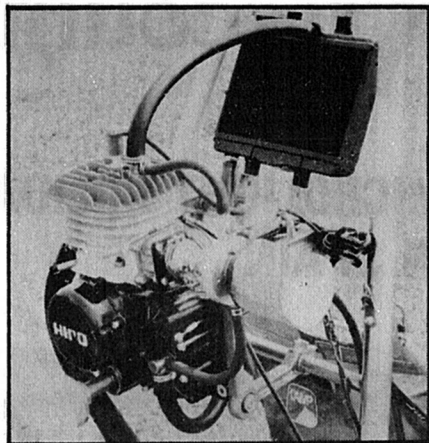
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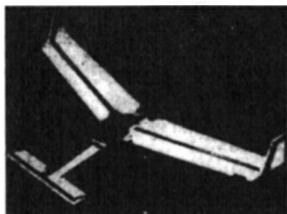
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ENQUIRIES

INVITED

Long Marston's swansong?

By Norman Burr

This was going to be a straightforward report of a straightforward fly-in. It was going to explain how the Long Marston 'Micro-Expo '82' held over August Bank Holiday weekend had a flyable Saturday and two too-windy other days, how a number of pilots used it as warm-up for the London-Paris the next weekend and how, even if the fly-in was not free of incident, it was at least free of injury.

All this has been overshadowed, however, by the news that the financial repercussions of the fly-in have placed Long Marston Aviation Co in severe financial difficulties, so much so that the future of microlighting at the site was in doubt as *Flightline* went to press.

Officially, Long Marston director Michael Hodges, who is acting as company spokesman in the absence of his co-director Nick Jerromes, has no comment to make. But reliable sources indicate that a disagreement with Northern Leisure — the company contracted to arrange the non-aviation side of the fly-in such as security, concession stands, gate receipts etc — over the share out of income from the event, has resulted in a financial crisis at Long Marston Aviation Co. Nick Jerromes is currently in the Middle East, on a business trip apparently unconnected with the present problems.

At the fly-in, however, there was no hint of the troubles just around the corner. Keith Vinning kept himself busy giving joyrides in the Puma — most of them to women for some strange reason — and was heard to tell Helen Wincott as she snuggled up behind him for her first-ever microlight flight: 'I'm going to enjoy this more than you!'

Of the single seat trikes present, the 330 Robin was virtually a universal fitment — except for John Wadsworth's Skytrike/Birdman 178. The combination was a new one for John* and he was having great trouble getting airborne with it. After a number of full-chat thrashes with the bar right out, teeth right gritted and no sign of lift, John finally made it — after a fashion, as he now explains:-

I pushed out the bar at a goodly speed... nothing! As I had reached the limit of my skinny little arms, I thought 'there's nothing for it but to lean forward'. Not a very safe flying stance, but by leaning to the limit I at least managed to leave terra firma. About 30-40ft (9-12m) up the left wing began to lift (you didn't look anything like that high to me John — ed) and in correcting this

my foot slipped off the accelerator. I was now in the most dangerous of all positions — a stall close to the ground, with less than 5s to impact. It was time for instinct; there was no time to think. I pulled the bar full right and in, found the foot throttle and pushed on the power. The wing responded and I found myself in a very fast shallow dive which resulted in a heavy landing and a bent rear axle.

How all this must have appeared to spectators I dare not think; it must have looked like an idiot trying to fly a trike, but in reality it was an average flyer getting out of a tricky situation.

John's nasty moment was not the only incident. Angus Fleming lent his beautiful Lazair to Philip Jacquery and watched aghast as Philip stalled, cartwheeled and then nose-dived the twin-engined machine. Miraculously he walked away unhurt, but none of us gave Angus much chance of getting the plane repaired in time for the London-Paris. As it turned out, we were wrong, as you can read elsewhere in the magazine.

On the lighter side, the competitions proved great fun, with both the contests being won by trikers, which must prove something. Mike Hurtle took the spot-landing power-off award with a remarkable 2ft (600mm) accuracy, and S Comben the 4min precision flight/spot-landing power-on.

The question now is, will anyone get the opportunity next year to improve on Mike's Long Marston achievement?

*If you have any experience of this combination, see small ad 11/65.



Philip Jacquery walked away from this unhurt!

Lift-off at Leicestershire . .

All that blood, sweat and tears — would it be worth it? As with any fly-in, the effort of organisation can instantly go to waste due to bad weather.

We were lucky. Saturday turned out an almost perfect day, a great reward for a Friday spent roping off areas for the public, parking and running-up, and erecting a marquee, control tent and PA system.

Another reward was the good turn-out — around 30 microlights during the day. We managed to have the usual microlight-type problems, like engines failures and of course the occasional out landing — including one from John Wincott.

Pilots flew in from near and far, the longest journey being from Bedford, and various competitions were arranged for the weekend, though most people were content to free fly and enjoy the scenery. Highlight of the day was a jousting match between the LMAC windsock and a Puma — the trike won!

One or two rare aircraft took to the air, including the brand new Weedhopper C. Even Paul Bennett thought this was better than the 'B' commenting 'perhaps we'll call it the Bushhopper'. The Scout MkIII, complete with wing warping, also flew but suffered from lack of power. However there was no doubting the star of the day — the Microbiplane, looking splendid

with its fully covered fuselage. Definitely an aircraft of character.

Sunday was windy enough to ground a lot of pilots, but there are always a few pilots willing to brave difficult conditions — including one in a Pterodactyl Ptraveler, which are always interesting in crosswinds. Several trikes flew too, but the star attraction was undoubtedly the Phantom, which was making its first public showing in the UK. From the same American stable as the Mirage, the Phantom is clearly more manoeuvrable than the earlier design.

The entire weekend passed without major incident, but this was nearly not the case. At 6pm on Sunday a pilot signed in at the control point and 'exaggerated' in the column labelled qualifications. He was taken at his word and proceeded to taxi out in his grossly underpowered trike which barely struggled into the air. Rather than land straight ahead on the runway, the pilot chose — at least we think he chose — to turn 180° downwind and hop over the hedge. After much nail-biting from the spectators, he reappeared, hopped back over the hedge and landed. One or two words of advice were whispered in his ear after this display.

Anyway, all things considered, it was a great weekend. We hope everyone who came enjoyed themselves, we certainly enjoyed having you. See you all next year at our bigger, better rally.

. .but sadness at Swansea

TONY FLETCHER reports on the Gower microlight fly-in on 11-12 September at Swansea Airport.

As seems to have happened elsewhere this year, microlight pilots were loath to leave their own patch, with the result that only three aircraft turned up on the Saturday and four on the Sunday.

Perhaps that was no bad thing, for not only was the weather fairly bad but on Saturday afternoon we received the heart-breaking news that nine good sky-diving friends had died in a helicopter crash in Germany. Words seemed inadequate: we all shared a love of flying — they

sky-dived, I piloted a microlight — but we shared the joys of open skies and free flight. In fact many of them were intending to try microlighting and I know at least one was going to take it up seriously. We had a Puma down for weekend and many had been looking forward to their first two-seater trips on their return.

By making a tremendous success of Swansea Skydivers, they inspired me to work towards a thriving Gower Microlight Club. I know they were keen for me to establish Swansea as a microlighting centre and I am determined to do so. I'm proud to have known them and I think their obituary will strike a note with flyers everywhere: 'Once you've tasted flight, you walk the earth with your eyes turned skywards, for

there you have been and there you long to return'.

But back to the fly-in — on Saturday the three aircraft in attendance were a Puma, piloted by Kelvin Wilson, a Tripacor/Storm piloted by Steve Morris and my own Skytrike/Lightning. The wind was south-east and fairly gusty at about 12kt (6.2 m/s) ground-speed, probably about 20–25kt (10.3–12.9m/s) at 1000ft (305mm), but only around 15kt (7.7m/s) at twice that height!

Steve had a real baptism of fire on his Gower flight — the airfield is notoriously bumpy lower down due to highly irregular surrounding terrain, woods etc. The trick is either to fly out of it over the coast or to climb out of it, when things usually smooth out nicely. Steve waited until the evening before trying again, when he finally tasted the Gower magic — more of that later.

There were a fair number of prospective microlight pilots in attendance — the backbone, in fact, of the future club. Consequently Kelvin and I flew several times apiece, Kelvin giving several people a taste of two-seater flying, while I managed to climb out of the stronger, gustier stuff to about 3000ft(915m), where there was a nice sandwich of clean air between cloud layers. As is often the case over Gower, I had cloud underneath me while still having safe visibility due to the coast. At least it was intriguing for those on the ground to see what a microlight could do.

In the evening, that old magic worked. The wind eased, the bumps eased, and the three of us, with Kelvin's wife Annie on pillion, enjoyed a lovely long flight over the coast between 1500ft and 2000ft (458–610m) as the sun set. Even the haze couldn't disguise the beauty of the place.

That evening Modern Air Sports from Blackpool arrived with a brand new, unflown and very impressive-looking Goldwing. The forecast for Sunday proved correct — wind picking up as the day wore on and rain later — and the only flying that took place was Mick Walsh doing three test flights on the Goldwing in fairly strong conditions. It certainly looked a delight to fly, even if slightly out of reach of many people's pockets.

So ended what for me had been a weekend from which so much had been hoped for and, in the end, so much had been lost. However, nature reminded us that every cloud has a silver lining, by giving us truly tremendous conditions on the Monday. I arrived at the airport to find Kelvin and Annie going strong in the Puma and I was soon able to join them in an evening that took us a long way towards putting the weekend in perspective.

My thanks to those who came; rest assured that there remains a welcome and great flying for any who care to venture this far west. Roll on 1983!

A northern

With the first five finishers all coming from the Pennine Hang Gliding Club, the 1982 Norfolk Air Race was something of a northern wipe-out. It wasn't only southern competitors who missed out either—southern reporters had their problems too, as MIKE LAKE reports.

Three years ago, of the 12 or so competitors who staggered into the air on the first Norfolk Air Race, only three completed the course. This year all but one of 15 entries zoomed home on their slick streamlined aircraft, demonstrating the sport's accelerating technology and pilot skills. All flew trikes—perhaps pointing the way to future trends?

The organisers had somehow managed to secure a sacred piece of land on the outskirts of Norwich as competition headquarters—the Royal Norfolk Showground. When I say sacred I mean used-twice-a-year and 'trespassers will be shot' type of ground. Must have been bribery involved somewhere! A 'town and country week-end' was in full swing at the same time and this ensured thousands of spectators watching the skills of these 'powered hand gliders'. I am sure the event proved a good PR exercise.

Popham fun

By Tom and Jeannie Knight

Sunshine and light winds greeted arrivals at Popham Airfield, near Winchester, for the traditional August bank holiday fly-in this year.

Microlights began to arrive at the tiny airfield early — some by road, but with many flying in from vast distances. The event had all the ingredients of being one of the best microlight events of the year until the weather stepped in and precluded any flying on the second two days. Even so, the first day of this 1982 event saw 15 microlights taking part in an absorbing three-point cross-country task designed to test navigational skills.

The task included one out-landing, with pilots flying a set route and making observations on the way. It was not a race and pilots had been set an average time, basically a gentle cruise, as optimum.

The entire task covered about 30 miles (48km) and took 50min to complete, with pilots having to locate the number of mini-roundabouts on a

wipe-out!

Perfect weather blessed the organisers, who were aided by marshall-to-base telephones (courtesy of Securicor) and computer-controlled scoring. No problem could prevent the smooth running of this competition although at times the gremlins tried very hard.

I watched the last competitor disappear into the distance before deciding to stroll around the 'town and country' event, content that I had plenty of time before the first pilot was due home.

After a while I was surprised to see a bright coloured flash zoom into land and sprinted to see who was first. Shock! there on the landing field were nine trikes, *nine trikes!* I had missed all the winners! Not surprising perhaps, in view of the incredibly fast times for the approximately 60 mile (97km) triangular course.

The results were announced later in the afternoon with first honours going to Geoff Ball and John Hudson. They received a 'bootiful' trophy which will be engraved alongside previous winners. What prestige! They also received an engraved plate to keep, not to mention a £50 cash prize.

They flew dual on a Puma Mk2 zipping round in only 1hr 25min. Second and third places

received engraved plates with Keith Dickinson pipping Bob Calvert to the post by just one minute. Both were flying very flash 330cc Pumas. Will Reynolds earned the now traditional frozen chicken for being the slowest to complete the course. Plenty of free-flying followed with some of the dual machines giving the marshalls an opportunity to get their feet off the ground. All who took part had a good time which is really what it is all about.

Past criticism of the event, completely unjust, ensured the number of entrants were lower than the organisers would have liked, but any sceptics I am sure need only to ask the pilots, or other people who matter, for their views on the event.

Preparations for next year's race have already started with a promise of a much tougher course. The way things are going, it will need to be.

Finally a certain gentleman who was to take photographs to accompany this article was busy organising trikes, poses, trophies etc and happily snapping away like David Bailey all day long. He later learned he had forgotten to load the film.

RESULTS - 1982 NORFOLK AIR RACE

16 entries, 12 starters, 11 finishers

1 Geoff Ball/John Hudson (Puma Mk2)

1hr 25min

2 Keith Dickinson (Puma single seat)

3 Bob Calvert (Puma single seat)

4 Graham Hobson/Phil Wyles (Puma Mk2)

5 Mike Hurlley (Tripacer 330/Flexiform Striker)

dual carriageway, note the number of aircraft on a particular airfield, find the out landing area and finally find their way back to Popham. As pilots arrived at the airfield, they were bundled off on this cross-country task and Mick Steer spent the entire day recording arrivals in the out-landing field.

Dave Thomas and airfield owner Jim Espin faced the more difficult task of selecting a winner. A Popham Prop Clock — combining a 54 in (1370mm) wooden propeller donated by Huntair and a clock donated, mounted and fitted by Dave Thomas — was at stake.

The intention had been to run more tasks throughout the weekend, but the gusting winds of Sunday and Monday prevented anything other than a spectacular Sunday arrival by Dave Shrimpton in his gleaming Topsy Nipper.

Four pilots virtually tied for the prize and it was decided to give it to Tom Carroll who had flown in from Beaconsfield on his microlight — a slightly modified Ptraveler. 'He flew into the airfield from home, completed the task, and flew home again. He had no previous flying experience until he began with microlights and had only recently completed his Group D. We felt that he thoroughly deserved the award.'

explained Dave Thomas.

The three runners up were Les Bryant (Pathfinder), Tom Knight (Pathfinder) and Graham Slater (Puma).

Despite the weather on the remaining two days, pilots still found plenty to look at and talk about. One disappointment of the weekend was that the much talked about Phoenix two-seater brought over from the Isle of Wight by Bruce GidJings never took to the air. (*It has now: see p21 — ed*).

The weekend was totally free from accident or incident of any sort and it was a great pity that another fly-in was taking place simultaneously at Long Marston. There is no doubt that the clashing of the two events kept away a number of people who would otherwise have contributed to the Popham event.

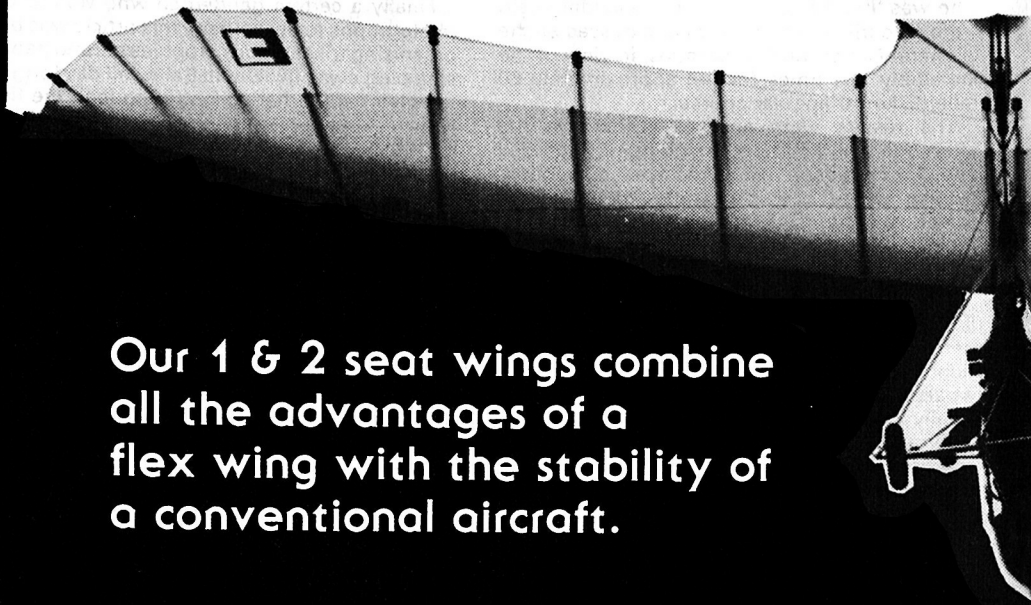
August Bank Holiday was established as a traditional Popham fly-in by Jim Espin three years ago and its popularity is undiminished. Possibly organisers of other events could avoid August Bank Holiday in future years so that there is no clash of interests.

Finally, to end on a more positive note, money raised at Popham 1982 is to be handed over at the BMAA AGM for the Fighting Fund.



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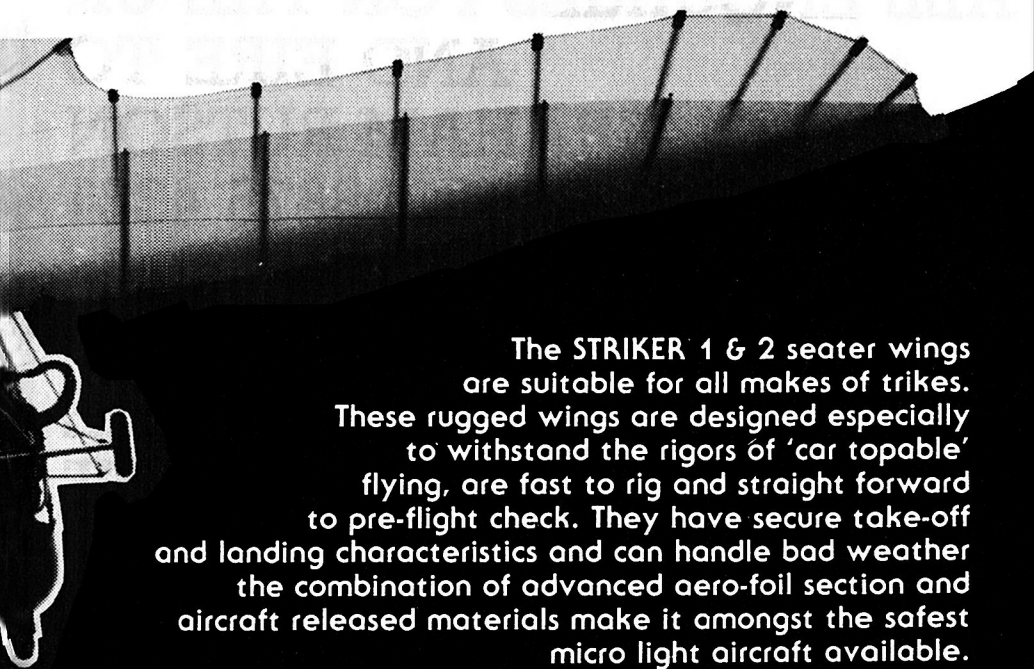


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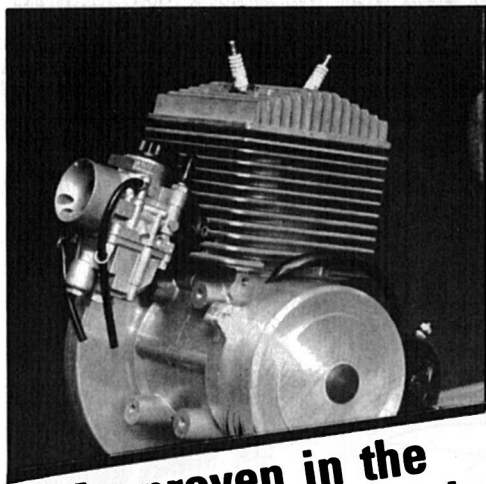
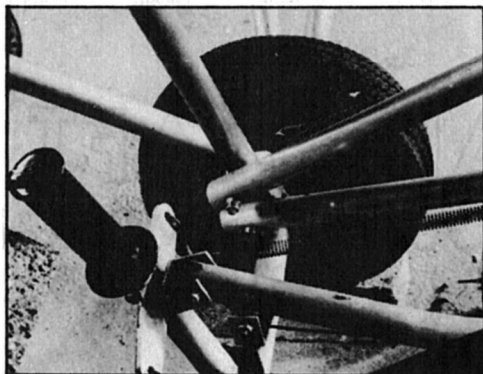
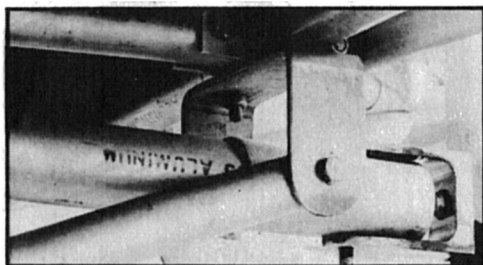
Anatomy of

PETER LOVEGROVE takes a dispassionate view of the Weedhopper B.

A few years ago Michael Langton went to the States to survey, amongst other things, the range of microlight aircraft available at that time. He came back home very much impressed with the Weedhopper; in fact, he was *so* impressed that he promptly sent off an order for a machine, including the then-new double-surface wing and Chotia 460 engine.

After almost a year of waiting and prompting Weedhopper Inc, his aircraft arrived. Sadly, once he had assembled it, he was so dismayed with the appallingly crude construction and more obvious design weaknesses that he would not risk his neck flying it. It was subsequently sold unflown.

Gordon Cleophane built a Weedhopper and found to his annoyance that, although the machine was very pleasant and easy to fly, the Chotia 460 engine was next to useless. Weedhopping was darn nearly all the aircraft would do! Investigation showed that the engine had a liner slid loosely into the barrel and held there with a screw. Anyone who knows anything



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- * Electric start, dynamo, dual electronic ignition
- * Weight 46 lbs plus silencer and battery
- * 3 bearing crankshaft
- * Price £295 + VAT



All drive components and props available from sole UK distributors:

Skyhook Sailwings Ltd, Vale Mill, Chamber Road,
Hollinwood, Oldham, Lancs OL8 4PG
Tel. 061-624 8351/3427
Telex 667849 Holmes G.

an aircraft

about two-stroke engines and their required gas flow will know the level of result to be expected with *that* sort of set-up—especially when the different rates of thermal expansion of aluminium alloy and steel begin to take their toll!

Robert Simpson had a B model Weedhopper and was driven to modify a motorcycle engine to replace the Chotia 460 engine, although he finally became so cheesed-off with karting it that he sold the aircraft before actually testing it with the motorcycle engine.

Other Weedhopper owners have slung the Chotia and installed Robin engines so as to get airborne reliably and acceptably; Don Roberts is one example.

OK, so it can be truthfully said that the Weedhopper, although only a 2-axis machine, is generally considered very pleasant and easy to fly. It is, one might say, a bit on the sedate side—rather an elderly gentleman's flying machine—which could be the basis for part of Paul Bennett's criticisms, since so many of today's 'standard format' aircraft are fairly zippy (and getting zippier!). However, if the aircraft which he flew was underpowered, it *would* have been very sloppy and mushy to operate. Aircraft do not like struggling around underpowered and

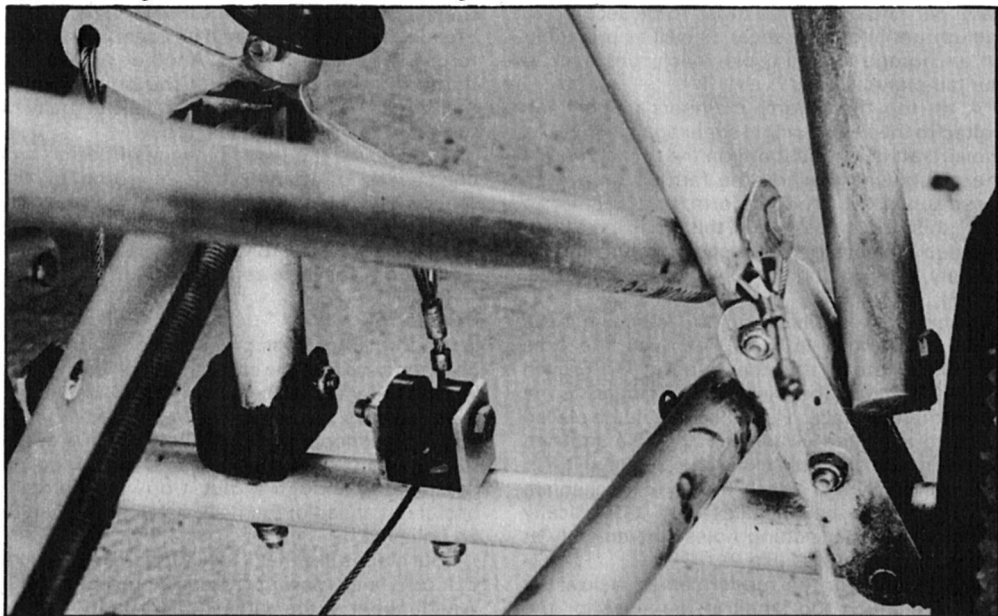
just above the stall. As for the suggestion that the engine was not run in, Chotia 460's have a reputation for being worn out by the time they are run in!

About the time Michael Langton was waiting for his machine to arrive, I was looking for some microlight machine with a proven format and flying characteristics to suit an elderly gent like me (gold medallist in gutlessness for British West Hartlepool). I nearly weakened and ordered one but when I saw his craft I was glad I didn't. Nevertheless, I still liked the basic wing/empennage/fuselage layout and resolved to build a machine based on the proven bits but without the amateurish design faults and agricultural construction.

No doubt, if Weedhoppers are going to continue to sell, they are bound to improve in detail as Mr French suggests they have, but most of the machines about in the UK at present are appalling, in my opinion. The sails are cut as if by a bread-knife and the finish of brackets etc is extremely rough; few machines are anodised, except the most recent. None of these faults, however, would make me too upset, for they can mostly be rectified. What cannot be easily rectified, if one is assembling a standard kit, is the dreadful, ill-conceived engineering design of the detailed sub-assemblies. I have mentioned some of these in previous articles, but let me put some of them together in one presentation.

Taking the tailplane first, many owners find

Upper left: Fig 1. Lower left: Fig 2. Below: Fig 3.



that they run out of adjustment on the plate which allows the pitch of the tailplane to be altered. The tailplane/elevator assembly also rocks about and sensible owners end up putting extra cables from the outer ends of the spars down to the base of the stern-post.

The channel-section fitting which supports the tailplane spar has two bolts passing vertically through it, at the point of maximum stress in the spar (Fig 1). Remember that tailplanes spend much of their time providing down-force and even an extra pair of cables to the stern-post will not remove or lessen the tensile stress experienced at this point on the spar.

The fabric covering the tailplane has crude cut-outs in the corners of its plan-form, which leave the fabric there simply flapping about. Most owners are driven to glue it to the frame tubing.

The booms from the rear of the A-frame to the tail-end of the fuselage boom are terminated by a single bolt which also pivots the tail-plane. This is virtually a single-shear joint, not at all suitable for taking the forces generated by the large inertia of the tail surfaces during high-g bounces across a grass field.

The elevator push-rod is secured to the horn with a bolt and Nylok-style nut, *not* a pinned castle nut.

The A-frame (the two tubes rising from the axle to the main fuselage keel-member) has three pairs of tubes attached to it, all liable to be quite highly loaded at times and *all* in single shear, (Figs 2 and 3). A single pair of plates would have permitted all three tubes to be secured to the upright in double shear as well as providing an anchorage for the cable which runs back to the tail-plane (Fig 4).

At the top, the A-frame members are bent and bolted to the keel in single shear again (Fig 5). As the aircraft is loaded (both on the ground *and* in the air, but particularly the former, on grass), these tubes will try to deform, and attempt to bend this single bolt. Again, this could have been avoided by the expedient used on other aircraft, namely, a second bolt and spacer *below* the keel (Fig 6).

Brackets everywhere on the machine have their attachment hole in line with the hole carrying whatever tube they support (Fig 5), even when the latter tube is not at right-angles to the attachment surface. The holes should be placed so as to align the thrust or pull of the attached tube with the bolt hole fixing the bracket (Fig 7).

The bolts which attach the stick mechanism and the rudder-cable pulleys are all vertically through the axle, putting holes conveniently at points of high stress (Fig 2).

The pulleys for the rudder cables, below the stick, are much too small in diameter for the

cables to survive in the long-term the resultant excessive bending.

But worst of all in my opinion—and events have already proved it—is the dangerous method of attaching the bent struts to the outboard ends of the axle with one bolt in single shear (Figs 8 and 9). As the wings bounce up and down, both on the ground and during flight, the bends in the struts try to straighten out or bend more, so bending the bolt in the process. It is virtually inevitable that the bolt will break eventually, letting the front and/or rear struts go free. (Both failures have already occurred overseas).

The engine-mounting and front of the fuselage assembly received special comment in the letters. To say that the installation has been 'designed' to balance torque against mass offset is rubbish. The whole front end is so flexible that the arrangement is a poor compromise to try to alleviate conditions which shouldn't be there in the first place! The addition of spacers and the consequent use of a larger bolt (in single shear of course) between the two tubes coming up to the front fuselage-keel from the A-frame, is yet another ineffective attempt to provide some much needed, but sadly lacking, torsional stiffness at the front end.

The actual bracket on which the engine hangs is crude, as are *all* of the alloy castings, made 'in house' by old techniques. Figure 10 shows the brake pad. As you can see, the use of rough, heavy sections is a poor substitute for proper design.

I would go on further, but I imagine you have the message by now. Nevertheless, I *still* like the Weedhopper's concept and its capability to be a forgiving aircraft in flight. Another point to be borne in mind is that *all* of the points I have mentioned have their direct parallels in many of the other machines on sale today.

God knows, the incompetency of design and coarseness of manufacture of some of the machines available today makes them, in my opinion, quite unfit for the task for which they are sold. Roll on the BMAA/CAA Airworthiness Standards. They are sorely needed.

Postscript

Since this article was prepared for publication, Stephen says that the criticisms levelled at the A Weedhopper—has been in touch with me. Stephen says that the criticism levelled at the A and B Weedhoppers are certainly not true of the C. He claims quality of manufacturing is outstanding enough to put it up with the very best if not ahead of them all; it has to be seen to be believed.

With claims like that, I look forward to seeing a C model and making a fresh appraisal of the Weedhopper at the earliest opportunity.

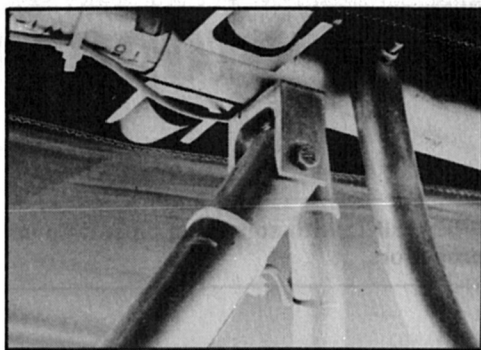
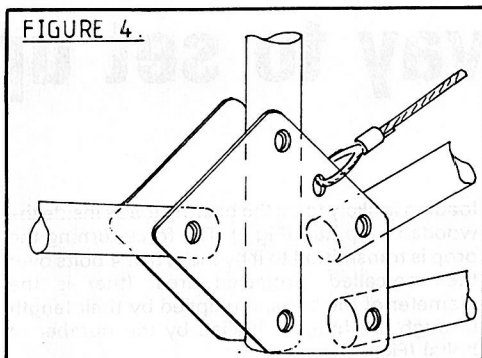


Fig 5.

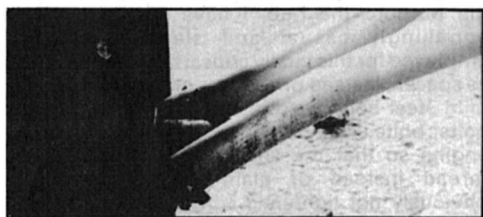
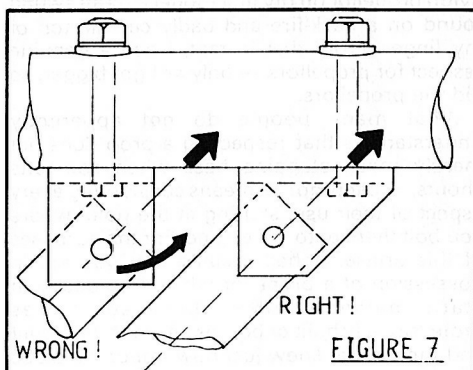
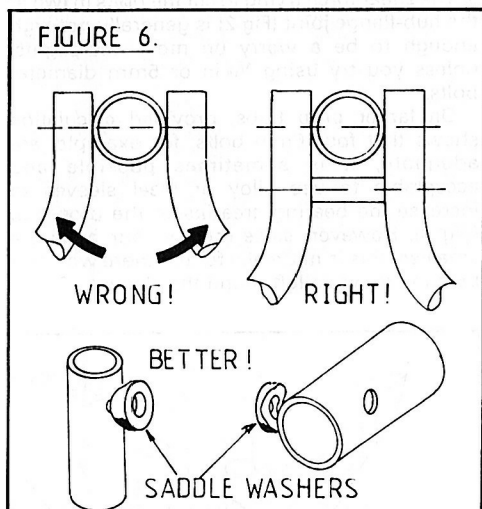


Fig 9.

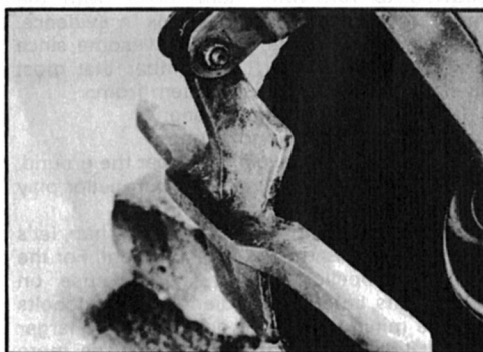


Fig 10.

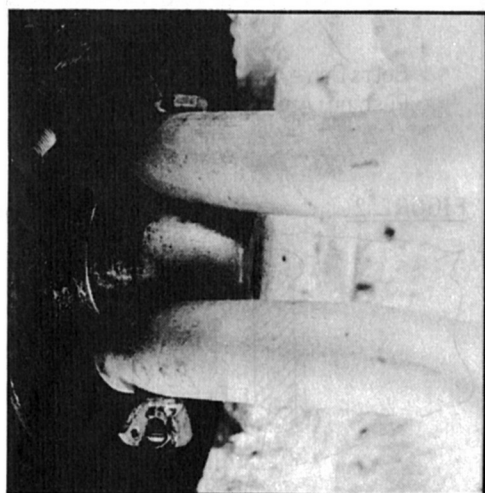


Fig 8.

The proper way to set up

ERIC BRIND with some tips on setting up propellers.

I was only knee-high to a sparrow when the tiny nylon propellor on my first model aircraft swung round on a back-fire and badly cut the top of my finger. From that instant, I had a genuine respect for propellers — only as I got bigger, so did the propellers.

What many people do not apparently understand is that respecting a prop does not merely mean stepping back when someone shouts, 'Clear prop!'. It means considering every aspect of their use, starting at the point where you bolt them onto the engine. For the purposes of this article, I shall assume that you are in possession of a propeller which is properly in static balance, either because it was professionally built or because it was home-built and the builder knew just how important static balance is.

The first thing we have to do is accurately to fit the prop to the hub. I have seen the most appallingly casual and slapdash fixings employed for this vitally critical task — nuts used as spacers instead of washers or turned spacers; mild steel bolts used instead of aircraft-quality bolts; bolts used with their threads towards the engine so that the shear-forces are taken by thread instead of plain bolt-length; bolts obviously not tightened correctly; bolts which have been tightened *after* the prop has been allowed to run with them loose, with the resultant varnish and paint burns in evidence. The list seems endless, which is awesome, since it shouldn't even start! Remember that most flying accidents and injuries stem from:-

- (a) Take-offs which go wrong,
- (b) Landings which go wrong,
- (c) Stalls which develop too near the ground.

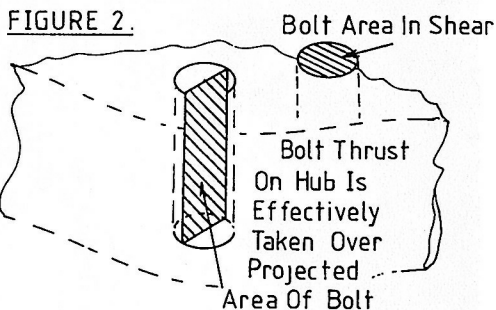
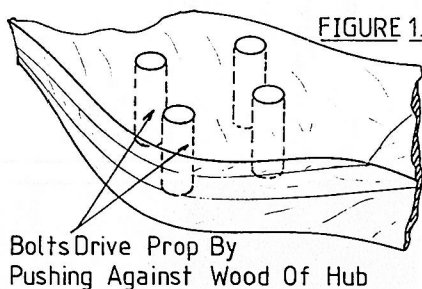
In all of these, the engine and propeller play major roles.

Before describing alignment on the hub, let's stay with nuts-and-bolts for a moment. For the size of propeller now in general use on microlights, 6mm (or $\frac{1}{4}$ in) diameter aircraft bolts are the minimum size to go for. On the larger twins, 8mm (or $\frac{5}{16}$ in) will probably be more appropriate. Remember that the most important

loading is likely to be the bearing loads inside the wooden prop hub (Fig 1). The force turning the prop is transmitted to it by these 3 or 4 bolts over their so-called 'projected area' (that is the diameter of the bolts, multiplied by their length through the hub, multiplied by the number of bolts) (Fig 2).

The shear force trying to cut the bolts in two at the hub-flange joint (Fig 2) is generally not high enough to be a worry on most microlights, unless you try using $\frac{3}{16}$ in or 5mm diameter bolts.

On larger prop hubs, provided calculation shows that four 6mm bolts, for example, are adequate, it is sometimes possible and acceptable to use alloy or steel sleeves to increase the bearing area inside the prop hub (Fig 3). However, since most of our hubs are smallish, this is not really for us; there wouldn't be enough wood left round the sleeves.



a prop

Next point: the whole of the working part of the bolt *must* be plain length. That is to say, where the bolt pushes against the engine prop-flange, the prop-hub itself, and the outer pressure flange, it must be plain (Fig 4). The thread is for fitting the nut, not for transmitting torque! Incidentally, I have heard the outer flange described as simply a plate to hold the heads of prop bolts, like some oversized washer. It *does* do that but, more important, it also transmits driving torque to the propellor. This is one reason why it should be properly machined and have the bolt-holes correctly drilled and reamed, and also why the bolts should be in reamed holes in the prop, at right-angles to the prop-hub face.

The bolts should be fitted with an adequate number of washers — or disc-springs; see below — to prevent the nuts binding on the root of the threads when torqued (Fig 5). The nuts should be

castellated and fitted with split pins. Nylok and Simmonds nuts etc are *out* — this is too critical a fixing to rely on friction alone.

It is very difficult to manufacture the hub faces of a wooden propellor totally flat, so it is usual to put a filler washer between the flange and the prop-hub, (Fig 6). I have successfully used oiled thick brown paper, thin ($\frac{1}{32}$ in, 0.8mm) cork-rubber gasket material and $\frac{1}{32}$ in asbestos-based gasket material. (It must *not* be thick). This gasket tends to flow into the roughnesses of the flange and prop hub, keying them firmly together.

The hub nuts should all be torqued to the same value, but what value is hard to say. I torqued three different propellers of identical type and size and, on one of them, the hub crushed noticeably on one side as soon as I began to raise the torque to the same value as used for the other two. So seek the best advice you can get for the type of prop you are using and watch for crushing as you apply the torque. Adjust the torque as necessary.

I noticed a very neat idea in use on the gyrocopters at the PFA Leicester rally. They use a stack of disc-spring washers on each prop-hub bolt (Fig 7). These are pulled down flat and exert a thrust along each prop-bolt. If the wood of the

FIGURE 3

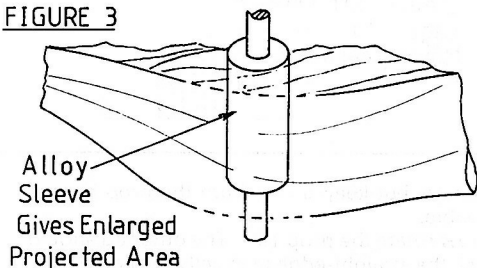


FIGURE 4.

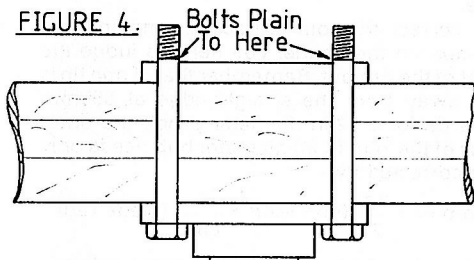


FIGURE 5.

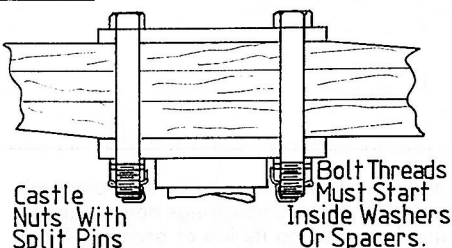


FIGURE 6

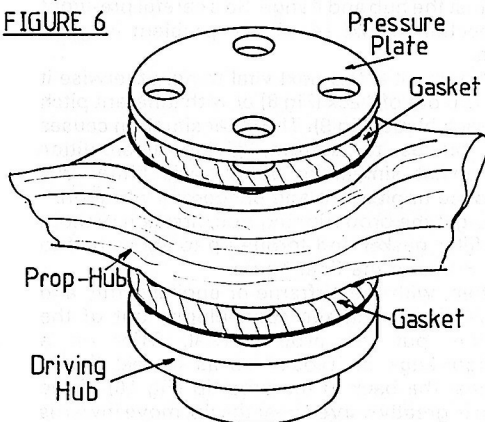


FIGURE 7.

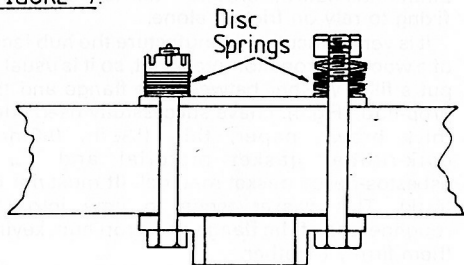


FIGURE 8.

Propellor
Running Out
Of True (Out
Of Track)

Tips Follow
Two Separate
Circular Paths

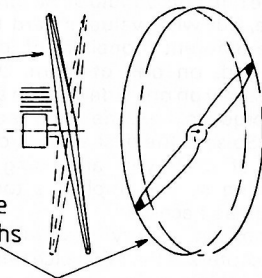


FIGURE 9. Prop Blades Not Set Equally Pitched

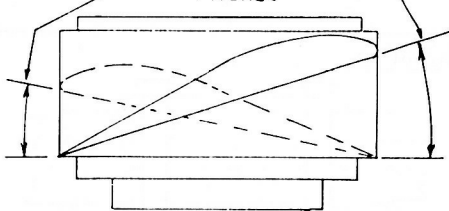


FIGURE 10.

Propellor
Tip
Straight-Edge
'Kissing' Rear Of
Prop

Wood
Blocks

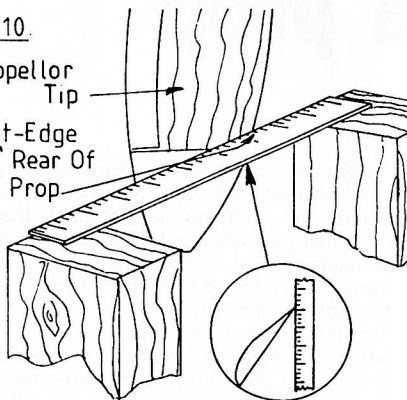
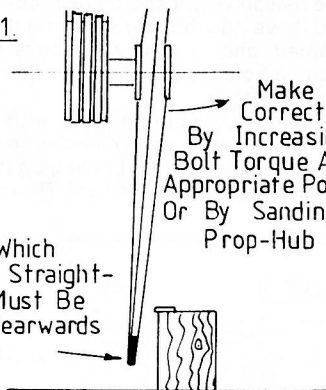


FIGURE 11.

Make
Correction
By Increasing
Bolt Torque At
Appropriate Points
Or By Sanding
Prop-Hub

Blade Which
Clears Straight-
Edge Must Be
Moved Rearwards
At Hub



prop-hub should shrink, as it can do, a crack will appear between the disc-springs before the bolt actually ceases to do its job of pressing firmly against the hub and flange. So a careful pre-flight inspection would reveal the problem in good time.

Alignment is the next vital thing, otherwise it will run out of track (Fig 8) or with different pitch on each blade (Fig 9). The latter situation causes the blades to deform, giving a condition somewhat similar to out-of-track. Either will produce unpleasant and dangerous vibration.

To get the prop running true, first fit it without the filler gasket and torque up to about half to two-thirds of the final figure.

Then, with the airframe or engine firmly and stably fixed, and the spark-plug(s) out of the engine, put the prop vertical. Offer up a straight-edge on blocks, so as to rest lightly against the back of the prop tip (Fig 10). If the prop is greatly curved near the tip, move inwards to where it is straighter to make the test more

accurate, but keep as far from the prop hub as possible.

Now rotate the prop 180°. The other tip should touch the straight-edge in exactly the same way. If it is clear of the edge, the prop-hub needs to be tilted backwards on the engine flange, near that blade (Fig 11). If it pushes the straight-edge away, reset the latter and recheck the other blade.

To correct this out-of-track by moving the prop-hub on the flange, you need to judge the extent of the run-out. Remember that, if one tip is 2mm away from the straight-edge at 660mm radius (ie for a 52 in diameter prop), the outer radius of the 76m (3 in) diameter hub needs only to be corrected by:-

$$2(\text{run-out}) \times \frac{76}{2} (\text{hub rad}), \times \frac{1}{660} (\text{blade rad})$$

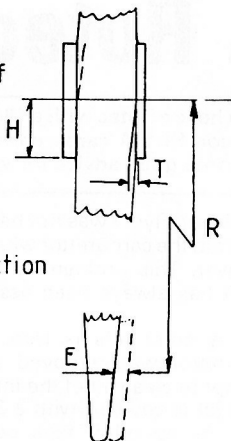
$$= 0.11\text{mm} = 0.004 \text{ inches at its outer radius.}$$

(See Fig 12).

This order of run-out can usually be corrected

FIGURE 12.

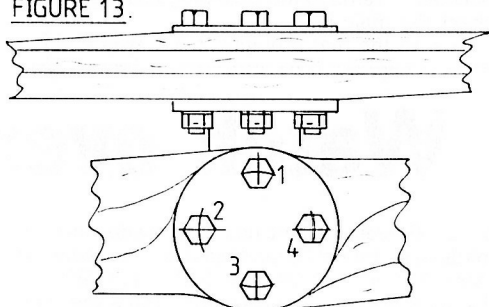
For Correction Of
Run-Out Error
E At Radius
'R', By Moving
Back On Hub
At Radius 'H':



Required Correction

$$T = \frac{E \times H}{R}$$

FIGURE 13.



If Bolt No 2 Is Raised In Torque, Bolts
1 And 3 Must Also Be Torqued A
Little Extra. Use Torque SPARINGLY!

FIGURE 14.

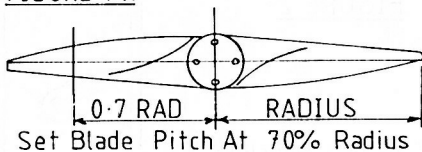


FIGURE 15.

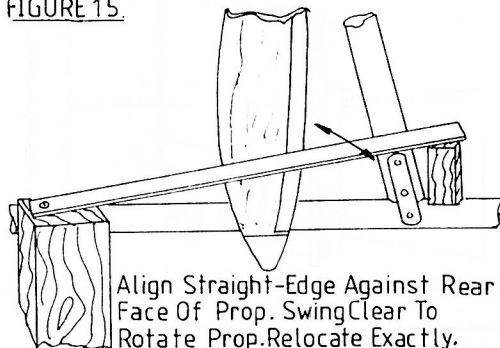
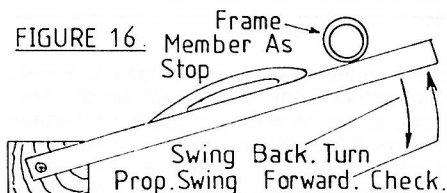


FIGURE 16.



on the final installation, by a fractionally higher torque on the bolt on the side which is 'trailing'. Do this in a series of *very* small steps, checking the effect as you go. Remember that, if all the bolts are torqued and you then raise the torque on one, you will almost certainly have to increase it a little on two others (Fig 13).

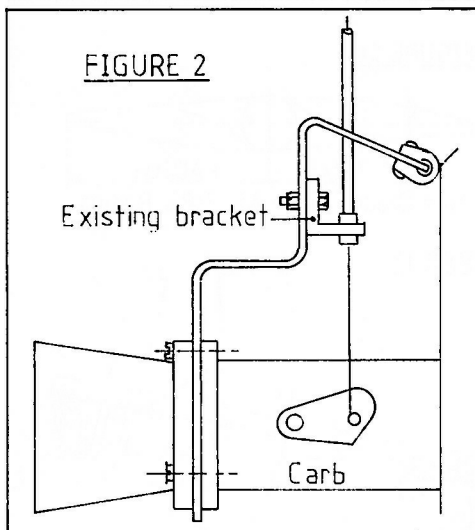
To check the prop-pitch setting, you do the tests at 70% radius. (Fig 14). Again, with the engine stably supported, make up some arrangement that allows you to hold a straight-edge against the flat back of the prop, at its actual pitch angle, (Fig 15). This straight-edge has to be swung out of position, to permit the prop to be rotated 180°, so the support has to allow this. One way to achieve this is to mount a long strip of wood with a wood-screw on a block. Fix a metal edge to the wood with sticky tape and position the wood strip so that it abuts against a frame member of the aircraft when the metal edge is exactly against the flat back of the prop blade (Fig 16). Set the edge against the blade,

identifying the exact location of the strip. Then pull the strip aside, rotate the propeller *exactly* 180° and then reposition the straight-edge to touch the prop. It should come to rest flat against the blade. If it does not, the prop is wrongly attached to the hub and must be adjusted, generally as for the tip-to-tip axis.

Adjustment for pitch errors — *across* the hub — may be made by bolt-torque settings, if the error is small, as for the out-of-track condition. If the error is large, for either condition, the hub must be sanded or lightly planed to get the necessary correction. Once the error has been removed, the bared hub surface should be painted with polyurethane clear varnish or similar.

Only when you have achieved a prop-fitting which is correct in both axes, should you fit the filler gaskets, castellated nuts and split-pins and torque the bolts to their final value. Do not forget to repeat the alignment checks when you have done all this.

FIGURE 2



A Rotec tip

If you have a Rotec with a 180cc Solo engine and Tillotson HR19A carburettor, then J F BISHOP has some good advice for you.

As a Rotec Flyer I was not happy with the drip of fuel from the carburettor when the engine was at tick-over. This problem is common on Rotecs and it has always been assumed to be a carb fault.

To a point this is true. To start with the carburettor was removed and stripped in an attempt to clean all of the internal parts, but the main jet is covered with a 3/8 in (9.5mm) core plug. As no other fault could be found, we decided to remove the core plug (not easy) and check the main jet.

Now to the real problem: there was nothing

BRIAN HAYES of Haze Sails with some advice on sail manufacture and maintenance.

Watch over

It is only eighteen months since Haze Sails was asked to produce microlight sails for the first time and, as we have moved gradually further from the world of sailing dinghies and into the expanding microlight market, a number of matters have come to our attention which may be worth discussing.

At an early stage, we carried out some careful material comparisons and discussed fabric choices with the British manufacturers and the importers of the best overseas fabrics. The manufacturers all err—rightly—on the side of caution and specify their best quality fabrics for microlights and hang-gliders. These are materials woven from high-tenacity yarns, which give the lowest stretch. The use of second-quality materials is never recommended. The price is perhaps 50% higher for these high-tenacity fabrics than, for example, the cost of the material found commonly on the sailboards that we see around the coast. Their sails are generally made from less tightly-woven fabrics using medium-tenacity yarns. Quite rightly, we have to pay more for a 'life-support system' and amateur sailmakers or prospective microlight designers should bear this in mind when ordering materials and working out their costs.

Cloth weights invariably cause confusion; sail fabric is called 'Terylene' if manufactured in the UK and 'Dacron' if manufactured in the United

States. Polyester fabric has other trade names if made in mainland Europe but it is all broadly the same. The differences come in the yarn tenacity, the tightness or openness of the cloth weave and the type of coating and finishing applied by the cloth finishers. Due to some aberration of our colonial forefathers, the Americans were apparently never taught how many inches there were in a yard and they traditionally cut all their material 27 in (69mm) wide instead of 36 in (92mm)!. This gives a single piece of material two weights; an American weight per running yard of 3.8 oz is the same as 5.0 oz British weight (multiply by four and divide by three to translate American to British) and you will find that this is the weight chosen for almost all microlights. Sailcloth manufacturers throughout the world produce large quantities of material in this weight band. So forget the confusion.

A manufacturer using 3.8 oz or 4.0 oz material is almost certainly using imported Dacron from the States; very often from the Howe & Bainbridge company, while another manufacturer using 5.0 oz or 5.2 oz material will equally certainly be using British Terylene from the British weavers Vectis, Windmaster, or Richard Hayward. It will all really be the same weight to within a few tenths of an ounce and with quite similar characteristics.

An early question that we asked in order to avoid obvious mistakes was: 'How many

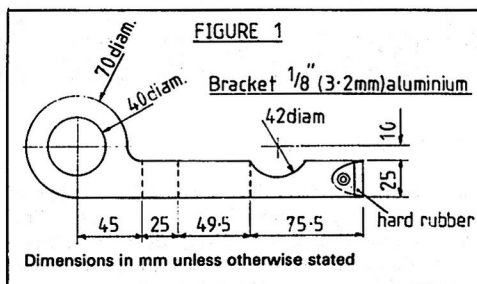
wrong with the jet, but it is an unusual device as jets go, consisting of a brass body with a small 3/32 in (2.4mm) nylon ball inside, which when the jet is one way up seals the opening and when the other way up leaves the jet wide open. This was the clue, because when the jet is installed in the carburettor, the way that it is fitted on the engine ensures that the whole thing is upside down!

Some telephone calls to Ian Stokes at S W Airports, and to Clive at Western Sky Sports confirmed this and the helpful comments from these gentlemen convinced me that refitting the carb the other way up was worth the work.

The problems are as follows:

- 1 It is difficult to tighten the front carb mounting nut—difficult but not impossible.
- 2 The throttle linkage has to be moved 180°. This requires making a bracket (Figs 1 and 2).

The work involved is worth every minute. The engine ticks over smoothly without any flooding or fuel drips and picks up smoothly when the



throttle is opened, without any hesitation. I would suggest extreme care setting the slow and fast jets after this mod, as the jet adjusters now face rearward, toward the prop.

The system I used was to set both jets 3/4 of a turn open, start the engine and test both tick over and full power, stop the engine and open/close the jet(s) 1/8 of a turn at a time until everything was right. I would like to thank Graham Bingham of the Moorland Flying Club for his help.

your wings

reported accidents have resulted from sail failure, as opposed to human error or failure of other components?' The answer was 'So far, none in the UK'. This could lead us to complacency but we believe a number of sail problems could be lurking just around the corner.

I have two particular points relating to the life-span of sails. So far the microlights in this country are very new, like W, X and Y-registration cars, which have yet to show which areas are prone to rust. On boats, it is clear that sunlight affects sail fabric and the thread used in the sewing very badly. This is most obvious on boats that are left on moorings during the summer, with sails furled around the mast and boom. Often, a 3 or 4 in (76—102mm) section of sail is left uncovered and the result is an extraordinary line of weak sail cloth and powdering thread next to a large expanse of near perfect sail. The lesson to be learned from the sailors is that microlights must not be tethered outside for weeks on end in the summer or the result, after a couple of years, could easily be fatal. However easy it is to tether, especially for the people involved in training and needing to keep aircraft flying, every sensible opportunity should be taken to keep them hangared. Don't let this keep you from flying but *please* bear in mind the effects of long-term exposure.

Keep an eye open, too, for worn stitching on

your sails and don't go too far in expecting repair tape to keep you in the sky! It is very efficient at holding torn edges together to stop further *immediate* damage but it is not designed to take loads in critical places. (Make particularly sure that you check what is hidden under repair tape if you are buying second-hand). So let a sailmaker, who knows about microlights or hang-gliders, have your sails for repair if you have *any doubt at all* and please start to get into the habit of a routine annual overhaul. This is particularly easy if you give up your flying in the winter.

And please, if you are going to do amateur repairs or sailmaking, speak to a professional first. I have already warned one prospective sailmaker that the trade has so far not found a glue which will hold sails together without additional stitching. This was a serious question; no doubt modern technology will give us the glues soon. But, in the meantime, don't use Bostik and prayer—remember what happened to Icarus—don't do the same.

Licence applicants please note

There is an error in the first paragraph of the document *Do You Read Me?*, which was enclosed with the last issue of *Flightline*. Contrary to what the document says, the only medical certificate needed is the simple *FCL Form 150 AB*, even for two-seater pilots and instructors.

Also, in the second paragraph, the reference to 'Approved (CAA/BMAA) Training Establishment' should of course read 'Approved BMAA Training Establishment', since the CAA is not involved with the BMAA Registration & Approval Scheme.

How not to build aircraft!

By Peter Lovegrove

Because the construction of the third version of my own-design microlight was proceeding rather slower than anticipated, I decided to buy a second-hand trike-Rogallo combination to fly until I had finished my building work. So, after a merry little 826 mile car-trip in 18 hours, partly through a snow and sleet blizzard, with the loading and inspection of the machine done in appalling weather conditions at the half-way mark, I was duly the proud (?) owner of a trike-Rogallo set-up. Fine, so now my eager sons and I could go flying . . .

No way! When I came to look at the trike in broad daylight, refreshed and awake, I knew that I was never going to suspend myself or my kinfolk in such dreadful workmanship! I won't name the manufacturers, not because I cannot prove everything I say, but because I simply don't want the boring aggravation of wasting time doing so.

Could not the faults have been the work of the first owner? Not really — what person buys a machine and in a couple of months of active flying dismantles it all to make it unairworthy, and anodises over his poor workmanship? I am

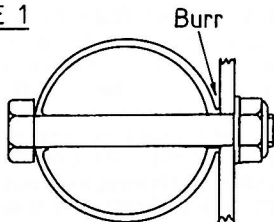
sure the machine was sold this way and I have seen others to prove the point.

Let us begin with the smaller faults, relating to the improper use of bolts.

1. Although the bolts are 6mm diameter aircraft bolts, all holes are drilled $\frac{1}{2}$ in (6.35mm) diameter. They should be drilled and reamed 6mm diameter. I had to use $\frac{1}{2}$ in diameter aircraft bolts to fill these sloppy holes.
2. The holes are not, in the main, properly deburred. Therefore, brackets and plates do not rest properly against the tubes and show signs of wear due to vibration as the burrs have tended to fret away. (Fig 1).
3. Almost all of the bolts are too short (Fig 2). They have thread pushing against alloy tube, which is very wrong. Because of its small load-bearing area, the thread will cut into the tube and the hole will enlarge easily under vibration — obviously most undesirable. The bolts should have been plain length resting against the tube (Fig 3) at both ends of the diameter.
4. To make matters worse, on some of the bolts, the component being attached to the tube was on the *thread* end of the bolt, ensuring that both tube and component will suffer from vibration-wear (Fig 4).
5. Worst of all, two stainless-steel lugs on the ends of cables were on the threads of bolts and spaced by washers (Fig 5). The very high local loading associated with a cable at a small angle to the tube on which it pulls, means that either the thread must wear quickly or the hole in the lug must enlarge, or both.
6. Several of the bolts, including two in the head plates, were of the mild-steel general-purpose type. Most were commercial (hopefully high-tensile) bolts, not aircraft grade.
7. Bolts which supported the engine-plate in the rubber isolation mounts were not fitted with castellated nuts and split pins.

On the engine installation there were several bad features. The bolts holding the support cables and the struts to the channel sections were again too short and overtightened, deforming the channel (Fig 6). I simply used tubular spacers, spacers for the thimble, and bolts of the correct length to bring the channels

FIGURE 1



Burr Prevents Correct Clamping Of Component To Tube. Vibration Destroys Burr; Component Becomes Loose.

FIGURE 2.

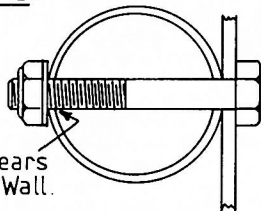


FIGURE 3

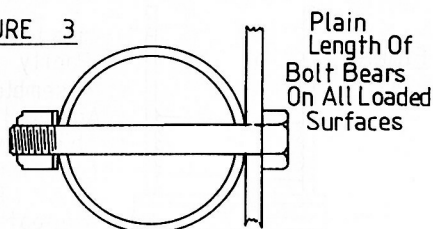


FIGURE 4.

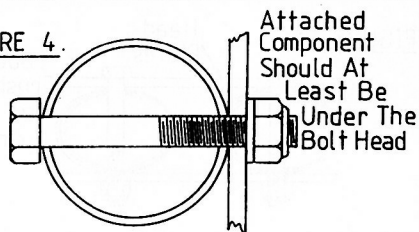


FIGURE 5.

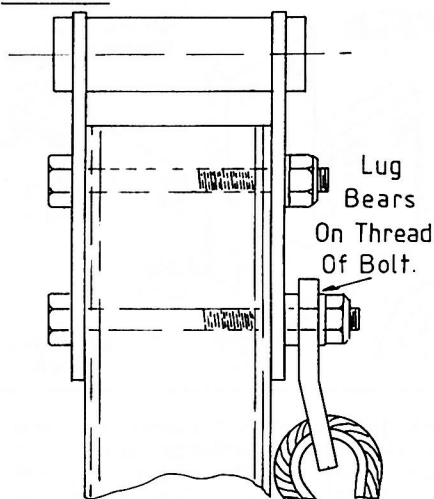


FIGURE 6.

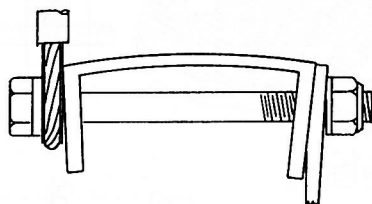


FIGURE 7.

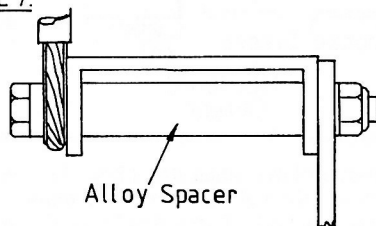


FIGURE 8.

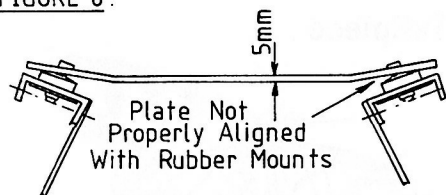
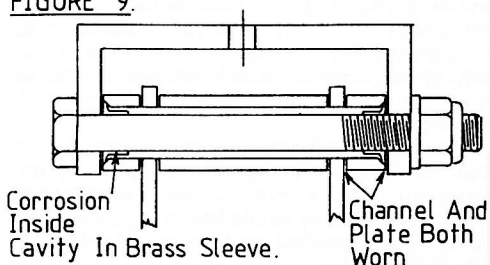


FIGURE 9.



back to their correct shape with the cable and strut properly secured (Fig 7).

The main engine bearer plate is only 5mm thick and was already deformed, presumably by a few bouncy landings, though a few rough-field take-offs would have produced enough g-force to cause the same result. This alloy plate also has fairly deep scribed lines next to the marks where a bending brake has folded it; (all anodised, of course!). The actual bends are not of the correct angle to place the ends of the plate correctly over the axis of the rubber isolation mounts, even allowing for the 'acquired' bends (Fig 8).

The construction of the gimbal-head unit was to my mind abominable. Alloy and brass should never be exposed to rain together unless kept thoroughly greased; otherwise they corrode electrolytically at a frightening rate. So it was no surprise to find that the alloy-and-brass bush through the head-plates was corroded, apparently never having seen any grease. It had abraided the surfaces of both the head-plate and the channel section (Fig 9). The head-plates were bolted to the top of the frame-tubes which had no spacers or wooden plugs, only an internal sleeve. The bolts were so tight that the internal

FIGURE 10.

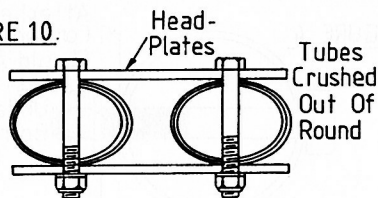


FIGURE 12

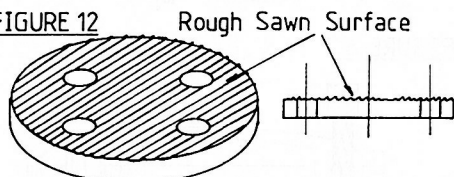


FIGURE 13

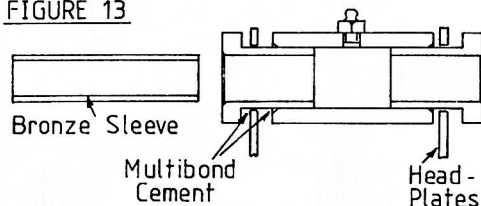


FIGURE 11.

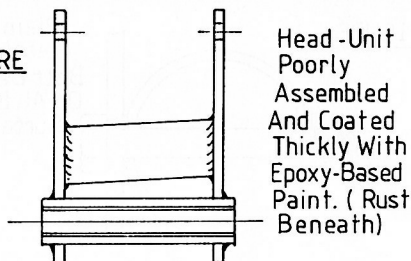
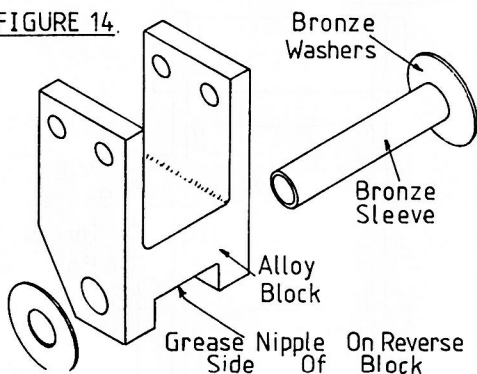


FIGURE 14.



diameter of the tubes was 2.5mm less along the bolt axes than at right angles to them (Fig 10).

The top part of this head-unit shows every indication of unskilled manufacture. A square-section tube is welded between the two flat plates at a very poor approximation to right-angles (Fig 11). The whole mess is coated with epoxy spray-powder paint, presumably to cloak the shoddy workmanship under its thick flowing lines.

My chosen methods for improving the gimbal head are shown in Figs 13 and 14. I do not suggest these would be acceptable commercially; they would be too expensive. But some similar method could be contrived which would be viable.

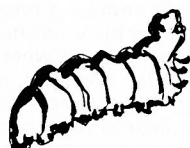
The flange on the outside of the propellor hub (Fig 12) was machined on its outer face, but the inner face was in its original crude rough-sawn condition. The face of the propellor hub was crushed by these rough corrugations, with the varnish cracked and waiting for oil to soak in.

Summarizing all of this, instead of having a machine which I could go and fly while leisurely building my own, I had to stop work on mine and put right these unairworthy attempts at engineering. So now I'm building two microlights!

I only hope manufacturers are going to raise their standards in the future. There is no way any

Airworthiness Board examiner would ever let machines like this receive any kind of Permit to Fly or Certificate of Airworthiness. The quality of a lot of craft is going to have to rise and rise steeply, if the manufacturers want to stay in business (and if we pilots want to stay alive).

Tailpiece . . .



You'd never get me up in one of those!

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New planes galore!

Diehl Aero-Nautical's eye-catching XTC attracted a lot of attention.

GLENN BRINKS reports from the mecca of US sport aviation — Oshkosh '82

Every year, Oshkosh is a showplace for the latest designs, airplanes, kits, engines, accessories and anything else connected with homebuilt and sport aircraft. But this year, the ultralights were the leaders in new designs and new products. It seemed like every other model shown was a new one. There were aircraft done in welded steel and fiberglass, folded and riveted sheet aluminum, wood and doped fabric and traditional hang-glider tube and Dacron. Layouts ranged from conventional tailed strut-braced monoplanes to a canard amphibian.

Until recently, engines have been a continuing problem for ultralight pilots and designers, but after this year's convention, the biggest problem will be choosing the best one from the multitudes available. There were so many new engines shown that almost every new ultralight could have its own engine without duplication.

Most were two-strokes, of course, but there was one four-stroke, and the two-strokes came in virtually every possible form. From simple, slow-revving singles to exotic four-cylinder radials (there were two), the engines showed how many people are betting on continued growth of the ultralight industry.

Based on the numbers, those bets are probably safe. From John Moody's appearance in a powered Easy Riser a few years ago, the ultralight presence at Oshkosh has climbed dramatically each year. This year 280 ultralights registered, nearly double last year's figure of 161.

And that figure doesn't include the many pilots who would have shown up if the EAA hadn't scheduled an ultralight convention in Oshkosh only a few weeks later, just far enough away to require pilots to make two trips. If the ultralight

convention had been held consecutively with the main fly-in, many people reckoned there would have been well over 500 ultralights.

Despite having to compete with the ultralight convention, the ultralight section of the fly-in was jammed. Planes were parked in fields left vacant previous years, and the commercial area was at least twice its previous size. All week the crowds came and watched and bought. One manufacturer said he sold 28 ultralights by mid-week.

In addition to the airframe manufacturers, there were all sorts of accessory companies, and they did a land-office business in reduction drives, strobes, instruments, fittings, and agricultural spraying equipment. Freelancers wandered the ultralight area doing everything from selling kit-built airspeed indicators to measuring people for custom flight suits.

The crowds didn't come for the commercial exhibits, they came to watch these strange featherweight machines fly. And they weren't disappointed. When the ultralight pattern was open, 30-40 machines would be in the air at one time.

So many pilots wanted to fly that they had to alternate their flying. After taking off, pilots were asked to do only two circuits of the smaller, inside pattern, and then land and get back in line, giving the next pilot a chance. A larger pattern was also in use, and pilots could do as many laps of it as they wished, but the smaller pattern was popular because it allowed the maximum amount of time in front of the crowd to show off a machine's capabilities.

As the ultralights took off and flew, differences in performance became obvious. CGS' new Hawk was impressive, motoring past many of the older designs, its strobe light flashing, looking like an airplane mistakenly flying with the ultralights.

Another top performer was American

Aerolights' prototype Falcon, showing both an excellent climb rate and good speed. From the ground, it had a most unusual sound, with more of a whistle than most, so it almost sounded like a turbine as it rushed past.

The most attention-getting design to fly was the XTC, a composite construction canard amphibian. This isn't a Goldwing with floats, but a completely new design with a hull fuselage, wingtip sponsons and retractable landing gear, a true seaplane. It appeared to bobble a bit after take-off. This could be due to overly sensitive controls or the relatively few hours the builders have flown the machine. In either case, the solution is easy—a change in the control linkage or more practice for the pilot. Once established in cruise, the XTC showed a good turn of speed and this may be improved when the Konig engine is replaced by a reduction-drive Cuyuna.

Steve Grossruck also attracted a lot of attention with his new Kasperwing pilot pod, a highly original solution to the problem of pilot streamlining. Grossruck didn't do his trademark vertical descents in the ultralight pattern (some say he wasn't allowed), but he did show the crowds the ultimate in short landings. He slowed his Kasperwing to barely walking speed a few feet above the ground, dropped, flared and probably didn't roll more than five or ten feet.

The Mitchell Wings turned in their usual, quite efficient performance, but one of them invited a second look. It appeared a little bulky and ungainly next to the streamlined, pod-equipped B-10s that took Grand Champion (Dennis Woodward) and Best Craftsmanship (Jay Sample), but there was a reason. It was a new

2-place B-10 designed by Micro Aviation of Canada. It features a 38ft (11.6m) span, beefed up wing spars and dual controls.

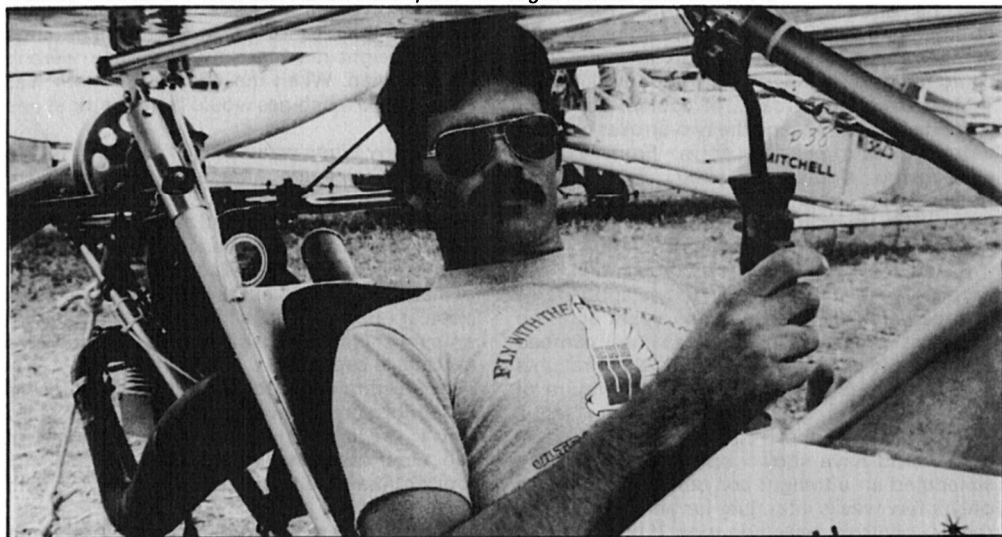
The FAA allowed the two place ultralights (actually a contradiction in terms) to fly if they carried N-numbers and were flown by licensed or student pilots. Passengers were permitted if the pilot held a private or higher grade license. Some of the manufacturers took advantage of this, notably Eipper, whose pretty show pilot, Tina Trefethen, was kept busy giving rides in the two-place MX.

Some of the other interesting ultralights in the pattern included the Kolb Ultrastar (a clipped wing, Cuyuna powered version of the Kolb Flyer), Flight designs' new Flight Star, Robertson Aircraft's B1-RD with its 72 in (183mm) prop, the Ultralight Flight Phantom, the Snoop and Mitchell Wing's Falcon Ag-plane which is based on the P-38.

Three Weedhoppers were frequently seen in the pattern, painted identical colors (white with stripes), and flying in formation. However, their performance didn't match their appearance and after each take-off, they consistently only just managed to clear the trees and powerlines.

One pilot with an Easy Riser did even worse. One of the patterns used, depending on the wind, required the pilots to take off northward and turn west before reaching a large tree, to avoid flying over the spectators. The Riser, apparently Mac 101 powered, didn't have enough climb to make it over the tree and seemed certain to hit it. A last minute violent turn avoided the mishap and the Easy Riser proceeded around the pattern.

Dennis Woodward won the Grand Champion Ultralight award with his B-10.





Goldwing's new Nexus looks like a small trainer.

There were a few incidents during the week, mostly minor. Fouled spark plugs and other engine problems caused almost all of them, and the plane would then glide to a quiet landing.

Bob Teman had the only serious incident among the ultralights and even he came away completely unhurt. He had a new machine, the Super-Fly, a prototype with two Onan engines and an experimental push-and-twist rod control system. Teman removed some centering bungees from the controls to see what difference it made and as soon as he took off, the tail got into an incredibly violent flutter.

From 60–70ft up (18–21m) Teman pulled the power off and had the plane nearly on the ground when a gust tipped up one wing. He landed on the nose and fell over on a wing tip.

Though disgusted after his accident, Teman wasn't daunted. He figured the damage at about \$300 and plans to build another plane, this time with a single engine and conventional control cables, as on the standard Mono-Fly kits he sells.

When the ultralights weren't flying, the crowds still had plenty to do and see on the ground. A favorite occupation was checking out the new prototypes and there were plenty.

Bob Lovejoy, designer of the Quicksilver, the grandfather of most ultralight designs, had a new prototype called the Avion. It's a high wing, strut braced monoplane, with ailerons and a full flying rudder and stabilator. It's an extremely light simple design and kits (to be produced by Ken Brock) are expected to sell for less than \$3000 with Yamaha engine. *(Since Oshkosh, Bob has been involved in a fatal accident. An appreciation of his career will appear in the next issue—ed.)*

Bob Hovey, designer of the Whing Ding, was back with his new Delta Bird, a tailed biplane with three-axis control and Cuyuna power.

The Vampire, though classified as an ultralight, is closer to an airplane or motorglider. It's all metal, with a fiberglass fuselage pod. Wings are metal covered with huge flaps and spoilers. It was one of the most talked about designs at the fly-in.

The Eclipse was also the subject of a lot of talk. Its spun aluminum wheels with rubber tread and hydraulic shock-absorber/spring landing gear were unusual enough, but the real focus was on its elliptically tapered cantilever wing with an aluminum truss spar and its use of weight-shift for both pitch and roll control. As of Oshkosh, it hadn't been flown and a conventional three-axis control system is planned if the weight-shift system isn't adequate.

The Ultravia showed a different approach. It looks vaguely like a Pterodactyl with pod, but is designed to be set up and taken down in the minimum time (not bolts or screws) with no metal to metal contact. Every connection is sheathed in Nylon bushings, so the structure won't wear and become loose after it has been taken apart and put together for a few years.

Goldwing had their new Nexus on display. It's a hybrid composite plane with foam and fiberglass, wood, aluminum and welded steel tube all used in its construction. The Nexus looks like a small trainer, with its tractor engine, enclosed fuselage and engine cowling and high wing. It also features winglets and three-position Fowler flaps.

continued overleaf

One of the more interesting new ultralights wasn't even in the ultralight area. The Greenwood Witch, designed by Marvin Greenwood of Aries T-250 fame, was in a display tent near the commercial and homebuilt designs. Instead of coming apart or folding, the Witch showed a new approach to transportation and storage. The wingtips fold onto the center section and then the entire center section rotates to be in line with the center of the craft. Then the entire thing can be hooked to a trailer hitch and towed home on its own wheels.

The ultralight engines at Oshkosh were every bit as impressive as the new airplanes. Perhaps the most unusual of the new designs at the meet were the two radial fours, the Kirk X-4 and the Konig Radial 4. The Kirk is noteworthy in that it uses a scotch yoke crankshaft mechanism and a separate oil pump.

Single-cylinder engines were offered by JPX and Rotax. In-line twins came from Hirth, Kawasaki and Rotax. Opposed twins were displayed by JPX, Hirth and Rebel Experimental Engines.

Advanced Engine Design showed a whole range of engines, an air cooled single and a water cooled single, opposed twin, in-line triple and in-line four-cylinder engines with up to 175hp, all modular combinations of the single-cylinder components.

The Chinese (mainland, not Taiwan), have entered the engine competition with a pair of military RPV engines. Putting out 16 and 26hp, they are two-stroke flat fours, looking much like miniature McCulloch drone engines.

In the face of all these two-strokes, Technopower, well known for their four-stroke radial model airplane engines, introduced a 100 in³ (1638cc) opposed twin four stroke. It's built as a direct-drive aircraft engine. Reliability and parts shouldn't be a problem — most of the internal components are from a Chevy 350!

The Cuyuna people didn't have anything new to show, but they said they are developing a lighter version of their old reliable 430 twin. Jack McCornack at Pterodactyl is doing some developing too. He has a back-burner project of a turbocharged Cuyuna for high altitude work.

Along with the engines came a flood of props and reduction drives. Dale Kjellsen of Motorized Gliders of Iowa had a reduction drive with a Flexidyne coupling similar to the one Molt Taylor uses on the Mini-Imp and Micro-Imp. Larry Sullivan attracted a lot of interest with his clean little self-contained, planetary-gear reduction drive, designed simply to bolt on to the front of a Cuyuna or other ultralight engine.

Leaders International showed a reduction drive with the propeller rotating concentrically around a 4 in (102mm) fuselage tube, solving the

Ultralight awards at Oshkosh

Grand Champion — Dennis Woodward, Mitchell Wing B-10

Reserve Grand Champion — Terry Fuller, CGS Hawk

Outstanding Workmanship — Jay Sample, Mitchell Wing B-10

Outstanding New Design — CGS Hawk

PUMA Outstanding Commercial Ultralight — Mid America Aircraft, Quicksilver MX

Ultralight Diamond Award — not given this year.

problem of clearance for a large-diameter prop. They're also designing an ultralight.

Competition Aircraft displayed a line of 2, 3 and 4 blade ground-adjustable props made from moulded plastic or composite, and Lazair had twin props mounted on top of one another to form a sort of biplane propeller (*see front cover — ed*) — it gives more thrust they say.

If the swarm of ultralights in the pattern, the commercial displays and the new designs and products weren't enough to satisfy the crowds, they could also attend workshops and forums on every aspect of building and flying an ultralight. There were even ultralights in the airshow. Lyle Byrum of Eipper put on an aerobatic display with a much modified Quicksilver MX that left no doubts about the growing acro-capability of ultralights.

Meanwhile, back at the ultralight area, Larry Newman was giving rides in a tandem, car-towed Eagle. And when the weather didn't permit flying, Bill Armor of Manta and Sal De Francesco of Flight Designs staged trike races (minus the gliders, of course).

It was a week of fun, despite the mostly grey, overcast weather. Jim Campbell and Pat Trusty spent the week in Oshkosh, on their way around the world in a pair of Pterodactyls. Zane Myers, who set a number of Ultralight World Records to demonstrate the abilities of the disabled, was there to accept the official certificates of his records, as well as a Mitchell U-2 donated for his next round of record attempts.

There were journalists, photographers, designers, manufacturers, pilots and just people, lots of people. Enough to make the ultralight section of Oshkosh '82 the best yet.

Picture — Gerry Breen over Paris



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Safety notes

By Dave Thomas, Safety Officer (South)

Pretty Grim

Alan Fountain's tragic death in his homebuilt three-axis machine, which *Flightline* will describe more fully once the investigation is complete, brings the total deaths in the UK this year to 9, as the chart below shows.

1982 accident summary

Compiled by Brian Giles,
Safety Officer (North)

Date	Ref	Aircraft	Seating	Location	Weather	Experience	Cause	Injuries	Period of Flight	Remarks
12.1	29	Rotec Rally 2B	1	Manby	C	P	H	M	ER	Control problems on first circuit. Stalled.
11.2	30	Mistrale	2	Avon	C	I	E	N	ER	Prop shaft sheared — emergency landing OK.
14.2	31	Scorpion	2	Long Marston	C	P	E	M	LD	Throttle cable failed — crashed on emergency landing.
14.2	32	Sealander trike	2	Darwen	C	S&I	H	SV	TO	Hit trees on take-off — crashed
14.2	33	Manta trike	1	Gloucester	C	S	H	M	LD	Stalled on approach, missing trees.
14.2	34	Hiway trike	1	Bristol	C	S	H	M	TO	First circuit, crashed in turn
27.2	44	Eagle	1	Wombleton	C	S	H	M	ER	Hit trees on low pass.
7.3	35	Eagle	1	Enstone	C	S	H	M	LD	Landed short and tipped.
24.3	45	Pathfinder	1	Brighton	C	L	H	M	LD	Circuit too low, hit boundary hedge.
27.3	36A	CP16	1	Wolverhampton	C	S	H	M	TO	First circuit, hit hedge, crashed.
12.4	36	Typhoon/trike	1	Wrexham	C	S	H	F	ER	First flight, lost control, hit trees in dive.
14.4	38	CP16	1	Davidstow	C	L	A	M	LD	Stalled on approach — aircraft pitch sensitive.
14.4	37	Pterodactyl	1	Monmouth	MD	S	H	M	LD	Lost control in turbulence — heavy landing.
2.5	46	Pterodactyl	1	Sandown	C	S	H	N	TO	Sink on take-off — stalled into trees.
8.5	39	Pterodactyl	1	Long Marston	C	S	H	M	TO	Modified control system confused pilot on take-off, dived into ground.
9.5	47	Weedhopper	1	Grantham	C	L	H	M	TO	PPL Group A on first microlight flight, swung on take-off, cartwheeled.
9.5	40	Rotec Rally 2B	1	Yoxford	C	S	H	F	ER	First circuit — slipped to port, hit tree.
14.5	64	Quicksilver MXII	2	Davidstow	C	I	H	M	TO	Caught thermal on take-off, sank and hit building.
18.5	41	Chargus prone trike	1	North Marston	C	I	H	F	ER	Stalled whilst attempting air restart.
19.5	65	Whing Ding	1	Blandford Forum	C	S	H&E	SV	LD	Engine failed, emergency landing too slow, stalled and spun into ground.
20.5	41A	Eagle	1	Billinge	C	P	E	N	ER	Prop bearing failed. Vibration. Successful emergency landing.
24.5	44A	Rotec Rally	1	Herts	C	L	H	M	TO	First circuit, stalled on take-off.
8.6	45A	Scorpion	2	Sissinghurst	C	I	E	N	ER	Emergency landing after loss of power.
8.6	46A	Hiway Skytrike	1	Brighton	C	S	A	M	LD	Trike undercarriage collapsed on landing, dug in.
13.6	47B	Sealander Hiway	1	Betchworth	C	P	E	N	TO	Engine drive failed — emergency landing OK.
14.6	47A	Scorpion	2	Fenland	C	P	A	M	TO	Aircraft rolled to port on take-off, would not recover, cartwheeled.

Rotating Tubular Propeller Shafts

There have now been a significant number of reported failures where tubular shafts are used to carry propeller hubs.

Failures usually result in the prop and hub

parting company from the power pack as a result of shaft breakage which occurs between hub and adjacent supporting bearing.

No such problems have been reported where solid shafts are used and the remedy would therefore appear obvious.

Date	Ref	Aircraft	Seating	Location	Weather	Experience	Cause	Injuries	Period of Flight	Remarks
15.6	48	Scorpion	2	Headcorn	C	I	E	N	ER	Engine failure, emergency landing, hit cow.
15.6	49	Vector 600	1	Leicester	MD	L	E	M	ER	Drive shaft failure, emergency landing, broke nosewheel.
21.6	42	Puma	2	Birmingham	C	S	E	N	TO	Throttle stuck open on fast taxi, aircraft took off, hit tree.
27.6	50	Scorpion	1	Reigate	C	S	A	F	ER	Airframe failure after severe manoeuvres.
2.7	51	Quicksilver MXII	2	Kincardineshire	MD	I	H	SV	TO	Aircraft flipped onto port wing in cross-wind, cartwheeled.
8.7	52	Mirage	1	Enstone	C	S	H	SV	TO	Stalled on take-off
10.7	43	Quicksilver MXII	2	Quorn	C	P	H	SV	LD	Hit van in avoiding electrical wires on approach.
11.7	52A	Gemini Hummingbird	2	Halfpenny Green	MD	S&I	U	2F	ER	Spiral dive in possible turbulence.
12.7	53	Striker	1	Pilling Sands	MD	S	E	SV	ER	Engine failure in low turn. Aircraft hit ground.
17.7	55	Quicksilver	1	Flixton	C	S	E	SV	TO	Drive belt sheared on take-off, aircraft stalled and dived to ground.
24.7	56	Skyhook	2	Broxton	C	S&P	H	M	TO	Caught down-draught on take-off, hit buildings.
30.7	57	Mirage	1	Saffron Walden	U	U	H	N	TO	Wing caught ground on take-off, nose wheel hit.
6.8	58	Lazair	1	Fulbeck	U	P	E	M	TO	Uncorrectable roll to starboard on take-off, wing touched, cartwheeled.
7.8	59	Scorpion	1	Ashburnham	C	P	A	SV	ER	Wings folded at 150ft (46m).
23.8	60	Scorpion	2	Headcorn	C	S&I	A	2F	ER	Aircraft collapsed in flight.
28.8	54	Lazair	1	Long Marston	C	S	H	N	TO	Stalled on take-off, cartwheeled.
3.9	66*	Baroudeur	1	Biggin Hill	C	P	H	M	TO	Insufficient height, hit sink over trees.
13.9	61	Eagle	1	Blackpool	C	L	H	N	TO	First circuit, stalled on take-off, nose-dived into ground.
14.9	62	Swallow	1	Halfpenny Green	C	P	A	M	ER	Uncorrectable roll, spun in.
19.9	63	Homebuilt	1	Rye	U	S	U	F	TO	Under investigation.

*This is the only incident involving a London-Paris competitor about which any details are known. As a general policy, accidents are only recorded in this list if (a) they have been officially reported to BMAA or (b) if sufficient information becomes available from reliable sources to justify their inclusion. Thus this is almost certainly not a full list of 1982 accidents.

Conclusions

- 1 Weather rarely a problem but watch for control in turbulence.
- 2 Initial flights most dangerous. Gentle progression essential with build-up of experience — particularly with holders of non-Group D PPL's.
- 3 More thorough training needed, particularly to cover 'engine out' situations.
- 4 Generally minor injuries but extensive aircraft damage.
- 5 Take-off phase critical — have adequate clear areas, get down quickly if malfunction apparent.

Key		L	Holder of non-Group D PPL	F	Fatal (2F means double fatality)
C	Calm	H	Human error	TO	Accident happened on take-off
MD	Moderate	E	Engine failure	ER	Accident happened en-route
S	Student	A	Airframe failure	LD	Accident happened on landing.
P	Pilot	M	Minor	N	None
I	Instructor	SV	Severe	U	Unknown

Flight test: Quicksilver MXII

By Paul Bennett

Introduction

The MXII is conventional in layout with side-by-side seating. The engine is situated above the pilot's head, driving a pusher prop. The high wing is single surface. Control is by spoilers, rudder and elevator, and MXIIs are currently popular with a number of schools as training aircraft.

General

Aircraft: Quicksilver MXII.

Manufacturer: Eipperformance Inc, USA.

UK distributor: The Aerolite Aviation Co, The Old Control Tower, Manby Airfield, Manby, Lincs LN11 8UF (tel 050782 8185).

Price: £4531 incl VAT (ready to fly).

Construction: Dacron sailcloth, 6061 aircraft-quality aluminium, stainless-steel rigging.

Power unit: 430cc twin-cylinder Cuyuna, 45hp, pull start.

Empty weight: 285 lb (130kg).

Controls: Three-axis with stick operating rudder and elevator and pedals operating spoilers. Nosewheel not steerable.

Undercarriage: Tricycle, no suspension (other than natural flexing). No braking.

Fuel consumption: 2–2.5gal/hr (9.1–11.4 litre/hr).

Fuel capacity: 2.2gal (10 litre).

Rigging time: 25min with two or three people.

Portability: Roof rack and trailer.

Performance

Pilot and passenger weight for test: 301 lb total (136kg).

Air temperature: 20°C.

Wind speed: 0–5mph (0–8kph) at ground level.

Climb rate: 250–350ft/min (1.27–1.78m/s); this was difficult to assess due to conditions at the time of test.

Level flight speed: 32–40mph (51–64kph).

Top speed: 45mph (72kph).

Take-off roll: 200–250ft (61–76m) on cut grass.

Spoileron control (roll/air brakes): Effective although fairly slow to respond. Used together (both feet down) they are very effective as air/dive brakes.

Yaw response: Good, although the yaw-to-roll is fairly quick compared to most aircraft.

Pitch response: Fairly positive; could be termed easy due to the fact that you are unlikely to over-react.

Score Chart

(1 excellent, 2 good, 3 fair, 4 poor)

Engine	2
Flight controls	2
Noise level	3
Ground handling	3
Flight handling	2
Crosswind control	2
Ground steering	4
Climb rate	3
Glide and sink rate	4
Speed range	3
Rigging and portability	3
Design and construction	1
*Beginner suitability	2
Pilot (PPL) suitability	2

*ie ease of familiarisation for those unused to the aircraft.

Stall characteristics: The aircraft does not really want to stall completely, tending to go into a controlled mush. The nose will drop but recover is instantaneous.

Comments

The general airframe and sail is good with a high standard of workmanship, as is to be expected from this manufacturer, which is currently producing the most popular microlights in the world. On the flying side, the MXII is a very easy machine to pilot with its relatively docile, predictable handling.

There has been some criticism of the MX control system. I have always thought of the MX as a two-axis machine with added spoilers which can double as air/dive brakes. Looking at the MXII as a training aircraft, the student is taught to fly two-axis with the instructor firmly in control of the spoilers. Obviously a person trained on the MXII is going to be limited to the MX or other two-axis machines; for the student to fly a conventional three-axis machine he would be strongly advised to take a proper conversion course for type.

The all round performance is pretty good considering the simplicity of design, the single-surface wing and the power unit used. Bad points are the sink rate, which is very poor—the aircraft sinks like a brick with power off—and the glide. Also, there is no ground steering apart from the rudder.

All in all the MXII is one of the better two-seaters available, and although it has its limitations as a training aircraft it is making a worthwhile contribution in this area. For pleasure flying, two can often be more fun than one.



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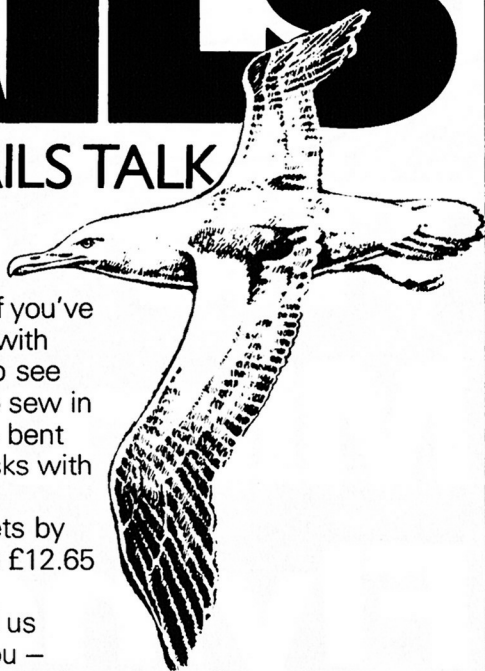
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This manual has been written specifically to cover all aspects of the Approved Training Syllabus for the Microlight Private Pilot Licence, Group 'D' rating. It also offers a sound understanding of how to develop safe operating practices.

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Published on behalf of Aviation Training Publications



Ron Campbell

BMAA Member and Chairman AOPA

and John Jones



The Microlight Flying Manual

GRANADA

Training notes

By Brian Powell, Training Officer

The Instructors' Symposium

All those on the list of instructors recommended by BMAA to CAA for Ratings will by now have received the invitation to the Instructors' Symposium at the Park Hall Hotel, Wolverhampton, on Saturday 13 November.

We hope that it will be an enjoyable gathering at which we can meet each other, exchange ideas and experiences, and have open discussions on matters of interest in the instructing field, in an informal atmosphere.

The 'package' of board, lodging and use of the conference hall is very reasonable at today's prices, and the event has been arranged for the day before the Annual General Meeting to avoid doubling up travelling costs for the two functions.

Agenda for the symposium is as follows:

- 10.00–10.45am Coffee.
- 10.45–11.00am Introduction by Chairman.
- 11.00am–12.45pm Discussion of administration.
- 12.45–1.45pm Lunch.
- 1.45–2.45pm Discussion on training.
- 2.45–3.45pm Discussion on dual training.
- 3.45–4.15pm Tea.
- 4.15–5.00pm Discussion on associated ground subjects
- 5.00–6.30pm General forum (questions in written form before lunch, please).

Some possible forum questions:

- 1 Are the present microlight criteria (of empty weight and wing-loading limitations) compatible with the needs for a two-seater dual trainer aircraft, (a) of rogallo type and (b) of three-axis type?
- 2 How can we train U/T instructors in a cost-effective way under the constraints of the new CAA legislation? *CAP 53 Supplement* Para 7.1 refers.
- 3 Is the CAA scheme for authorisation of solo exercises towards the obtaining of the PPL D from a privately owned field safe and workable?
- 4 The new legislation makes no difference between the arts of solo and dual instruction. Is this safe and practical, or should the BMAA insist on some form of conversion flying being given to the solo instructor before he may give dual instruction?
- 5 The provisions of *CAP 53 Supplement* Para

7.7 only give advice to a rated instructor on light aircraft to get some form of conversion training before giving instruction on microlight aircraft. There is no legal requirement as such. Is this safe, practical or compatible with other legal requirements laid down?

6 There is no legal requirement for a three-axis instructor to obtain any experience on a weight-shift aircraft before giving instruction on it—or vice-versa. Is this a safe practice?

7 If there is a consensus of opinion that any of the legal requirements are either not safe or are impracticable, should the BMAA, as a responsible body,

- (a) let matters rest
- (b) simply encourage microlighters to do the safe thing or
- (c) press for revision of the legal requirements (bearing in mind that this might make them either less—or more—restrictive?).

Maximum Charges

The following is the scale of maximum charges for the various examinations and inspections, as agreed recently by the Training Committee:

- General flying test, £15 plus travelling cost.
- Ground examinations taken externally, £8 per subject.
- Ground examinations taken internally, discretionary charge.
- Oral examination and flight test for solo authorisation, £5.
- Site inspection for approval for solo authorisation, £20 plus travelling cost.
- Certificate of experience and logbook inspection, £2.

Useful Publication

The School of Graphic Design at Ravensbourne College of Art & Design was recently good enough to send me a copy of an interesting exercise which its students have undertaken.

It is a little booklet produced for the Southern Hang Gliding Club and entitled *Flying in the Southern Hang Gliding Area*. It includes a useful map of the area plus some excellent three-dimensional diagrams of control zones and flight rules.

If at any time a second edition were contemplated, it should be pointed out that it is a legal requirement to set QNH once over 1500ft (456m) on a cross-country, and similarly that standard setting is also obligatory once over transition height.

Anyone wishing to acquire a copy of this worthwhile publication should contact the secretary of the Southern Hang Gliding Club: Mike Robertson, 25a Surrendon Road, Brighton (tel 0273 553286).

FIGURE 1.

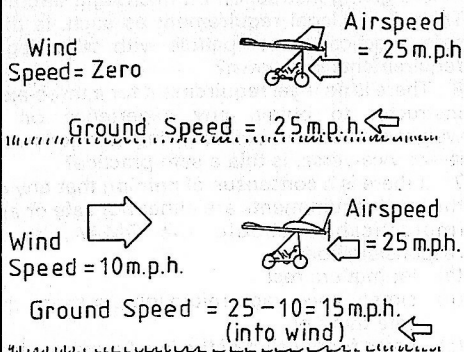


FIGURE 2.

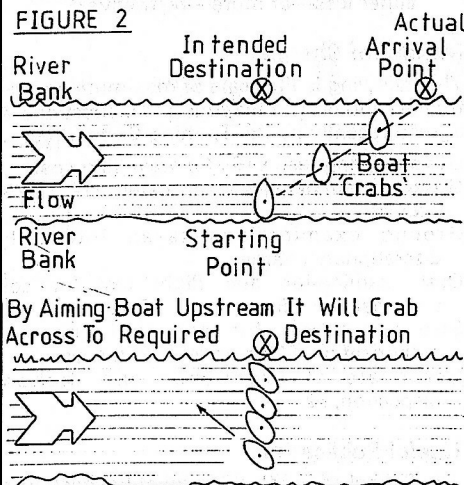


FIGURE 3.

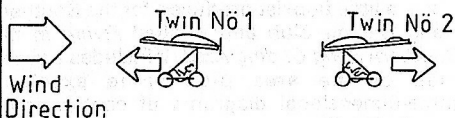
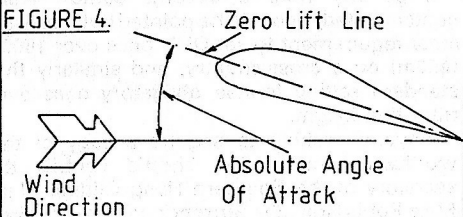


FIGURE 4.



If you think you know all there is to know about wind, turn the page. Otherwise read on, as TIM WILLIAMS gives his beginners' guide to...

Flying and

As any aspiring pilot will know, wind creates problems! Perhaps the first problem encountered is understanding the difference between groundspeed and airspeed. Fig 1 is just to refresh your memory.

However, the wind also creates other problems. Firstly, it can fool the inexperienced pilot into false impressions of speed. Man is basically a terrestrial animal and bases his impression of how fast he is moving by the speed at which the ground moves below him. The most important thing whilst flying is *airspeed*, not the speed over the ground, *groundspeed*. Pilots have to educate themselves into sensing *airspeed* and can do this by paying particular attention to:

1. The feel of the wind against our face.
2. The 'feel' of the aircraft. (An aircraft flown too slowly will feel sloppy and difficult to keep on a straight course).
3. The reading on the airspeed indicator (if you have one, which ideally you should).

It is best to take off into wind because the wind gives us a head-start, providing 'for free' some of the airflow we need over the wing in order for it to generate enough lift for us to take off. By the same token, we will also find that it is better to land into wind. Our actual contact with the ground will be at a lower ground velocity.

When we fly cross wind, we find that the aircraft will not end up where it is pointing, but will seem to crab sideways across the ground. This is analogous to rowing a boat across a river, (Fig 2). In order to reach an intended destination on the opposite bank, we have to aim the boat upstream. The amount by which we aim upstream depends on the speed of the river and the speed at which we row. The wind works in exactly the same way. Airspeed corresponds to the speed of the boat through the water, groundspeed to the speed of the boat relative to the bank.

OK so that's easy! Well, just to test you, here's a little teaser!

In Fig 3 we have two identical aircraft piloted by identical twins, who are in telepathic communication with each other. At a predetermined telepathic signal, the twins shut their throttles and ease back on their control sticks in unison (or push out the bars in the case of weight-shift aircraft). Each twin's aircraft will,

the wind

of course, stall. But which aircraft will stall first, the one flying into wind or the one flying down-wind?

The answer is, of course, that they will stall at exactly the same moment with the same degree of ease. The stall is dependent solely on the angle of attack which their wings make with the incident airflow (Fig 4).

Another analogy: two goal-keepers set up their goals at each end of a railway carriage. A player in the middle of the carriage takes alternate shots at goal, first one end of the carriage and then the other. He does this while the train is in the station and then when the train has reached a steady speed. Of course both goal-keepers will experience the same degree of difficulty in intercepting the balls in either instance. But a player standing beside the track and looking in through the windows would notice that the ball travelling in the same direction as the train is travelling faster.

When you are flying, you are like the goalie on the train — it is the speed at which the air (or the ball) is coming towards *you* that counts. It is this *airspeed* which keeps you in the air.

Wind also creates another problem. As the air flows over the ground, it is stirred up by obstacles such as buildings and trees. This disturbance to the smooth airflow is known as turbulence.

On the ground this turbulence makes itself felt as gusts of wind. In the air, the turbulence makes the aircraft deviate from its course and gain or lose height. This can cause the aircraft to be loaded beyond its design limitations if the turbulence is severe. I would suggest that, with the wing-loading restrictions that microlights have (2 lb/ft², 96N/m²), flying in hilly regions below 1000ft (300m) would be dangerous in winds of over about 18mph (15.6kts 29kph) and that, in any circumstances, flying in winds of 30mph (26kts 48kph) or more could be a terminal habit!

The higher the wing loading, the less noticeable the turbulence becomes. The more controllable the aircraft, the safer it is to fly in turbulence. Since many microlights leave something to be desired by way of control (*that is putting it mildly!* — ed) we should all be on our guard against pilots who look like exceeding their capabilities and their aircraft's flight

FIGURE 5.

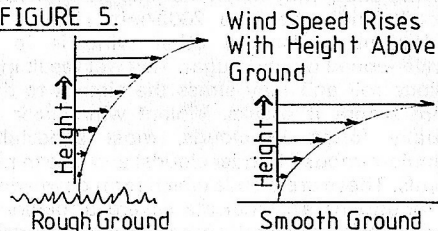
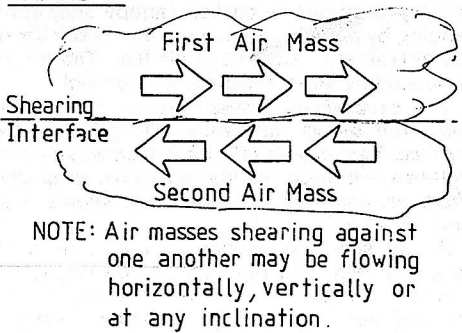


FIGURE 6.



envelopes. They could end up injured or worse: it is *far better* to annoy someone who is about to take off, by commenting that his actions are not sensible in your opinion, than to end up having to call an ambulance! I know of three people who dearly wish they had told pilots (now deceased) that they considered the wind and weather conditions too dangerous.

Air is a fluid and like all fluids it is 'sticky'. By that I mean that it behaves like a very thin syrup, its flow over the ground being impeded by the surface irregularities. The amount by which the air is slowed depends on the type of surface over which it is flowing (Fig 5). This effect is called wind gradient; the higher off the ground one is, the less effect the ground has on the wind speed. Meteorologists give the wind speed at 2000ft (600m) because by this level the ground is considered to have little or no effect.

Wind gradient will cause a sudden increase in groundspeed as we come into land. If we are silly enough to be flying near the stall, this sudden drop in the wind velocity will result in a sudden loss of airspeed and may result in a bent aeroplane or worse.

There is another effect called wind shear which can have dire consequences for the unwary. Wind shear results at the interface where one mass of air flows in one direction directly against another mass of air flowing in an opposite direction (Fig 6).

continued overleaf

Wind shear may mean that one wing of your aircraft might be in a 200ft/min (1.02 m/s) updraught whilst the other wing is in a similar-speed downdraught. This will result in a vicious roll and may stress the aircraft to the point where it breaks. Violent wind-shear is usually found in clouds, most especially cumulo-nimbus (thunder clouds) and also in roll clouds. These are clouds which form downwind of mountains and indicate severe turbulence. One unhappy glider pilot found his glider literally torn to shreds in a roll cloud. He was ejected forcibly through the cockpit canopy and, upon landing by parachute, he found the rudder bar of his aircraft still attached to his feet. The forces produced by wind shear can be horrific!

(We have all seen waves on water, produced as the wind blows (and thus, shears) over the surface. You may equally have seen wave-cloud patterns — though you may not have recognised them as such — as one air-mass shears over another — ed).

As we see, wind is definitely a force to be reckoned with and must always be respected. Never under-estimate the wind; always be on the look-out for clouds which betray what the wind is doing and, before you fly, make sure you understand the wind and the effect it can have on your aircraft.

Airworthiness

By Bruce Giddings, Tech. Committee Chairman

As from 1 April 1983 all microlights flying in Britain will require a full Certificate of Airworthiness, renewable annually.

In order to obtain the initial Type Certificate, manufacturers will have to complete exhaustive calculations, submit a full schedule of parts with details of origin, aircraft release notes, etc, and keep accurate records of batch numbers and end use, in order to trace aircraft fitted with faulty parts should problems arise.

CAA will charge £2000-£3000 for Type Certification (assuming Certificated engines are available). After this, it will be the responsibility of the pilot to gain annual C of A's. To do this the aircraft will need to be inspected by CAA approved and licensed engineers. This will cost upwards of £200pa. No modifications or repairs will be permitted other than those carried out by licensed engineers or the manufacturer.

Now for the good news. None of this is true — yet! It is true, however, that CAA will require some form of airworthiness certification for microlights in the very near future, bowing as they must to pressure from AIB, ARB, parliament and others. This has increased dramatically of late because of the recent spate of fatalities, mainly on Scorpions but most recently on a home-built (see page 69 — ed).

The BMAA exists to further the cause of microlight aviation, to promote safe and inexpensive flying with the minimum of regulation. What we cannot do is (a) usurp or overrule CAA or (b) operate without support from those whom we wish to help, viz the flying public and UK manufacturers.

One example of this is the much maligned PPL D now upon us. A lot of people, I know, feel that the BMAA failed in 'allowing' this to come about, or that in some way it is a product of BMAA bureaucracy. This is far from the truth. In fact, CAA made it very clear some two years ago that licencing *would* be introduced — possibly a requirement for a full PPL A. Whether our members (and hangers-on who reap the benefit of BMAA's existence without supporting the association by joining) realise it or not, it was by positive action by this association that the licencing requirements were diluted to produce the Group D currently required. A lot of hard (unpaid) work went into producing the syllabus, and proving it viable, for which time, effort, and money spent the BMAA receives not one penny from the £45 licence fee.

So it is with airworthiness. CAA has made it clear that this is a requirement, to be

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implemented soon. What should we do? We can either work with CAA in producing viable requirements, or against them. There are those who would advocate civil disobedience — but history has shown this to be counter-productive. In any case, it is surely the philosophy of fools to resist requirements for safe aircraft.

In order to ensure that the aircraft we fly are safe, clearly there are two main requirements. One is for a set of 'standards' — a 'definition' if you like of structural, engineering and flight handling qualities; the other is for a workable means of implementing them, on both new aircraft and those in the field (or preferably air).

The Technical Committee has already produced what we feel to be realistic, workable standards, and submitted them to CAA as our recommendation on Microlight Airworthiness Requirements. They have recently been updated, specifically in the weight-shift area, so that they provide the basis for a workable code covering the whole spectrum of microlights.

CAA will shortly be publishing its first draft MAR, and we hope, of course, that in formulating this they will have taken note of our recommendations, gained in many areas from years of practical experience with microlights past and present.

Whatever the content of the final document, its method of implementation will probably have the greatest effect on microlight flying costs. To this end BMAA is seeking to be largely responsible for this area, providing we can demonstrate our competence to do so. This does *not* mean we have brought yet another blow to bear on the pilot who simply wants to enjoy himself — rather that we are attempting to cushion the inevitable, and simultaneously

ensure that our sort of flying really is safe and inexpensive.

Set out in the panel is how we intend to do this. In formulating this we are very fortunate in having the assistance of Dick Stratton. Dick has been closely involved with the technical side of gliders, motor gliders, and light aircraft for many years, and has been sitting on the Technical Committee for the past year. He has agreed to act on behalf of BMAA in the furtherance of the above objectives, and will I am sure get the very best deal possible in negotiation with CAA.

In all this, however, we especially need the support of our membership, and of UK manufacturers. To our members, if any of you feel you are in a position to help on the inspectorate side, let us know. To manufacturers, if you don't like the sound of all this, consider the alternatives — re-read my opening paragraphs.

Prospective inspectors should write to the Technical Committee with a brief CV regarding their engineering background. Duties are likely to include assistance on initial type assessment; accident repairs evaluation; approval of modifications, etc. One further most important area will be liaison with home- and kit-builders. There are a growing number of kits on offer, and often the expertise needed to complete the more complex variety is far beyond that of the average enthusiast, so that help from better qualified people is essential in avoiding expensive cock-ups or, at worst, fatalities.

Manufacturers should be prepared to co-operate fully with BMAA in assessment of new machines — independent, qualified and non-commercially involved inspectors will need to report on all aspects of structural testing, detail design and flight evaluation. In many cases importers of foreign aircraft will have to accept that modifications must be made to raise these aircraft to an acceptable standard. This will cost money, but that is cheaper than lives.

BMAA Draft Technical Procedure Manual - Airworthiness

Section 1 — Objectives

- (a) To establish an airworthiness code of practice to safeguard designers, manufacturers, importers, vendors, owners and operators from the consequences of sub-standard design, manufacture, repair, modification or maintenance of microlight aircraft on the UK Civil Register.
- (b) The BMAA Code of Airworthiness is also intended to safeguard BMAA members from the necessity to comply with the more formal

and costly forms of traditional airworthiness procedures, which may otherwise have to be applied under the Air Navigation Order.

- (c) The co-operation and approval of the Department of Trade and the Civil Aviation Authority is sought, whereby a most all of the airworthiness activity applicable to the UK registered microlights, is delegated to the BMAA.

Section 2 — Airworthiness Procedures

- 2.1. Design Requirements. Joint Airworthiness Requirements (JARs) are being developed in an attempt to co-ordinate and rationalise the codes of airworthiness practices not only throughout the European Community, but

► also to embrace the USA (FAA) requirements. JARs are drafted in the UK by a secretariat attached to the CAA (Airworthiness Division), and have adopted the format of USA Federal Airworthiness Requirements (FARs).

- 2.2. *The BMAA Technical Committee* have developed draft *Microlight Airworthiness Requirements* (based upon JAR 22) and subject to approval by the CAA (Airworthiness Division), and acceptance by the Airworthiness Requirements Board (ARB) will be adopted by the United Kingdom.
- 2.3. *JAR Part 22 (Gliders and Motor-Gliders)* has already been published, and it is proposed that a modified version of JAR 22 be adopted for microlight aircraft on the UK register (whether this code will be adopted in other ICAO contracting states remains to be seen).
- 2.4. *Aeronautical Engineering Practices* (manufacture, repair, modification and maintenance). Sub-standard engineering practices will degrade the airworthiness standard to a dangerous level, however excellent the design. Therefore, it is essential that acceptable standards of engineering practice are adopted and maintained throughout the life of microlight aircraft.
- 2.5. *Sources of Information — Acceptable Practices* (a) CAIPs (Civil Aircraft Inspection Procedures) available from CAA Publications Department and (b) FAA (USA) publication EA-AC-A3-13 1A & 2 *Acceptable Methods, Techniques and Practices, Aircraft Inspection and Repair — Aircraft Alterations* available from the BMAA are acceptable guidelines for the manufacture, repair, modification and maintenance of microlight aircraft.
- 2.6. *Maintenance of Airworthiness*. An approved programme of repetitive maintenance will be required of all operators. A suitable schedule will be published for each type in the type manual (or a general schedule by BMAA).
- 2.7. *BMAA Inspectors*. The BMAA Technical Committee will grant the privilege of inspector to suitable applicants. This privilege may be withdrawn at the discretion of the Technical Committee.
- 2.8. *Repairs & Modifications* (a) Both repairs and modifications must comply with the design and engineering standards acceptable to the BMAA (b) Modifications, including product improvements: the addition of accessories and changes in configuration must comply with airworthiness requirements. Approval of significant modifications introduced by the operator must be sought from either the manufacturer or the BMAA.

Section 3 — Implementation of Airworthiness Procedures

- 3.1. *Design Requirements*. New designs or newly imported designs will be required to show compliance with UK microlight design

requirements (JAR 22 modified). Methods of compliance are outlined therein.

- 3.2. *Manufacturing Standards*. The BMAA Technical Committee will require an independent engineering assessment to be made of each new design, or newly imported design, to ensure compliance with acceptable engineering practices, and the achievement of acceptable standards of airworthiness.
- 3.3. *Equivalent Standards of Airworthiness* may be demonstrated and accepted by BMAA, in such cases as compliance with JAR 22 is not met.
- 3.4. *Type Records*. In the form of drawings or schedules of materials and specifications will be required for each type.
- 3.5. *Operating Manuals*. A document, acceptable to the BMAA and preferably in the form of the generally accepted light aircraft (or glider) pilots manual, will be required for each type and to be supplied with each aircraft. This document will contain the following data:-
 - (a) Certificate of type approval.
 - (b) Manufacturer's name, address
 - (c) Aircraft type specification, mark & serial number
 - (d) Aircraft type limitations
 - (e) Daily inspection procedure
 - (f) Scheduled inspection procedure
 - (g) Pilot's operating procedures
 - (h) Repair procedures (if permitted)
- 3.6. *UK Special Conditions* (modifications to imported types in order to show compliance with UK requirements). A list of such modifications will be compiled by BMAA and will be applicable to each type imported into the UK prior to certification. The vendor will be responsible not only for advising the manufacturer of such UK special conditions, but also for incorporating these (unless otherwise agreed with the persons making application for certification).

Where necessary, the first sample of a new type will be submitted by the vendor/importer for such tests as may be necessary to show compliance including tests to destruction of selected components or assemblies.

Appendix A

Criteria for the selection and appointment of BMAA approved inspectors (similar to BGA)

Appendix B

Form of engineering appraisal and inspection of new types.

Appendix C

Form of type certificate and supporting documentation.

Appendix D

BMAA certificate of airworthiness application/renewal — inspection schedule.

Dick Stratton

1 September 1982



Unsaddling the cowboys



By John Wincott

What is the BMAA Registration & Approval Scheme? Why have a scheme at all? Why should any manufacturer/dealer/school/club register anyway?

If you have been asking these questions, then read on and (hopefully) all will be revealed.

The Registration & Approval Scheme was implemented after BMAA received a steady stream of complaints regarding 'cowboy' microlight operations. These complaints ranged from a dealer who was taking large deposits from prospective customers and not delivering any aircraft, to a school teaching students on aircraft not considered to be airworthy. The question a lot of members were asking was 'How do I know this organisation is not just another cowboy?' — and it was not an easy question to answer. Hence the Registration & Approval Scheme, which we hope will help clarify the situation.

Leaving aside the relatively simple category of clubs, which was summarised in the last issue on p61, here's how the scheme works for the other three categories of organisation.

Step 1. The manufacturer/dealer/school is given a code of conduct which he is required to abide by. He signs a declaration to this effect and sends this together with a registration fee (currently £50 to £75) to the BMAA.

Step 2. The application is checked by BMAA and if everything is OK the registration is accepted. The business can now carry the 'Registered BMAA Organisation' stamp on its publicity material and advertisements, showing that it will operate within BMAA guidelines. The organisation is also included in the BMAA *Yellow Pages*.

Step 3. A spot check of the organisation is conducted by an impartial BMAA representative, who is qualified in the relevant field. The cost of this check is included in the registration fee.

Step 4. Either: the organisation passes the spot check and is thus approved, allowing it to carry the 'Approved BMAA Organisation' stamp to indicate that, when checked, the organisation conformed to the BMAA requirements.

Or: The organisation fails the spot check, in which case it is allowed a reasonable amount of time to rectify the problems, prior to a second

check. This second check must be paid for by the organisation, but in the interim period the organisation retains its registered status. If the organisation fails the second spot check the registration is withdrawn until it is able to show the necessary improvement.

Step 5. Each subsequent year the organisation is subject to a further spot check to ensure that the standard is maintained. The cost of this is included in the annual registration renewal fee.

What this means to you, the member, is this: if you go to a registered organisation you should receive a high standard of service. If this is not the case, then a written complaint to the BMAA will result in an investigation and possibly a further spot check on the organisation.

The scheme is in its infancy. No doubt during the next 12–18 months improvements will be made — however, we must start somewhere. Hopefully what we have is a good foundation to build on for the future.

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DEALER ENQUIRIES INVITED

Secretary's letter

By Ron Bott

Within a few days of your receiving this, the AGM will be upon us. With your last magazine you received several inserts. These included: the last AGM minutes, the draft rules of the constitution (which you will be asked to vote on), a proposal form for the new BMAA insurance scheme (giving you £1M third party cover for *only* £20, or £1M third party for £28), a map of the town centre of Wolverhampton (showing you the *free* car parks all within 300m of the AGM halls), a copy of a letter for club secretaries to fill in and send back to me, and information on the reverse telling you of the latest requirements for students travelling towards their PPL Group D.

I trust that you all received these items, which should be studied before setting out for the AGM. The map contains several notes. One points out that there is a parade on that day in the area of the *Civic Hall* and you are requested *not* to park in the immediate vicinity as this will cause problems for exhibitors at the AGM and probably a parking ticket for you. Entrance to the AGM is by your current membership card. This will be sufficient for you, your spouse and children, provided they are accompanied by *you*. Anyone without a membership card will be charged admission and treated as a member of the general public, so check your card now.

The halls will be open from 9am to 10.30am for AGM exhibitors and officials only. BMAA members will be admitted from 10.30am and the general public from 11am. There will be coffee and tea available from 10.30am to 4pm, a buffet will be available over lunch and a bar will be open from midday until 2pm. The AGM will start at 1.30pm prompt, in the *Civic Hall*. During the meeting there will be no viewing in the *Civic Hall* but it will be allowed to carry on in the adjoining Wulfrun Hall, to where loudspeakers will relay the meeting. Procedural details of the meeting are discussed in *Chairman's Airwaves*. Security will be in the capable hands of Mr Brown and his local ATC squadron. No one will be admitted to the halls before 9am or after 5pm. The meeting is expected to finish between 4.30 and 5pm and both halls will be vacated by 6pm.

When you arrive at the AGM (entrance at the front of the *Civic Hall*) and show your membership card, you will be given a coloured ticket and a small pack of information. Contained in this pack will be a voting form so please ensure

that you arrive with your membership card. (Other visitors will receive a different coloured ticket). Your ticket will act as your pass-out.

Club secretaries are advised that the best and probably the cheapest way to travel to the AGM is by coach. The coach can drop you at the front door and pick you up later, making the AGM a much more enjoyable event. On show will be some of the most up-to-date microlights and plenty of the information that you have been seeking. Small accessory manufacturers will also be on hand to show their wares, so this is probably a good time to remind you that the Sale of Goods Act is applicable to all microlight transactions. See you there?

I would like to comment on several letters I have recently received. One, a notification that the Council for the Protection of Rural England, Lancashire Branch is voicing strong opposition to microlight flying as, 'They created an intrusive noise, their operations did not appear to be under any control and damage and disturbance could result from forced landings'. They, (their members) are recommended to make representations to their district councils in known cases of annoyance (bad public relations?).

I had in the same post a letter from a microlighter in Lancashire complaining bitterly about what he believes is the ineffectual BMAA Council, the bad deal over licencing that we have managed and the loss of his 'freedom from bureaucracy that he had hitherto enjoyed'. I have also just received a sad little note from a member in Italy who tells me that 'From 1 August is forbidden to fly in Italy with ULM (microlights to us), but I enclose my annual membership fee with pleasure'. Thank you, Giancarlo Busi, for bringing home the fact to some of us, that we now have a licence that is recognised throughout the world. Your Council is not happy about the costs of licence, registration fee or instructor ratings, but we *have* retained a lot of our freedom, from the start of our solo flying right the way through to the end of our training. At the end of the day, having learnt a few things and passed our exams, you are recognised as a competent person, and the knowledge you have gained might just save your life one day.

The licence, however expensive we may think it, is an official PPL. It is recognised by officialdom in many countries. With it, we can fly, without it, all these associations who hate microlights, would have fuel for their campaigns to get these 'noisy motor-bikes of the sky' grounded.

The costs of the different licences are worked out by representatives of *our* government. If we feel so strongly about the costs we can do one of three things:

1. Change the government through the ballot box (see what the other lot would charge).
2. Ignore the lot of them by burying our heads in the sand (can't fly like that though).
3. Request the government to return our money in the form of grant aid (they can only say 'No').

The last one is the course that we have taken and we are pressing quite hard for financial aid from the Department of Trade and the Sports Council. We hope for some news around AGM time. Incidentally, at the Central Council for Physical Recreation meeting that I attended, our coloured brochure was held by the chairman of the meeting as the best example he had seen of how to sell your image to the general public.

Your BMAA Council, no matter how critical you may feel about them, have done a tremendous lot of hard work this past year. They have attempted to get the best possible deal for you, the members of BMAA, and at the AGM there will be a lot of information as to the future and what it holds for us. There will be some members wishing to retire from the Council. There may be some of you wanting to join the council for reasons known only to yourself. Let me warn you that you will be letting yourself in for a lot of hard work and there will be no excuses accepted if you fall down in any way. There are

no medals to be earned and you will come in for a lot of criticism no matter what you achieve! Having said that, the other words to consider before you volunteer are ethics and integrity. Enthusiasm and gut-feelings for aviation are not enough. If you are married, consider your family, as if you are elected to Council you may be a candidate for a divorce, due to the invasion of your privacy. We have achieved a lot in the last 12 months; we have made microlights respectable and have gained a lot of support and recognition throughout the world.

At the Council meeting in Farnham recently we had the good fortune to have a talk from Dick Stratton about aviation regulations in general and microlight airworthiness in particular. He has a wealth of expertise and is well respected throughout aviation, in particular the BGA and PFA. BMAA intends to take advantage of his expertise in the future.

Finally I would like to thank all those members who have written or phoned to say how pleased they are with our progress and that they all are looking forward to the big happenings in 1983. The London-Paris event was just a sweetener. Thanks also to the BHGA for offering the use of their test rig. Happy landings to you all.

*Ron Bott, 20 Church Hill, Ironbridge
Telford, Shropshire TF8 7PZ*

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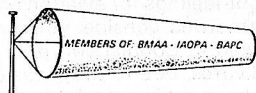
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Contact

Attention Scots Microlighters

Tom Spears and Ken Rolph would like to organise a get together of microlight pilots in Scotland. So if any flyers north of the border are getting lonely, ring Tom on Ayr 262851 or Ken on Troon 314582.

Popham Microlight Group

A microlight group is to be formed at Popham airfield near Winchester, with BMAA Council member Dave Thomas as CFI. The aim of the group is to enable local pilots to join and complete the necessary supervised flying for their licences.

It is not a commercial venture and anyone wishing to join should contact either Dave, at the numbers shown on the *Contents* page, or Popham airfield, on 025675 733.

Pennine Aviation Society

Pennine Aviation Society has just been formed and meets in the Royal Oak in Chapel-en-le-Frith. So far about 15 people have joined and new members are welcome. The club hopes that the Chapel-en-le-Frith location will make it accessible for flyers from Sheffield as well as from Greater Manchester.

Club officials are G T Morris as chairman, Sue Cousins as secretary and Paul Quinn as the contact man for enquiries. Paul's number is 061-487 2374.

West Midlands Microlight Club

Formerly known as the Halfpenny Green Microlight Club, West Midlands Microlight Club is still based at Halfpenny Green but is now run independently of the Micro Aviation company. Although details of the club's flying rights at Halfpenny Green airfield have yet to be settled, the club is making good progress. Prospective members should contact Harry Clarke at 021-552 2736 day or 021-559 8850 evenings.

Calendar

12 November: 'The design and development of a family of small, low-cost aero engines' — talk on small turbines by Noel Penny (of Noel Penny Turbines), B Chevis, and I Grant. 5pm at the Royal Aeronautical Society, 4 Hamilton Place, London W1. Non-members welcome, free.

14 November: BMAA Annual General Meeting at Civic Hall, Wolverhampton, West Midlands.

Easter 1983: Microlight Symposium at Bristol University, sponsored by RAS and BMAA.

May 1983: Annual BMAA Rally.

Small ads

Small ads are free to BMAA members advertising *privately*, all business ads and non-members' ads £3; maximum 30 words in every case. Please make cheques payable to BMAA and send with ad wording to Flightline, Oak Cottage, The Green, Wennington, near Lancaster LA2 8NW.

Aircraft: for Sale/Wanted/Exchange

460cc CHOTIA C-TYPE ENGINE. 30hp. Complete with recoil starter, mounting and prop — factory test run only — bargain at £395. Tel Washington (0632) 464632. (11/11)

HIWAY SKYTRIKE 160cc Valmet engine with Chargus Cyclone wing. Quick sale needed, buying Puma. £995. Tel Tilbury 78902. (11/12)

FOR SALE HIWAY MKII SKYTRIKE 250cc low hours, immaculate condition. £800. D Shrimpton, Chandlersford (Hants) 60185. (11/13)

NEW HIWAY DEMON 175 for sale — only flown twice. Also Hiway 250cc Skytrike in excellent condition. Please write or telephone Andy Coveney, Silken, Stelling Minnis, Nr Canterbury, Kent. (Stelling Minnis 356). (11/14)

TRIFLYER 250 and MEDIUM FLEXIFORM STRIKER WING. (G-MBHS). 1 year old. 40hr use. Excellent condition. £1450 ono. Skelmersdale (0695) 20601. (11/16)

EAGLE, registered G-MJBH, 5½hr only so condition is as new. Bank manager forces this very reluctant but urgent sale for only £1500. For more details phone Mark on 06284 (Marlow) 2473. (11/17)

HIWAY SKYTRIKE with 175 Demon wing. Mint condition 10 months old, 10hr flying, with waterproof cover for wing, road trailer, spare prop, airspeed indicator, altimeter. Contact John Casey, c/o Waverley Coaches, Kildimo Co Limerick. Tel Limerick 061 93220. (11/18)

WANTED MICROLIGHT or parts to build; part-build project, write-off considered, engine props etc. Lincoln 810896. (11/11)

HIWAY 160 SKYTRIKE with Highlander wing, spare engine, custom-built road trailer, extras. £1150 complete, will sell separately. Tel (07592) 3663. (11/12)

FOR SALE MIRAGE MKII. Kawasaki engine — wheel spats — sail bag — electric start — cushioned luxury seat cover. Professionally run-in — 5hr. Selling for twin seat. Price £4000 ono. Phone 023 588 426. (11/13)

STORM/HIWAY 250 TRIKE combination immaculate condition. Very low air time many extras £1150. Tel 0793 40934 (Swindon). (11/14)

G-MBCB SOUTHDOWN LIGHTNING, 250cc engine, ASI and vario, full service record, excellent condition. Going 2-seat. Offers. Tel Compton (070131) 263 any time (Sussex). (11/15)

185 NIMROD & TRIKE FOR SALE, wing virtually brand new with 250 Robin trike. £1250. Must sell. Phone 0672 810521. (11/16)

TRIPACER SKYTRIKE 250cc Robin engine, good condition. Registered G-MBDW. £650. Reason for sale — going dual. Tel evenings Bradford 0274 630494. (11/17)

PTERODACTYL PTRAVELER FOR SALE. 430cc Cuyuna, reduction gear, registered, 30hr flying only. Owner finds he has too many commitments over next year or so to utilise. What offers? Tel Midhurst 4146 (Sussex). (11/18)

HIWAY 160 SKYTRIKE, new engine not fully run in, good condition. £450 ono. Also B-bar and unused 3 blade nylon prop, offers. Phone Southampton 333660. (11/22)

B-MJGA 160 SKYTRIKE/MOONRAKER 78 WING FOR SALE. Skytrike in first class condition with new engine just run in. Birdman Moonraker wing also excellent condition with an AR of

7-1 and all round 2" tubing. This combo must be seen. Price only £900 (including £100 worth of instruments). Will split. Busby 0734 (Reading Berks) 471851 after 17.30 hrs and weekends. (11/23)

PUMA MS. Our two-seater demonstrator for sale. Factory maintained. Ultra reliable. £2800. Any trial. Mainair Sports, 0706 55131 (Rochdale). (11/24)

POWER PILOTS. Full range of new and used 250, 330 and 440 Tri-Flyers plus Strikers, Typhoons and Puma Wings in stock. Mainair Sports. 0706 55131 (Rochdale). (11/25)

TRIKE unfinished project. 100cc go-kart engine, spare propeller, very light weight. £220 ono. Markfield 2808 (nr Leicester). (11/26)

ULTRASPORTS/SOUTHDOWN PUMA dual seater. Low hours, mint condition, £2500. Contact Bob Calvert on 0254 21615 (Blackburn). (11/27)

TRIKE — MAINAIR TRI-FLYER Fully run-in, never flown. 250cc Fuji-Robin engine. Sensible offers only. Reading 479231 evenings. (11/28)

STREAK EAGLE FOR SALE minus its Chrysler engines, only 2 hours flying time, offers around £1900. Reasons for sale; no money, no time, no pilot's licence. Tel. 0254 385445 (Accrington). (11/29)

SEALANDER LARGE. Ideal for power. Stainless steel brackets etc. £575. Phone Ian Hoad, Loughborough 216853 (office hours). (11/30)

ROTEC RALLY 2B. 3-axis. Jan 82 excellent condition. Hangar stored. Registered G-MJKR. Full check of airframe and re-rigging completed Sept 82. 3hr only on engine. Custom trailer included. £1600 ono. Tel Bedford 56823. (11/31)

WANTED Griffin 180 wing and Sachs 330 engine. Must be in good condition, no reasonable offer refused. Tel 0272 735631 daytime, 0272 739407 evenings (Bristol). (11/32)

SOUTHWEST AIRSPORTS have probably got, in addition to new aircraft and kits, the largest selection of high-quality second-hand microlights in Cornwall. For full details phone Ian Stokes on 056686 514. (11/36)

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FOR SALE 1 share in Hiway trike with Scorpion wing, 250cc engine. Based and flown from private field near Hainault, Essex. £300. Phone Tony on Rainham 51556. (11/40)

FOR SALE MIRAGE MKII G-MBBK Kawasaki engine. 40hr - colours orange black. Excellent condition, tuition available from BMAA instructors. Price £2400. Tel. Nottingham 44194 day, 417221 evenings. (11/44)

MUST SELL - going abroad, Desert Eagle, only 10hr since new 14 months ago. Perfect twin Chryslers. Absolute bargain £1950 or offers. 061-624 6258 (office), Rochdale 355171 (home). Ask for Scott. (11/45)

VOLMER VJ-24W Probably the best handling 3-axis in Europe. Instructor's own. 60mph, KT100 Yamaha. Rigs in 15 min. Beautiful little aircraft £2500. All weather custom trailer plus spare engine, total £2900. Tel. 0728 85 3209 (Suffolk). (11/46)

CP16 Approx 5hr airtime, complete with new waterproof wing bags, and trailer, £2280. Tel 098984 310 (Herefordshire). (11/57)

MY BEAUTIFUL RAINBOW EAGLE is unfortunately up for sale - I need the cash towards a two-seater. She has a Robin engine and is in absolutely perfect condition. Offers around £2300. Tel Peter Cole at Tavistock 832266. (11/52)

DRAGON sales, training, demonstration and finance can be arranged. Part exchange Range Rover, Caravan, Portacabin or field facility in Hertfordshire. Tel Stevenage (0438) 3276. (11/54)

MX KIT FOR SALE £2950. MX trailer for sale, offers. Tel Newark on Trent 704286 any time. (11/57)

MITCHELL WING B10 plans and framing timbers. Some ribs assembled. £150 the lot. Phone East Kilbride 30579 evenings. (11/58)

TYPHOON/SKYTRIKE G-MBDB. 250cc Fuji Robin nicely run-in at 25hr. Beautifully engineered trike breaks down to pack in estate car. Will split. Going 2-seat. £1295. Dave Smith, Mansfield (0623) 882174. (11/60)

PUMA LIGHTNING 2 SEAT G-MJID. Only 4 months old, as new, under 25hr, long range tank. House purchase forces sale. Bargain at £2550. Nick Kirby, day 04605 3211, evening 0823 672474 (Somerset). (11/61)

GOLDEN EAGLE FOR SALE, 6hr approx certified flight time. Very good condition. Going three-axis: £1950 or best offer. 021-353 6706 evenings, 021-551 4038 8am till 5pm. (11/62)

SCOUT MK3, 250cc Robin nicely run in at 25hr, complete with purpose-built trailer. Registered. £2500. Ring Tom on Ayr (0292) 262851 day, 283745 home. (11/63)

HIWAY 250 SKYTRIKE as new, Cherokee wing, ASI and altimeter, £1200 net. Tel 0440 61329. (11/66)

EAGLE AIRCRAFT for sale, two Chrysler 9hp engines. Under two years old, never flown and still in original packaging. £2250 plus VAT. Tel 0734 734774 ex 34 (Berks). (11/69)

BRAND NEW PUMA I - Lightning DS wing and Ultrasports 250cc single-seater trike. Only test flown. Finance forces sale. £1850. C/o Petersfield (0730) 4467 (Kent). (11/70)

Miscellaneous

FLIGHTLINE back issues are available at 75p per copy including postage. Also **BMAA PILOT'S LOG BOOKS** at 80p each. **TRAINING ON MICROLIGHT AIRCRAFT** by Ann Welch at £1.00 each, enclose SAE please. Always quote your BMAA membership no, and send to BMAA Sales, Membership Dept, Abergynolwyn, Tywyn, Gwynedd LL36 9YR.

A GOOD PROPELLOR IS A SOUND INVESTMENT - less noise - less vibration - less wear and tear! For the best in propellers write or call Andy Coveney, Silken, Stelling Minnis, Nr Canterbury, Kent. Tel Stelling Minnis 356. (11/5)

PROPELLOR MAKING FOR THE AMATEUR - this book tells it all in simple language. Design, drawing, shaping, balancing, repairing, plus experimentals. Revised; £3. Eric Clutton, 92 Newlands Street, Stoke-on-Trent ST4 2RF. (11/9)

FULLY COLOURED MEDITERRANEAN T-SHIRTS. Design by top European drawer. Cotton/viscose mix. Price £3.50 including p&p. Sizes S M L and XL. Andres Puente, Perez Galdos, 102, Valencia-18, Spain. (11/10)

FOR SALE Detached 3-bedroomed house in rural position, full central heating 1/3 acre garden with access to private airfield. Extra land available. Price £45,995. Tel Ham Street 2910 (Kent). (11/19)

AIRSCREW CLOCKS, BAROMETERS. Laminated wood, varnished or striking black satin. 4 1/2" propeller with 51" clock face. £90 including VAT, p&p inland. Southern Reliants, 80 St Georges Road, Aldershot, Hants. (11/20)

FULL AND PART TIME TRAINEE MICROLIGHT INSTRUCTORS wanted for Eagles and trikes at Breen Aviation Ltd. Previous experience preferred. CV please to L Breen at Enstone Airfield, Church Enstone, Oxon. (11/21)

SACHS 340cc engine. Price £50. Phone 0254 691300. (11/34)

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KASPERWING. Send A4 SAE for leaflet: information package £3.50; book *The Kasperwing* £7.50; BKB and BEKAS-N plans £75; Kasperwing ultralight kit £2850; Built £3270 includes tuition. Sunrise Aviation, 42 Blakedene Road, Poole, Dorset. (11/35)

SOUTHWEST AIRSPORTS offer tuition to all stages of competence at competitive prices. New and second-hand aircraft to suit all needs and pockets. Phone Ian Stokes on 056686 514. (11/37)

PLANS REQUIRED of Mirage/Quicksilver or very similar microlight. Loan/purchase/or hire. Tel Bottesford (0949) 42607 (Nottinghamshire). (11/41)

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WOULD ANYONE who has flown a Birdman Moonraker 78 with a trike like to compare notes? Please phone 0734 471851 after 6pm. (11/65)

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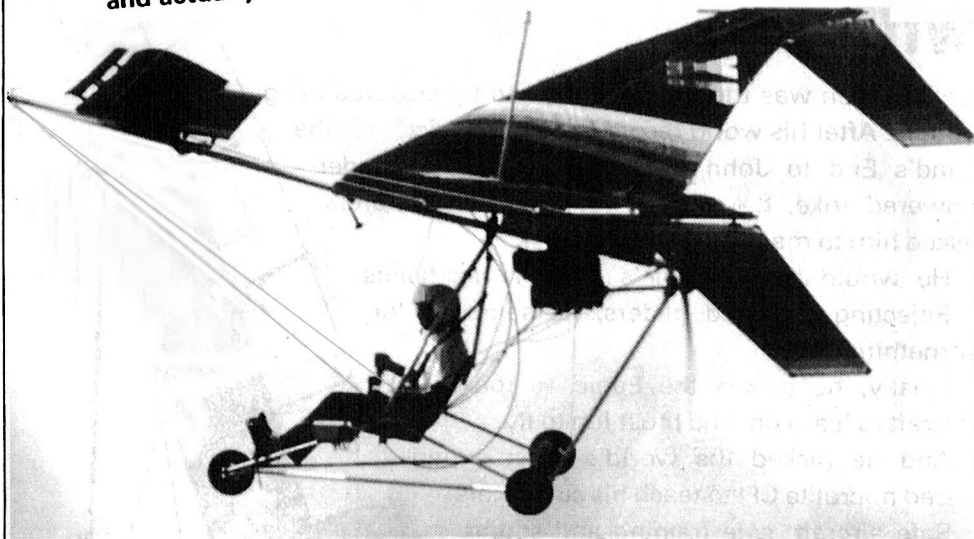


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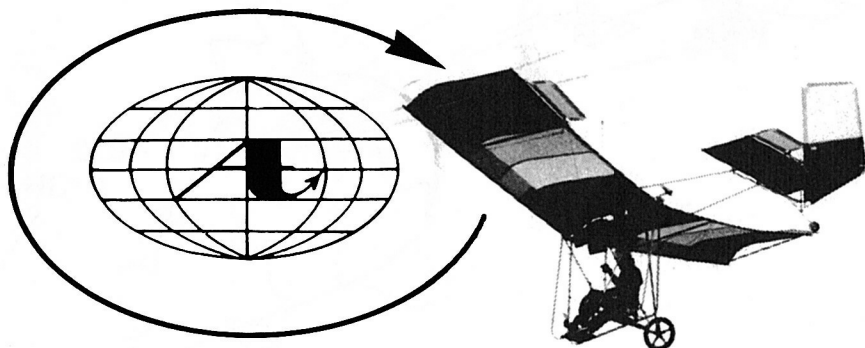


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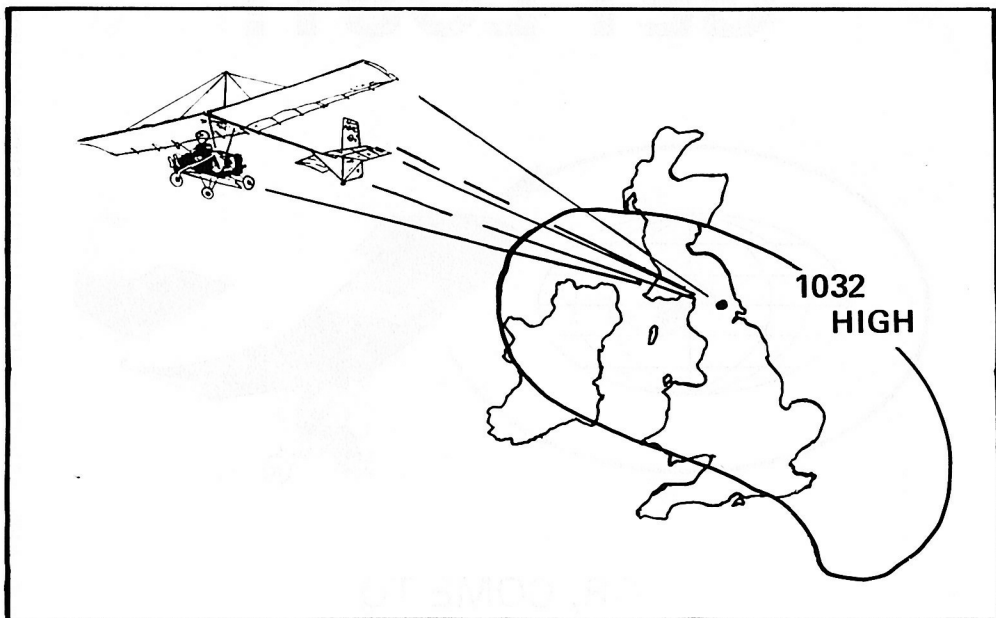
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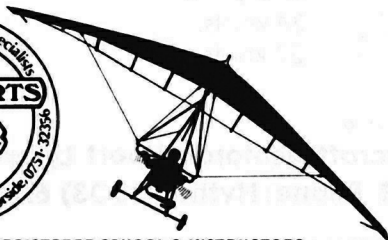
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