SAILPLANE & GLIDING 1992 YEARBOOK

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Finding the Diamond Wave Day — And How to Exploit It — Parachuting

Airspace — Club Directory — Records — Statistics

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SAILPLANE & GLIDING 1992 YEARBOOK

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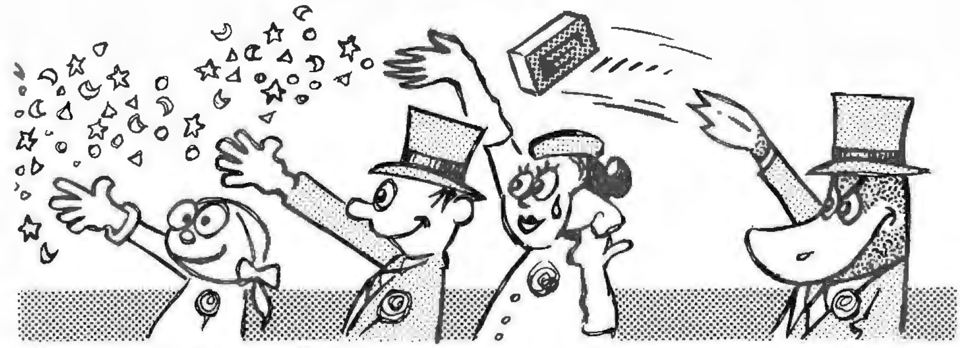
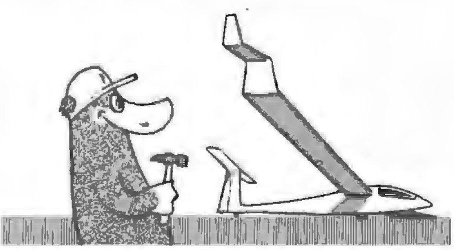
TAIL FEATHERS



More experience than me.

You either get it or you don't

Gosh, weren't you impressed by the article by Keith Nurcombe in the February issue of *S&G*, p23, describing the cross-country flights done in a Tutor, or, as it was known when it first appeared in the 1930s, Long Wing Cadet? To think that in the 1950s, when my friends and I were all struggling Tutor pilots, we used to yearn hopelessly for more performance, and all the time we unknowingly had at our fingertips a responsive hot ship ready and willing to leap over mountain and vale.



Yearn for performance.

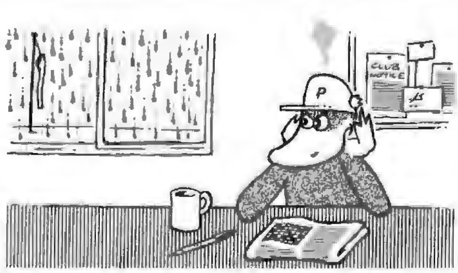
Hell, I still yearn for performance, and the moment a brochure arrives guaranteeing that an extra 2½ft of carbon-fibre on each tip – every foot costing more than I earned in the year that I joined the club, 50 weeks of miserable pen-pushing toil that I shudder to recall – will reduce my min sink by 9/16ths of an in/sec which in turn will improve my glide angle by 3.3%, I'm pleading for them to dispatch the merchandise by Federal Express, adding 75p for nails and glue and string to fix them on, and a pathetic PS: please fax and say when you are going to stick vertical winglets on to the horizontal tiplets to shave another 3/16ths off the sink and here's my signed blank cheque ready for you to fill in the first number that enters your head. I must be daft. I need counselling by an aged wise aviator, begoggled and with long streaming hair, on the benefits of wood, canvas and open cockpits to the health and pocketbook, not to mention the National Ladder.

Anyway, back in 1958 one of our group, an attractive female Tutor pilot (who went off and married a chap with more experience than me, by which I mean he had 50hrs in his logbook against my five) used to end all debate about better glide angles by flatly stating "Performance is irrelevant: you either get the next thermal or you don't." Despite having wrestled with formal logic at our most ancient university, I could not figure out why that was supposed to be such a knock-down argument. I think it was just the confident way it was stated; it would have floored Wittgenstein.

Now, 34 years later, I see that she was right; if you have the right mental approach, you can ignore performance. It is rather like those cartoon films where Tom and Jerry race out over a cliff and don't drop until they look down. Top Tutor Pilots Don't Look Down, that's all.

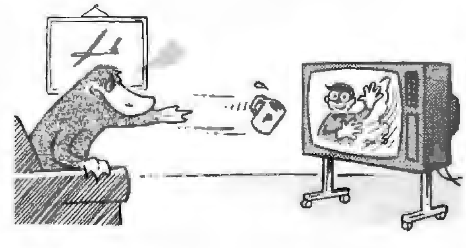
Shoot the messenger!

April may be the cruellest month, but February has the dreariest weather. The only things to recommend it are that is shorter than the other months and once every four years there is a chance that a shy and diffident single man may get a marriage proposal from a bold and confident woman. For myself, I'll be in hiding on the 29th, and will rely on propositions rather than proposals over the remaining 306 days of 1992.



Dreariest weather.

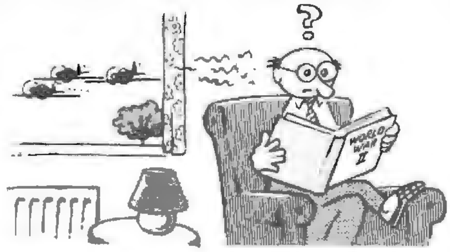
This last February there has been an active correspondence in the letters column of *The Times* about the incomprehensibility of television weather forecasts. The gripes are from ordinary citizens who just want to know whether to carry an umbrella on the way to work. This problem has been around for years and in many countries. In 1981 an American telephone survey found that people who had just a minute or so ago watched the TV weatherman had not the slightest understanding of it. Not one respondent could play back any part of the forecast. Same again in Holland. The trouble about professional communicators (here's me having a go at the poor hacks again) is that they are so convinced that everyone understands and is fascinated by what they are saying, that there is no need to check up on whether what they transmitted was received. Hence the garbage graphs in newspapers, designed by art editors to look pretty, not to communicate data: 50% of them convey the opposite of the truth and the other 50% convey nothing at all.



Too much talk.

Back to the forecasts: the reason for the failure to get anything across is simple. **Excess.** *Too much talk.* "But if we talk slowly people will get bored and switch to another channel or wander out to the kitchen to make a cup of tea or find something more exciting to do on the sofa." Oh really, how do you know? *And too many fancy graphics.* "We've got to make it look lively and colourful." Why?

The best trainers in public speaking skills tell us that most of us talk far too quickly, partly out of nerves and partly out of this untested conviction that slow is boring. When we do presentations we make our charts and slides far too busy, till the listener's head swims, rather than communicating one clear and simple idea at a time. Like all of you out there, I have a lively interest in the weather, but the only way I can follow it on the box is to videotape it. When I play the videotape back I can freeze-frame the isobars, assuming there are any, and study them at my



Battle of Britain obsession.

leisure. But that all this palaver is necessary is an indictment of the overpaid celebrities who have failed to deliver.

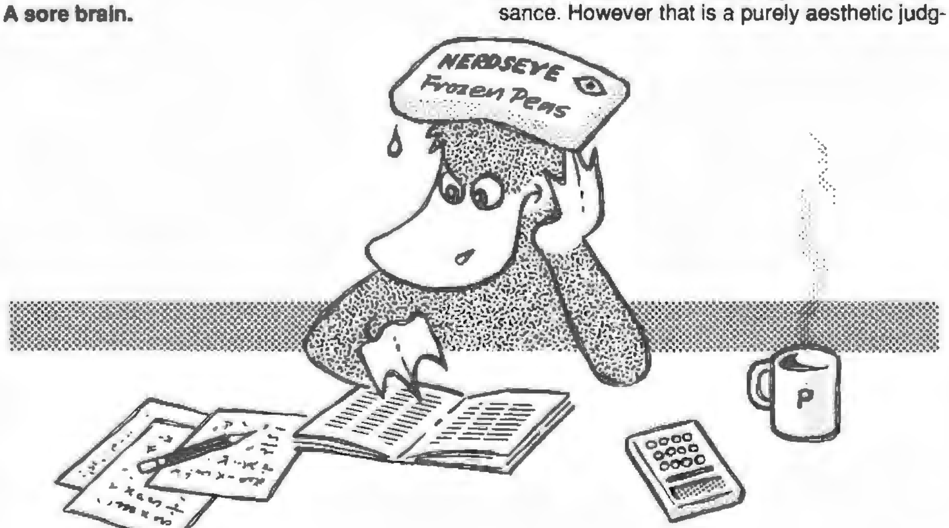
The fact that television weather presenters become personalities is not due to their personal charisma – they have as much real presence as a letterbox – but paradoxically is due to their terrible presentation technique. Good presentation is when people get the message, not comment on the messenger. "Is Michael Fish losing his hair, Bert? Where *did* he get that jacket? It makes those weird patterns all over the screen. Oh dear, I still don't know if the kids' picnic will be rained off. What did he say? No, he can't have said *hurricanes* dear, that's your Battle of Britain obsession coming out again . . ."

POSTperson's Knock

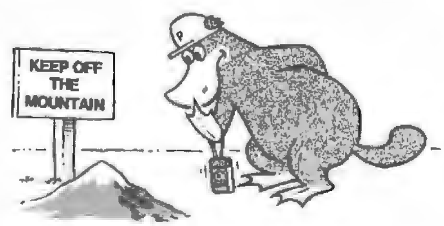
I've flown in POST tasks in the back seat of an ASH-25 at the World Championships, and very exciting they were too – especially the bit where we were nearly wiped out of the cerulean by another monster two-pew coming into the same TP from a different direction – though the excitement all I was thinking of was that of trying to get back just before the deadline, facing dire penalties for lateness. (A bit like getting your *S&G* copy to the printer? Ed) However in spite of having been there and done that, I began to get a sore brain trying to understand the new rules for POST tasks discussed in the February issue of *S&G*, p15. It would be easier to follow an exposition of European Community rules for the packaging and labelling of environmentally friendly high-octane pile ointment, expounded in Old Serbo-Croat. I suppose that anybody who has coped with the instructions for a computer should be able to manage, but frankly I leave that to the younger generation:

"What's the other seat for, mummy?"
"That's for the pilot's lawyer, sweetie"
"Ooh what fun, can I be a lawyer when I grow up, Mummy?"
"Any more filthy talk like that and it'll be *if*, not *when*"

A sore brain.



Wearing out our welcome?

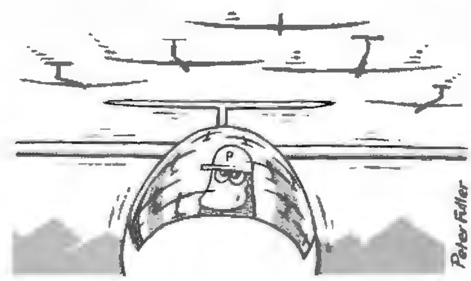


Wearing out the whole mountainside.

Talking about the environment, I wonder at what point gliders flying low over a ridge cease to be an interesting and attractive novelty to the groundborne observer and become an infestation. If by the end of this century we can expect every French Alp or every Scottish brae to bear on its noble brow a cloud of assorted glass (fast) or fabric (slow) flying machines, then they might well come to be seen as an eyesore and a nuisance. However that is a purely aesthetic judgment; at a practical level it is the groundborne walkers and skiers who are literally wearing out whole mountainsides already. Soon access to beautiful scenery will be rationed:

"Sorry, Snowdon's full. Try the Matterhorn, a few chaps have dropped out – or rather fallen off – so you might just be lucky."

– and that's only November.



A squadron of rock-polishers.

At least gliders don't wear out the hills they use, so perhaps we shall be tolerated or even encouraged. All the same I can imagine traffic lights or a Gendarme in a balloon to direct the flow of plastic along the *Parcours des Combattants* in August, especially on some sharp corners where you can't see a squadron of rock-polishers coming the other way until – aaaarrrgghhh!

WORLD RECORDS

(Subject to Homologation)

Single-Seaters (Women)			
Goal Distance			
806.21km	Janet Hider-Smith, Australia	Discus A	14.1.1992
Multi-Seaters (Women)			
Goal & Return Distance			
675.22km	Katrin Keime, Germany and A. Orsi (in South Africa)	ASH-25	7.1.1992
Triangular Distance			
759km	Katrin Keime, Germany and A. Orsi (in South Africa)	ASH-25	5.1.1992
100km Triangle			
133km/h	Katrin Keime, Germany and A. Orsi (in South Africa)	ASH-25	9.1.1992
100km Triangle			
142km/h	Adele Orsi, Italy and K. Keime (in South Africa)	ASH-25	10.1.1992
300km Triangle			
123km/h	Katrin Keime, Germany and A. Orsi (in South Africa)	ASH-25	6.1.1992
500km Triangle			
113.36km/h	Katrin Keime and U. Keime, Germany (in South Africa)	ASH-25	3.1.1992
750km Triangle			
120.79km/h	Katrin Keime, Germany and A. Orsi (in South Africa)	ASH-25	5.1.1992
Single-Seaters Motor Gliders			
Goal & Return Distance			
1131.39km	K. Holighaus, Germany (in South Africa)	Nimbus 4M	6.1.1992
Triangular Distance			
1163km	K. Holighaus, Germany (in South Africa)	Nimbus 4M	9.1.1992
Multi-Seaters Motor Gliders			
1000km Triangle			
144.49km/h	H-W. Grosse, Germany and ? (in Australia)	ASH-25BM	10.1.1992

(See also Records on p44.)

GLIDING AND UK AIRSPACE

Chris Garton, chairman of the BGA Airspace Committee, gives the latest airspace position

ICAO Airspace Classification. In November 1991 the UK adopted the new system of international airspace classification developed by the International Civil Airspace Organisation. The status of a piece of airspace is denoted by a letter which will be shown on all aeronautical charts, and it is this letter rather than the title of the airspace that will determine the rules applying to it. *Eg* in the UK airways will all be Class A, but in other countries they may be Class E. In order to fly within Controlled Airspace, gliders will often require legal exemptions, and the availability and nature of these will vary from country to country.

Class A Controlled Airspace

Cotswold CTA **Daventry CTA**
London CTR **London TMA**
Manchester TMA **Worthing CTA**

All **Airways** (except where they pass through a TMA, CTA or CTR of lower status).

The airspace is effectively closed to gliders, since it is subject to permanent Instrument Flight Rules, whatever the weather, and there are requirements relating to filing of flight plans, standard of equipment, pilot qualifications and adherence to ATC clearances. Gliders cannot comply with these. However, specified airways may be crossed by gliders under the provisions of Rule 21(2) which stipulates:

1. The crossing must be carried out in the most expeditious manner and, as far as is practicable, at right angles to the airway centreline.
2. The crossing must be carried out in VMC, by day.

The **UK Air Pilot** contains a map showing the crossable airways and maximum permitted crossing levels. In summary, these are:
Crossable below FL245: A25, B2, B3 (NW of Manchester), B226, R1, R14, R39.
Crossable below FL95: A1, A2.
Crossable below FL55: B3 (NW of Luton), R8 (west of Midhurst)
Airway G1 is crossable below FL195 to the west of A25. To the east of A25, it is crossable below FL165 and FL105 as denoted by the base of the Cotswold CTA.
Exceptionally, gliders may fly in other Class A airspace by virtue of a Letter of Agreement or other pre-arranged permission.

Class B Controlled Airspace. The entire airspace over the UK above FL245, comprising the **Upper Airspace CTA** and the **Hebrides Upper Control Area (UTA)**, is Class B Airspace. Gliders are permitted to fly in this airspace without restriction. Since the upper airspace contains Upper Air Routes and Military training Areas, glider pilots intending to fly at high altitude would be well advised to acquaint themselves with these areas, since jet aircraft speeds are much greater than at lower altitudes, and their pilots may not be aware of the presence of gliders.

Class C Controlled Airspace. No UK airspace currently falls in this category, though it is possible some may be so redesignated in future.

Class D Controlled Airspace. Formerly Special Rules Airspace, there are effectively two types of Class D airspace for glider pilots – those areas in which they need ATC clearance to fly and those in which they may fly without ATC clearance subject to maintaining VMC. Class D airspace is subject to Rule 27 which stipulates that any pilot wishing to enter it must:

1. Contact the ATC unit and pass details of the flight.
2. Obtain entry clearance.
3. Remain on the ATC frequency whilst in that airspace.
4. Comply with ATC instructions.

The above rules apply to gliders in the following Areas:

Belfast CTR **London Stansted**
Belfast City CTR/CTA **CTR/CTA**
Birmingham CTR/CTA **London City CTR**
Bristol CTR/CTA **Luton CTR/CTA**
Brize Norton CTR **Manston Cross-**
Cardiff CTR/CTA **Channel CTR**
Edinburgh CTR **Manchester**
Glasgow CTR **CTR/CTA**
Liverpool CTR **Prestwick CTR.**
London Gatwick
CTR/CTA

Gliders are exempted from the provisions of Rule 27 and may fly in the following airspace without ATC clearance in VMC:

Aberdeen CTR/CTA **Newcastle CTR/CTA**
Bournemouth CTR **Southampton CTR/CTA**
East Midlands **Southend CTR**
CTR/CTA **Teesside CTR/CTA**
Leeds/Bradford **Scottish TMA above**
CTR/CTA **6000ft.**
Lyneham CTR/CTA
Cross-Channel CTA

Guidelines for the use of this airspace by gliders in VMC have been drawn up by the BGA and approved by NATS. These are set out at the end of this article.

Class E Controlled Airspace. The Scottish TMA below 6000ft including the Scottish CTR outside of the Glasgow and Prestwick CTRs, and the Belfast TMA are notified as Class E, and permit all aircraft (including gliders) to fly in these areas without ATC clearance subject to maintaining VMC.

Visual Meteorological Conditions (VMC). To comply with VMC in order to cross Class A airways in accordance with Rule 21(2), or to use the exemption described above to fly in certain Class D airspace, a glider shall remain at least 1000ft vertically, and at least 1500m horizontally from cloud in a flight visibility of at least 8km. In Class E airspace, the visibility requirement becomes 5km when below FL100.

Local Agreements. A number of local agreements exist which modify the effects of some of the airspace listed above. Letters of Agreement (LoAs) between a gliding club and a nearby airport can make airspace either more or less restrictive than described above, depending on circumstances. These arrangements are too numerous to list in full, but the principal ones are:

Luton – A large segment of airspace in the northwest of the Luton SRZ is delegated to London GC, up to 3500ft in summer and on request in winter, to permit gliding operations at Dunstable. London GC should be contacted for full details. (See *S&G*, June 1987, p141.)
Brize Norton – Glider transits of the Brize Norton SRZ are the subject of a LoA between Brize Norton ATC and the BGA. See S&G, April 1988, p89, for details.
Airway Bravo 2 – At weekends, a section of this airway between Glasgow and Aberdeen may be de-regulated on request from the Scottish Gliding Union to permit wave soaring from Portmoak to proceed unrestricted within the confines of the airway.

Class F. Airspace. An Advisory Route (ADR) is a route used by airline type traffic, but without the full protection of an airway. Although depicted only as a centreline on UK aeronautical charts, it is nominally 10nm wide. Gliders may cross Class F airspace without restriction, but caution should be exercised.

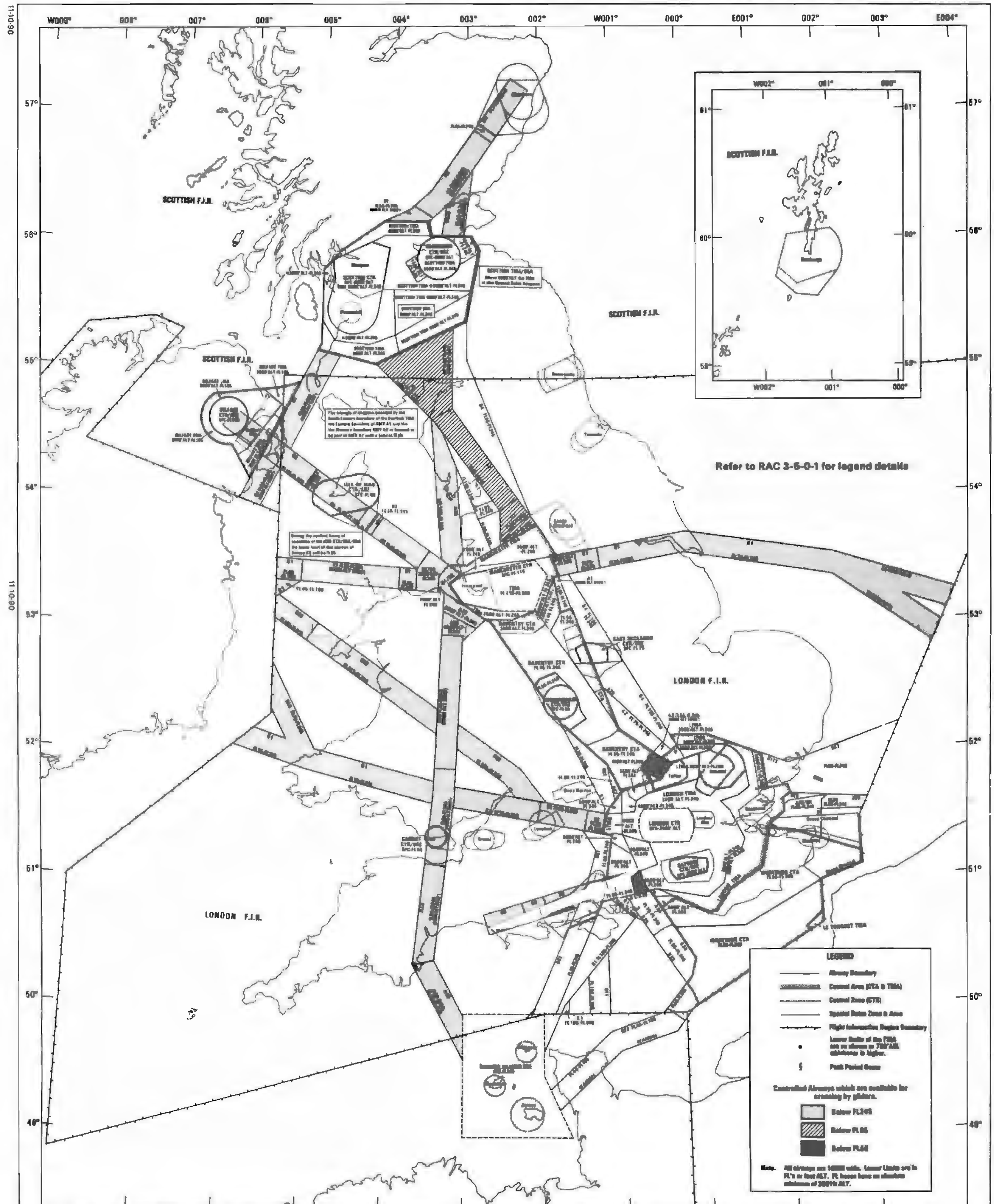
Class G Airspace. This is the term given to the "open" FIR (Flight Information Region), which is the uncontrolled airspace not subject to any of the afore-going classifications. Within Class G airspace there are various non-ICAO types of airspace, which are described below.

Aerodrome Traffic Zone (ATZ). A glider pilot wishing to enter an ATZ must first call the airfield on the notified radio frequency. An ATZ is only active during the notified hours of operation of the airfield.

At an airfield with an Air Traffic Control (ATC) unit, that unit is able to give or refuse permission for any aircraft to enter the ATZ and to give clearances to take-off or land.

At an airfield with an Aerodrome Flight

Controlled Airspace and Special Rules Airspace within the UK FIRs - Controlled Areas (Airways) available for crossing by gliders.



Reproduced with the permission of the CAA. See changes to this map on p6.

Information Service (AFIS) or Air/Ground (A/G) service, that unit is able only to pass information from which a pilot may judge whether or not it is safe to enter the ATZ or to take-off or land, *ie* the unit cannot issue clearances or withhold permission.

The following categories of airfield are protected by an ATZ: government aerodromes, and licenced aerodromes with one of the above types of service.

The ATZ comprises the airspace extending from ground level to 2000ft above the level of the aerodrome and within a radius of 2 or 2½nm of the centre of the aerodrome, depending on the length of the main runway.

At airfields without ATZs, including most gliding sites regardless of how busy they are, an itinerant aircraft may legally penetrate the airspace near and over the airfield, provided the pilot conforms to the traffic pattern or keeps clear of the circuit airspace, and observes the normal rules of good airmanship to avoid conflictions.

For landing at airfields with or without ATZs, it should be noted that many are listed in the **UK Air Pilot** as "PPR", "PPR to non-radio aircraft" or even "not available to non-radio aircraft". PPR (Prior Permission Required) means that landing permission must be obtained in advance of the flight, *eg* by telephone. All military airfields are effectively PPR and will not permit landings by civil aircraft except where they have been prearranged, or in an emergency.

Military Aerodrome Traffic Zones (MATZ). The rules applicable to the penetration of a MATZ are not mandatory for civil aircraft, and the same applies to the **Honington Military Control Zone.** However, radio contact is advised, and inside every MATZ there is an ATZ, the rules of which must be observed.

A standard MATZ comprises the airspace within a 5nm radius of the centre of the airfield extending from the surface to 3000ft above airfield elevation. In addition, projecting stubs 5nm long and 4nm wide extending from 1000ft to 3000ft above airfield elevation are aligned with the approach to the main runway at one or both ends. Some MATZ may lack stubs, or form part of a combined MATZ (CMATZ).

Upper Heyford Mandatory Radio Area. On weekdays gliders may only penetrate the UHMRA after establishing radio contact on 128.55Mhz, must listen out during transit and must call again on leaving or before landing within its confines. Gliders should not be issued with ATC instructions while within the UHMRA, unless they appear likely to enter the Upper Heyford ATZ.

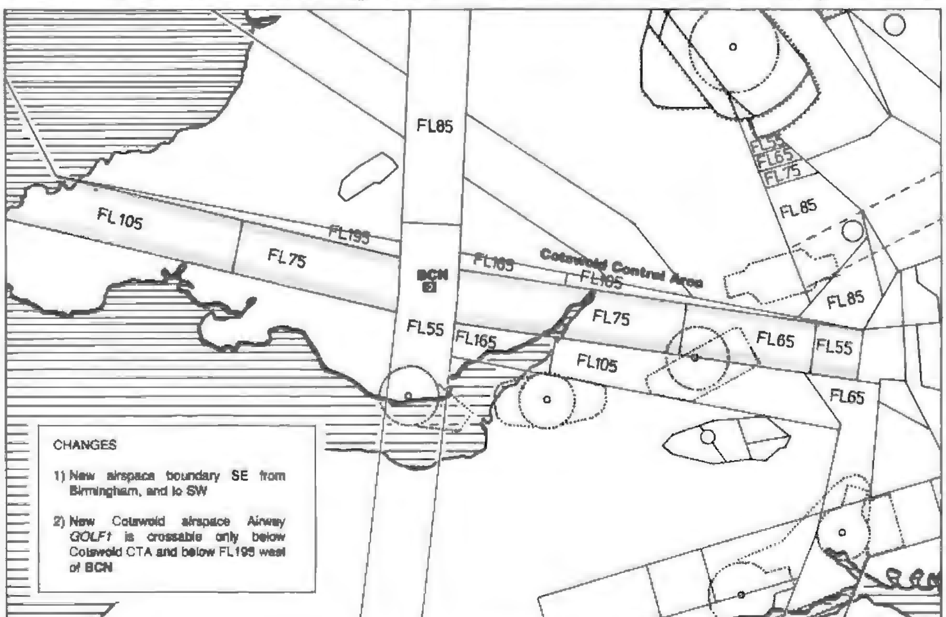
At weekends and on UK and USA public holidays there is no requirement to contact Upper Heyford. Gliders based within the UHMRA are covered by special procedures defined in LoAs with the clubs concerned.

Prohibited and Restricted Areas. A Prohibited Area (P-prefix) is prohibited to all aircraft, whereas a Restricted Area (R-prefix) permits limited access by aircraft under defined circumstances, *eg* landing at a nearby airfield. These areas include atomic energy establishments, security areas in Northern Ireland and sensitive military installations. Most Restricted Areas should be considered as prohibited to gliders, but the following are exceptions.

The Restricted Airspace established around high security prisons is applicable only to helicopters, and R105 at Highworth House, Glos, applies only to helicopters and microlights.

R313 at Scampton exists for the purpose of protecting the Red Arrows' display training – not normally more than two periods of 20-30min/day. The area is a circle of 5nm radius extending to 9500ft amsl and active only during Scampton's normal operating hours, which are weekdays and as notified by NOTAM. During these times, a glider may enter the area by permission of ATC Waddington.

The Highlands Restricted Area is a large piece of airspace over NW Scotland used for military low flying and weapons training, up to 5000ft. It is outside of the area of current glider operations, and access to it is set out in the **UK Air Pilot.**



Temporary Restricted Airspace. Major air displays such as Farnborough or Fairford are often protected by temporary Restricted Airspace. Local gliding clubs usually negotiate limited access routes to and from their sites to enable non-radio gliders to continue operating, but a glider equipped with suitable radio may fly in the area if it contacts the ATC unit designated by the NOTAM as the controlling authority.

Other types of temporary Restricted Airspace are effectively closed to gliders. They are established to protect Red Arrows' displays throughout the country, plus major flypast formations, over events of political significance and over the sites of major disasters. The duration and extent of the restriction can be quite short, and will be published by NOTAM.

Purple Airspace. Purple Airspace is established from time to time on a temporary basis to protect Royal Flights in fixed wing aircraft. Full details are promulgated by special NOTAM. It is important that gliding clubs receive and publish this information, because gliders are not permitted to fly within Purple Airspace, even by contacting ATC. Royal Flight NOTAMs also cover royal helicopter flights. These are not protected by Purple Airspace, but all the pilots are required to look out for and keep well clear of the royal helicopter.

Danger Areas. The UK is covered with Danger Areas of many types, shapes and sizes. They are active part-time, permanently or when notified by NOTAM. Full details will be found in the **UK Air Pilot**, RAC Section. The chart of UK Airspace Restrictions is also useful.

The **UK Air Pilot** lists only the type of activity most likely to be encountered, but in practice various hazards may be encountered in one area simultaneously. Furthermore high performance military aircraft may be encountered manoeuvring outside of the confines of the Danger Area, especially, if it is a Weapons Range Danger Area.

Flight not prohibited — but may be foolhardy

Many Danger Areas contain areas over which flight is prohibited at times within the period of activity of the Danger Area by reason of bye-laws made under the Military Lands Act 1892 and associated legislation. It is also worth noting that the **UK Air Pilot** does not list Danger Areas with upper limits 500ft or less above the local surface, to which prohibiting bye-laws may also apply.

With these exceptions, flight through a Danger Area is not prohibited, but may be foolhardy.

For Certain Danger Areas, a **Danger Area Crossing Service** is available, most notably for Salisbury Plain. A **Danger Area Activity Service** is available in other cases: this should be viewed as a means of establishing the state of activity of a Danger Area at a particular time, ➡

not as a clearance to cross it. A convenient summary of these two services and the ATC units to contact is printed at the foot of the 1:500 000 series CAA charts.

Other Hazardous Areas. Other types of hazard include **free fall parachute sites.** The airspace is contained in a circle radius 1½ or 2nm from the centre of the drop zone up to a maximum of FL150. It may not be apparent to a glider pilot, observing the drop zone in flight, whether or not there is parachuting in progress; parachutists normally free-fall down to 2000ft agl and are extremely difficult to see. Beware!

High Intensity Radio transmission Areas contain powerful radio emissions which may cause interference with glider radios and electronic variometers. In particular, Flyingdales is so powerful that prolonged exposure may be injurious to health.

Areas of Intense Aerial Activity. An AIAA is airspace which is not otherwise protected by regulated airspace, but where the activity of civil and/or military flying is exceptionally high, or within which aircraft regularly participate in unusual manoeuvres.

Gliders may penetrate these areas, but in view of the hazards, a sharp lookout is essential.

Military Low Flying System. Low flying by high performance military aircraft takes place in most parts of the UK up to 2000ft agl, with the greatest concentration between 250ft and 500ft. A chart is available denoting the system (**UK Air Pilot**, RAC Section).

All gliding sites are notified to MoD, which affords them the status of a Military Avoidance Zone, radius 1½nm.

The Low Level Civil Aviation Notification Procedure (CANP) enables civilian aircraft operators to give advance warning to MoD of any activities that could conflict with low flying military aircraft. In the case of winch launching permission this is done automatically, but clubs planning to make use of a temporary aerotow or motor glider site, especially midweek, may wish to take advantage of CANP.

Radar Advisory Service Area. A RASA is airspace in which a pilot may, if he so chooses, avail himself of the services of a radar unit. There is no requirement to do so, and a glider pilot should not assume that other aircraft are being separated from him, nor even that the radar unit is aware of the glider's presence.

The Airmiss System. An airmiss may be filed by a pilot who considers his flight to have been endangered by the proximity of another aircraft. All airmisses are investigated by the Joint Airmiss Working Group (JAWG), whose deliberations are confidential so as to preserve anonymity. The purpose of a JAWG investigation is to determine what lessons can be learnt, not to take punitive action.

Prompt airmiss reporting is vital if the other aircraft is to be traced. If in radio contact with an ATC unit report to them at once, or if not possible, telephone straight after landing. Either call the nearest ATS unit or Freephone 2230 (on Monday for a weekend incident) to speak to AIS (MIL) at LATCC West Drayton, who will start trace action at once and tell the Joint Airmiss Section (JAS). Follow up with a written report on form CA1094 to JAS within seven days. Always use GMT (UTC is the same) in reports.

JAS can be contacted in working hours on 0895 76-121, 122 or 125, or fax 0895 76124.

Code of Conduct for Glider Flights Through Class D Airspace.

1. Glider pilots should plan to route their flights through Class D airspace only when it is clear there are significant advantages from so doing, such as better soaring weather and shorter track distance.
2. Flights should be arranged so that the minimum amount of time is spent in Class D airspace. Pilots should avoid circling on or close to the runway extended centre lines, since this may interfere with aircraft carrying out instrument approaches or departures.
3. Good lookout is vital at all times, and glider pilots should be prepared to initiate avoiding action notwithstanding their right of way priority. Gliders are not always visible on radar, and other aircraft, including commercial jets, may not have been warned of a glider's presence.
4. Pilots of gliders equipped with suitable radio should listen on the appropriate frequency for information on other traffic in their vicinity.
5. Competition tasks should only be set through Class D airspace after consultation with the appropriate ATC unit. Where a task leg has to be set close to but not through Class D airspace, the ATC unit should be informed. When possible, photographic control point(s) should be established, to help ensure that gliders remain outside the airspace.

References. The information in this article is only a brief synopsis of the airspace rules as they affect glider pilots, and is believed to be accurate at the time of writing. In case of doubt, authoritative references should be consulted. These are: Air Navigation Order 1989; Rules of the Air Regulations 1991; **UK Air Pilot**, RAC section.

BARGAIN CORNER

2 off, 1000 metre, 7x7, 5mm, winch wire rope, surplus to requirements, unused – £150 each. John McKenzie, club manager, Derby & Lancs GC, 0298 871270

2 off, bungy ropes of unknown quality, sold as seen – £50 each. Steve Carver, 0433 21517

Altimeter (metres), 90mm, Winter ASI (30-150km/h) – offers. Winter ASI (50-250kt) – £40. 0529 303249

Pye Westminster ground radio, 130.1, 130.125, 130.4 and hand held microphone and speaker – £110. 0476 73163

Kiddie 530L oxygen, full 3 year certificate plus regulator. Suit Kestrel – £150. Fuess barograph 6km – £120. 0252 722279 (evenings)

Black and white film, 16exp. 200ASA, only £1.00 each! J. Wright, 84 James Street, Oxford, OX4 1EX. 0865 721944

Pye Westminster ground radio, 3 frequencies – 130.1, 130.125 and 130.4 – £95. 0532 755576

Pair of Pilatus B-4 ailerons – £100ono. Geoff Wilkinson. 0995 605730

Pye Cambridge base station in good working order – £50ono. 0234 840426

1 tailplane, strutted with trimmer, Grunau (?), condition unknown, sold as seen £100. 1 aileron, T-31 (?), condition looks reasonable, sold as seen – £50. Peter Rivers, 0298 871668

DIAMOND WAVE DAYS

Wave flow is very common, especially when there is an inversion or stable layer a few thousand feet above the ground. Waves which can give a 5km gain of height are much less common. This is a survey of occasions when pilots exceeded Diamond heights in wave climbs over the British Isles

The list of days was obtained from the BGA book of claims. Inevitably it excludes flights which were made by pilots who already had their height Diamonds. However, there were enough claims to give a fair representation of conditions on good wave days.

THEORY AND OBSERVATIONS

Essential for Soarable Waves

The basic requirements for soarable waves have been known for a long time, they are:
(a) A wind speed of more than 15kt blowing across a ridge which lies at right angles (±30°) to the wind direction. Large mountains work better with stronger winds and a speed of about 30kt seems to give the best results over the UK.
(b) The wind speed should increase with height by at least 2kt/1000ft while the direction should remain fairly constant with height.
(c) An inversion or stable layer lying above the level of the mountain tops. In the UK this stable layer is often between 3000 and 7000ft.

If there is no inversion waves are still possible when the wind speed increases with height but the stability decreases.

These items are regarded as essential for a train of lee waves which extends far downstream of the mountains. There may still be strong waves when these requirements are not satisfied. Close up to the mountains a single wave or a very short train of rapidly decaying waves can give high climbs even when conditions are theoretically unfavourable. This was noticed many years ago when the RAFGSA did a wave survey in the Carlisle area; it is confirmed by many reports from the Highlands.

Wave calculations

In theory one can calculate the shape of streamlines over and to lee of a mountain range. To do this one needs a detailed upper air sounding giving wind velocities and temperatures in the undisturbed air before it reaches the mountains. The data is entered into a computer together with a set of complex equations. The computed streamlines usually look realistic but unfortunately they are not always confirmed by aircraft and radar observations.

The problem with nearly all wave calculations is:
1. You need to know the size and shape of the mountain upwind. This has a major influence on the streamlines. That is not the end of the problem; if the airflow breaks away from the slope the wave pattern alters. Separation of flow seems to be common if the lee wavelength is longer than the width of the ridge. This often happens with strong winds.
2. A further problem is the length of the ridge. If the ridge is short some of the air flow will pass round the ends, reducing the amount which actually goes over the top to produce waves. If there is no ridge but just an isolated peak the waves often appear angled back from the peak like the wake of a ship. Two or more peaks can set up an interference pattern between their wake waves. Where waves are in phase the amplitude is given a boost; where they are antiphase they cancel each other out.
3. Even if you are dealing with a very long smooth ridge there is still the problem of time-dependence. Calculations which were based on a steady state upwind showed that the wave did not always produce a steady pattern on the lee side. In one case studied in America the wave pattern altered dramatically over a period of an hour or two. Some streamlines changed from gentle undulations to a violent upward swoop which took the air from a few thousand feet up to the base of the stratosphere. This was observed near Boulder, Colorado, where the mountains are much bigger than those in the UK. The principle remains the same however; even with steady upstream conditions the streamlines may vary with time to lee of the ridge.

Dispensing with the mathematics

Few people have the means to compute reliable wave patterns. Instead one can try an statistical approach. This involves collecting data on occasions when pilots proved that lee waves were big enough to give 5km climbs and looking for common factors. An attempt to do this is described below.

Dates of Diamond wave climbs

The majority of wave dates were taken from the BGA book of Diamond Height claims over the last ten years, with some additions from earlier occasions. A few Cb climbs had to be weeded out. There were several Cb climbs in England and I heard that one pilot who trailed all the way up to Portmoak for the waves ended up gaining his height in a cu-nim.

Charts

No attempt was made to analyse upper air soundings on every occasion. Instead two sets of charts were used:
(a) The surface charts showing isobars and fronts at 1200GMT. From this one can derive the low level wind speed and direction.
(b) The 500mb contours and thickness lines for the same time. From these one can work out the actual wind velocity at about 18000ft and also the thermal wind which is the vector difference between the upper and lower level winds.

Monthly variations in wave days

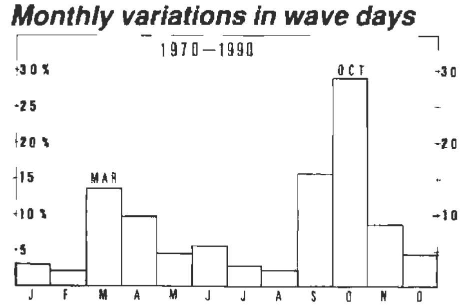


Fig 1

Fig 1 is a block diagram showing the percentage frequency of Diamond wave claims month by month. Notice the peaks in March and October. The October peak is probably due to the increased number of southern pilots who migrate northward for the wave season when thermals are rare. However, it is also a time when the winds are particularly favourable and the days are still fairly long.

Twenty years ago many people thought that autumn and spring were the best times for waves; summer was the time to use thermals and winter was often too bleak for serious wave flying. Since then good wave days have been found throughout the year and high climbs have been made around Christmas and the New Year as well as in midsummer. Some pilots say June can give excellent wave days. Only the members of the Scottish clubs stay to sample their summer waves and since many of them already have their Diamonds the BGA has only recorded a few of the 5km climbs which occurred in summer. There are lots of June waves in England and Wales too but they seldom appear in the list of claims.

SOME STATISTICS FROM THE WEATHER MAPS

Low level winds

Fig 2 shows the low level (about 3000ft) wind directions over the Highlands of Scotland over a ten year period. The length of the lines radiating out in different directions represents the per-

The three photographs on the right were taken by Tom on Diamond wave days. 1. A climb to 22000ft looking SW along Strathallan wave towards Loch Lomond. 2. Shobdon wave. 3. Wave climb looking W over Crieff towards Loch Earn.

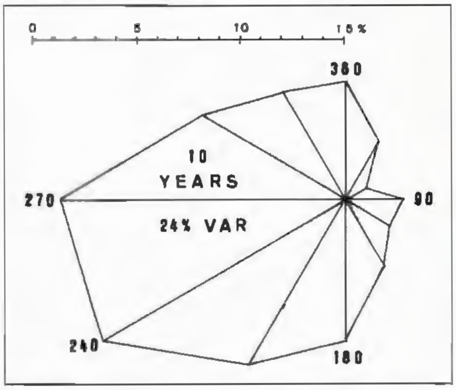


Fig 2

centage frequency of winds in each 30° sector. Winds from the west and south-west are common (a scale is shown above the diagram). The entry "24% VAR" means that on nearly a quarter of the days the midday wind speed was less than 10kt and/or the direction varied considerably a few hours either side of midday.

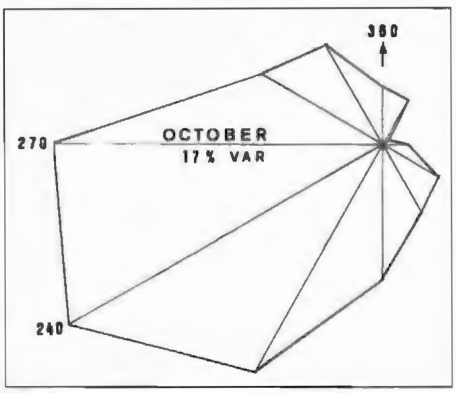
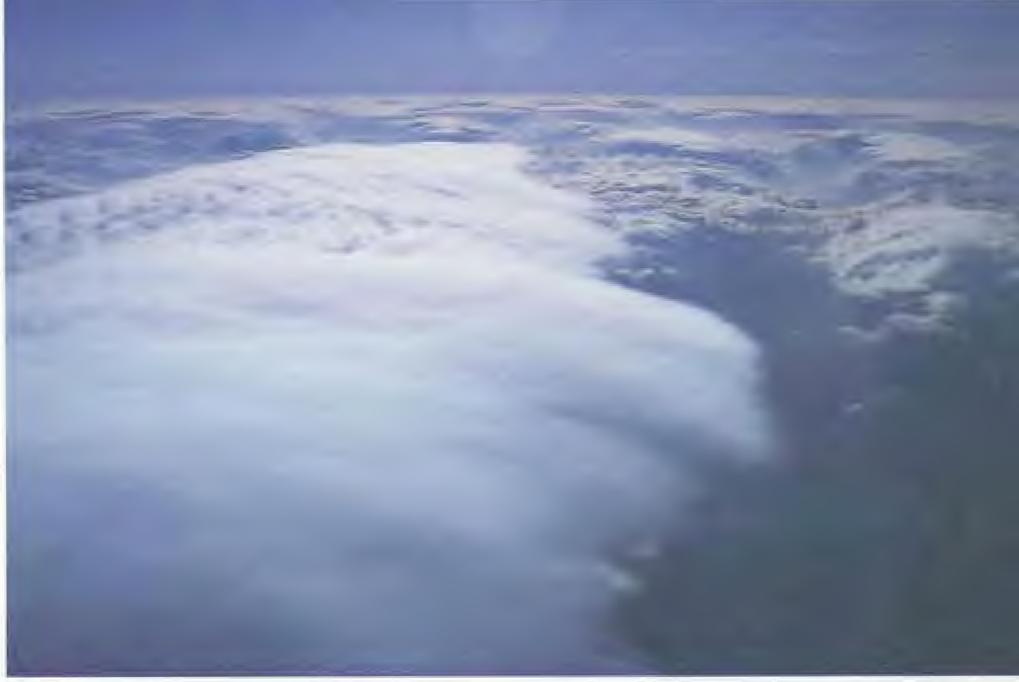


Fig 3

Fig 3 shows what the distribution was in the popular month of October. Notice that there are fewer variable or light wind days (down to 17%



1.↑

2.↑ 3.↓

instead of the annual average of 24%) and the winds from 240 and 270 are more common.

Best wind directions at different sites

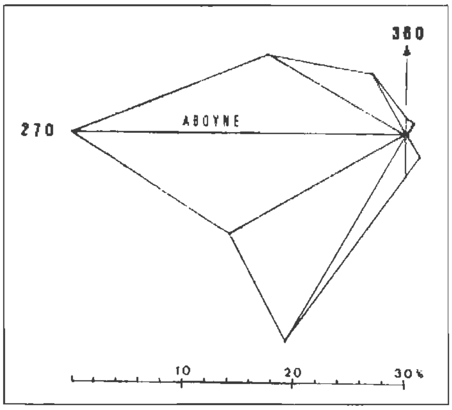


Fig 4

Fig 4 shows the wind directions on wave days at Aboyne. Notice that it is very similar to the October pattern. (The scale has been altered; the new scale is shown underneath.) Aboyne is fortunate in having an unusually wide sector – 270 is the most common direction but big waves have been found with most wind directions except those between NE and SE.

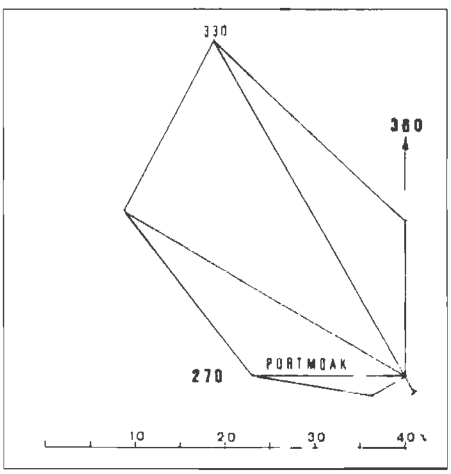


Fig 5

Fig 5 shows the wind directions which gave Diamonds at Portmoak. Here the sector for good waves is much narrower. North-westerly winds (directions 300-330°) are by far the best for wave. The south and SW winds are seldom much use for Diamonds at Portmoak. This is a pity because there are many more days of SW wind.

Fig 6 shows the pattern for Yorkshire. Climbs from Northumberland down to Camphill were included in this diagram. It shows a much narrower sector of good directions than the two Scottish sites. Westerly winds predominate. This is because many of the waves are controlled by the long N-S barrier of the Pennines. Satellite pictures show that northerly winds also produced wave patterns but it seems these waves are

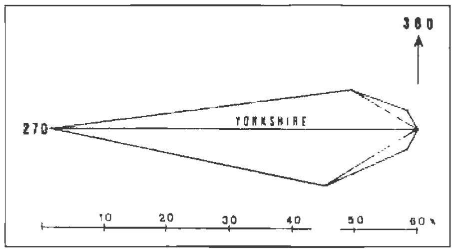


Fig 6

either harder to enter or do not go high enough for many Diamonds.

Fig 7 shows the pattern for Wales (excluding the western part). Here 270 to 300° seems by far the best direction. There are rare occasions with a 210° wind and (to my surprise) even 090 which gave Talgarth a rare easterly Diamond climb. Easterly waves are common to lee of the Black Mountains but they seldom give really high climbs.

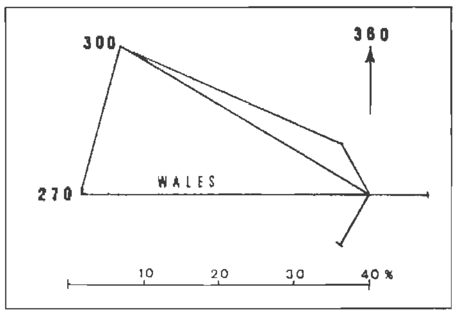


Fig 7

Changes of wind speed with height

Lee wave theory requires the wind speed to increase with height. Fig 8 shows the frequency of different wind speeds both at 3000ft and higher up at the 500mb level (about 18300ft). There were hardly any big waves until the 3000ft wind speed was at least 20kt and the majority of waves occurred with speeds in the range 30 to 40kt. The strongest winds were usually found over the Highlands. It was most surprising to discover a few winds in the 60kt range at Aboyne. Such strong winds at low levels tend to prevent high waves developing. It may be that the shelter of the mountains brought the actual wind speed well below its geostrophic value at

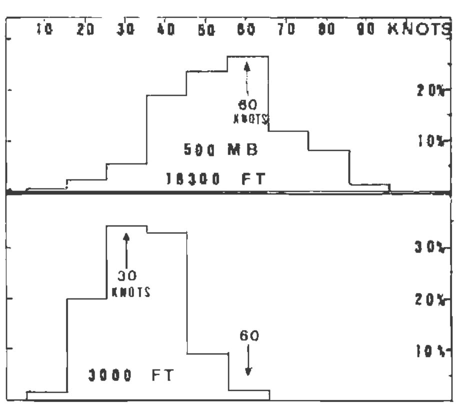


Fig 8

Aboyne. On the exposed north and west coasts of Scotland there were gusts to storm force on a few of these wave days.

The upper part of the diagram shows the range of wind speeds at 500mb. Diamond climbs almost always exceed this level unless the pilot manages to contact wave very low down. On the majority of occasions it shows the expected increase of wind speed aloft with 60kt as the most popular value and 90kt being reached occasionally.

The 500mb winds were taken from contour charts, not individual reports. These charts smooth out minor fluctuations which show up on the wind profile measured by a radiosonde. The streamlines of air flow to lee of mountains sometimes have a remarkably steep slope on the upwind side of a wave. A balloon passing through this part of the wave will have a much lower wind speed than reported upstream.

The spacing of the 500mb contours showed that the wind aloft could be the same as or even less than the 3000ft wind. This conflicts with traditional lee wave theory. With such a wind profile one does not expect lee waves to extend downwind but there is nothing to prevent the air making a single bounce over the peaks. Diamond heights were achieved over the Highlands on days when the simple wave models failed to predict any wave at all.

Waves in relation to highs and lows

One of the items noted was the position of the wave climb in relation to the main centres of high and low pressure. The aim was to see if Diamond waves could be found close to a low or high. On each wave day the sea level pressure at the airfield was compared with the central pressures of the main highs and lows on the 12GMT chart. For example if the pressure change from high to low was 1030 to 980mb (a range of 50mb) and the local pressure was 1010, 30mb above the lowest pressure, then it scored 30/50 or 60%. In this scoring system the centre of the low gets 0% while the centre of the high gets 100%.

Most highs have inversions aloft which favour waves, but near the centre the winds are usually too light. Going towards a low the air tends to become less stable, there is more often a marked change of wind direction with height and the cloud cover is liable to be too great for visual navigation.

Fig 9 shows that for most of England and Wales (the lower section of the diagram) Diamond waves are more likely in the 70% to 90% sector. In contrast reports from the Highlands showed that Diamond waves could occur with a much wider range of values. 60% to 80% got the best scores but there was a significant percentage of wave days with scores down in the 20% to 30% (2 and 3 on the diagram). There were even a very few occasions at the 10% level when good waves were found although a little low was just off the east coast of Scotland.

Waves and fronts

It was interesting to see how often strong waves were associated with the presence of a front near to the region of the climb. The frontal zone almost always provides a deep stable layer

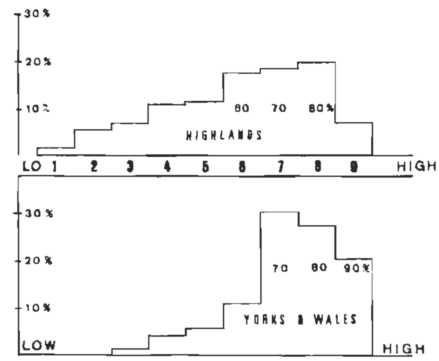


Fig 9

and the contrast between the warm and cold air masses produces a marked wind shear. Unfortunately fronts are also liable to bring thick cloud and rain which makes wave flying impracticable. However, the shelter effect of a wide belt of mountains often allows small clear slots to persist even while the tip of a frontal wave crosses the area. Scottish sunshine records showed that, in spite of the proximity of fronts, there were nearly always some breaks in the cloud around Aviemore. With west to south-west winds the wave slots expanded to lee of the mountains so that Aberdeen or Inverness recorded two or three times as much sun. When winds were north-westerly Leuchars (west of Portmoak) and Edinburgh got the most sun.

I recall sitting in the clear at about 17000ft anxiously watching the only hole visible hoping this tiny gap would stay open. Meanwhile the club radio broadcast dreadful accounts of sleet and rain sweeping in great gusts across the airfield below. Later on I looked up the chart for that day and found that the tip of a frontal wave had passed right across the area.

Good and bad frontal structures

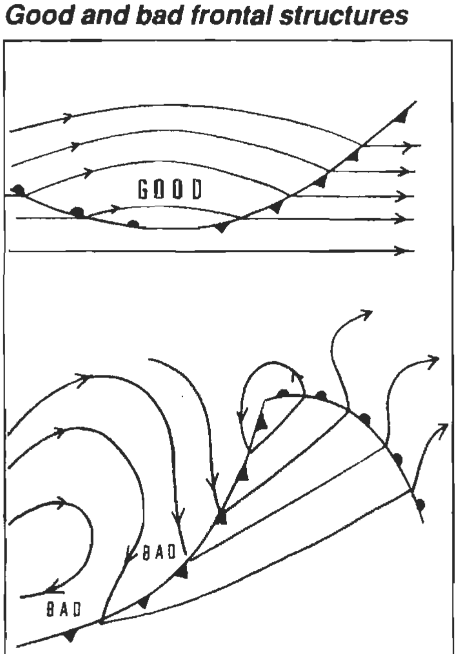


Fig 10

Fig 10 shows two patterns of fronts and isobars. The top one shows a good wave situation. These occur when the front is almost parallel to the isobars and especially if there is a small isobaric ridge across the line of the front. The ridge suggests the air aloft has been subsiding. This dries out the air and makes the upper cloud thin enough to break up into wave bars and slots. On the lee side of the mountains the low level air is dried out by its passage over the hills so that one can see some strips of ground during the climb.

The lower diagram is bad news. The difference is that the isobars are at a marked angle to the front. A sharp kink in the isobars is one indicator of an active front. It also spoils the profile of the winds aloft because the thermal winds are opposed to the low level winds.

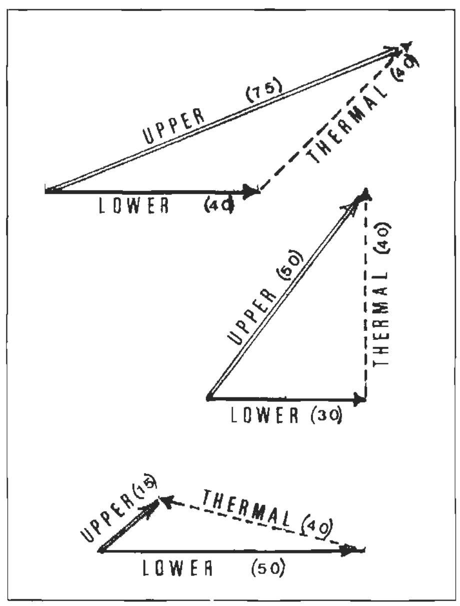


Fig 11

Introducing the thermal wind

The upper winds are related to the low level winds by a vector known as the "thermal wind". It is called this because it is produced by a horizontal change of temperature; a front is almost always marked by a decrease of temperature as you fly from the warm to the cold side. The temperature gradient produces a thermal wind. Thermal winds blow parallel to the temperature gradient with the cold air to the left (in the northern hemisphere). This is similar to the rule for isobaric charts in the northern hemisphere: the wind blows parallel to the isobars with low pressure to the left.

Thermal winds and fronts

Since fronts separate warm from cold air the thermal winds usually blow almost parallel to the front.

Fig 11 shows how one can use vector addition to find the upper wind if you know the lower wind and the thermal wind. In these three examples the lower wind is drawn with a solid line, the thermal wind with a pecked line and the upper wind by a double line. The actual wind speeds correspond to the length of the lines and are written near the arrow points.

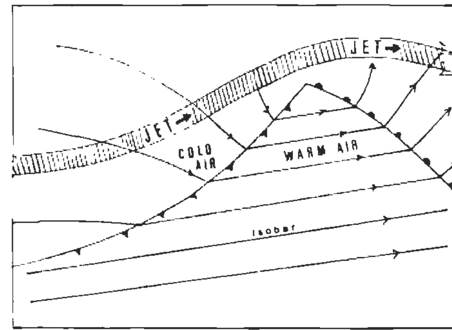


Fig 12

In the upper diagram the thermal wind makes a small angle to the lower wind and the two 40kt vectors combine to give a 75kt upper wind blowing at an angle intermediate between the lower and thermal winds. If the first two vectors had the same direction the upper wind would be just an arithmetic addition (80kt).

In the middle diagram the thermal wind is at right angles to the lower wind. Now the upper wind shows a marked change of direction but not so much increase in speed.

In the lower diagram the thermal wind is in almost the opposite direction to the lower wind. The resultant upper wind is then greatly reduced, being only 15kt aloft while the lower wind is 50kt.

Jet streams

Jet streams are often associated with frontal systems. Indeed the jet stream may develop before the front becomes an active feature. Jet streams occur because the contrast between warm and cold air produces a very strong "thermal wind" vector. This vector increases with height and the core of most jet streams is found just below the base of the stratosphere. (Not far from 35000ft on many days.) The very strong winds in the jet stream trap wave energy coming up from below and deflect it back towards the ground. When this happens waves tend to die out high up but extend a long way downwind. This makes them good for cross-country flying as well as Diamond heights. Fig 12 shows the alignment of a jet stream associated with a developing frontal wave.

Best regions for waves near fronts

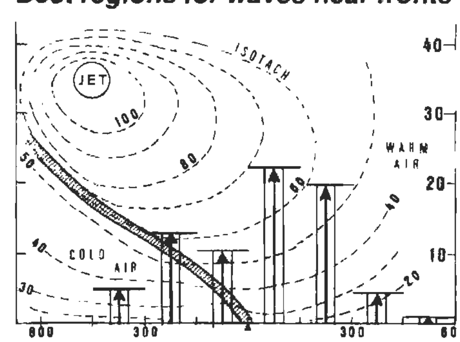


Fig 13

Fig 13 shows a cross section of a slow moving front (slow moving because it lies at a small angle to the isobars). The hatched section is the ➡

frontal layer, there is cold air below and to the left and warm air above and to the right. At the frontal surface, where the two air masses meet, is an inversion or region of strong stability. The core of the jet stream is shown above the frontal surface. The pecked lines are isotachs. These show the wind speed (blowing inwards when this is a northern hemisphere diagram). They are labelled 100, 80, 60 etc showing the speed in knots. The distance away from surface front are shown along the base line.

The series of arrows ending in horizontal lines shows the frequency with which Diamond waves were encountered in relation to the front. The longer the arrow the greater the frequency of Diamond claims. The arrows are for sections 150 miles wide on either side of the front.

Good waves were often found in the warm sector of a frontal system. If there was a slow moving front then the chance of making a high climb increased as one moved towards the front. The prospects were apparently not quite so good on the cold side. However these figures depend on there being a front actually marked on the 1200GMT map. On some occasions the Bracknell analyst dropped the end of a front where it appeared to become weak. There may still have been a frontal zone aloft giving a stable layer and a favourable wind shear.

SUMMARY OF GOOD WAVE SIGNS ON SURFACE WEATHER MAPS

1. Winds (measured from the isobars) of at least 20kt approximately at right angles to the main mountain ridges. Speeds of 30kt seem best.

2. Best directions:
Wales. WNW: mainly in the sector 270-300°.
Yorkshire. Westerly: mostly 270 but also in the sector from 240-300°.
Portmoak. NW: Directions from 360-270 all worked but 330 gave most Diamonds.
Aboyne. Almost all directions except NE to SE. 240 and 210 gave many good days but the largest number were in the 270 sector.

3. Distance between centres of high and low pressure.

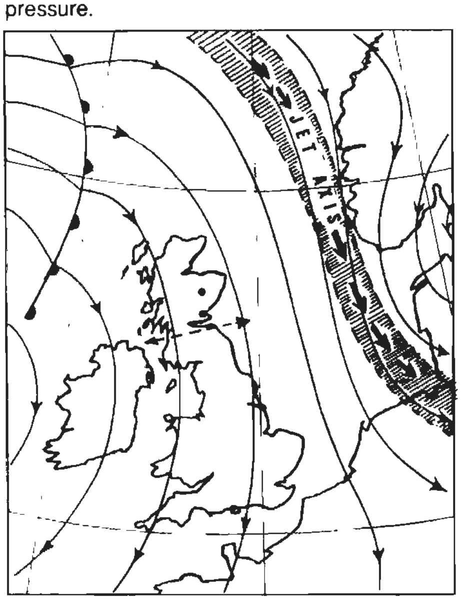


Fig 14

On most wave days the area was 70% to 90% (by pressure difference) towards the high. Over the Highlands the range is much wider and waves were sometimes found very close to lows but not quite so close to highs.

4. Association with fronts.

Good waves were often found within 300 miles of a slow moving front (a front lying almost parallel to the isobars), especially on the warm side. If there was no slow moving front then wide warm sectors were good, provided high ground broke up the usual low stratus found near windward coasts.

If you have upper wind forecasts too

(a) If the wind speed increases with height while remaining almost constant in direction, *eg* 30kt at mountain top level, (approx 3000ft) and 60kt at 18 000ft.

(b) If there is a jet stream with its axis a few hundred miles towards the cold air. For example very good waves are likely if there is a NW flow over Scotland and also a NW jet lying over the North Sea near Norway.

Some examples

These charts show three general situations when waves went very high or extended over a large area. They are a combination of several dates, not individual occasions.

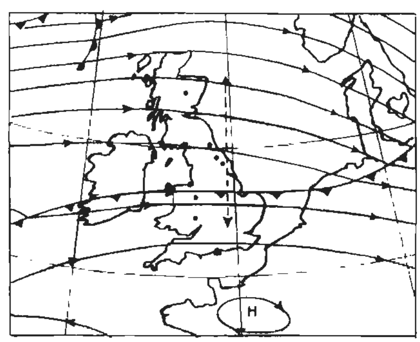


Fig 15

Fig 14. The north-westerly flow. Here the area lies in cold air but a warm front to the west of Scotland provides a stable layer (fairly high up). The thermal and geostrophic winds are almost parallel and there is a jet stream over the North Sea between Scotland and the Norwegian coast. Very high climbs have been made over the Highlands in such conditions. The pecked line with arrows at each end shows the width of wave patterns on satellite pictures.

Fig 15. Westerly flow. Here there is a very slow moving front lying EW across the country. The geostrophic wind is reinforced by the thermal wind which (blowing parallel to the front) has almost the same direction. Thus the wind direction remains constant but its speed increases with height. Diamond heights were achieved from Usk in the south to Aboyne in the north with claims from many clubs in between.

Fig 16 The south to south-west flow. This is seldom good for anywhere except Aboyne and places north of the Cairngorms but a few claims came from Wales and Yorkshire. This is an example of wide warm sector conditions bringing

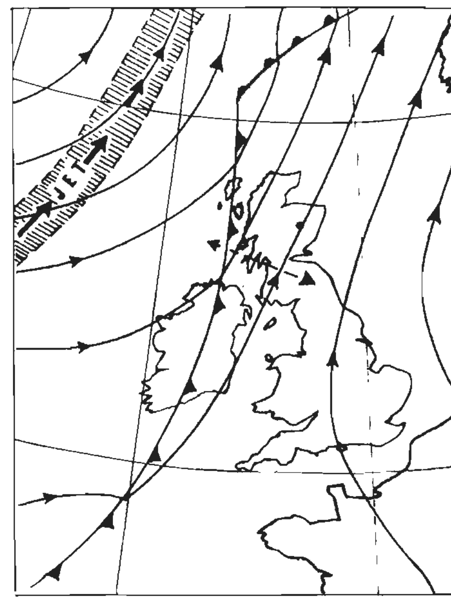


Fig 16

low cloud, drizzle and hill fog to many places and rain to Ireland and the west of Scotland. On at least one occasion Glasgow reported continuous moderate rain yet it was flyable at Aboyne. The existence of a slow moving cold front west of the Highlands provides good conditions for waves and one frequently sees them on satellite pictures. However, only where there is particularly good shelter does the cloud break up enough for people to use the wave system. ■

WAVE AT ABOYNE

Above: Terry Joint's photograph of the Lasham Janus. Below: sunrise and sunset during the second week of October, 1990. Photos: John Allan.

FLYING IN WAVE

Following Tom Bradbury's survey of when pilots exceeded Diamond heights in wave climbs on the previous pages, Graham McAndrew, national coach, tells how it may be exploited

Anyone who has ever sat and watched in silent awe at the unfolding Elysium splendour as you climb past and above layer upon layer of linen smooth rolling fields of cloud will, like me, find any description inadequate.

Using wave to gain the dizzy heights of Diamond and above has become commonplace. The process of wave propagation is fairly well understood, if still a little difficult to comprehend. Although a vivid imagination helps, I think it's best to leave the scientific analysis to the people who understand that sort of thing. Tom Bradbury's excellent book **Meteorology and Flight** is a must for every pilot, and his article in this Yearbook will give a far better insight than I can to the mysterious workings of the atmosphere.

Although an understanding of the theory is important, it must be backed up with practical instruction which is what I hope this article will do.

The first obvious problem is how do we know it is there. Apart from other gliders climbing in the stuff, what clues are we going to be able to see from the ground that will help us?

Most of the time we have to work for rewards and become used to spotting subtle clues

The days when wave presents itself like a ladder in the skies, offering an easy climb to Diamond or above, are few. Most of the time we have to work for rewards and so become used to spotting the subtle clues. There are three main cloud formations that will help.

First the rotor cloud. This is a cumulus type cloud (fractocumulus) which may take the form of a few feathery wisps of ragged tendrils, a single bundle of cloud or of a long roll lying across the wind. Any formation should be investigated; search on the upwind side, ideally above its base. It will not necessarily have any particular form, although sometimes its upwind edge and its crest may be smooth and laminar. At times you may see the cloud rolling, building on its upwind side and decaying on the downwind side, such that it remains stationary over the ground. The air which lies within these clouds can be very confused and chaotic as can be seen at times from the tumbling effect.

Rotor clouds will form if the air is moist at low levels, their base generally corresponding to the base of other convective cumulus for that day. Lift may be very good on the upwind side then again it may be very broken, turbulent and difficult to use. It varies. The rotor cloud may exist all day or it may be transient, hopping around into or downwind or disappearing altogether. There are days when the climb above the rotor reveals a definite system with well marked lenticulars and other days when the only cloud indications are the low level rotors. If this is the case it does not necessarily mean the wave lift ceases above the rotor cloud; it simply means the air above these clouds is too dry to form lenticulars. Climbs in excess of 20000ft have been experienced with completely blue skies above the lower rotors.

Classic wave photographed at Aboyne by John Bridge.

The classic wave indication is the lenticular cloud with its incredibly smooth edges and dinner plate appearance. Sometimes there are single slivers of gossamer fillets, other times gigantic walls formed by millions of tons air and vapour on the move. They must be the most photographed things in the sky, appearing motionless, hanging in space. They, like the rotors, are stationary relative to the ground. Indeed the wind can be said to blow through the lenticular, ascending and condensing any water vapour on the upwind side and descending and evaporating that vapour on the downwind side. It follows, therefore, that we should fly upwind of these clouds in the rising air in order to climb.

The third clue to where the wave lies is the slot or gap formed in sheet stratus. The wave flow punches holes in the layer cloud on the ascending and descending phases, evaporating any water vapour and forming clear slots. It may not be immediately obvious when viewed from below the cloud layer what the pattern is, but once above it the cloud begins to look organised and regular with uniform slots carved into an otherwise smooth scape. It can sometimes be a bit of a risk climbing above such expanses of cloud as the possibility of the gaps closing are high. More on this later.

There are other occasions, as with thermal soaring, when there is simply not enough water vapour contained within the air to form any cloud at all. The air is dry and no visual clues exist. All that can be done is to rely on local knowledge to decide where the lift should be. Failing that, try something. If it does not work then try something else.

Before you take-off you need to consider your own comfort and well being. Keeping warm is a real and important problem. Failure to dress adequately will not only reduce enjoyment or achievement but safety as well. You can estimate how cold it is going to be at particular heights using a lapse rate of 2°C/1000ft. This means that if the air temperature at ground level is 10°C then at 10000ft it will be –10°C, at 20000ft it will be –30°C and at 25000ft it will be in the region of –40°C. That in any one's book is cold. Of course the temperature within a well sealed and sunlit cockpit will be a little warmer than this, but not much. You are dressing to survive not for fashion. The effect of cold on the body is slow to take effect and will lag behind actual temperatures. Wear lots of thin layers rather than fewer thick layers and keep as much of the body covered as possible.

Ski clothing is about the best together with all of the following:- thermal underclothes, two pairs of socks and moonboots (make sure socks and feet are dry to the extent of changing just prior to take-off and dusting bare feet with talcum powder), thick trousers (padded if possible, shirt (again padded), two thin jumpers, which are better than one thick one, ski suit or salopets, a good quality quilted jacket, gloves with inner linnings to trap more air and don't forget your favourite warm hat. A lot of heat can be lost through the head (something like 10% of all body heat) so keep it covered.

A lot can be written about oxygen equipment and the effect that lack of oxygen has on the body but I do not go into it now. You cannot take wave flying seriously if you do not have a good system and know how it works and its short comings. Switch the bottle on, make sure the mask fits and the system is serviceable and topped up, know how to use it and definitely have it working by 12000ft. You cannot afford to take chances with it.

So, once you have decided that it is actually waving, and you've wedged yourself in the cockpit, which now seems far too small with all those clothes you are wearing, how do you go about using it? At established wave sites the tug pilots usually have a very good idea of where to tow you for the best results. At times it may be necessary to go very high to get into the lift. An aerotow to 5000ft may be necessary for a soaring flight whereas a 4000ft tow will see the pilot back on the ground in 25min. You must decide whether it is worth the cost. Other times the wave may be accessible from much lower altitudes.

A good tug pilot will see the indications already talked about and position the glider on the upwind side of likely clouds while you should be keeping an eye on the vario. The tug will climb at a particular rate in still air. It will be between 4-6kt for a 180hp tug and a single-seater. If the rate of climb reduces to say 2-3kt, then you can be pretty sure you are flying through sink. This is actually a good sign there is lift further into wind. You may experience turbulence on tow; again this is a good sign. It pays to expect severe turbulence and make sure you, and everything else in the cockpit, are well strapped down. No loose cameras or oxygen masks. If you lose sight of a the tug, pull off. This turbulence could mean you are passing through the rotor area and that the wave lift is a little further into wind. Do not pull off in this turbulence even if the vario hits the stops, which it may well do. It will only be very transient and pulling off could well lead to a rough and rapid descent. Hang on and wait until you see the vario go through the original climb rate and begin to exceed it, wait a few seconds to ensure it is steady and smooth and then pull-off. You are in it.

There are times, of course, when you are already airborne, on a ridge or in thermal, when the wave sets up. The transition from thermal or ridge into wave can be tricky and may be impossible. At times it may only be possible to contact the wave for a brief period when it dips into the lower layers, usually after the passage of a large shower has left a cold and stable mass of air that acts as a springboard for the wave. Once this air has become unstable again through ground heating the wave may be forced above it once more, leaving it unaccessible from lower levels.

Thermals beneath active wave systems can be terribly distorted and twisted. Some may be next to impossible to climb in while others give uncharacteristically strong rates of climb. Gaining as much height as possible in such a thermal, even to the extent of climbing a few feet into the cloud itself and then pushing into wind, may gain you access to the wave on the upwind edge of the cumulus. Several attempts may be needed before you succeed. Transition from the thermal lift to the wave should be marked by a smoothing out of the turbulence and, although weak at first, should show steady lift.

Contacting wave from a ridge is down to luck really. If the wave dips low enough and is in phase with your ridge then the chances are you will be able to make the transition. Get as high as you can in the ridge lift, fly into wind at a steady airspeed and watch for a trend in the vario reading. If the needle begins to move down, even by a small amount, then the chances are it's going to get worse. If, however, it shows the slightest movement up it is worth investigating further. If it gets to zero, slow down and see what's happening.

Whatever the circumstances it always pays to assume that any lift that is smooth is wave lift and fly accordingly.

It is not necessary to dive off hundreds of feet of precious height

There is a lot of myth about notching barographs on wave climbs to establish a low point. Notching is only necessary if the rate of climb you experience off tow matches the rate of climb you were getting on tow. If there is a difference then it will show in the gradient of the climb on your barograph. This, together with the tug pilot's report, is enough to establish your release height. If a notch is required then flying with the airbrakes open to stay at a constant height for about one minute will give a perfectly adequate low point. It is not necessary to dive off hundreds of feet of precious height for the sake of a cavernous dip which may see you out of the lift altogether. Even if you forget the notch then that nice man at the BGA who looks at height claims etc will simply add 500ft to whatever the tug pilot claimed was your release point to take the height gain from there. The biggest reason claims cannot be verified is the age old problem of forgetting to switch the barograph on in the first place.

So let's assume that you've found yourself in lift, what do we do next? The answer is easy. Stay where you are. It sounds easy but it does have its problems. The lift you are climbing in, at whatever rate, is an unknown quantity. You do not know how extensive it is but you do know it is working where you are now. Don't go valiantly off to explore until you have gained some height and have some idea of where to come back to if you fail to find better.

Remember the lift is stationary relative to the ground but at the same time the air is moving relative to the ground. The strength of the wind will determine what should be done. If the wind speed is equal to or greater than the minimum sink speed of your glider then you can simply turn into wind and fly at a speed corresponding to the wind speed, at the same time remaining in the same position over the ground. At this height, however, this is unlikely to be the case, although it may well apply the higher we go due to the increase of windspeed with height.

What is more likely is that the windspeed is less than your stall speed or at least less than min sink, in which case if you point into wind you will make progress forward and so fly out of the lift. In order to climb in the initial stages you must stay in the same position over the ground. Pick up an easily recognisable ground feature, preferably almost directly beneath you, (not immediately beneath you because you will not be able to see it), and judge the strength of wind from progress related to it. If pointing into wind causes you to progress forward then turn across wind by increasingly larger angles until there is no more progress into wind. Of course this will see you travelling slowly across the wind and as long as you remain in lift this is fine. As soon as the vario begins to show a reducing trend, reverse the beat, picking up another ground feature and re-establishing the position of the next beat.

There will be occasions when it is not possible to stay in the lift by beating across the wind. The area of lift may at this height be very small, in which case S turns may be appropriate, just as you would do when trying to climb initially in a thermal from a ridge. A modification to this might be to fly directly into wind until the lift begins to reduce, then turn across the wind and allow the glider to be drifted through the area of best lift. Repeat the manoeuvre in the other direction. At other times the best rates of climb can be achieved by full 360° turns, stretching the turn into wind to prevent being drifted back.

Whatever you do, the aim must be to maintain station over the ground until the climb is sufficiently established and enough height has been gained to move around a little and explore the extent of the lift.

As you gain height you will begin to climb past whatever cloud has formed. In general this should be easy as the position for best lift can be related to your position relative to the cloud. Try penetrating into wind a little and seeing if the lift increases; if that does not work then go back to climb up the side of the cloud. Track along the bar, following its shape just as you would when ridge soaring. In fact that is exactly what it's like at this stage and careful study of the shape of the cloud could reveal a mirror image of the relief of the hill generating the wave. The gradient of the face of the cloud may give you a clue as to the strength of the lift, the steeper gradients tending to show stronger rates of climb resulting from the streamlines of flow rising near vertically.

There are a couple of important points to be aware of here: The leading edge of the cloud you are flying along is developing very quickly, even though this may be difficult to see. If you allow the glider to drift into it, or if the cloud be- ➡

gins to form into wind of you, which may happen if the wave jumps forward, then you will need to know in which direction to fly to get out of it again. Once more the analogy can be drawn to ridge flying and the formation of orographic cloud.

If cloud is forming into wind of you it is probably because you are now flying too slowly or at too great an angle to an increasing headwind. If you lose the lift or it begins to decay, or if cloud is forming around you, increase the speed by 10-15kts and fly directly into wind. This applies at whatever height you are at, except that as you get higher then you will need to increase the airspeed a little more. Losing the lift or being surrounded by cloud is almost always as a result of allowing the glider to be drifted back.

As you climb above whatever cloud is around the pattern of the wave system should begin to reveal itself and become obvious. Suddenly it becomes straightforward and clear what it is you need to do to continue climbing. Again, unless the lift has fallen off to zero, stay where you are. If you need to search then make your first search into wind. If nothing is found then you can turn across the wind and allow it to drift you back.

Making your first exploration downwind will mean that if nothing is found you have a struggle on your hands against a strong headwind to get back to where you were. The result could be a crippling height loss. It is usual for the lift to lean into wind with height again, favouring an into wind search first. In fact it is quite possible that as you climb you need to be constantly moving into wind to stay with the lift, on occasions even ending up above the trailing edge of the next into wind bar, although by this time of course you will be some distance above it.

Do not turn downwind. At no point should you turn your back to the ever increasing wind. The higher you climb the more important this becomes. Although you may not be experiencing a very strong headwind in the lift, it could be quite a lot stronger in the sink. A study of computer generated, hypothetical models of the streamlines will give an explanation of this (see **Meteorology and Flight**). In the ascending flow the streamlines will tend to be wider and more vertical, resulting in less horizontal component and therefore a lighter wind. In the descending flow the streamlines, although shallower, will be closer together causing an increase in the horizontal component and a corresponding increase in the wind speed.

The consequence of this is that progress through the descending flow, when you add together the sink rate due to the descending air and the increased sink rate due to increased airspeed (because you are flying through sink against a head wind), results in massive height loss.

There will be the same problem if trying to jump to the next into wind bar. The easiest and safest way of jumping bars is to fly along the first bar until the lift begins to drop off then turn into wind and increase the speed to make headway, the theory being that if the lift is weak then the sink upwind will be weak as well. The problem with this method is that it leaves you flying into weak lift again on the upwind bar which may be so weak you miss it altogether, or waste precious time locating the good stuff again. The more dramatic and exciting method is to cross at the point of max lift in the hope that it corresponds to the same point on the next bar (Fig 1). Be warned, however, that the height loss experienced can be colossal. Off the clock sink is common with height loss in the region of 10000ft not unheard of. Ensure that you can clear the upwind cloud and that your flight path does not take you through it. If in doubt turn back. The lift behind you is far more accessible than the lift ahead of you.

There are several problems with this, the first being one of perspective

Whilst climbing it is essential to be aware of your position at all times. There are several problems with this, the first being one of perspective. You may not have had previous trouble with navigation on any of your flying in thermal conditions, but looking at the ground from several kilometres above it presents its own difficulties. Things that look from the map to be many miles away, in reality appear to be ridiculously close, which can be confusing. Large and obvious to-

Another Aboyne wave study by John Bridge.

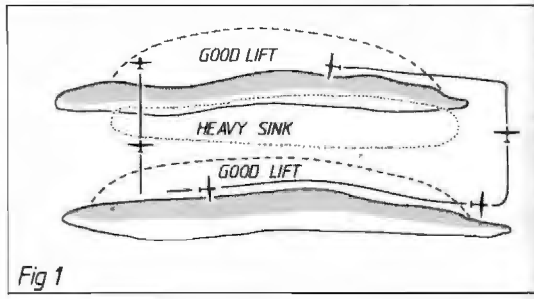


Fig 1

pographical features, such as lines of hills or mountains, pale into insignificance against an apparent flattish landscape.

An important and easily recognisable feature such as a lake, an unusual shaped wood or a distinctive river should be chosen in preference and your location relative to it referred to. Keep such a feature visual at all times and if you move away then the first job is to pick up another feature. Do not allow anything to distract you from this vital task. Becoming unsure of your position on a thermal soaring flight is rarely life threatening but on a high wave climb in the UK with the coast never far away from 15000ft it most certainly is.

Another hazard to navigation and flight safety is cloud cover. Large amounts of cloud cover beneath you reduces the amount of ground you can see to the extent possibly that all that can be seen below is featureless terrain. The same rules apply; if you cannot stay in the lift and be sure of where you are then you should not be trying to stay in the lift. Try again for that Diamond on a day with less cloud cover; descend and enjoy the view from a more secure position.

Cloud amount also presents a more insidious dilemma. Although when active, the wave system should keep clear windows free from cloud, there is the very real prospect of the wave system collapsing and allowing the gaps to fill in. A second possibility is that the wave continues but air which is more moist creates blanket cover below a still active system. Whatever the reason may be, flying above solid cloud cover is only for the most experienced and best equipped pilots, and then only with extreme caution.

There is the obvious problem of losing your location over complete cover, which in itself can be fraught, but the prospect of having to make a cloud descent through layer cloud, the depth or the base of which is not known, into an area that you cannot see is horrendous. I will leave you to imagine the consequences for yourself. Suffice to say you should be below the gap watching it fill rather than above it wondering if it will clear. Pointers to watch for are the upwind gaps closing which is an indication that the wave is collapsing, in which case you can be pretty certain your gap will fill next. Monitoring the size of the gap you are over very carefully will give you an idea of whether the air is becoming more moist.

Remember it is no good waiting until the gap has almost completely closed before deciding to descend. Height that has taken time to accrue will take time to burn-off. A descent of 15000ft may take as long as 7-8min, even if performed expeditiously, which is time enough for a small hole to fill in completely. If, once you have descended below the base the cloud looks like it is opening up again you can always close the brakes and begin climbing once again.

Quite a common problem with inexperienced pilots is allowing themselves to be drifted back over the tops of any cloud and forming the impression that the gap is getting smaller (Fig 2). It's only getting smaller because you are now looking at it from an angle and the effect is one of the window closing. Move into wind and see if you still think the same. If you do, descend.

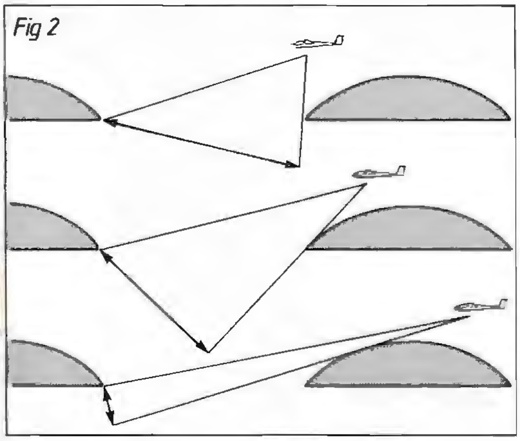


Fig 2

At some point during your climb you are going to begin to notice all those annoying little drafts you didn't know existed. A gentle breeze round the toes or face can be very pleasant on a sunny day at 4000ft but at 20 000ft it has become an intolerable icy blast. Keeping warm is important, not just for the sake of comfort but in terms of mental performance and physical well being. Once the body goes past the shivering stage it has no other protective reflexes left other than to reduce metabolic rate and cut down on blood flow to the extremities. This could result in frostbite as well as an impairment of mental facilities. Those precautions talked about earlier will now be proving their worth. During a descent when the airflow is moving over and through the glider a lot quicker it will become even colder, especially if there is no warmth from the sun due to upper cloud cover.

There will be probably be a compromise to make between keeping warm enough and maintaining an ice free canopy. Ice build up on the inside of the canopy once it starts can be impossible to scrape off quick enough. You may also notice that your instruments begin to frost over. If the sun is shining this will normally not be a problem, but climbing under cirrus thick enough to obscure the sun usually means excess ice and an early descent. Another possible problem can be airbrakes freezing closed. It pays to exercise the airbrakes, and the other controls come to that, every so often to keep them free and available when you need them.

As you get higher and the density of the air reduces, then your ASI will read less dynamic pressure than at lower altitudes. The result is the true airspeed being achieved is greater than the airspeed indicated. Although this will not affect the stalling speed, it may affect the spin characteristics of your glider (it will probably be more willing to spin), and will have an influence on the indicated flutter speed. You may also notice the glider begins to feel as if it is flying fast; even though the ASI is only reading 45kt or so the ailerons feel heavy due to the increase of air flowing across them. As a rough rule of thumb if you reduce your glider's VNE by 1kt for every 1000ft above 5000ft then you will not be far off the truth. That in effect will give a glider with a sea level VNE of 138kt, a VNE at 20 000ft of 120kt and at 30 000ft its VNE should be reduced to 105kt.

The tendency is for wave to improve towards the end of the day. It may become more uniform and so easier to use, as well as becoming stronger. The problem can be that at 20 000ft or so the sun sets later than at ground level. There is always the temptation to stay a little longer trying to squeeze the last few hundred feet towards Diamond and leave it too late to land in daylight.

Leave yourself enough time for a controlled descent before sunset time, landing even earlier if there is heavy cloud cover.

At some point you are going to decide to call it a day. Either the wave has gone as high as it is going to, it's getting dark or the cloud is closing, or you've achieved what you set out to do. It's time to descend. Open the brakes, increase the airspeed and start on down. The airframe of the glider will have become extremely cold during your climb, to the extent that any moisture encountered will freeze instantly on the wings and canopy. Avoid cloud if at all possible; even a small wisp or short exposure will cause sudden freezing and associated problems.

From time to time ease the brakes in and level off. This serves several purposes. First it will ensure the airbrakes do not freeze open; an embarrassment at the least. Secondly it will go some way towards increasing the temperature of the airframe slowly and so being a little kinder to its finish. Thirdly it will give you a chance to get used to looking at the world from a more normal angle. It is a good idea to increase the duration and frequency of the steps as you get lower. You certainly want to spend at least 15min below cloudbase before attempting to start the circuit.

After a peaceful, calm, sunny flight at even modest heights the ground can look awfully close and the world dreadfully gloomy and dark below base. The smoothness of the wave can easily make you forget about the chaos of the rotor or the strength of the wind at ground level. Settle down to a normal speed and rate of descent and be in no hurry to land.

If your descent needs to be rapid for any reason, cloud cover, darkness, approaching weather etc, then a useful technique to practise is to open the brakes, trim forward to about 80kt and perform a continuous 2*g* turn. The rate of descent can be in excess of 20kt or 2000ft/min. It is a useful trick to get you out of problems you should have seen coming sooner but one that needs practice. Beware of becoming disorientated or allowing speed or *g* to build too high.

Once down to circuit height, keep a careful watch on the windsock. A lot could have happened to the wind while you've been away.

Finally, don't go flying in wave unless you have a serviceable radio. Apart from the obvious advantage of finding out from others what's going up best, It is your connection with the ground. Details about approaching weather or current wind conditions are all valuable guides as to what you should be doing. And if you do get lost there's always 121.50.

See you on a BGA wave soaring course at Aboyne this season. Book early to avoid disappointment.

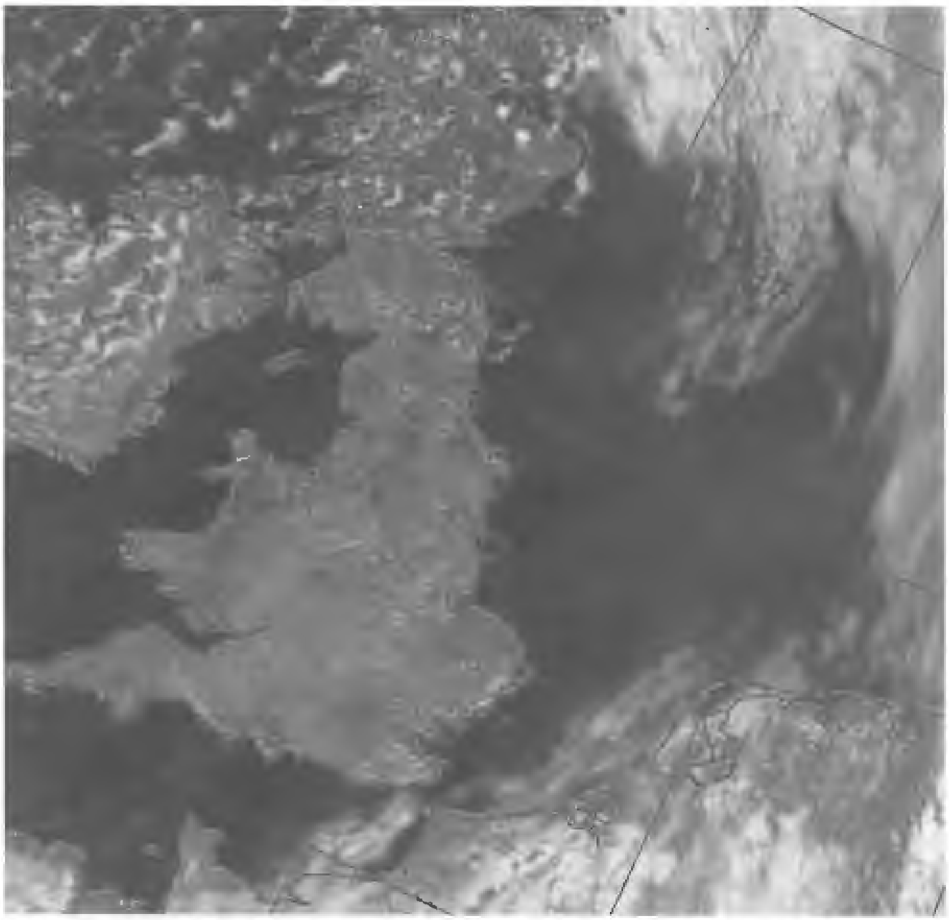
JUST WHAT KIND OF DAY WAS IT?

Chris Rollings, senior BGA national coach, looks at satellite photographs taken on the days when he had some long flights and describes how he made use of the conditions

May 28, 1985 – 770km (remote start) triangle, Booker, Petersfield, Welshpool, York in a Jantar 2A

The day in question was a Tuesday – Monday had been a Bank Holiday. Predictably it had rained heavily the three previous days. I drove from Nympsfield to Booker late afternoon of the 27th keeping pace with a classic cold front clearance. The next day looked to be good.

It still looked good the next morning with the first wisps of cu at about 0830-0845 (all times BST). By 0930 the sky was looking usable with about 2-3/8 cumulus and it was time to go. I released from tow at 0940 just to the west of Booker at 3200ft (above Booker add 500ft for amsl) and set off south-west, then south across the middle of Reading.



A satellite photo of May 28, 1985. The copyright of both photographs belong to the University of Dundee.

Cloudbase had been about 2000ft agl on the launch and was about 2200ft as I came down past it, crossing Reading. By flying first through and then under reasonable clouds, I was above Blackbush before I needed my first climb – 3kt to a cloudbase now 2500ft agl. I passed Lasham, 30min and 50km after release (it's always 30min to Lasham if I attempt this task, regardless of what happens next).

From this point on the flight was unremarkable except for its length. Clouds were regularly spaced and thermals easy to use, though only modestly strong. With a couple of exceptions in mid afternoon the maximum strengths were about 4-5kt and the averages perhaps a little less. The east-west streeting apparent on the satellite photo was not a significant feature in flying that day (luckily as most of my track was north-south).

By mid afternoon cloudbase over the Pennines had risen to 6000ft amsl, still 3/8 cu and I got the two exceptional 9-10kt climbs of the day. Turning at York at 1410 I was beginning to think I had under set! The sky still looked fabulous and only 260km to go.

However! From York southwards every superb looking cloud only gave 2kt at 2000ft improving to 2-3kt at 3000ft when I left on trac k to look for better lift.

Nearly 1800hrs and I was at 1300ft over Saltby, the clouds looked great and the vario said 0. Finally, and much too late, I dumped 300lbs of water. The climb became 2 then 3 and by 3000ft it was 5kt.

A 48km final glide through dead calm air to a landing exactly 10hrs after take-off

I found three more like that under clouds that looked good, then had a cloud climb the Daventry CTA base near Silverstone. This was followed by a 48km final glide through dead calm air under a clear blue sky (some active cu was still visible in the distance) to a landing exactly 10hrs after take-off.

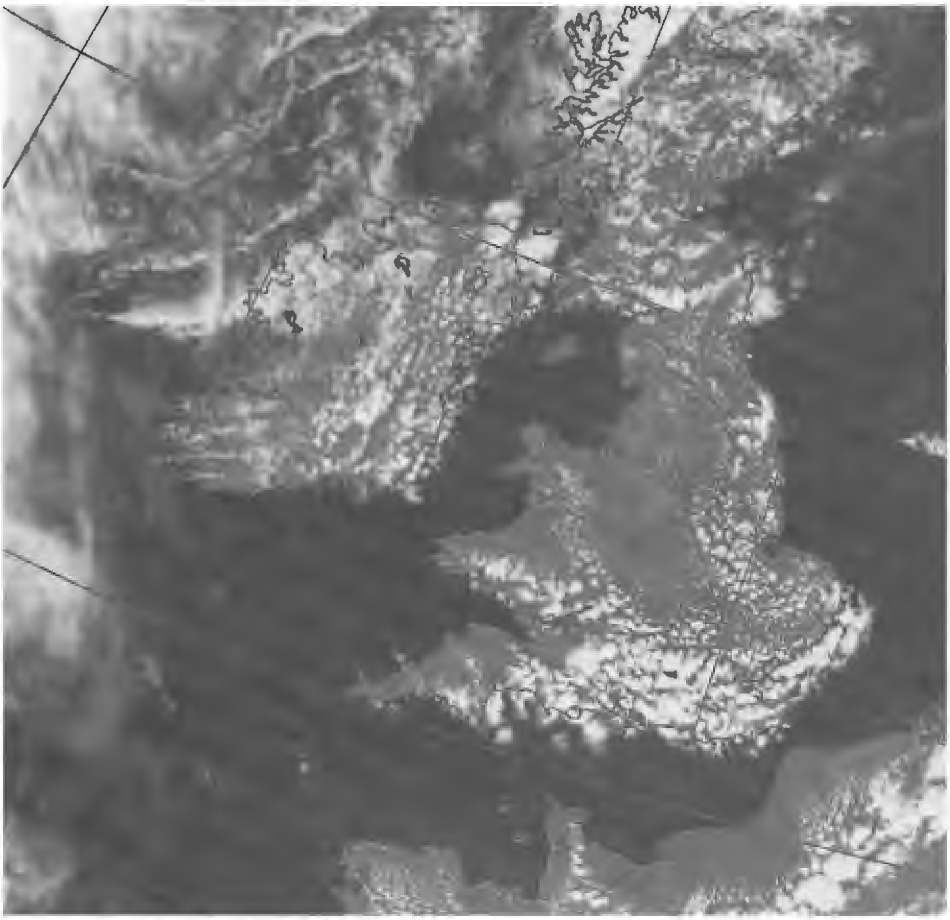
Why the trouble along the line south from York? My guess is low lying flat ground being very wet after the previous three days of heavy rain.

July 3, 1990 – the same 770km triangle but this time in an ASH-25 with Basil Fairstone as P2.

Francis Wilson's Breakfast TV forecast was sure there would be strato-cu spread out after the fine start in central and southern England. All the experts – me included – thought he was probably right. However, you don't get many days when you have an ASH-25 to fly, a day off and a sky that is looking good at 0930.

So, I thought, let's try – we could always turn back. Except we started at about 1000 instead of 0930 and cloudbase was about 500ft higher. The first part of the flight was a repeat of the earlier one except the clouds always looked as though they were about to spread out.

As we approached Welshpool at almost 1330 conditions seemed to be improving and the threat of spread out seemed much less. Listening to others on the radio told me that behind us over most of central and southern England the spread out was giving a lot of problems.



The satellite photo of July 3, 1990.

The next problem, however, was flying from the robust 5-6kt climbs to 5500ft amsl near Welshpool to near blue 3-4kt climbs to around 4500ft in the Cheshire gap. There was a very brief improvement around Stafford and then reducing cloudbases, poor visibility and weak thermals over the Pennines (3500-4000ft amsl, less than 2500ft agl and only a 1-2kt rate of climb). There was rather too much cloud as well.

It soon improved as we came down off the hills with the cloudbase up to 5500ft and good 4-5kt thermals, at least until York. After York it was the same story as last time. Good climbs but poor thermals all the way to Leicester. After Leicester the clouds didn't look much either and two other pilots (Bruce Cooper and John Glossop) who had just crossed the area, warned it was very weak. So we stopped for 1kt at 2500ft just between Husbands Bosworth and Northampton.

We climbed to 4000ft and went on to a very suspect cu over Northampton which gave 5kt to 5500ft and an easy final glide! My excuse this time (no rain in the previous week) was the strato-cu spread out shown on the satellite picture in the east Midlands had dispersed by this time, but the thermals hadn't had time to pick up again.

A Guide To Gliding In France

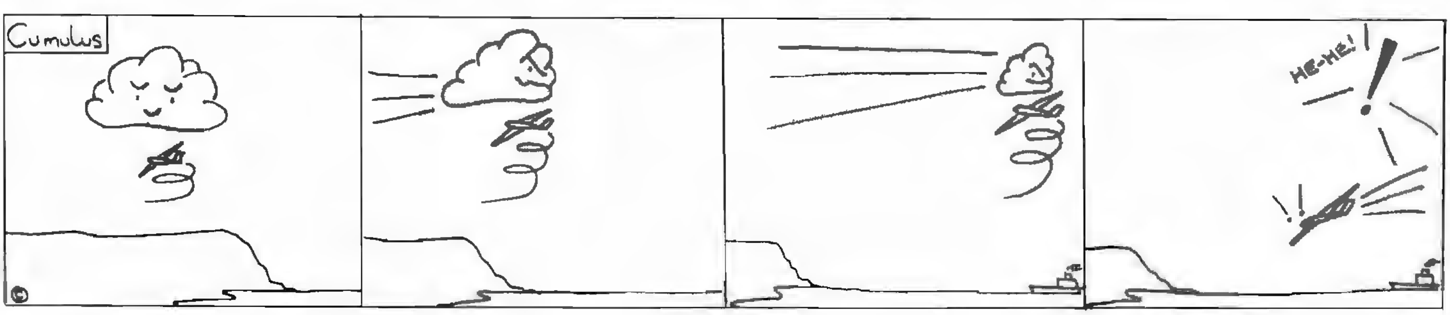
The information we gave in the 1991 Yearbook, p24, on 1:500000 air maps was out of date by the time we went to press. There are now only four sheets covering the whole of France, instead of seven. They are called NE, NW, SE and SW France and are stocked by RD Aviation.

AIR LINES

By early morning the high had moved in from the west dissolving the landscape in a clammy mist. At the far end of the strip I could just make out the windsock, limp and dripping, hanging loosely from its mast, and all around the fields of oil-seed rape glowed through the damp air like fires burning up behind a sheet.

With the coming of spring the airfield had changed from the way I remembered it the previous September. The dark patch on the earth that was part oil, part scorching, had gone. Wild flowers were growing everywhere now, and above, undaunted by the weather, larks were singing with that liquid sound which is like nothing else.

I walked slowly across the field looking for the precise spot where it had happened, but it was no longer possible to be sure and I realised I was glad of that. It isn't necessary to put up stones or erect memorials in order to remember somebody. The mark is inside yourself and it takes more than one season of new grass for that to fade.



THE ONGOING CHALLENGE

Andy Davis, a member of the British team who has topped the National Open Ladder for five years on the run, describes how this competition gives you motivation and an incentive to develop cross-country skills

It's late afternoon in September, 170km from home in a dying overcast sky. The Discus whispers on at 60kt in smooth air towards the last remaining smudge of darker grey cloud. As I start to contemplate the unappealing prospect of an outlanding in the stubble below, that annoying little voice in the back of my head ventures forth, "You've really blown it this time! What are you doing here? Why do you keep doing this?"

Before I can answer, the Discus arrives under the darker smudge and that familiar and oh so welcome tremble in the air wrenches my thoughts back to the task at hand. Agonisingly slowly we start to climb and throughout the endless circles look around the overcast for a sign of better lift.

Just out of gliding range a puff of smoke rises from behind the next hill. The smoke becomes a dense column. Slowly we climb, and then high enough at last tiptoe towards the smoke. Passing over the top of the hill I can see flames leaping across the field and enter the billowing, mushrooming column of black smoke. The vario screams as we are catapulted upwards.

Late in the day, cruising from stubble fire to stubble fire my mind reflects on the questions posed earlier by the doubting small voice. "What are you doing here? Why are you doing this?" The answers are many and complex, but on this day the motivation is quite simple. The National Ladder.

The pilot's four highest scoring flights count

Any solo pilot may enter the National Ladder. At many clubs entries to the club's own ladder are automatically re-entered in the National Ladder by the club's organiser. Points are awarded for altitude gain, or more commonly for cross-country flights. The pilot's four highest scoring flights of the year count towards the annual total in a Ladder year that runs from October 1 to the end of September.

A recent improvement was the formation of the Weekend Ladder in which only flights completed during the weekend may be entered. Any pilot flying any glider on any day may of course enter the Open Ladder.

A handicapping system is used for cross-country flights so that it is not necessary to own the latest Nimbus 5 or LS-8 to stand a chance of winning. A conventional Standard Class glider has been placed top of the Open Ladder for the last few years, but wooden gliders have also enjoyed great success. Indeed some argue that the handicapping system positively favours lower performance gliders on the better than average days on which ladder flights are typically flown.

By entering regularly, the National Ladder provides the developing pilot with the means to monitor his year on year progress, albeit with some fluctuation for "good" and "bad" years.

The real strength of the National Ladder lies in the way it acts as an incentive for the individual to develop cross-country flying skills. The most points are awarded for pre-declared and completed cross-country flights. It is therefore necessary to become familiar with, and practice, the discipline of declarations and use of the camera for TPs. The Ladder provides an informal way to practice regularly these skills before it really counts, *eg*, on your first Diamond distance attempt.

By awarding points both for distance and average speed the Ladder emphasises not only the ability to plan and complete cross-country flights but also the development of racing skills. It provides an incentive to continue cross-country flying long after badge flights have ceased to be a goal.

Successful Ladder flights tend not to be spectacularly long epics, but challenging and realistic tasks appropriate to the day's we ather, glider and pilot, completed at a good average speed for the conditions. Successful ladder pilots are those who can consistently achieve several such flights throughout the year. The emphasis is on pleasurable completion of an achievable task rather than demoralising failure of an impossible attempt.

I first entered the National Ladder some five years ago after recognising that my recreation flying outside of competitions had lost direction somewhat, typically taking-off late to fly the same safe old tasks. My enthusiasm has been rekindled and I have been a mazed to discover just what can be achieved in typical UK weather, in particular by using the whole of the soarable day.

By getting airborne earlier I have almost doubled my average cross-country distance and my enthusiasm is sustained by the continuing challenge to surpass last year's points total. My completion rate is far higher than ever it used to be, no doubt due in part to the extra incentive provided by the Ladder to continue and collect the points rather than abandon the task early in the first patch of dodgy weather.

If you feel that your cross-country flying needs new direction and purpose, then why not start writing some declarations for the National Ladder. It's fun, it's challenging and it's addictive. You don't need the last word in hot competition gliders; in the National Ladder every glider is competitive. What you do need is dedication, determination and the tantalising ability to set and complete the best task for the day. And who knows, you might even win (but not without some serious opposition from the direction of Nympsfield!).

LOOKING BACK ON 25 YEARS

This year Bill Scull the BGA director of operations celebrates 25 years of gliding for a living. Here he reviews those years

I suspect that most people who instruct contemplate gliding for a living. I was no exception. The gliding bug bit me at the age of 11 as an aeromodeller. Later, I discovered Terence Horsley's **Soaring Flight**. I was captivated by a picture of a Grunau Baby in a tree, made models, learnt about scale effect and fitted a bigger tailplane. The seed had been sown.

I decided that the aeronautical business was for me and started an apprenticeship with A.V. Roe & Co in 1950. There was a gliding club at Woodford, the subscriptions were, I recall, 2 shillings and sixpence deducted weekly. The gliders were a T-31 and a Tutor, both without spoilers. Progress was slow, three three minute winch launches a day being the norm. Soaring was discovered by accident, gobbled up in the Tutor by an enormous thermal. Then we got a state-of-the-art Skylark 2 and started visiting other sites.

Private ownership was a quarter share in the wreckage of an Olympia at £30 a share

1957 saw progress into the realms of instructing and private ownership – a quarter share in the wreckage of an Olympia at £30 a share. I borrowed the money to buy in! The three other partners went on to become Speedwell Sailplanes. I had worked with Tom Smith , the senior member during my apprenticeship. 2000 man hours later we had a beautiful new glider and trailer. It was eventually blown away from Camphill, trailer and all. Tragic. It wasn't insured.

In 1960 my life took a turn for the better – I got married and Tom Smith was my best man. Those of you who know Yvonne will appreciate my good fortune. Gliding took second place for a few weeks and I traded down to the wreckage of a Grunau which I part rebuilt . It was eventually reincarnated with the wings of an EoN Baby.

By 1964 the die was cast. With over 1000 instructional launches in my logbook I did an instructor's course with Derek Piggott at Lasham (where else?) and started looking for work in gliding with interviews at Dunstable and the Long Mynd. I got an offer at the Midland Club after a considerate interview with, among others, Keith Mansell. The salary was £800 a year, and I couldn't afford to take the job.

With increasing disenchantment with the aircraft industry I took a seasonal appointment at Sutton Bank in 1966, starting on April 1 at £700 a year. My wife, Yvonne had a good job and was able to support me/us. The apprenticeship with Henryk Doktor was good experience, he trained me as a tug pilot and I flew a lot of hours that season.

The self-improver route is a fairly well-trodden path nowadays, maybe then too. I built enough hours to take an aeroplane instructor course at Cranfield, got the rating, a part-time job at Liverpool and started studying for the CPL. In the meantime John Everett, the first national coach, mentioned my name at Lasham where they were looking for staff instructors. They offered me a job which I took but I kept on instructing at Liverpool most weekends. Progress at Lasham was rapid; deputy CFI within seven months and CFI four months later with tremendous help from a number of people.

Bill works from home but travels extensively in his involvement with gliding clubs.

At Portmoak at the beginning of 1969 Vic Carr raised the prospect of my becoming national coach. Within days an interview with the chairman of the BGA Instructor's Committee, Roger Neaves, resulted in an offer I couldn't refuse. When I'd embarked on this gliding career my aspiration had been to be CFI/manager of a medium-sized club, then this – after barely three years.

The coaching job had developed over the previous six years. It was moving in the direction of specific instructor training, since one could possibly have an effect on the whole of the movement directly. In my first year this direction was confirmed and the Capstan (Slingsby T-49) replaced with a Falke (SF-25B), which was a significant advance on training efficiency. The scope of the job grew. Audio-visual training aids were produced and a second coach employed. Over the years there were significant contributions to coaching from Brian Spreckley, Ken Stewart and John Williamson.

The 1970s saw some new dimensions to the job. Increasing involvement on matters of airspace and CAA liaison and the formation of a conference of European coaches – really a think-tank. There was an interlude with the charismatic Mike Carlton who wanted to start gliding again. Chris Simpson suggested I looked after his retraining. Mike bought a Kestrel and then a Calif; we went gliding in Australia, South Africa, France and Germany. Mike set records and we all gained a lot of experience. Subsequently we got the use of the Calif for coaching courses and his solo glider for competitions which, maybe, set the precedent for the current glider policy.

By 1979, ten years on, the coaching job had evolved some more and under the direction of Chris Simpson and John Large (then BGA treasurer) the post of director of operations was created. This involved helping on airspace, development, safety, CAA laision and, of course, coaching. It was never boring and no two successive years were the same. As the seasons passed the coaching involvement reduced, by virtue of the other pressures. A particularly interesting phase was in the early 1980s with the battle over airways in Scotland. Almost 18 months were spent on this, with a large part of the effort being political lobby. Gliding had a new ally here, the redoubtable Bill Walker MP.

On the personal front my involvement with the Guild of Air Pilots and Air Navigators to represent gliding interests had led to my election to the Livery of that Company. I had been a member of the Royal Aeronautical Society for some years and in 1984 became a Fellow; an honour indeed.

A developing problem so far as coaching was ➡

concerned was one of increasing back pain. Being almost 6½ft tall is not entirely compatible with glider or motor glider seating. The problem worsened and in 1987 it could only be contained by giving up flying. The risk of further damage, say from a heavy landing, was considered too great. Too much driving did not help; 35000 miles a year was typical and still is. It was a traumatic and depressing year, made worse by briefing the instructors' courses and then not flying with the student intructors. The only recompense was that I wrote up all the course briefings as lecture handouts. The meanwhile a course of (physical) rehabiliation contained the problem which had become a matter of pain management.

The psycholgical readjustment after stopping flying took longer. Survival hinged on still having some contribution to make. The non-coaching parts of the job had become increasingly demanding. Over the years there had been an increasing emphasis on safety, both accident investigation and prevention efforts. As we, the BGA, gained expertise in investigating fatal accidents the AIB increasingly delegated most of the gliding accidents to us, usually me, to investigate. The prevention efforts stemmed from this awful experience; one does not become inured to death, particularly so when it seems so preventable.

Improved safety awareness continues to be a driving force and the international forum, now the OSTIV training and safety panel (TSP) continues to be a think-tank and the source of useful data. It is a privelege to be chairman of it. Through this group there has been the stimulus to tackle problems such as towplane upsets with some international degree of success.

In taking stock it seems remarkable that 25 years have gone by so quickly. A function, I would like to think, of the satisfaction . The job is immensely fulfilling and continues to be so. At the level of personal contact, pilots I trained as instructors are still around as chairman and CFIs. The only down side are remarks such as "my father did a course with you". Down the years I have had the privilege to work with some remarkable people who have made exceptional contributions to gliding and some have become friends , good friends. They have contributed to the quality of my life, showing that you get out of life what you put into it. ■

WOLDS GC'S TWO-SEATER COMPETITION

Andrew Butler, the Wolds GC's publicity officer, writes about the increasing success of their competition which this season will be held at Pocklington from August 16-22

Do you remember looking up to those pundits who could stay airborne for more than five minutes and those demi-gods who practised that thing called cross-country flying? How could you ever become as good as them?

As time's gone by you may have gained the status of pundit, or even demi-god, but this has probably been reached *via* the self teach method.

This takes us to the 1985 Enstone Regionals where a Wolds GC instructor, Derrick Roddie, was competing in a club K-10. His crew were a bunch of "green" soaring pilots but as the competition progressed under Derrick's guidance their cross-country skills improved greatly.

After a particularly good flight, Derrick and Simon Parker, who was to become competition director, hit on the idea of a two-seater competition and worked out its formula. It was to be an event where experienced pilots would pass on their skill and knowledge while giving hands on tuition to the uninitiated, or to the initiated who wished to learn more. As well as being competitive, there was to be a great emphasis on fun.

The first competition was in 1986. Every club in the country had been sent details, but there were only seven entries – probably because it was restricted to K-7s and K-13s. The weather was unkind, in fact it was a washout with no tasks during the five days. But there was a winner. A K-7 from Avro set off downwind and flew a staggering 6km to gain the trophy.

Lessons learned, the second year it was open to all wooden two-seaters and due to greater interest in 1988 it was open to all two-seaters. Entries have steadily increased with pilots coming from all over the country and it is anticipated we will soon have our first overseas competition. As the British weather is so unpredictable the Comp is now over seven days in the hope of increasing the tasks.

Scoring is always a problem with any open competition with gliders of differing performances. Ours is based on the National Ladder, but with some important differences.

There is no "Y", which means every flight is scored on its own merit, so if you get round and all the others fail your score won't be discarded or de-valued.

There is no 1000pts limit – abolishing "Y" and using the National Ladder system allows high scores for low performance machines rounding long tasks. Fast times in hot ships will also score well – 3000 or even 4000pts are possible.

Pilot selection. Where practical, multi-tasks of varying distances are set which introduces a degree of tactical choice. Should the pilot go for the shorter task, be sure of finishing and be rewarded by a lower handicap and speed points? Or should the longer more difficult task be attempted knowing that success will open the points' floodgate? Failure, even by the narrowest margin, will give a very low score. In choosing, the pilot must decide that the weather *en route* is suitable and that he and/or his aircraft can hack the conditions.

As a result the Comp is usually fraught with excitement to the very end. It leads to a very competitive atmosphere with interesting and sometimes controversial results. On one day last year the ASH-25 was beaten by a Bergfalke and ever year there are instances of wood beating glass.

Determined to make the most of the soaring

The competition gets stronger each year with more courageous flights and pilots determined to make the most of the soaring, no matter how weak. At the same time it remains very friendly with many social events from rounders matches, cheese and wine nights to hog roasts.

So what is the future? With our new land we can cater for more gliders and hope there will be enough high performance entries to make two Classes. It is evident it is successful in all its aims as it is becoming increasingly popular.

In short the Two-Seater Comp is all about flying. Don't expect triangles or quadrilaterals etc as the weather may not allow anything other than a very small circular task or cat's cradle, but you can be assured that as much flying as possible will be squeezed out of each day. Although people enter to win, it doesn't really matter if you come last (just ask our CFI!). The aim is for everyone to enjoy their flying.

So this year why not bring your two-seater? It doesn't have to be club owned. After all it's the only Comp of its kind in Europe and as far as we know the world. The week is also open to single-seaters, so while the competing pilots are away the crew left behind can practise what they have learnt.

So we'll see you there! ■

MIKE CUMING

WHAT IS THE BGA DOING ABOUT IT?

Technical Matters

The basic function of the BGA Technical Committee is to carry out the BGA responsibility as the UK airworthiness authority for sailplanes, as delegated by the CAA. This freedom from centralised bureaucracy was established during the formalisation of gliding in 1947 and remains a cornerstone of UK gliding operations. This is a unique position within sport aviation which permits flexibility and autonomy of operation well beyond that which has since been permitted to more recently established aviation communities.

The committee also attracts delegates from other glider operators in the UK such as RAFGSA/AGA/RNGSA, the Air Cadets and the Vintage GC and has become the forum for exchange and harmonisation of technical practices.

Dick is very well known in the UK in just about every sphere of aviation

To maintain control of standards in line with this authority the BGA employs a chief technical officer (CTO) (currently Dick Stratton) who is responsible for seeing that the decisions of the Technical Committee are carried out. Dick is in fact very well known in the UK in just about every sphere of aviation and not just gliding. With the assistance of the BGA office in Leicester the CTO maintains records of all registered sailplane Cs of A and also of accredited sailplane airworthiness inspectors as outlined in the BGA Technical Procedures Manual (our formal agreement with the CAA).

The cost of these services by the BGA are a very small fraction of those which would be imposed by the national authority.

BGA approved inspectors are the individuals in the field who ultimately make this system work. They are appointed by the Technical Committee, on the basis of personal qualification and experience, usually after an interview with a committee member or the CTO. A large part of the CTO's role is dedicated to seeing that they are well informed (through a newsletter and defect notices) and have available to them the specialist advice needed in cases beyond their own abilities. They also enjoy the benefit of a group insurance scheme as part of their annual fee.

In recent years, and particularly to the credit of the present CTO, the Technical Committee has negotiated broader powers over the maintenance and certification of tugs and motor gliders. While actual certification authority has been retained by CAA, a system of approval has been established whereby motor gliders (within a technical definition) and some tug aircraft types are being maintained locally by accredited inspectors in approved conditions. This has vastly reduced cost and increased convenience, particularly in more outlying areas where lengthy and costly travel was demanded of CAA qualified inspectors.

Beyond the arrangement of tugs, the Technical Committee has pursued the development of launch equipment and techniques. Clubs have been encouraged to consider propeller and silencer modifications to reduce noise pollution and several have been installed on those tug types for which the BGA hold authority, with significantly less bureaucracy than has occurred on CAA controlled aircraft. Further, the BGA has carried out vital research on the use of cheaper non-aviation fuel specifications for use in tugs, which has proven to be of great advantage to the light aviation community at large.

Dick Stratton, BGA chief technical officer.

Substantial Improvements have been made to winch technology in recent years, especially in those cases where the chief technical officer has persuaded clubs to fit more powerful winch engines, or to use better quality cable. These two factors, plus the associated ability to use the correct rated weak link for each sailplane, have resulted in improvements of the order of 50% in launch height with reduced launch failures.

The Technical Committee holds the authority to grant certification to new UK sailplane designs requiring mounting of engineering reviews and flight tests. For this purpose the Committee maintains a register of accredited flight test evaluators. For the past few years this has, regrettably, been confined to homebuilds as UK supports no production sailplane interests. The service is also applicable for new designs, kit builds or local modification which can be processed at a fraction of the alternative costs. Recent examples of applications successfully made by BGA members include the tip extensions on the Vega, motorised T-21, King Kite and Falcon replicas and conversions to hand controls for the disabled (for both single and two-seater gliders).

As a more routine matter, the flight test groups carry out a brief vetting of imported sailplanes for UK certification. While most foreign gliders are now designed to common requirements, we have occasionally found cases where UK interpretation and needs are not well considered. The committee also acts as a UK focal point for JAR22 sailplane airworthiness standards.

The Technical Committee naturally provides specialist advice to all other BGA committees, in particular on accidents and incidents. Accidents directly attributable to lack of airworthiness are exceptionally rare, but continued vigilance is appropriate. Therefore joint discussions of the technical issues which may underlie accidents are often undertaken in close liaison with the director of operations. The joint sponsorship of a programme of research into aerotow tug/glider upsets is a recent example of this liaison.

Several members are active in international collaboration through OSTIV and maintain worldwide contacts in the technical aspect of soaring. For example, we have recently enjoyed an extremely useful exchange of information with Australia in the field of airframe fatigue on both metal and GRP structures.

THE HISTORY OF WINCHING

Chris Riddell traces the development of winch launching and looks to the future

Winch launching started in the early 1930s at the London GC. The Yorkshire GC followed in 1934 when the then CFI, Norman Sharp, was launched at Sutton Bank in a Hols de Teufel.

Gliders were light and heights gained were not great. All that was asked of the winch was a launch of adequate flying speed over a cliff or mountain slope. Power demand was not high and the winch was often a converted car with a large capacity, long stroke engine.

The cable was drawn in by a drum bolted to the back axle in place of a rear wheel – a practice that overloaded the differential mechanism so that it needed frequent repair. Guide rollers were fitted to the front bumper so the driver sat facing forward and the controls were used in the normal way.

Converted car winch at Stockholm GC in 1952; probably a Volvo chassis.

The Cambridge University GC winch, the Brute, at the Long Mynd in 1954.

The Yorkshire GC used a Rolls Royce as a winch that was believed to have belonged to Ramsay MacDonald, the first British Labour prime minister. The Rolls was very cheap for there was a desire to remove it at his death so that no questions were asked.

The Wild winch

The Air Training Corps was formed during the rearmament drive in the late 1930s to interest boys in aviation with a view to recruitment into the RAF. To give them some experience of flight, they were taught to solo standard in the Kirby Cadet. The gliders were bungy launched in a sloping field but there was so much damage to the machines it became necessary to start two-seater training.

The Ministry of Supply wanted a winch capable of launching a glider and M.B.Wild Ltd, a general engineering company in Birmingham, were awarded the contract. They had built a large number of barrage balloon launching winches for the defence of cities against low flying aircraft and this design was modified for launching sailplanes.

It was mounted on a trailer chassis so that it could be pushed into a hedge for maximum use of space. Like many other hurried developments, it was not wholly successful. The 85hp Ford V8 petrol engine was sufficient for the slow flying and very light Falcon 3 two-seater but when the T-21B was introduced there wasn't enough power, even at 45kt.

The second Wild winch

It was the expansion in soaring after the Second World War that required winches to lift gliders high enough to contact thermals and for safe training circuits from wartime military airfields. In the early 1950s the Ministry of Defence wanted an improved two drum winch for the ATC.

M.B.Wild Ltd again got the contract and the design used the well tried GMC Bedford Commercial Vehicle components. A six cylinder inline petrol engine of 330 cubic inch capacity was installed and developed to give 150hp. A dry plate automotive clutch took the drive to a four speed gearbox and thence to a dog clutch which split the drive to the cable drums. Forty-four winches were built and remained in use for some thirty years.

The Wild winch had four poor design features that gave trouble. The lead on rollers wore quickly in spite of being case hardened. The dog clutches also wore and jumped out of mesh on the launch. The cable winding gear was poorly lubricated and often seized with damage to the scroll and to the worm and wheel gear that drove it. The cable drums were too small on the flange and cable often wound around the drum bearings if too much was added to the drum.

Civilian winch developments

It was in civilian clubs that gliding was developing. When balloon winches came on the market as war surplus equipment, Jack Rice , a keen glider pilot who owned a trailer making business in Leicester, produced the Rice winch. He adapted balloon winch components to make a lightweight two wheeled unit that could be towed by car.

The Ford V8 85hp engine of the Wild unit was fitted to small unbraked balloon tyred trailers. The Wild cable spreader gear was retained and the single drum was driven through a right angled gearbox. There was a rudimentary cab.

Commercial vehicle conversions

The Cambridge University GC Brute was one of the best attempts to build a two drum winch. Two engineering students, David Clayton and David Martlew, built it in the university workshops between 1948 and 1951. It used the 115hp Ford V8 engine mounted on an ex Army long wheelbase American Ford chassis. It served the Cambridge GC for many years, sometimes as a tow vehicle on expeditions.

Impatience with the shortcomings of the Wild winch led to the conversion of readily available second-hand bus chassis. The engines were large, often capable of 200hp and had the advantage of having fluid flywheel transmissions.


The Yorkshire winch conversion in 1957.


ATC Wild winches at Syerston in 1983.

It was then relatively simple to strip off as little bodywork as possible and fit a drive shaft to a rear axle mounted across the chassis. Two drums replaced the wheels on the added axle.

Bus and truck conversions still provide the basis for many winches in use today. The RAFGSA produced a number of well built and ingenious winches for their clubs based on a variety of truck and tractor chassis. They were initiators in the use of pneumatics for drum brakes, cable cutters and engine controls.

The Tost winch

In Germany the Tost winch was the standard. Trailer or truck mounted, a 250hp petrol engine drives a single drum. Swivel pulleys were fitted. Its high power was disconcerting for British pilots after the lower powered Wild winch.

The Musters van Gelder winch

The next significant design was the Musters van Gelder winch in Holland. There are similarities to the French Perrein winch and it isn't known if it was derived from this unit. However, it was subsequently taken up by the DAF Truck Company and a batch were produced.

The power is much more than the 150hp Wild winch and heights achieved impressed pilots. It uses a DAF diesel engine that produces 220hp at 2400rpm. A hydraulic transmission feeds the drive to two, four, six or eight drums mounted on a single drive shaft and the cable is led through small pay-on rollers. Mounted on a trailer chassis, it weighs about 5t. The power is well matched to the drums and gives a superior launch performance, but the winch is expensive.

Supacat and Yorkshire winches

Disillusion was setting in with the bus conversion and slowly clubs began to spend more money on winches and to look for purpose built, reliable machines. No longer were members prepared to accept the loss of flying that came from constant cable breaks and snarl ups on the cables.

The Cambridge University GC commissioned consultant engineers to design and build them a winch using a Ford turbo diesel engine. This gave excellent launches at Duxford where there was plenty of space.

A very competent winch was built for the Bath GC by a member who was an experienced plant hire man and understood how machinery could be treated in use. But it was David Clayton, now of Dulverton, and Nick Jones of Dunkeswell, who produced the Supacat two drum winch for the Devon & Somerset GC at North Hill. It was very successful and several have been built.

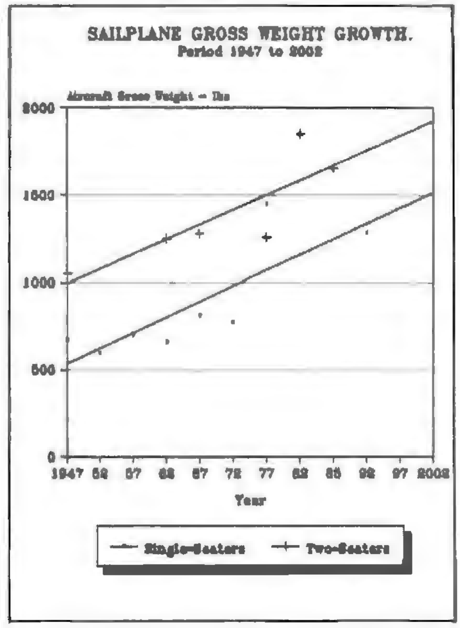
At the Yorkshire GC, the author and others continued to build winches on the bus chassis. The particular objective was to design a winch of extreme simplicity that needed little maintenance. Narrow drums with single swivel guide rollers were developed. The latest design has taken the drive through the forward drum to a ➡


The RAFGSA winch at Bicester in 1985.


The Yorkshire GC winch at Sutton Bank in 1988. Photos: Chris Riddell.

TABLE 1: Sailplane AUW

Year	*Single-seater*	*Weight (lbs)*	*Two-seater*	*Weight (lbs)*
1936	Kirby Kadet	513	Falcon 3	899
"	Kirby Tutor	550	Steadman TS1	725
"	Rhonsperber	562		
1938	Slingsby Petrel	637		
1947	EoN Oympia	670	Slingsby T21	1050
			Short Nimbus 1204	
1953	Skylark 2	600		
1955	Skylark 3F	790		
	Jaskolka	816		
1957	Swallow	700	Blanik L-13	1102
	K-8	683		
1959			K-7	1058
1961	Skylark 4	830	Capstan T-49	1250
1963	Olympia 463	630		
1964	Libelle H301	661		
	Dart 15	730		
1965	SHK	816	Bocian	1190
	Dart 17R	816		
	K-6E	661		
	ASW-12	948		
1967	Libelle H201	772	K-13	1058
	ASW-15	899		
1970	Kestrel 17	772	Bergfalke 4	1113
			Calif A-21S	1420
1971	Sigma	1550		
	ASW-17	1257		
1974	Kestrel 22	1450	Janus	1367
1976	KS-3A	1036	Twin Astir	1367
	ASW-19	1000		
1978	Nimbus 2c	1435	K-21	1256
	ASW-20	1000		
1982			Nimbus 2NT	1850
			Marianne	1275
1985			ASH-25	1650



splitter dog clutch in the centre. A dual pressure pneumatic circuit operates the drum brakes; one pressure restrains the cable on pull out while the second stops the drum. The epicyclic Wilson gearbox is also selected pneumatically.

The Future

The future will lie with the professionally designed and built winches such as Supacat and Tost. The gliding movement will have to accept their price – often more than an aircraft – as a necessary operational cost to be recovered over a large number of launches and winch drivers will have to be thoroughly trained.

Sailplane AUW has doubled in the sixty years since soaring began as a serious sport and the horse power available has increased by a ratio of 2.5:1. The trend suggests that by the year 2000 we will be looking to winches to launch gliders of flying weights of 2000lbs. Table 1 lists a range of well-known models in use today.

The weight increase need not prevent gliders from being winch launched. Engine powers can increase to 450hp or so but this will call for heavier 7mm cable and much more space – 7000ft or more for launches of comparable height to an aerotow.

Super winching will reduce the need for aerotows. As a winch launch to 2000ft takes 1-2min of winch engine running time compared with the 10-15min of tug engine running time, launch costs will be less. Winch launches may also be preferred as they reduce atmospheric pollution and noise.

Where internal combustion engines are not acceptable an electric drive can be used, unlike the aeroplane. Winching in the 21st century will allow soaring to be a pollution free, environmentally friendly activity; the benign recreation and sport.

KEITH J. NURCOMBE

IN FOR A PENNY

Keith Nurcombe of Tutor fame says you don't need to fly a glider that costs as much as a house to find adventure

Gliding is a truly amazing pastime. For some folk, simply getting their feet off the ground is sufficient adventure, while others haven't had a good time unless they have been to some distant part of the realm and back in as short a time as possible, navigating by satellite and playing computer games, while pitting their competitive skills against other like-minded souls.

An apocryphal tale: One evening some twenty years ago in a clubhouse somewhere in England a group of poverty-stricken glider pilots (what's new) were indulging their fancies as to which of the new super ships they would spend their pools winnings on. "Well," says Chris T. when his turn arrived, "all the best stories I have heard have involved T-21s." "Yes" says Lou the Glue, "Let's buy one." And so was born That T-21 syndicate. The membership has changed much, but over the years that glider has been to Skegness , Plymouth, the Isle of Wight, Great Yarmouth and all stops in between, providing its pilots and their crews some marvellous fun and magnificent memories with which to bore their grandchildren – and all for a tiny outlay.

To compete successfully you need a modern glider which may cost as much as a substantial house

The top and bottom of the sport have been racing away from each other for many years now. There are still people flying who flew open cockpit in the Nationals in the late fifties; not that they expected to win, mind you. These days there is only one way to compete successfully in serious competition, and that is to beg, borrow or steal a competitive modern glider. Such an aircraft may cost as much as a substantial house, and you either need an appropriate income to support the mortgage, or you syndicate with as few partners as you can get away with to cover the costs between you.

The latter course will probably mean a reduction in the number of days available for you to fly it, but there is a trade-off in that you have someone to scream to for help when you misjudge things and land out. One comes across fortunate types who have a partner who is in prison/lives in Scotland (or England, if you live in Scotland)/ can't stand flying/ only flies on Wednesdays, or some such ludicrous story, and one can only envy them. You also come across other folk who have twelve partners who all want to fly on Sundays, and one is inclined to wonder whether they get value for money.

If you are one of the latter rather than one of the former, do not despair, there just might be another way!

The important thing is to decide just what you want out of gliding. If you really do have a burning ambition to become National Champion then you have no choice but to buy into a competitive ship that will let you first win Regional Championships, and then the big one. Now, much of the buzz that racing pilots get comes from the competition rather than from the flying *per se.* If the racing aspect does not appeal, or you simply can't afford the time and expense, just look what is left for you to do – gliding can be full of adventure.

Cloud flying, cross-country exploration, task flying against the clock, aerobatics even, can all be classified as what you might call local soaring, even if it takes you a few hours away by road retrieve. Soaring sea breeze fronts, downwind dashes to distant goals, or ridge and mountain soaring and wave flying expeditions from time-to-time may add to the expense, but can make for rare memories to warm you on long winter nights, especially if you can combine several of the aforementioned activities in one flight. Perm any two out of three to keep boredom at bay, or maybe frighten you silly, but you can do it all in the humblest of gliders at minimal expense.

The current trend to "get back" has undoubtedly made cross-country flying more popular. The convenience of de-rigging back at your home site with the congenial help of a friend, followed by a drink in the bar, is infinitely less tiresome than trudging three miles to a phone then returning to the glider only to find that a cow that wasn't there before has just eaten the rudder. So do O/Rs.

But closed circuit flying tends to keep you over the same country, so every now and then plan a flight to exotic parts, and the hell with the expense. The money you've saved by flying an old glider will pay for the retrieve, and for the celebratory dinner on the way back, while your crew will double as captive audience for your tale of high adventure.

Compare the asking price of a vintage glider with the cost of building one and it has to be good buy

I have been gently chided in some quarters for suggesting that vintage gliders are good because they are cheap. If that is true, then it is only because they are perceived to be of little value. My advice in that case, would be to grab one while that is so and hang on to it. Compare the asking price with the cost of building one and you may find that it simply has to be a good buy.

It is also true that after thirty years of gliding, I have had more enjoyment from the two seasons flying a "barn door" (Tutor glide angle about 12:1, price circa £500, modern hot ship glide angle about 40 or 45:1 or better, price £20-40000 upwards) than I have had in almost anything else.

Wooden gliders over the past thirty years have given me some high adventure – surf riding a cold front across East Anglia; the sullen threat of a dark storm cloud; the frozen emptiness of the Scottish wave; to Snowdonia, where I would never dare to take a glass ship (there would be almost nowhere to land it) and to the beach at Great Yarmouth.

Short closed circuits are no less an achievement for being short if they are well flown – and you will know when you've done well. Do the same "milk run" over again, and see how you improve with practice. The satisfaction of successfully completing a mere 100km triangle in a low performance ship compares favourably with a much larger task in a high performance glider, and if things don't work out, well, you're only a few miles from home.

The very fact that this marvellous fun can be obtained at a microscopic cost simply adds to the pleasure. Spend the money on flying rather than on keeping up with the Jones's. You really don't need to spend a great deal of money.

I would not advise a comparative novice to go and buy a glider with a very poor performance other than as an investment for the future. As with many things mechanical, it takes skill and practice to make poor tools work well. However, there are many good wooden gliders still around that are superb value for money and properly cared for will provide years of enjoyment.

You have to balance the benefits against the disadvantage of lower performance. A wooden glider will probably be easy to fling in to any bit of cow pasture, which will give you more confidence to venture low for that next thermal: The powerful dive brakes and greater pitch stability of an Olympia or Skylark make cloud flying easier and safer for the comparative novice. Maintenance and minor repairs are easier to do yourself (under supervision, of course, and then you'll have another reason not to get bored in the winter evenings). Insurance is less of a burden.

If you still need convincing, go and read Philip Wills or Peter Scott, or any of the classics of the 1950s and 1960s. Really, despite all the progress of the last twenty years, nothing has changed. These gliders are part of a disappearing world. Don't pass up the chance to make those memories. I promise you, *the magic still works!*

GOLDEN OLDIES

Vintage gliders are so photogenic we need few excuses to feature them

1. Dick Hadlow and Peter and David Underwood's Kirby Kite (BGA No. 400) which was restored by Peter and David. 2. Mike Beach's Scud 2 (BGA No. 231) which is Britain's oldest flyable glider. In the background is the Falcon I replica owned by Mike Russell who took both photos. Tony Hutchings took the photos on p29. 3. Mike Challenor's Hawkridge Grunau Baby 2. 4. "Lofty" Russell on his Grasshopper prior to launching. 5. Chris Wills's T-31.

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SETTING YOUR OWN GOALS – From solo to Bronze

Liz Veysey, London GC's manager, explains a formula for making steady progress in the early stages of gliding

So now you've done your first solo flight. Great! But after the euphoria has died down – now what? "It's important for every flight to have a purpose" is what all the gliding books say. But what? Most of us only have a hazy idea of the sort of thing one should be doing to build our judgment skills and stretch our flying abilities.

Here are some ideas of goals you could set yourself so that you can monitor your own progress after you have finished your pre-solo syllabus. These ideas are only as a guide to supplement any formal training given to you by your own club instructors. I am sure there are many omissions which only they can supply.

The idea is to set some structure around your own post-solo progress in the same way that you were able to tick off the items completed on your pre-solo progress card. This way you can see that you are progressing towards your Bronze badge and remain motivated to carry on when the going gets tough. In my example I have gone for a rather ambitious six month goal of achieving a Bronze badge, but you can double it or choose your own timescale. Only you know how much time/money you can invest in your flying.

Try and enlist an instructor's help

First, using the marking grid below, fill in your own target dates for your calibration flights. It is better still if you can enlist the help of one of your own instructors to be your "mentor" and watch over your progress, explain things you find difficult and test you on your "calibration flights". There is no reason why you cannot test yourself on these exercises, but remember to keep a really good lookout whilst doing them.

EXAMPLE GOALS FOR ACHIEVING A BRONZE BADGE IN SIX MONTHS

Month 1

1. Fly for a minimum 3hrs solo and 25 launches.
2. Practise centring in thermals on at least ten flights.
3. Stall the glider at least ten times.
4. Buy and study a 1/2 mill and a 1/4 mill map and really familiarise yourself with it. Paste them up behind the loo door or use them as a tablecloth – but get to know your local area and all the symbols.
5. Study **air law** and get your instructors to explain about airways, and other no-go areas near where you fly.
6. Read up about the atmosphere from Met books. Understand the relationship between temperature, pressure and moisture, and what is meant by a stable or an unstable day.
7. Make sure you really understand how a glider flies (well, up to Bronze badge standard anyway) – how the controls alter your flight path and how drag affects things. Do you really understand adverse yaw?

Month 2

1. Fly for a minimum 3hrs solo and 25 launches.
2. Fly the second calibration flight – note total score.
3. Fly dual to practise crosswind landings.
4. Practise centring in thermals on at least ten flights.
5. Fly with an instructor to have demonstrated the whole range of stall reinforcement exercises.
6. Practise at least ten stalls and five spins with an instructor.
7. Get someone to show you how to smoke a barograph, unless you are so rich you can afford your own electronic version.
8. Learn about the use of airband radios and radio etiquette (the do's and especially the don'ts).
9. Learn how to recognise crops and which are good fields to land in. Evaluate fields all the time you are out for walks or are in your car – it's a habit which will never leave you and really annoys the rest of the family. Get an experienced cross-country pilot to comment on your evaluations.
10. Learn about weather fronts and the winds and weather connected with them. Learn about areas of high and low pressure, ridges, troughs and what about cols? Find out how all these affect gliding.

Month 3

1. Fly for a minimum 3hrs solo and 25 launches.
2. Fly the third calibration flight – note total score.
3. Fly dual and learn how it feels to land downwind (isn't it awful) so you won't make that mistake on your own one day.
4. Get a dual cross-country. Don't ask me how, that's your problem.
5. Get one Bronze leg under your belt.

CALIBRATION FLIGHTS TO CHECK ACCURATE FLYING

Marks out of 10 – No more than 1min spent on exercises 1 – 6.

	date	date	date	date	date	date
Timed turns						
1. 360° in 30sec, speed constant, string in middle						
2. 360° in 25sec, speed constant, string in middle						
3. 360° in 20sec, speed constant, string in middle						
S Turns 4. 30° of bank, speed constant, string in middle						
Turns with changing angles of bank 5. 90° of turn with 5° of bank, 90° with 30° of bank, 90° with 5° of bank, 90° with 30° of bank, speed constant, string in middle						
Spot Landing 6. Approach speed control never more than 2kt from nominated speed, well held off landing						
Circuit judgment 7. Well judged for conditions of day						
TOTALS						

6. Take an instructor with you and ask for criticism on how you handle spin recovery.
7. Practise at least ten stalls and put it into a spin yourself. Do ask your duty instructor first if you want to do this solo, or you may give him/her a heart attack.
8. Ask an instructor to give you a session of cable breaks.
9. Ask an instructor to explain about altimeter settings – QFE, QNH and 1013mb, then go and read about them. Relate this information to your air maps with which you are now getting very friendly.
10. Make sure you understand about wave conditions.
11. Find out how thermals are formed and the best place to find them. Ask your instructors the best place to find your local thermals for the time of year.
12. Learn to recognise different types of cloud
13. Do you really understand all about the placards in the glider you are flying? If not make sure you get an instructor to explain them and why, and learn all about flight envelopes before this month is out.

Month 4
1. Fly for a minimum 3hrs solo and 25 launches.
2. Fly the fourth calibration flight – note total score and compare it with your first totals and see how much better you are getting!
3. Fly with an instructor and ask to land in different parts of your airfield and ask your instructor to comment on your circuit. (I bet it's too small.)
4. Fly from a different club for the experience.
5. Practise at least ten stalls and ask if you can have at least three flights practising putting the glider into spins.
6. Ask an instructor to explain all the details of cross-country flight preparation, including route planning, NOTAMS, Royal Flight avoidance, Met, food/drink, money, phone numbers, declarations, barographs and trailer preparation.
7. Get your mandatory briefings on cross-country flying and field landings
8. Read up about sea breeze fronts and make sure you'll know how to recognise one when you meet one.
9. Learn how to predict the cloudbase, and whether the cumulus are likely to stay nice and friendly or turn into glider gobbling nasties which rain all over you.

Month 5
1. Fly for a minimum 3hrs solo and 25 launches.
2. Fly the fifth calibration flight – note total score.
3. Get your second Bronze leg completed.
4. Fly with an instructor and ask for constructive criticism on your thermalling technique.
5. Arrange a flight in a tug, motor glider or a dual cross-country in a glider with an instructor where you can test out your knowledge of your air maps and navigating skills.
6. Ask an instructor how far out you could fly to remain well within gliding range and complete a safe circuit at, say, 1500ft. Fly to that place and **don't** come back until you are down to 1500ft. Don't chicken out of this one.
7. Practise at least ten stalls and at least three spins.
8. Ask an instructor to explain how the basic glider instruments work. Then go and read up about them.
9. Now settle down for a few evenings and leaf through a gliding meteorological book, and stop and re-read any chapters you don't fully understand. Engage the help of a club instructor if you get really stuck.
10. Ask an instructor to go through **Laws and Rules** with you and point out all the bits you should learn for your Bronze badge test. There's an awful lot in there for reference. Learn the bits you need.
11. Fly dual to learn side-slips.

Month 6
1. Fly for a minimum 3hrs solo and 25 launches.
2. Read a book on cross country flying.
3. Fly with an instructor on a minimum of three circuits with all your instruments covered up.
4. Take an instructor with you for your sixth calibration flight and ask him/her to rate you Compare your score with your previous totals. Is it good?
5. Revise all ground school subjects.
6. Humbly approach CFI and ask for check flights and written exam paper.
GOOD LUCK!

WOMEN IN GLIDING

The BGA Women's Working Group is looking forward to a sociable and successful soaring season. Following our popular wave soaring weekend last November we are running a programme of weekend events built around various themes, including basic and advanced cross-country flying and wave soaring. We hope many people will take the opportunity of polishing up their gliding skills, or perhaps just flying a different glider, with new company, at a different site.

The group, formed in 1990 in response to an article in *S&G*, has contacts with pilots in Germany, France, Holland, Poland and Australia. We publish a quarterly newsletter, *Slipstream.*

Much of the work is relevant to men as well as to women

We have reached the stage where necessary but perhaps rather dull groundwork has been completed. Reports on technical and safety matters, instructing (which involved sending out a questionnaire to women pilots), medical problems, childcare and gliding club facilities have been produced and distributed to the appropriate authorities. Much of our work is relevant to men as well as women, as our terms of reference make clear:

1. To further the gliding movement as a whole and, within that, look at the fact that there are very few women in gliding.
2. To investigate and identify causes of low participation and achievement in gliding by women.
3. To suggest methods of raising the numbers participating and standards of achievement and to make recommendations to the Executive Committee.
4. To consider if the above recommendations are applicable to the gliding movement as a whole.
5. If accepted, to assist in putting such recommendations into practice.

If you'd like to find out more about our work and activities, just contact us c/o the BGA office.

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his Nimbus 3DT with Barbara West (P2) near oto John Bridge. 2. & 3. Mike Cuming took both. m in an Astir CS near Aboyne and 3. a K-13 in 4. Alan Fretwell, flying a Junior, photographed ventry GC's old Puchacz at the Long Mynd. 5. vinter view" which would have made a super

4.↑ 5.↓

DEREK PIGGOTT RETIRED!

What is it like to stop doing something you have really enjoyed for so long? You would think it would be a great let down without anything planned to look forward too – but it's not so bad after all

I don't feel as though I have retired although I do miss my old work instructing at Lasham every day. But in many ways it is quite a relief, particularly not having to open the hangar doors in the middle of a cold and windy winter afternoon, when no one except me really wants to fly.

Now I look out at the weather and think, I'm glad I haven't got to go out in this, or I'm glad I haven't got to keep them amused all day with talks. But I do miss it all and it's lovely to go back for a few days and instruct on a glider without feeling responsible for everything that goes on all over the airfield.

I miss meeting all the other enthusiasts more than the actual flying. Sharing their achievements and excitements meant a lot to me and I look back on many special days when new records were set. Things like Doc Hilditch making the first ever 300km triangle in the UK in a Skylark 2 and Chris Garton's long flight in his Kestrel to Durham Cathedral and back, arriving late in the evening after 803km. But also the hundreds of first solos when I felt I shared their thrills and achievements.

Being retired has given me much more time to do some of the things I've always wanted to do, although for one reason or another I still have not been able to do them all.

I have had several very enjoyable visits to other countries over the years, visiting the various gliding clubs and organisations. Often they are very isolated and have developed their own methods and I find that I am able to give them new ideas and helpful hints on gliding operations.

A few years ago I went to Israel to tour the gliding clubs and had a wonderful time. I love visiting new places and seeing how other people's methods differ from our own. Last year it was to Albuquerque as a guest speaker for the Soaring Society of America's annual Convention.

I had an interesting time giving lectures and flying with the local club instructors and learning about their very special soaring conditions. I had the honour to be checked out for my American instructor rating by a Mr Santilli, who showed me his license and logbook which had been signed by Orville Wright, one of the Wright Brothers!

I have several half finished books on various aspects of gliding

Of course talking is really just an extension to writing about gliding, but it has the advantage that it can all be made relevant to the people listening, whereas book writing has to be more formal and generalised. I have several half finished books on various aspects of gliding but am beginning to find it difficult to write fresh material after the last one. (Number 7, I believe.)

Certainly thinking of titles is getting difficult. People keep asking me for my autobiography **Delta Papa**. It is right out of print and needs a complete re-write if it is ever to be published

again. Perhaps I will get down to it sometime. I have just started another book, this time on flying small aircraft, explaining the special hazards and problems involved with flying at low speeds; a subject that not many power pilots seem to understand.

One thing I have continued to do since retiring as CFI is to run introductory days of gliding for schoolchildren. These are usually during half term holidays and we take about ten girls and boys from state schools and give them a taste of being a member of a gliding club. They start the day with a very comprehensive briefing on ground handling and how to do all the normal jobs at the launch point, so they can really play a proper part as a member instead of just a visitor.

They have two winch launches in a K-13, learning how to fly. Being young and quick to learn they are usually doing co-ordinated turns and having a go at the landing by the end of the second trip. We have had hundreds of children on these very short courses and some have come back to become members. I really enjoy flying with them all and listening to their comments after their first flight.

A few weeks ago I took part in a series of Master Classes in Technology organised by the Sussex SATRO organisation from Brighton Polytechnic on the lines of the Royal Institute TV series of Christmas lectures. The first day consisted of demonstrations using videos, models and a wind machine to explain how and why a glider can fly and soar.

The second day was all practical work with the 60 children in small groups. They had to assemble a small smoke, wind tunnel to conduct various experiments on streamlining, reducing wingtip vortices etc, and they also investigated flutter and made flying model gliders. It was a challenge for me and quite different to teaching on a one to one basis.

I now do quite a lot of instructing on the little Chevvron microlight, converting pilots who have been flying weight shift flexwings or normal light aircraft and showing them how to use thermals and have fun soaring. Now it has a proper trailing edge airbrake, it promises to be excellent for basic instruction for both glider pilots and students wanting to learn to fly either three axis microlights or even normal light aircraft. It is such a joy to rig and de-rig compared with a normal glider, that I find I fly it in preference to anything else for the amount of pleasure per degree of aching back muscles.

Demonstrating it is fun because it is incredibly quiet, has glider like handling and always creates a good impression. Most of my Chevvron flying is with pilots from all over the world who are thinking of buying the aircraft. This has meant a number of trips to France, Belgium and Germany to demonstrate it at various air shows.

I am hoping to take the Chevvron round to some of the gliding clubs I have never visited, in order to meet people and show them what it is like. I am also looking for somewhere to do some concentrated training courses using it, because I still believe that our normal methods of teaching in gliders are too time-consuming for many would be glider pilots. It would be nice to have a base where I could teach the basics on the Chevvron for people who don't have the time to do all their training in a normal gliding club.

One of the things I have always enjoyed is flying new types of aircraft and I have been lucky to be asked to help with the certification of several of the new motor gliders. Certainly the latest breed are magnificent machines with excellent handling and performance, but they are so expensive that otherwise I would never have the chance to fly them.

The modern microlights are also fun to fly and I occasionally get the opportunity to assess them for the magazines. I still thoroughly enjoy aerobatics in anything, but I don't get much chance to practise in gliders as tows to 4000ft are an expensive luxury.

Of course I will always enjoy talking to other pilots and beginners about flying and now I have got time to do it, I am more than happy to have the opportunity to visit new sites and to give talks as well as flying with anyone who wants to fly with me. I have done this in many places in the USA and Australia, as well as at a few English sites including Parham and Camphill. These weekend visits are great fun for me as they bring back my many exciting experiences instructing, solving beginners' problems, explaining soaring techniques and answering all the questions brought up by members.

Many clubs still seem to have very little in the way of formal talks

Derek flying the Chevvron.

I often think that perhaps they are the best use of my time because with talks so many people can benefit from new ideas, compared with flying which is very much a one to one affair. Many clubs still seem to have very little in the way of formal talks for their members. When I do visit we usually end up with a social evening, talking about stunt flying for the films and tales of my near misses and various crashes.

I often ask myself what should I be doing, or what could I be doing? You see, in my time I have done a lot of film flying and this is something I really enjoy more than anything. It combines flying new machines with the demands of putting the aircraft in the right place at the right moment for the camera, which I find fascinating. You may have seen my last little effort for the TV advertisement with a DG flying over the dried up reservoirs near Husbands Bosworth. Of course I would like to make training videos but need a sponsor to finance them to do the job properly.

It is natural to look back over the years I spent at Lasham. I used to enjoy instructing in the open T-21s, but now I wonder how I ever stood the bitter cold. Now I find that after 20 minutes in an open cockpit I'm longing to get down.

Thanks to the generosity of their owners, I have had flights in the Nimbus 3DT and been lent a Nimbus 3T on several occasions. I had a wonderful trip to Wales and up into wave, without the anxiety of a long retrieve if the weather had changed and dumped me there. I still have my share in 906, the first Astir to come to this country and still, I think, with the nicest handling of the Astir family. But I have begun to yearn for more cross-country flying without the fumbles of outlandings and I find myself not bothering to fly or even to go to Lasham unless it looks certain to be good weather. The trouble is that I really enjoy the more marginal days and the excitement of a good scrape. So I'm beginning to think more and more of a turbo or self-launcher in order to do more serious gliding.

Most of all I enjoy the competitions and I wish I could fly several Regionals or all three Nationals to get in form. Last year I didn't even go across country in a glider before the Regionals, but I was in good flying practice including the odd engine failure and forced landing in fields.

Like most real flying enthusiasts, I started by building and flying models and I badly want to get back to building them again. I still have a large supply of Balsa wood stored away for the day when I have to stop flying. But at the moment, that's out of the question.

I am kept fairly busy with writing books and magazine articles and whatever flying I can organise. I am always fascinated to fly new types regardless of what they are and I don't seem to have lost any of my enthusiasm, or so people tell me. I welcome any suggestions as to what I should do next in life. It has been great to spend half a life time helping people to learn to glide and doing what I most enjoy. I shall certainly die happy – though not quite yet, I hope!

BE A SAFER PILOT

With seven fatalities last year was the worst on record. The start of the season is time for us to reflect on safety. Here Bill Scull considers some of the lessons learnt and gives tips on how you can be safer

Reflect on the amount of your flying experience and compare it with driving. When did you last fly? Three weeks ago, six weeks, three months? How good would you be in a motor car after such a lay-off?

Even if you are a "good pilot" (and don't we all like to think of ourselves as that?) a lack of recent practice means that we will cope less well with an emergency even though we may be all right at the basics. I became particularly conscious of this after a three year lay-off when I renewed my PPL for self-launching motor gliders.

So, what can you do to make yourself safer? In ideal circumstances you would be checked on all the emergencies, stalling, spinning, cable breaks at awkward heights and so on. However, there is a level of experience where such an approach is falsely regarded as beneath one's dignity or unnecessary.

Some basic lessons

Since generally you have to take off to have an accident this is where we will start. How many take-offs have you made? How many have gone wrong with a swing or wing drop? The answer – "probably very few". The implication of this balance between successful/unsuccessful take-offs breeds complacency and a reluctance to pull the cable release when the launch starts to go wrong.

For the most part the incident may be no worse than a swing or a minor groundloop. But there are other possibilities, especially on the winch. The time scale of events in the series of pictures on opposite page is probably less than two seconds – the time it takes to get flying speed on a powerful winch.

Releasing has to be considered as an early option; only by being prepared can you reduce your reaction time. Realise that it goes wrong very quickly indeed – like less than two seconds.

Climbing too steeply

In the acceleration phase of a high powered winch launch there is a marked tendency to pitch nose up. In some gliders the stick may be on the front stop for a second or two. Failure to make this control input can result in a rapid nose-up pitch from which it is impossible to stop the nose from rising further. Did you know that the stalling speed increases on a winch launch. Not a lot of people know that!

In the early part of the launch the stalling speed increase is in the order of 10%.

Towards the top of the launch the amount is in the order of 40% of the normal stalling speed in free flight.

This type of accident – a flick roll – is rare but usually fatal. Some possible contributory factors are having soft cushions behind you or, with a reclining seating position, not having the shoulder straps tight and so sliding upwards and backwards as the glider accelerates. Yet another possibility for smaller pilots is that even strapped in before flying they cannot get full forward movement of the stick. Try it – your arm should still be slightly bent with the stick fully forward.

Cable Breaks (and launch failures)

At any time during the winch launch this continues to be a fairly common event leading to accidents. Powerful winches, stronger cables and the approved weak link strength seem to be reducing the risk. However quickly you, the pilot, react there is bound to be some loss of speed. Your possible errors are:

Opening the airbrakes, "the going-into-land syndrome" (a conditioned reflex action).

Turning before the glider has reached a safe manoeuvring speed, although the nose may be well down. Has the glider reached the speed for this attitude? <u>Probably not!</u>

The recovery manoeuvre, a "push over", reduces the *g* and the stalling speed. When the glider is restored to 1*g* it may still be at a speed below this (1*g*) value. Consider the implications of manoeuvring or using the airbrakes in this situation.

The last point may warrant further explanation. By the time the glider has flown into a nose-down attitude and is at lg again, the speed will have reduced. Although the speed in the push over may well be below the 1*g* stalling speed, the stalling speed at reduced *g* is also lower. The lower flying speed will only matter if you attempt to manoeuvre, *ie* turn, which will cause an immediate stall and maybe a spin.

Stalling and spinning

This continues to kill pilots year after year; experienced or otherwise the minor variations are academic. Those of you who have been to a recent flight safety presentation should have a handout on this subject – "All you need to know about spinning." But it's not just a matter of knowledge but more a matter of your skill. The time it takes to read the following words would entail a height loss of 800ft or so in a spinning glider:

Full opposite rudder.	[1]
Pause, centralise ailerons.	[2]
Ease the stick forward until the spinning stops.	[3]
Centralise the rudder and	[4]
Ease out of the dive.	[5]

The words describe the complete drill that should work for any spin. The numbers refer to the comments below.

[1] Failure to apply full opposite rudder may delay or even preclude recovery.

[2] The pause is regarded as academic in gliders; also it is unlikely that the pilot will ease the stick forward without actually centralising the ailerons.

[3] In practice some gliders recover from the spin by simply relaxing the backward pressure but, if not, then further forward movement is required, say to a central position. (Centralising the stick may actually be recommended in the pilot's manual.) If that doesn't work then still further forward movement is required. The risk here is in over-controlling – moving the stick further forward than is necessary.

[4] Centralising the rudder is essential before pulling out of the dive. If you don't you may spin in the opposite direction.

[5] Easing out of the dive needs to be carefully controlled to avoid pulling too much *g*. Incidentally, have you thought that by using the airbrakes in a near-vertical dive they limit further speed increases while recovering from the dive?

Perhaps the final point to make about the recovery dive is that being slow to recover is potentially very hazardous indeed. In a vertical dive the glider accelerates at 32ft/sec/sec or 19kt/sec – drag is not significant in the equation. If the glider is diving at 100kt initially you don't have to be a mathematician to work out the speed after 1, 2 or 3sec. Incidentally, think of the implications of ASI lag and errors due to yaw.

High speed flight

The final message concerns high speed flight at altitude. Not a lot of people know about this but do it just the same. To understand properly all that is involved you need to know about the manoeuvring envelope, the atmopshere and airspeed indicators. But the bottom line is quite simple if you consider a glider with a never-exceed speed of 135 knots:

At 20 000ft. the indicated speed for this limit is 115kt;

at 30 000ft. it is only 96 knots.

One of the consequences of exceeding the never-exceed speed is flutter and, as Frank Irving puts it – **Flutter can seriously damage your health!**

CHRIS PULLEN

ENGINES – A CAUTIOUS APPROACH

Chris Pullen, Thames Valley senior regional examiner, mainly directs this article at self-sustaining motor glider pilots who have no formal engine training

This airfield is relatively rough but even short grass can have the same effect.

The wing has dropped but you do not release; the glider has only yawed slightly.

Now the glider is airborne and the cable still attached. An accident is inevitable but even at this stage releasing might make it not so serious. Below: Now it really is too late. How serious your injuries might be is a matter for speculation.

About 80% of all new gliders built in Germany either come with an engine, or have the facility to have one retro fitted. In some cases we are talking about true motor gliders – those machines capable of self launching, single or two-seaters, with or without retractable engines. These gliders require formal CAA registration mandatory engine hour checks, and the P1 must have either a PPL(A) or a PPL(A) SLMG.

However, an increasing number of gliders are produced with no intention of taking off under their own power. These are referred to as self-sustaining motor gliders. They normally have retractable engines, and are regarded as a glider. This means that pilots of these gliders do not need to have undertaken any motor training as a normal glider qualification is all that is required. It is perhaps the fact that these self retrieving gliders can be flown without any extra paperwork of any kind, make them so attractive. I direct this article mainly towards these people without formal engine training, but hopefully it is applicable to all.

The engine is most probably going to be used to try to prevent a field landing. Here height above ground is related to time in the air. It takes time to erect the engine. It takes time, and normally height, to start the engine (most sustaining engine are dive started). If it doesn't start you need time and height to either try to start it again, put it away, or to accept the lower performance (*ie* reduced time in circuit). The engine starting process requires height.

It is therefore logical to assume that should you try to start the engine at what you considered a normal circuit height, you are already too late regardless of whether it starts or not!

Practising starting your new toy at 2000ft plus gives you great confidence both in your own ability to do the right things in the correct order, and in the fact that the engine starts easily first time. Understandably you then begin starting it closer and closer to the ground. This confidence also extends to field landing situations. Your decision height to start the engine becomes lower and lower, after all, it only takes about 200ft to start it.

You begin to assume that the motor will always start first time when required.

Modern engines, like most modern machinery, are increasingly reliable. It is all too easy to be lulled into a false sense of security, especially when going for that last cloud and trying to thermal away from low down. So the great care you have been giving up to now on field selection, and the concentration given to your exact circuit planning, starts to deteriorate. And still you seem to get away with it!

But what if it doesn't start?

No field picked, or at best a general area chosen. Rushed decisions need to be made. Meanwhile you are still considering why it didn't start. Did I forget to do all the things in the correct order etc etc. The temptation is often to try it again. You're so convinced it should have started that your mind is still not giving full attention to the problems to come.

Probably flying around with the engine up, producing a glider performance you're not expecting

Faced with what is normally a high workload situation, late rushed decisions, and still part of your mind on other things, creates a recipe for disaster. On top of this, you are probably still flying around with the engine up, producing a glider performance you are not expecting, and an increase in stalling speed you had never even considered.

How then should you modify your flying if you have an engine? Having read all the paper work I began by starting the engine at a height of about 2000ft so as to familiarise myself with the procedures. It is a low stress situation, so if it doesn't start I've plenty of time to have another go, or put it away. As I have already said your confidence soon grows. But long before I expected to use it for a field landing retrieve I spent some time examining the changes in stalling speed and general glider handling engine up. The normal prestall buffet becomes almost impossible to hear, due to the additional noise generated by having the motor erect. Learn to increase your awareness of other stalling symptoms. Concentrate on the climbing as well as the land- ➡

ing configurations. These must be done as upper air exercises.

I then flew several circuits into my own club field engine up, erecting the motor in the high key area. Be ever ready to modify your normal circuit because the change in normal glide angle can be quite marked. Expect an increase in stalling speed of the glider with the engine out, so circuits and especially final turns need extra speed. All the additional drag created by the motor tends to slow your flying speed down so an attitude change is required. Just to fly at your normal gliding speed will therefore require a marked nose down attitude. Now to fly a little faster as suggested will mean an even better view of the fields! Remember all this extra drag also reduces your rate of acceleration, so any need to increase speed will require a greater height loss and a greater time, so monitor your flying speed and circuit position much more closely than normal.

I still make a point of landing my glider engine up, about one in ten landings, to remind me of these changes.

Now for the real thing. The most important thing is to have your field picked. I began by starting my field landing circuit considerably higher than normal, at about 1500ft agl. This can indeed be considered a disadvantage when you would have normally expected to be still searching for lift for some time to come. However initially I consider it a small price to pay. Even having done several engine saves during the past few years, I still set myself a minimum height limit of 1000ft above ground. I erect the motor in the high key area starting my down wind leg, field clearly picked. I expect about a 200ft height loss starting the motor, so this gives me a possibility of two attempts to start it. Should it start, I climb keeping my chosen field well within range, or until I have sufficient height to either pick another field or put the motor away. There would be problems if having started the motor I then cruise off only to have the motor stop on me with no field picked.

Should it not start I continue with the circuit modifying it as required. It may be possible to have another go at starting it, or put the engine away again, but my experience is that this is most unlikely, there simply isn't time. It is much better to concentrate on the circuit and landing then sort the engine out when you're safely down.

Should I, for whatever reason, fly below my 1000ft minimum, then I make no attempt to start the engine, but consider myself a normal glider and accept a normal field landing circuit.

Is it worth it? I believe it most certainly is. At the moment of decision it gives you the choice to either continue as you would have done, or to sacrifice some low scratching height with a very good probability of a self retrieve. Providing you go back to basics, and think a little more, it gives you the chance to attempt cross country flying with the minimum of inconvenience to either yourself or others. This has enabled me to learn by my mistakes in the shortest period of time, and also to try further and more often on those marginal days.

So far the engine has never failed to start, but you just never know! ■

OSTIV: SOARING CELEBRATION

Frank Irving says that there are few features of a modern sailplane which have not been influenced by OSTIV

OSTIV is the acronym for "Organisation Scientifique et Technique Internationale du Vol à Voile". (There are informal translations, mostly starting "Organisation Sociale et Touristique . . ."). It is significant that gliding is unique in being the only "discipline" of the Fédération Aéronautique Internationale (FAI) to have its own organisation devoted to its technical and scientific aspects.

Louis de Lange, former president of OSTIV, explained how this came to pass when writing in 1956 about OSTIV's predecessor, the pre-war ISTUS: "In gliding, more than in any other aeronautical activity, the scientific and technical problems are closely related to the sporting ones and it was by virtue of this fact that the ISTUS became automatically the acknowledged scientific and technical authority in this field of activities of the FAI, with the result that a most profitable collaboration was established between these two international organisations". Also, the study of gliding and its associated meteorology was already a reputable intellectual pursuit in German universities and technical high schools, and by 1929, the same was true at Imperial College, London.

ISTUS (Internationale Studienkommission für Segelflug) was set up in 1930, with Professor Walter Georgii as president. The initial seven participating nations had grown to 21 by 1939 and its activities included not only technical and scientific matters, like OSTIV, but also sporting matters. For example, it instituted the international Silver and Gold badges and maintained a numbered register. In 1932, it persuaded the FAI to set up the CVSM (Commission de Vol sans Moteur), the predecessor of the International Gliding Commission or IGC (previously CIVV), to handle most of the sporting matters.

At the first post-war General Conference of the FAI in 1946, it was agreed that the work of the ISTUS should continue, although the infrastructure previously available in Germany no longer existed. A working group was set up as a sub-committee of the CVSM. At its inaugural meeting in 1948, it decided to call itself OSTIV and this name, together with its objectives (Fig 1), were approved by the FAI. Eventually, OSTIV became an "International Associate Member" (the only one) of FAI. So OSTIV enjoys a rather curious status: on the one hand, it is a "member" of the FAI (Fig 2) almost like a National Aero Club (NAC); on the other, it submits annual reports which were published in the *FAI Bulletin* along with those of the sporting commissions.

The rules of the FAI only permit acceptance of offers from potential organisers of World Gliding Championships if provision is made for a simultaneous OSTIV Congress. Since 1948, 22 Congresses have been held, the latest in Uvalde, Texas, in 1991. The Congresses are the most obvious manifestation of OSTIV. They provide an opportunity for the presentation of appropriate papers and for their discussion. New ideas are aired and exchanged. Members often have the opportunity to see the latest developments and sometimes (as with stall-warning devices at Wiener Neustadt in 1989) to get hands-on experience. The Congresses are where OSTIV mainly fulfils its objectives.

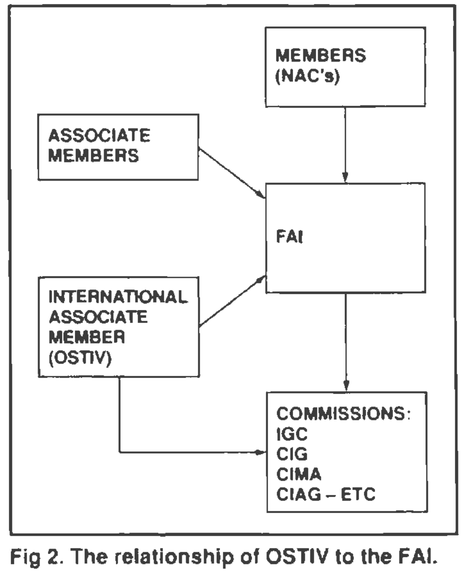


Fig 2. The relationship of OSTIV to the FAI.

OSTIV OBJECTIVES

TO ENCOURAGE AND CO-ORDINATE INTERNATIONALLY THE SCIENCE AND TECHNOLOGY OF SOARING AND THE DEVELOPMENT AND USE OF THE SAILPLANE IN PURE AND APPLIED RESEARCH

Fig 1

Papers for the Congress are submitted to the chairmen of the "Sections" (see Fig 3). The technical papers are mainly devoted to the design and operation of sailplanes, whilst the scientific papers are mostly concerned with meteorology. Latterly, there has been an expanding area labelled "Special Subjects", mainly devoted to medical matters. For an overview of the 1991 Congress, see Cedric Vernon's article in the December 1991-January 1992 issue of *S&G*, p307.

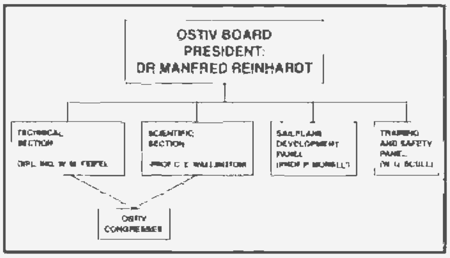


Fig 3

The object of having Congresses alongside WGCs is to encourage the exchange of ideas between the Thinkers and the Aviators. Unfortunately, in several past WGCs, the distance of the Congress from the airfield has tended to defeat these intentions.

The papers read at these meetings are published quarterly in *Technical Soaring* by The Soaring Society of America. This is automatically sent to members and is included in the subscription. The OSTIV Editor is our own Cedric Vernon who, not infrequently, has the task of unscrambling drafts written in a very strange version of English, complete with graphs carefully drawn in blotchy ball-point.

OSTIV has two off-shoots: the Sailplane Development Panel (SDP), chairman Professor Piero Morelli, and the Training and Safety Panel (TSP), chairman Bill Scull (see Fig 3). I must confess to being a little vague about the early history of the SDP, but it certainly became important after the Standard Class became a firm proposition at St Yan in 1956. The Standard Class was the product of lengthy discussions in smoke-filled rooms in the Hotels de la Gare or de la Poste in St Yan village, with copious libations of the local basic Burgundy. When CIVV agreed the principle of the Class, the SDP was asked to propose the specification of the gliders.

It was then realised that such a Class would require a reasonable degree of uniformity in respect of airworthiness, particularly since some countries had little in the way of formal requirements for sailplanes. Much of the work of the SDP was then devoted to writing Requirements for Standard Class sailplanes, later broadened to include sailplanes in general and, latterly, motor sailplanes. Rather belatedly, at the urging of Cedric Vernon, it was realised that OSTIV – unlike a national authority – was in no position to require anybody to do anything, so the title OSTIV Airworthiness Requirements (OSTIVAR) has been changed to OSTIV Airworthiness Standards, OSTIVAS.

The original OSTIVAR rapidly gained widespread acceptance, despite the initial fears – particularly in the UK – that they would turn into a collection of all the most difficult requirements available in Europe. In fact these misgivings were ill-founded. Early versions incorporated much of British Civil Airworthiness Requirements, Section E, together with some German input. Their requirements had become somewhat out-dated and when the German Authority, LBA, revised them, they incorporated many of the ideas of OSTIVAR. And then the various European airworthiness authorities decided to institute Joint Airworthiness Requirements, eventually including JAR-22, Sailplanes and Motor Sailplanes. These were based largely, and inevitably, on the German requirements. So one can see a thread running through all of these requirements, with OSTIV and the Brits providing a significant input.

OSTIVAS are still being actively discussed and up-dated, partly for the benefit of countries outside the JAR system and partly because the meetings form an unofficial forum for airing ideas which may eventually get into JAR-22, since there is noticeable overlap of personnel between the JAR-22 Committee and the SDP. Some of the airworthiness topics in which OSTIV is taking the initiative are Crash Loads, Protection from Injury (Tony Segal), Canopy Jettison, revision of the Stalling Standards (Cedric Vernon and Heiko Friess) and up-dating of the Flutter Standards (Frank Irving). The SDP normally meets once per year, with alternate meetings preceding Congresses. The current British members are Cedric Vernon and myself.

Other activities of the SDP include advising CIVV on Class Structure, competition documentation and definitions of sailplanes and motor sailplanes. Electronic instruments, gel coats and standardised engine installations have also been discussed. Latterly, some of the SDP were involved in activities similar to those at St Yan 35 years ago. The World Class Sailplane is largely the brainchild of Piero Morelli, just as the Standard Class was mainly Lorne Welch's. Piero involved a few others in helping to produce specifications and rules, leading to a remarkably enthusiastic response.

It has turned into a truly international body, as opposed to being purely European

The Training and Safety Panel is a more recent offshoot of OSTIV, chaired by Bill Scull. Its origins go back to 1973, when a European TSP was set up by Bill Scull and Fred Weinholz of Germany. Meetings occurred at fairly long intervals until 1984 when at Reno, Nevada, it turned into a truly international body, as opposed to being purely European. Subsequent meetings have followed at roughly two-year intervals. In 1987, it became a Panel of OSTIV and in 1988 there was a most satisfactory occasion, when simultaneous and partly joint meetings of the SDP and the TSP occurred at Rochester, UK, enjoying the facilities and hospitality of our sponsor, GEC-Marconi. Overlapping meetings also took place at Stuttgart in 1990. Present were 27 TSP members from 16 countries and 23 SDP members with 15 observers. Clearly, there are considerable areas of mutual interest, such as the spinning characteristics of training aircraft and various matters relating to accidents. The TSP has also been much concerned with recent European proposals on the rationalisation of pilot licences. The next TSP meeting was in Oslo in March, 1992.

OSTIV AWARDS

OSTIV PLAQUE WITH KLEMPERER AWARD
OSTIV PRIZE
OSTIV DIPLOMA
2000KM JOACHIM KUETTNER PRIZE AND TROPHY

Fig 4

OSTIV also awards prizes (Fig 4). The OSTIV plaque (a beautiful piece of silver) with the Klemperer award (money!) is presented to the person who has made "the most noteworthy scientific and/or technical contribution to soaring flight" in recent years. The 1991 award was to Cedric Vernon ". . . for his outstanding contribution to the technical development of sailplanes through an uninterrupted activity over about 40 years." The OSTIV prize is given for any outstanding improvement in sailplane technology. The 1989 winner was Dr Tony Segal for his work on crashworthiness.

A trophy for the first 2000km flight and for longer subsequent flights

The Kuettner prize is 2000DM for the first straight-line 2000km flight. The trophy will be awarded for the first 2000km flight and for longer subsequent flights, each improvement being more than 50km.

There are occasional competitions. The last was for a stall-warning indicator which, to my mind, did not lead to particularly practicable results. At the time there was some criticism of OSTIV for dissipating its funds on large prizes. In fact, the prizes were provided by the Swiss airworthiness authority.

So OSTIV isn't just a talking-shop. It actively incites technical development, improvements to safety and the making of outstanding flights. As a result of the advice of its panels to CIVV, it exerts a significant influence on the Class structure of WGCs and on the Class definitions. Probably unbeknown to the owners, there are few features of a modern sailplane which have not been influenced by OSTIV.

As we have always known, soaring offers a unique blend of sporting and intellectual efforts – which is why it is so attractive. OSTIV, under the presidency of Dr Manfred Reinhardt, is the prime means of encouraging the application of thought to the sport.

* * *

Individual members are welcomed. The annual subscription is currently 60DM, and includes Technical Soaring. *Further details may be obtained from the OSTIV Secretariate, c/o Institut für Physik der Atmosphäre, DLR, D-8031 Wessling, Germany.*

EMERGENCY PARACHUTING FOR GLIDER PILOTS

This is a subject few glider pilots like to think about, most dismissing the parachute as a piece of equipment they trust will never be used. Here Martin Lyster, who jumps out of aircraft for fun, tells you just about all you need to know from looking after your parachute to baling out

For most people, the word "parachute" raises images of Biggles hitting the silk, the battle of Arnhem, canopies that "fail to open" and sponsored daredevils with broken ankles. To focus on what is relevant to glider pilots, a distinction should be drawn between emergency, military and recreational parachuting. Recreational and military jumps both number millions per year. In both fields, equipment and techniques are highly developed and training is professional and intensive.

By comparison, however, emergency jumping is an unknown field. Very few such jumps are made. It is done by untrained and highly stressed people, without protective clothing and sometimes at very low altitudes. It is, therefore, much more dangerous than intentional jumping. The fatality rate among recreational parachutists in 1989 was 1/55 199 jumps, weighted towards the inexperienced. In a study of emergency jumps in Germany by Prof Wolf Röger (see "Jump or Bump", S&G, April 1992), the fatality rate was 40%, although this may include deaths not directly attributable to parachuting.

Emergency jumps are sufficiently rare that most pilots have never met anyone who has had this experience. This puts it at a sufficient distance from most of us that we are able to ignore the possibility; the "it wont happen to me" attitude. In fact, there are about one or two emergency jumps per year in the UK. It would appear that your chances of having to jump are lower than your chances of having a road accident driving to the airfield; but you are more likely to survive the road accident.

Given the high cost of buying and flying a glider, many pilots are reluctant to spend more than the minimum possible on an item they do not seriously believe they will ever use, other than as a cushion. This attitude continues after purchase, with abuse and neglect acting together to run down the condition of the parachute. The result is that many pilots fly wearing a parachute that is not airworthy. This only contributes additional, unnecessary dangers to the already hazardous bale out situation.

Neither the CAA nor the BGA requires pilots to wear parachutes, except when cloud flying (a BGA rule). There are no rules on maintenance and repacking; it is left to pilots' own judgment how to care for their parachutes. Many pilots apparently do not put much effort into this. John Curtis, chairman of the British Parachute Association (BPA) Riggers' Committee, has estimated that as many as 50% of the emergency parachutes brought to him are unairworthy in some respect. Another rigger put the figure as high as 60%.

Photographed in action from a balloon basket, Martin Lyster has about 70hrs P1 in gliders but is not currently an active pilot. He started jumping in 1980 and has about 4hrs free fall time. He is learning to fly hot air balloons, and also likes motor bikes, canal boats and parties in West Virginia.

New emergency parachutes

The UK market for new emergency parachutes is estimated by one supplier at around 300 units per year. This does not offer a very attractive return on the investment in designing and testing a new type. There are different approaches to this problem. One is to use an old design. Another is put on the civilian market a product originally designed for a military requirement, and tested by the military customer (largely at their expense). The market for skydiving reserve parachutes uses the mix-and-match approach, in which a parachute system is assembled using a canopy from one maker, a container from another, and possibly other parts from different sources. All three approaches can be seen in the emergency parachute market.

Some of the cheaper parachutes available today are simply very old designs. You can spot these by features such as elastic pack opening bands, and packs held closed by up to four pins passing through small metal cones. These are not used in modern designs, and indeed the BPA has long since banned pin-and-cone closures. They may require high pull forces if grit gets into them, and if a pin gets bent, may be impossible to pull. In modern designs the pins pass through cord loops instead of cones.

Another old fashioned feature is the sleeve; the canopy has a long tube pulled over it in order to slow down the opening (yes, really). The idea is that the lines have to pay out fully and tighten, before the canopy inflates, and that this orderly sequence of events should reduce the risk of certain possible malfunctions. Modern designs have other ways to ensure orderly, reliable deployment, without slowing down the opening.

Several small, independent firms supply mix-and-match systems, buying canopies from larger companies, and making the harness and container themselves from standard materials and hardware. Mostly these systems have up to date designs, and offer the possibility of servicing by the maker. The majority of canopies used in this way are American. Older systems still in use may include a canopy known as an I-24. This was mass produced for the US forces and large numbers were sold on the surplus market. It is a simple design and has been widely used as a reserve or emergency parachute. It is now obsolete and is no longer available in new systems.

The market leaders, GQ and Irvin, both offer modern designs with a background of military testing. The whole rig (canopy, harness, container, and deployment system) went through the testing program together.

GQ and Irvin meet the MoD quality assurance standards. Thomas Sports Equipment, leading suppliers of equipment of mixed origin, meet QA standard BS 5750/ISO 9000. The major US canopy makers, such as Strong, Pioneer and National are all reputable companies with high quality standards. However, anyone with a sewing machine can set up tomorrow as a parachute maker and start selling to gullible pilots. While this is not yet a problem in gliding, there is some very dodgy kit on offer to hang and para gliders.

Reassuringly, the industry demonstrated responsibility in the 1980s, when a large number of round parachutes were affected by a reaction between the nylon fabric and a fire-retarding substance. This chemical had been applied to the mesh that covers vents in the rear of the parachute. The reaction severely weakened the canopy fabric at an unpredictable time after manufacture. Several companies had used the mesh. Because records had been kept of batches of material, they could issue lists of serial numbers of all affected canopies. The vast majority of listed canopies were traced and treated; and all professional riggers have been circulated with information. The reassuring part (in case you were wondering) is that no company tried to avoid its responsibilities. This is part of what you pay for when you buy from the more established firms.

Buying a new emergency parachute

There is a wide choice of emergency parachutes on the market, all of which claim to do the same job with great reliability, together with low weight, comfort, durability etc. The price range is considerable, from £320 up to £800. At the lower end of the market are rigs imported from countries with low labour costs. They are generally old (or old fashioned) designs. The middle range is occupied by equipment of mixed origin. The market leaders, GQ and Irvin, sell rigs made in the UK, to both the military and civilian markets.

All the US products meet the TSO C23 standard, which is laid down by the Federal Aviation Administration, and involves a tough testing program. Some European countries have official standards for parachutes. Nobody knows yet whether European integration will mean a common standard being adopted for the whole EC, or not. At present, the diversity of foreign standards and absence of a British one, means there is no single kite-mark you can seek for reassurance.

Buying an Emergency Parachute

New:
More expensive.
More choice.
Modern design.
Confidence in condition.
Choose for shape, comfort, fit, descent rate, quality of manufacture.

Used:
Cheaper.
Less choice.
Many old designs in use.
Uncertainty of history.
Choose for packing record, age, condition, descent rate, shape and fit.
Ask a rigger if in any doubt.

So, what do you get for paying extra? According to RD Aviation, who sell GQ products (from £600 to £800), their selling points are comfort and performance. The design of the harness and container reflects the needs of glider pilots, with the top model (the Silhouette) featuring an inflatable cushion in the backpad which provides individually adjustable lumbar support, along with an integral seat cushion. It is possible to use a foam pad instead of the inflatable one. The canopy is GQ's conical design, a popular and well proven canopy, giving a low descent rate and more forward speed than most other round parachutes.

Irvin are currently re-equipping the Air Cadets with a parachute design originally for military emergency use. They sell the same type on the civilian market under the name EB80. This canopy also gives a low descent rate, but with less forward speed.

For most pilots the comfort and shape are crucial deciding factors. If you are planning to buy a rig, try wearing it for a few hours, ideally in flight, but otherwise while watching TV; don't get one that gives you backache. If you are heavy, talk to a dealer about the descent rate under canopy, and make sure you aren't going to pile in too hard if you ever have to jump. A descent rate of 6m/sec or less is desirable.

Second-hand emergency parachutes

If you are offered a parachute second-hand, it may appear to offer a big saving over a new one. Before buying it, check whether there is any document with it, recording regular inspection and repacking. If not, you can only assume that it has not been inspected and repacked; whatever the seller tells you, any professional rigger who packs a parachute, records the fact on a card that should be kept with the rig, often in a pocket on the container. No record, no packing. Buying a rig with no card is like buying a car with no MOT or logbook. Is the seller wearing a sheepskin jacket?

Just as with a used car, you can form a general impression of how well kept the parachute is. Dirt, scuff marks, kinked ripcord cables, and shabbiness suggest that it has not been carefully handled. On the other hand, a second-hand rig with a full packing record since manufacture, which looks well cared for and fits you comfortably, may save you a good deal of money.

You ought to be able to establish the date of manufacture. This is printed on the canopy material itself, with the serial number. It should also be on the packing card. If the parachute is 10-15 years old or more, you would want to be sure that it had been very well kept indeed before parting with any money; and ask a rigger to look at it. You may be tempted to use a parachute beyond the maker's recommended life; this is reasonable if you know that the rig has been properly stored, and regularly inspected and repacked.

There are some old designs which you may be offered. For example, there is a design of pilot 'chute still in circulation,which opens like an umbrella, with spidery legs that spring out. Two riggers who contributed their views have described this design as "a death trap", although no recorded deaths have been attributed to it. If in any doubt about a rig, ask a rigger to look at it and be guided by their advice.

Maintenance and care

All parachute makers recommend that rigs are kept in a dry place, out of direct sunlight, protected from extreme temperatures, away from solvents, oil, acids, petrol and grit. Car boots and glider cockpits are bad places for storage. Riggers often report seeing equipment which has suffered from neglect by storage in an unsuitable place. After a long, hot flight it may be tempting to leave your sweat-soaked parachute in the cockpit while you go for your tea. As the sun beats down, it slowly cooks the sweat into something resembling the primordial soup. After years of this treatment, your rig will look quite shabby. The harness webbing is unlikely to lose a significant amount of strength from sunlight exposure, being quite thick, but will fray at the surface. Dry storage out of direct sunlight avoids the soup effect and your rig will also look well cared for. Water contamination is not a problem, if you have a dry store; putting a parachute down for a few minutes on damp grass, for example, will not degrade it. Contamination by oil-based products should be avoided. Do not store a parachute in the same room as potential contaminants.

Parachutes fitted with elastic ripcord pockets or pack opening bands will need these parts replacing from time to time. In particular, the ripcord handle retaining elastic should be kept in good condition. If your ripcord handle often falls out, you need to replace the elastic. Jumping out and not being able to find the handle could spoil your whole day. Failing to find the handle has caused many skydivers to use their reserves; you haven't got a reserve. It is better to ask a rigger to replace the elastic with new material, than to try yourself to tighten the existing, worn-out elastic. There is a risk of over-tightening in DIY repairs.

Proper storage costs only a little effort; regular inspection and repacking costs money, so there is a temptation to skimp on it. Makers recommend various intervals between repacks, but almost all in the range four to six months. The main reason is that a perfectly good parachute ➡

can deteriorate over time, and become less airworthy. Regular attention prevents this going too far. The process involves exercising the ripcord, pack opening bands, pilot 'chute spring and elastic parts. Parachute lines are stowed in rubber bands inside the pack, which are not visible from outside. These perish and should be replaced from time to time. The canopy and hardware is inspected for deterioration, aired, and then repacked.

The BPA used to have a three month rule for reserves, recently relaxed to four months, which is in line with most foreign organisations. Experience shows that if a rig is not maltreated, repacking every four months is often enough. The same could not be said for a longer period. This does not mean your parachute will fail you if it has not been repacked for a year. It means that it cannot be recommended, on the basis of experience, that you should leave it so long.

Routine inspection and repacking

The rigger will check for the more obvious signs of contamination. Some surprising objects have been found in parachutes, including gravel, nails and even a mouse. The rigger ought to check the integrity of the lines, pilot 'chute, bridle cord and connector links. These links attach the suspension lines to the harness and are fixed with screws. The tightness of these screws should be checked. Canopy material strength can be quickly checked by hand. The rigger will air the canopy, preferably by hanging it up, and then repack it according to the makers' instructions. Any professional rigger will have the makers' instructions for every common type, and while all round canopies are packed in a similar way, there are differences of detail which may be important. Several riggers have reported finding parachutes incorrectly packed, or modified in an unauthorised way; possibly because the owner had a friend who goes parachuting, is used to packing reserves, and offered to do the job for some beer. Anyone familiar with skydiving will know that the sport is full of packing experts; thirsty ones too.

> **"Several riggers have reported finding parachutes incorrectly packed or modified in an unauthorised way..."**

Your choice of who to entrust with this job involves less soul-searching and wallet-emptying than the original choice of parachute. Professional riggers charge modest sums; all those I asked charge £15-£18. If this is more than you can afford, you can't afford gliding. There is no national standard qualification for parachute riggers, but the major manufacturers (GQ and Irvin at least in the UK) employ packers, whose work is subject to the same quality assurance as any part of the manufacturing process. The armed forces have riggers who are trained to a high standard; and civilian riggers, who mainly serve the skydiving market, are issued with licences by the BPA.

Anybody with one of the above qualifications is a reliable, professional expert who you may trust with confidence. They are kept up to date with safety notices and they have proper facilities for the job. They can also carry out minor alterations and repairs, like replacing elastics. When they have done the job, they will sign the packing record card, and many will also put their seal in the closing loop with red thread, which is like the tamper-proof seals on bottles of baby food. If you subsequently find the seal broken, you know it has been opened and re-packed by someone other than your rigger.

If it is practical, when you give your parachute to the rigger, pull the ripcord yourself. Apart from the value of practice, seeing the correct operation of the pilot 'chute will give you confidence. Take care not to lose the ripcord, and if the parachute is not to be aired straight away, put it in a clean polythene bag.

> ***Maintenance and Care***
>
> *Store in a dry place away from sunlight, solvents, oils, battery acid and dirt.*
>
> *Do not store in cockpits or car boots.*
>
> *Regularly take to a professional rigger for inspection and repacking.*
>
> *Ensure elastic parts are in good condition – especially ripcord handle retaining pocket.*
>
> *If practical, pull the ripcord yourself before packing to maintain your confidence.*
>
> *Do not allow unauthorised modifications – if in doubt about the design, get professional advice.*
>
> *Ensure the packing record card is kept up to date – if lost, get a replacement.*
>
> *If past manufacturer's recommended useful life, be guided by a rigger's advice on continued use.*

Useful life of emergency parachutes

Some emergency parachute makers recommend discarding a canopy if it is used. Others allow a small number of jumps; others do not life their products in terms of jumps. A skydiver would scoff at the suggestion that a canopy be discarded until it is either worn out by at least a thousand jumps, or (worse) has become unfashionable. The reason for the variation is largely defensive. When manufactured, each parachute has safety margins built in, but through age, use and abuse these margins are eroded. The manufacturer may feel it has to make cautious assumptions about the rate of deterioration. One company, asked why they short-lifed their product, said, "This way we don't get a queue of widows at the door".

GQ give their product a 15 year life, which they are prepared to extend on inspection. Irvin say ten years or one jump, whichever is earlier; they base this on a lack of significant data in favour of a longer life. They do not extend on inspection, because the only reliable way of determining parachute strength involves destructive pull testing. In the USA, many riggers will inspect a parachute when it is brought to them, and certify it airworthy for the next period of four months. This is probably the most sensible approach. Any rigger or manufacturer will say, defensively, that if you use a parachute beyond its recommended life, it is at your own risk. In fact, all parachute use is at your own risk.

Using your parachute

When you DI the glider, have a look at the parachute. Do you often find it with the ripcord handle hanging loose? Get it fixed. Do the buckles work? There are two kinds of buckle in popular use; B12 snaps, and ejectors. B12 snaps have a simple spring-loaded gate which is held positively closed. Minor mishandling can cause the gate to jam open, which allows the buckle to come undone. This is easy to fix with a pair of pliers. Ejectors have a tang which ejects the buckle when the lever is operated. These snaps are more complicated but they can also fail, allowing the buckle to undo itself. Check their operation when you put on a parachute.

Many designs of emergency parachute have a chest strap which is so close to the ripcord handle that it is possible to do up the strap through the handle, preventing you from pulling the ripcord. You can avoid this if you add a parachute harness check to the "straps" part of your pre-take-off checks. Check that the three buckles are correctly done up, the straps are tight and the ripcord in its pocket.

There I was, nothing on the clock but the maker's name . . .

The decision to jump is usually easy to make. Damage severe enough to require abandoning the glider may happen through overstress, collision or incomplete assembly. Less severe damage, or perhaps most dangerous, damage you can't see, but which affects the handling, may be harder to assess. Derek Piggott jumped on an instructional flight when the rear canopy came off, damaging the tail. He does not think there is any difficulty making the decision when the time comes. His principle is that any serious difficulty in control, or damage which may cause such difficulty, is a reason to jump if high enough.

"Too many people have brought aircraft back with serious damage", he says. "A Dutch Prefect went out of control in the final turn after being flown down following a collision, seriously injuring the pilot." Ian Macfadyen had a collision while cloud flying: "The first thing I knew was that my whole canopy was shattered. The next thing I was in a violent inverted spin, blind, in cloud, and pressed into my cockpit by powerful *g* forces. I spun for 800ft before I succeeded in struggling free of that very small cockpit. I used such force I tore out the instrument panel."

Remarkable strength is suddenly available in such circumstances. Fortunately he got out with enough height to spare. Ian now argues for a ban on cloud flying; the collision happened despite proper radio procedure. Curiously, while Ian wanted to jump but was stuck in his seat, the other pilot in the collision didn't even have to make the choice, as the crash threw him out of his cockpit.

There is no absolute minimum jumping height which can be firmly quoted as a golden rule. Free fall jumps have been successfully made as low as 200ft, although realistically, your survival chances if a collision happens this low are almost nil. Generally, at altitudes of only a few hundred feet, you will have to be exceptionally fast at climbing out and jumping if you are to survive. A lot will depend on the rate at which you are losing height after being damaged.

Your chances are largely determined by the height at which you pull the handle; from that point, the parachute should open in 200-300ft. Paratroop training includes jumps from balloons at only 800ft. A successful jump has been made from the top of a winch launch. If this sort of excitement appeals, there is a party held every year in West Virginia, on a 875ft bridge, during which hundreds of parachutists throw themselves off at 30sec intervals all day, proving that the human frame can accommodate a parachute or a brain, but not both.

Using an Emergency Parachute

DI your parachute, checking for proper buckle function and condition of elastics.

Check buckles are fastened and ripcord is in place and clear of chest strap, before take-off.

If in doubt about how to decide whether to jump, ask an experienced instructor for advice.

Jump as quickly as possible having decided to do so – ground practice will help.

Pull the ripcord as soon as you are clear of the glider.

Try to avoid water, cables, buildings and trees by steering the canopy.

It is preferable to land facing into wind, but do not land in a turn as your descent rate is higher.

Land with feet and knees together.

Actually jumping

It should be obvious that exit should be as fast as possible once the decision to jump is made, especially at low altitudes, but people have been known to develop strange priorities. Nero played the fiddle while Rome burned; Derek Piggott's student decided to put his sunglasses away in the pocket before climbing out.

Each situation being different, it is not possible to lay down hard and fast rules about exactly how to jump out of a stricken glider, except that you can do it faster if you rehearse. Try actually using the cockpit canopy release some time, on the ground of course, with someone holding the canopy so it doesn't get broken. Work out the best order in which to go through the motions of undoing your harness and releasing the canopy; this might save a second or two of fumbling. How you climb out of the cockpit will depend on the glider motion, which will probably be abnormal, given that you are jumping.

The one firm rule of emergency jumping is to wait until you are clear of the aircraft before pulling the ripcord. There is a serious risk of the parachute tangling with the aircraft if you do not. If you stand up in the cockpit and pull the ripcord, your pilot 'chute is likely to be caught on the tail, so jump right out before pulling. Some people recommend holding the ripcord handle as you exit, allowing you to pull it sooner. However, experience shows that you may need both hands to pull yourself out of the cockpit, so you must be able to find the handle while falling.

Once clear of the glider, pull the ripcord handle hard and pull it all the way out. Typically, at least six inches of travel is needed to extract the pin and a force of several pounds. Expect to wait between one and two seconds for the parachute to slow your fall. Ian Macfadyen said, "It seemed like an eternity – I had time to look at the D-ring and ask myself what I should do if nothing happened!" Luckily this turned out to be an academic question. Don't wait longer than you have to before pulling. This is hardly likely, unless you spend ten seconds tugging energetically on your chest strap buckle – an easy confusion if you don't look down to see what you are reaching for. If you build up a high speed and possibly a rapid rotation, there is more chance of damage to the parachute or injury to you (and of hitting the ground, of course).

Descending under canopy

Once under an open canopy, you need to take stock straight away of your position. Assess your height and the time you have before landing. Almost all emergency parachutes have vents in the back to give you a modest forward speed, and most have toggles, one on each side, to rotate the canopy. As a glider pilot, you will be aware of the approximate wind direction, and remember that like any other aircraft, a parachute should be landed facing into wind. Landing downwind is a leading cause of injury among student parachutists. If the only control you exercise during the descent is to face into wind, you will have improved your chances significantly.

Most manufacturers do not recommend emergency jumpers to attempt to steer to a particular landing site, since experience suggests that such attempts are as likely to make the situation worse as to make it better. After all, first-time skydivers are equipped with stout boots and a helmet, given detailed instruction on steering; and then they are dropped in low winds, over a large clear area from a safe height. Even so, some of them still manage to get hurt. A study of military aircrew who have ejected showed that most exercised no steering control anyway; the MoD no longer specify steerability in their parachutes.

Landing

If you are going to get hurt, this is when it will happen. The best technique is to keep your feet and knees together, with the knees slightly bent and arms holding the risers beside your head. Wait for the ground to arrive, don't anticipate the impact, try to stay relaxed and wait for it to happen. Deflating the parachute in a strong wind may prove impossible, but you can try the following. In a light wind, stand up and run around until you are downwind of the parachute; it will then collapse. If you can't manage to stand up, take hold of one or two lines and pull. Keep pulling in the line until you reach the hem of the parachute. It will then spill air and you can bundle it up.

In a very high wind even this may be beyond you and there are then two strategies; allow yourself to be dragged until the parachute catches on something, or try to undo the harness (chest strap first or it could strangle you). Either way, it has to be said that parachuting in high winds is very likely to result in injury and is only attempted when there is no choice. The wind limit for first-time sport parachutists is 10kt and for experienced jumpers 18kt. You may be flying in winds double that strength.

The landscape is littered with hazards to safe landing. Water hazards are the most dangerous. Many intentional water landings have ended in drowning, despite the use of buoyancy aids and recovery boats. If you are unable to avoid landing in water, it will speed your escape from the harness if you undo the chest strap and even one leg strap just before impact, then you can slip if off and swim out from under the canopy. If you land on a building, the canopy will deflate, and then either you fall off the roof and are injured, or a gust of wind catches your canopy and pulls you off. Trees are unforgiving; power lines are bad news; and while Ian Macfadyen hurt his spine landing on a road, happily he wasn't run over as well.

If you see wires, posts, houses, or trees coming up to meet you, keep your knees and ankles very firmly together to avoid straddling a hazard. Crossing the legs cannot be recommended because it increases the risk of injury when you finally land. Some recommend protecting the head with the arms, others recommend folding the arms; take your pick, as there really is no safe way to land on a hazard. An attempt to steer away would be worth a try, since these hazards are likely to put you in hospital, but don't leave it until the last minute, as it will be ineffective and increase your descent rate.

Fancy a jump?

If, after all this, you are inspired to have a go, contact your local skydiving club and sign up for a static-line jump course. You will learn many things not covered in this article, like how to recognise parachute malfunctions and open a reserve if they happen. (If your one and only emergency parachute has a severe malfunction, well, you really are having a bad day. As if losing the glider wasn't enough.) At some clubs, you will be offered a tandem ride; this is a fairly new technique in which you have a short briefing, then make your jump strapped to an instructor; a sort of air experience ride. This is more fun, involves some free fall and is less like an emergency jump. Another training method involves doing a long free fall with two instructors holding you steady. This is a great way to learn if you want to take up skydiving, but costs more, and is nothing like an emergency jump. Take your pick and enjoy yourself.

RECORDS

INTERNATIONAL GLIDING RECORDS (as at 14.2.92)

		SINGLE-SEATERS		
Height Gain	12 894m	P. F. Bikle, USA	SGS 1-23E	25.2.1961
Absolute Altitude	14 938m	R. R. Harris, USA	Grob-102	17.2.1986
Straight Distance	1460.8km	H-W Grosse, W. Germany	ASW-12	25.4.1972
Goal Distance	1254.26km	B. L. Drake, D. N. Speight, S. H. Georgeson, New Zealand	Nimbus 2	14.1.1978
Goal & Return Distance	1646.68km	T. L. Knauff, USA	Nimbus 3	25.4.1983
Triangular Distance	1362.68km	T. L. Knauff (Nimbus 3), L. R. McMaster, J. C. Seymour		2.5.1986
		K-H. Striedieck, (USA) (ASW-20B)		
		R. L. Robertson, Gt Britain (in USA)	Ventus A	
100km Triangle	195.30km/h	I. Renner, Australia	Nimbus 3	14.12.1982
300km Triangle	169.49km/h	J. P. Castle, France (in South Africa)	Nimbus 3	15.11.1986
500km Triangle	170.06km/h	B. Bünzli, Switzerland	DG-400 (sealed)	9.1.1988
750km Triangle	158.40km/h	H-W. Grosse, W. Germany (in Australia)	ASW-22	8.1.1985
1000km Triangle	145.32km/h	H-W. Grosse, W. Germany (in Australia)	ASW-17	3.1.1979
1250km Triangle	133.24km/h	H-W. Grosse, W. Germany (in Australia)	ASW-17	9.12.1980
		MULTI-SEATERS		
Height Gain	11 680m	S. Josefczak and J. Tarczon, Poland	Bocian	5.11.1966
Absolute Altitude	13 489m	L. Edgar and H. Klieforth, USA	Pratt Read	19.3.1952
Straight Distance*	1092.08km	H-W. Grosse and Karin Grosse, W. Germany (in Australia)	ASH-25	14.1.1990
Goal Distance*	1092.08km	H-W. Grosse and Karin Grosse, W. Germany (in Australia)	ASH-25	14.1.1990
Goal & Return Distance*	1260.00km	M. W. Walker and T. Delore, New Zealand	ASW-22	1.12.1989
Triangular Distance	1379.35km	H-W. Grosse and H. Kohlmeyer, W. Germany (in Australia)	ASH-25	10.1.1987
100km Triangle	177.26km/h	E. Sommer and I. Andersen, W. Germany (in USA)	Janus C	26.7.1984
300km	170.90km/h	H-W. Grosse and Karin Grosse, W. Germany (in Australia)	ASH-25	8.1.1988
500km Triangle	163.03km/h	H-W. Grosse and Karin Grosse, W. Germany (in Australia)	ASH-25	20.1.1988
750km Triangle	161.33km/h	H-W. Grosse and Karin Grosse, W. Germany (in Australia)	ASH-25	10.1.1988
1000km Triangle	157.25km/h	H-W. Grosse and Karin Grosse, W. Germany (in Australia)	ASH-25	11.1.1988
1250km Triangle	143.46km/h	H-W. Grosse and H. Kohlimeyer, W. Germany (in Australia)	ASH-25	10.1.1987
		SINGLE-SEATERS (WOMEN)		
Height Gain	10 212m	Yvonne Loader, New Zealand	Nimbus 2	12.1.1988
Absolute Altitude	12 637m	Sabrina Jackintell, USA	Astir CS	14.2.1979
Straight Distance	949.7km	Karla Karel, Gt Britain (in Australia)	LS-3	20.1.1980
Goal Distance*	951.43km	Joann Shaw, USA	Nimbus 2	2.7.1990
Goal & Return Distance	1126.68km	Doris Grove, USA	Nimbus 2	28.9.1981
Triangular Distance	847.27km	Joann Shaw, USA	Nimbus 2	5.8.1984
100km Triangle	145.49km/h	Susan Beatty, South Africa	ASW-20B	24.12.1990
300km Triangle	143.9km/h	Susan Beatty, South Africa	ASW-20B	26.12.1990
500km Triangle	133.14km/h	Susan Martin, Australia	LS-3	29.1.1979
750km Triangle	127.29km/h	Susan Beatty, South Africa	ASW-20B	21.12.1990
		MULTI-SEATERS (WOMEN)		
Height Gain	8430m	Adela Dankowska and M. Mateliska, Poland	Bocian	17.10.1967
Absolute Altitude	10 809m	Mary Nurr and H. Duncan, USA	SGS 2-32	5.3.1975
Straight Distance	864.85km	Tatiana Pavlova and L. Filomechkina, USSR	Blanik	3.6.1967
Goal Distance	864.86km	Isabella Gorokhova and Z. Koslova, USSR	Blanik	3.6.1967
Goal & Return Distance	649.63km	Tamara Sviridova and V. Toporova, USSR	LAK 12DP	24.5.1986
100km Triangle	126.28km/h	Adela Dankowska and E. Grzelak, Poland	Halny	1.8.1978
300km Triangle	123.33km/h	Inge Müller and C Müller, W. Germany (in SW Africa)	Janus C	7.12.1984
500km Triangle	95.72km/h	Daina Vilne and V. Toporova, USSR	LAK 12DP	16.5.1986

BRITISH NATIONAL RECORDS (as at 14.2.92)

		SINGLE-SEATERS		
Height Gain	10 985m	D. Benton	Nimbus 2	18.4.1980
Absolute Altitude	11 500m	H. C. N. Goodhart (in USA)	SGS 1-23	12.5.1955
Straight Distance	949.7km	Karla Karel (in Australia)	LS-3	20.1.1980
Goal Distance	859.20km	M. T. A. Sands (in USA)	Nimbus 3	23.4.1986
Goal & Return Distance	1127.68km	M. T. A. Sands (in USA)	Nimbus 3	7.5.1985
Triangular Distance	1362.68km	R. L. Robertson (in USA)	Ventus A	2.5.1986
300km Goal and Return	153.3km/h	M. T. A. Sands (in USA)	Kestrel 19	10.5.1983
500km Goal and Return	152.7km/h	M. R. Carlton (in South Africa)	ASW-17	24.12.1980
100km Goal and Return	105.79km/h	M. T. A. Sands (in USA)	Nimbus 3	7.5.1985
100km Triangle	166.38km/h	B. Cooper (in Australia)	LS-6B	4.1.1991
300km Triangle	146.8km/h	E. Pearson (in South Africa)	Nimbus 2	30.11.1976
500km Triangle	141.3km/h	B. J. G. Pearson (in South Africa)	ASW-20	28.12.1982
750km Triangle	109.8km/h	M. R. Carlton (in South Africa)	Kestrel 19	5.1.1975
1000km Triangle	112.15km/h	G. E. Lee (in Australia)	ASW-20B	25.1.1989
1250km Triangle	109.01km/h	R. L. Robertson (in USA)	Ventus A	2.5.1986
		MULTI-SEATERS		
Height Gain	10 234m	A. E. Kay and K. Wilson	ASH-25	12.10.1990
Absolute Altitude	11 023m	A. E. Kay and K. Wilson	ASH-25	12.10.1990
Straight Distance	472.43km	M. R. Carlton and M. French (in South Africa)	Calif A-21	18.12.1979
Goal Distance	472.43km	M. R. Carlton and M. French (in South Africa)	Calif A-21	18.12.1979
Goal and Return Distance	709.35km	R. C. May and S. G. Jones (in Finland)	ASH-25	11.6.1988
Triangular Distance	825km	B. T. Spreckley and P. Jones (in Australia)	Nimbus 3DT	7.2.1987
300km Goal and Return	138km/h	G. Dale and M. Bird (in Australia)	ASH-25	4.1.1991
500km Goal and Return	113.08km/h	M. R. Carlton and C. Greaves (in South Africa)	Calif A-21	23.12.1978
100km Triangle	137.22km/h	M. R. Carlton and Leonie Lawson (in South Africa)	Calif A-21	27.12.1978
300km Triangle	138.37km/h	B. T. Spreckley and P. Jones (in Australia)	Nimbus 3DT	6.2.1987
500km Triangle	130.56km/h	M. Bird and R. Gardner (in Australia)	ASH-25	3.1.1991
750km Triangle	114.18km/h	B. T. Spreckley and P. Jones (in Australia)	Nimbus 3DT	7.2.1987
		SINGLE-SEATERS (WOMEN)		
Height Gain	9119m	Anne Burns (in South Africa)	Skylark 3B	13.1.1961
Absolute Altitude	10 550m	Anne Burns (in South Africa)	Skylark 3B	13.1.1961
Straight Distance	949.7km	Karla Karel (in Australia)	KS-3	20.1.1980
Goal Distance	528km	Ann Welch (in Poland)	Jaskolka	20.6.1961
Goal & Return Distance	545km	Anne Burns (in South Africa)	Std Austria	6.1.1966
Triangular Distance	814.01km	Karla Karel (in Australia)	LS-3	9.1.1980
300km Goal and Return	107.5km/h	Karla Karel (in South Africa)	ASW-15B	1.1.1975
500km Goal and Return	102.6km/h	Karla Karel (in Rhodesia)	ASW-15B	16.10.1975
100km Triangle	110.8km/h	Karla Karel (in Rhodesia)	ASW-15B	2.11.1975
300km Triangle	125.87km/h	Karla Karel (in Australia)	LS-3	12.2.1980
500km Triangle	120.69km/h	Karla Karel (in Australia)	LS-3	20.2.1980
750km Triangle	110.53km/h	Pamela Hawkins (in Australia)	ASW-17	17.11.1984

* Subject to homologation

UNITED KINGDOM RECORDS (as at 14.2.92)

SINGLE-SEATERS

Height Gain	10 065m	D. Benton	Nimbus 2	18.4.1980
Absolute Altitude	11 031m	D. Benton	Nimbus 2	18.4.1980
Straight Distance	827.9km	T. J. Wills	LS-6	29.5.1986
Goal Distance	579.36km	H. C. N. Goodhart	Skylark 3	10.5.1959
Goal & Return Distance	801.3km	C. Garton	Kestrel 19	22.7.1976
Triangular Distance	770.5km	C. C. Rollings	Jantar 2A	28.5.1985
300km Goal & Return	114.5km/h	D. S. Watt	ASW-22	18.8.1983
500km Goal & Return	93km/h	M. B. Jefferyes	DG-202	12.5.1984
100km Triangle	123.2km/h	R. Jones	Nimbus 3	13.8.1983
200km Triangle	108.6km/h	R. Jones	Nimbus 3	14.8.1983
300km Triangle	117.14km/h	R. Jones	Nimbus 3	28.5.1985
400km Triangle	114.3km/h	R. Jones	Nimbus 3	1.8.1984
500km Triangle	106.9km/h	R. Jones	Nimbus 2	31.5.1975
600km Triangle	88.8km/h	C. Garton	Kestrel 19	10.6.1976
750km Triangle	77.98km/h	C. C. Rollings	Jantar 2A	28.5.1985
100km Goal	150km/h	T. J. Wills	LS-4	12.5.1984
200km Goal	127.1km/h	A. H. Warminger	Vega	12.5.1984
300km Goal	132.8km/h	A. H. Warminger	Kestrel 19	24.4.1976
400km Goal	98.36km/h	A. H. Warminger	Ventus 16.6m	7.4.1990
500km Goal	90.7km/h	H. C. N. Goodhart	Skylark 3	10.5.1959

15m CLASS

Straight Distance	827.9km	T. J. Wills	LS-6	29.5.1986
Goal & Return Distance	617km	C. Garton	LS-6	28.8.1989
Triangular Distance	609.9km/h	A. E. Kay	ASW-24	9.5.1991
500km Goal & Return	83.42km/h	M. B. Jefferyes	DG-600	25.5.1990
100km Triangle	119.7km/h	T. J. Wills	LS-4	18.4.1981
200km Triangle	114.95km/h	D. S. Watt	ASW-24	3.8.1990
300km Triangle	115.85km/h	J. Gorringe	LS-7	3.8.1990
400km Triangle	95.88km/h	D. S. Watt	ASW-20FL	29.5.1985
500km Triangle	93.1km/h	M. D. Wells	LS-7	26.5.1990
600km Triangle	88.1km/h	A. E. Kay	ASW-24	9.5.1991
200km Goal	127.1km/h	A. H. Warminger	Vega	12.5.1984

STANDARD CLASS

Straight Distance	718km	T. J. Wills	Std Libelle	1.8.1976
Triangular Distance	609.9km	A. E. Kay	ASW-24	9.5.1991
300km Goal & Return	104.09km/h	A. Kay	ASW-24	28.4.1989
500km Goal & Return	75.66km/h	P. Jeffery	Pegasus	3.9.1989
100km Triangle	119.7km/h	T. J. Wills	LS-4	18.4.1981
200km Triangle	114.95km/h	D. S. Watt	ASW-24	3.8.1990
300km Triangle	115.85km/h	J. Gorringe	LS-7	3.8.1990
400km Triangle	91.7km/h	S. J. Redman	Std Cirrus	31.5.1975
500km Triangle	93.1km/h	M. B. Wells	LS-7	26.5.1990
600km Triangle	88.1km/h	A. E. Kay	ASW-24	9.5.1991
100km Goal	150km/h	T. J. Wills	LS-4	12.5.1984
300km Goal	131.1km/h	T. J. Wills	Std Libelle	24.4.1976
400km Goal	73.8km/h	T. J. Wills	Std Libelle	7.6.1976

UK 750km DIPLOMA

1. Goal & Return	801.3km	C. Garton	Kestrel 19	22.7.1976
2. Distance	761km	D. S. Watt	ASW-20L	9.5.1980
3. Triangular Distance	770.5km	C. C. Rollings	Jantar 2A	28.5.1985
4. Distance	827.9km	T. J. Wills	LS-6	29.5.1986
5. Triangular Distance	770.28km	C. C. Rollings & B. A. Fairston	ASH-25	3.7.1990
6. Distance	757km	A. J. Davis	Discus	7.8.1990
7. Quadrilateral	753km	B. Elliott & D. P. Francis	Nimbus 3DT	7.8.1990

MULTI-SEATERS

Height Gain	10 234m	A. E. Kay and K. Wilson	ASH-25	12.10.1990
Absolute Altitude	11 023m	A. E. Kay and K. Wilson	ASH-25	12.10.1990
Straight Distance	421.5km	J. S. Fielden and Valerie Fielden	Bergfalke 3	14.8.1970
Goal Distance	421.5km	J. S. Fielden and Valerie Fielden	Bergfalke 3	14.8.1970
Goal & Return Distance	542.91km	A. E. Kay and A. Kay	ASH-25	12.8.1990
Triangular Distance	770.27km	C. C. Rollings and B. Fairston	ASH-25	3.7.1990
300km Goal & Return	112.2km/h	A. E. Kay and C. Lyttleton	ASH-25	27.5.1990
500km Goal & Return	98.20km/h	A. E. Kay and A. Kay	ASH-25	12.8.1990
100km Triangle	123.99km/h	R. C. May and E. Morris	ASH-25	27.7.1989
200km Triangle	119.07km/h	R. C. May and P. Townsend	ASH-25	18.7.1990
300km Triangle	109.08km/h	C. C. Rollings and G. McAndrew	ASH-25	18.8.1989
400km Triangle	113.70km/h	J. D. J. Glossop and I. Baker	Nimbus 3DT	30.8.1990
500km Triangle	104.74km/h	C. C. Rollings and P. Price	ASH-25	25.5.1990
600km Triangle	94.94km/h	R. C. May and S. Lynn	ASH-25	19.7.1990
750km Triangle	92.34km/h	C. C. Rollings and B. Fairston	ASH-25	3.7.1990
100km Goal	173.32km/h	D. Hill and J. Gorringe	ASH-25	8.4.1990
200km Goal	113.3km/h	R. Miller and B. Tapson	Janus C	11.5.1984
300km Goal	107.4km/h	P. R. Pentecost and A. H. Pentecost	Janus C	7.5.1984

SINGLE-SEATERS (WOMEN)

Height Gain	7833m	Alison Jordan	Astir CS	8.10.1978
Absolute Altitude	8701m	Alison Jordan	Astir CS	8.10.1978
Straight Distance	454km	Anne Burns	Skylark 3B	10.5.1959
Goal Distance	324.4km	Jane Nash	Ventus B	15.4.1989
Goal & Return Distance	334.2km	Ruth Housden	Libelle	29.5.1982
300km Goal & Return	80.60km/h	Jane Nash	Ventus B	4.6.1989
100km Triangle	80km/h	Anne Burns	Cirrus	14.6.1970
200km Triangle	77.08km/h	Jane Randle	Nimbus 2	12.8.1990
300km Triangle	76.8km/h	Jane Randle	Kestrel 19	18.8.1976
400km Triangle	60.6km/h	Anne Burns	SHK	5.8.1967
500km Triangle	76.1km/h	Anne Burns	Nimbus 2	31.5.1975
100km Goal	135.39km/h	Jane Nash	Ventus B	11.6.1989
200km Goal	85.5km/h	Anne Burns	Olympia 419	2.6.1963
300km Goal	93.16km/h	Jane Nash	Mini-Nimbus	7.4.1990

MOTOR GLIDERS (+Also British National Record; †British National Record only)

SINGLE-SEATERS

Straight Distance†	652.7km	B. J. Willson (in Australia)	PIK-20E	10.1.1983
Goal Distance†	415.1km	B. J. Willson (in Australia)	PIK-20E	11.1.1983
Goal & Return Distance†	510.45km	T. J. Wills (in Norway)	DG-400	6.7.1986
100km Triangle	76.5km/h	I. W. Strachan	PIK-20E	11.8.1984
100km Triangle†	86.1km/h	A. Munro (in Norway)	DG-400	6.7.1989
200km Triangle	48.2km/h	I. W. Strachan	SF-27M	23.8.1976
300km Triangle†	83.1km/h	I. W. Strachan	PIK-20E	19.8.1984
500km Triangle†	71.75km/h	B. J. Wilson (in Finland)	PIK-20E	22.5.1980
100km Goal	85.7km/h	I. W. Strachan	SF-27M	16.7.1971
500km Goal & Return†	93.09km/h	T. J. Wills (in Norway)	DG-400	6.7.1986

MULTI-SEATERS (†Also BRITISH NATIONAL RECORD)

Height Gain†	5882m	M. G. Throssell and P. Bartle	Janus CM	27.9.1988
Absolute Altitude†	6888m	M. G. Throssell and P. Bartle	Janus CM	27.9.1988
100km Triangle†	35.6km/h	P. T. Ross and H. Daniels	SF-28A	27.6.1976
100km Goal	76.2km/h	P. T. Ross and K. Winfield	SF-28A	22.8.1976
200km Goal	66.3km/h	P. T. Ross and P. Fletcher	SF-28A	18.7.1976
500km Triangle	78.45km	B. T. Spreckley and O. Pugh	Janus CM	16.5.1986

INTERNATIONAL MOTOR GLIDERS (as at 14.2.92)

SINGLE-SEATERS

Height Gain	9935m	M. D. Stevenson, USA	DG-400	25.10.1985
Absolute Altitude	10 408m	G. Cichon, W. Germany	Nimbus 2M	27.5.1979
Straight Distance	826.66km	P. Elkmann, W. Germany	ASW-22M	15.4.1989
Goal Distance	762.98km	K. Holighaus, W. Germany (in South Africa)	Ventus CM	10.1.1991
Goal and Return Distance	1084.94km	O. Schauble, W. Germany (in South Africa)	ASW-22	9.1.1988
Triangular Distance	1115.95km	W. Eisele, W. Germany (in South Africa)	ASW-22M	3.1.1990
100km Triangle	191.19km/h	B. Bünzli, Switzerland (in South Africa)	DG-400	29.12.1987
300km Triangle	165.51km/h	B. Bünzli, Switzerland (in South Africa)	DG-400	22.12.1984
500km Triangle	170 05km.h	B. Bünzli, Switzerland (in S. W. Africa)	DG-400	9.1.1988
750km Triangle	150.81km/h	B. Bünzli, Switzerland (in S. W. Africa)	DG-400	17.12.1987
1000km Triangle	139.96km/h	B. Bünzli, Switzerland (in South Africa)	DG-400	28.12.1984

MULTI-SEATERS

Height Gain	5650m	H. Köhler, W. Germany and J-C Batault (in USA)	Taifun 17E	28.4.1986
Absolute Altitude	8000m	H. Köhler, W. Germany and J-C Batault (in USA)	Taifun 17E	28.4.1986
Straight Distance	969.75km	J. W. Wenger and W. W. Aitken, USA	Nimbus 3DM	7.7.1989
Goal Distance	777.81km	J. W. Wenger and D. W. Sitken, USA	Nimbus 3DM	?.?.1989
Goal & Return Distance	1017.17km	O. Wegscheider and O. Schröder, W. Germany (in South Africa)	ASH-25	9.1.1988
Triangular Distance	1140.42km	W. Binder and A. Lackner (in South Africa)	ASH-25	22.12.1990
100km Triangle	179.53km/h	O. Wegscheider and P. Eich, W. Germany (in South Africa)	Nimbus 3DM	5.1.1989
300km Triangle	164.88km/h	H-W. Grosse and Karin Grosse, W. Germany (in Australia)	ASH-25T	9.1.1991
500km Triangle	171.1km/h	H-W. Grosse and J. Hacker, W. Germany (in Australia)	ASH-25T	31.12.1990
750km Triangle	157.27km/h	H-W. Grosse and Karin Grosse, W. Germany (in Australia)	ASH-25T	10.1.1991
1000km Triangle	129.98km/h	E. Müller and W. Binder, W. Germany (in Australia)	ASH-25MB	27.12.1986

SINGLE-SEATERS (WOMEN)

Height Gain	8844m	Ingrid Köhler, W. Germany (in USA)	DG-400	12.6.1988
Absolute Altitude	10 245m	Ingrid Köhler, W. Germany (in USA)	DG-400	12.6.1988
Goal & Return Distance	531.10km	Ingrid Köhler, W. Germany (in USA)	DG-400	1.7.1989
100km Triangle	127.49km/h	Ingrid Köhler, W. Germany (in USA)	DG-400	4.7.1989
300km Triangle	87.53km/h	Ingrid Köhler, W. Germany (in USA)	DG-400	4.7.1989
500km Triangle	84.94km/h	Margrit Pantenberg-Becker, Germany	Ventus CM	31.5.1991

MULTI-SEATERS (WOMEN)

300km Triangle*	66km/h	Isabell Mittag and K. Walter, W. Germany	DG-500M	27.5.1990

(See also p3.)

ANNUAL STATISTICS OCTOBER 1, 1990 TO SEPTEMBER 30, 1991

GLIDING CLUBS	AIRCRAFT				ALL LAUNCHES	NO. OF AEROTOWS	HOURS	KMS FLOWN	MEMBERSHIP		
	Club 2s	Club 1s	PO	Tugs					Flying	Estimated No. of Temporary Members	No. of Female Members
ANGUS	2	2	4	–	2724	32	383	300	40	197	5
AQUILA	2	2	11	3	1433	1378	479	10 000	36	77	2
ARGYLL & WEST HIGHLAND	2	2	6	0	1360	0	414	2000	10	310	1
AVON	–	–	38	–	9800	9800	N/K	N/K	180	1684	5
BATH & WILTS	–	–	–	–	3466	771	922	5000	77	205	6
BLACK MOUNTAINS	3	1	14	1	2811	2811	3328	9800	62	242	5
BLACKPOOL & FYLDE	2	4	20	1	4100	4	2027	3500	102	218	6
BOOKER	8	10	85	5	12 343	12 343	10 000	150 000	396	878	23
BORDERS	2	1	17	1	1730	1730	1205	5400	75	260	3
BRACKLEY	1	2	5		2400	–	350	200	40	70	3
BRISTOL & GLOS	4	5		3	8330	5000		78 000	241	973	–
BUCKMINSTER*	3	2	14	2	3523	2627	1510	6500	95	531	7
BURN	4	5	18	2	5870	2827	1962	2300	147	332	6
CAIRNGORM*	1	0	9	0	1144	249	800	500	28	52	2
CARLTON MOOR*	3	1	3	0				500	22	18	1
CAMBRIDGE UNIV	5	6	43	2	7920	2551	4192	81 771	210	1288	11
CHANNEL	3	1	5	0	2971	0	459	–	62	396	9
CONNEL	2	2	8	–	600	38	160	250	20	154	2
CORNISH	3	2	4	1	2597	94	509	1100	43	218	1
COTSWOLD	4	4	45	0	9866	15	1293	48 400	225	555	14
COVENTRY	8	6	79	4	15 352	11 790	7311	71 522	293	1885	18
CRANFIELD*	1	1	11	3	1299	1299	777	2150	39	164	2
DARTMOOR	3	1	12	0	3753	0	468	250	82	351	10
DEESIDE	2	3	17	3	6308	6040	6727	–	94	748	11
DERBY & LANCS	5	4	30	0	9166	–	3505	5000	196	1394	17
DEVON & SOMERSET	3	3	28	2	9630	769	2773	6430	201	1224	11
DORSET	2	3	9	1	3257	354	535	5000	93	260	5
DUKERIES	2	1	5	0	2733	0	375	647	38	235	4
DUMFRIES & DISTRICT	1	0	2	0	340	–	190	0	17	12	1
EAST SUSSEX*	3	3	10	0	6868	64	1061	N/K	126	753	5
ENSTONE EAGLES	2	1	10	2	2317	1503	2095	34 000	50	725	6
ESSEX*	4	2	25	1	5348	1152	1215	24 000	156	1225	5
ESSEX & SUFFOLK	3	2	17	2	3991	1403	1084	12 000	105	350	9
GRAMPIAN	1	0	0		358		36		12		
GLYNDWR SOARING	4	3	12	0	4650	3	1150	–	45	200	4
HEREFORDSHIRE	1	1	10	1	865	865	815	N/K	44	106	2
HIGHLAND	1	3	6	0	3104	40	487	–	55	338	10
IMPERIAL COLLEGE*	0	3	2	0	290	80	320	7750	50	25	6
KENT*	3	3	30	2	9419	4091	N/K	N/K	240	1043	20
LAKES	2	2	4	1	1348	1348	408	3700	35	169	1
LASHAM	12		148	6	36 742	14 372	14 800	120 419	513	2614	86
LONDON*	8	5	90	3	27 000	8000	N/K	143 000	340	4810	15
MARCHINGTON	3	1	11	1	1950	1821	854	N/K	92	376	5
MENDIP	2	2	11	0	4218	103	971	36 000	92	678	5
MIDLAND	3	4	30	1	11 487	192	4807	20 744	234	701	28
NENE VALLEY	4	6	5	0	2478	0	425	1157	30	272	2
NEWARK & NOTTS	3	3	14	0	3680	10	634	2500	57	250	8
NORFOLK	3	2	30	3	4678	3995	2818	N/K	190	690	23
NORTH DEVON	1	8	7	1	350	350	170	750	12	50	0
NORTH WALES*	3	2	2	0	3873	0	462	50	64	170	8
NORTHUMBRIA	3	2	14	1	3325	804	717	1000	104	229	10
OXFORD	3	3	14	0	3810	0	1331	14 000	92	205	5
OXFORDSHIRE	3						1294	107 808	40	501	3
PETERBORO & SPALDING*	3	1	13	2	2598	2368	1365	6500	67	220	3
RAE BEDFORD*	1	0	7	0	328	0			8	24	0
RAE FARNBOROUGH	2	3	7	0	3110	0	1085	5600	60		5
RATTLESDEN	2	2	17	2	2724	164	710	8145	68	240	8
RSRE	2	1	0	0	234	0	33	0	15	0	0

SACKVILLE*	2	0	4	1	800	350	1000	N/K	11	0	0
SCOTTISH GLIDING UNION	4	4	35	3	9411	3244	4642	N/K	290	980	20
SHALBOURNE	3	1	14	–	4088	0	1147	4000	86	820	15
SHENINGTON	3	–	2	1	2272	182	271	2041	37	643	5
SHROPSHIRE	0	0	14	1	642	642	1405	15 400	37	0	1
SOUTH WALES*	3	2	20	2	4342	1530	1818	17 000	78	654	9
SOUTHDOWN	4	3	30	3	6956	4877	3600	16 512	260	890	25
STAFFORDSHIRE	2	2	4	0	2040	0	320	105	74	229	2
STRATFORD ON AVON*	5	2	14		5594	0	668	3193	114	943	9
STRATHCLYDE*	3	1	5	1	262	118	110		26	98	2
STRUBBY*	2	3	6	0	2652	0	441	580	31	131	0
SURREY & HANTS	0	12		0	2672		1923		201	0	14
SURREY HILLS	6	2	4	0	3073	0	189	200	45	483	3
THRUXTON	2	1	8	1	882	882	294	N/K	46	120	4
TRENT VALLEY	3	2	20	1	4409	896	1546	7250	92	263	10
ULSTER	2	1	10	1	1352	1300	775	250	39	100	0
UPWARD BOUND	2	0	2	0	1957	0	261	–	25	340	3
VALE OF NEATH	2	2	4	1	772	269	308	0	34	24	2
VALE OF WHITE HORSE*	2	1	11	0	2785	41	507	19 500	45	254	6
VECTIS	1	1	5	1	742	742	266	200	36	79	3
WELLAND	2	2	16	0	2379	78	985	11 450	45	167	3
WEST WALES*	2	1	1	0	576	0	79	–	20	51	0
WOLDS	3	4	30	3	12 654	1123	2458	10 000	209	991	23
YORK	3	4	15	3	6664	2391	1494	3000	144	660	12
YORKSHIRE*	4	5	35	3	6260	4478	3942	12 500	338	882	–
CIVILIAN CLUB TOTAL	231	198	1397	89	374 205	128 393	124 250	1156 955	8523	41 697	644
ARMY GLIDING ASSOCIATIONS											
KESTREL	2	4	2	1	3833	117	727	16 500	81	230	5
WYVERN	2	4	6	0	–	–	–	–	90	340	4
ROYAL NAVAL GSA											
CULDROSE	3	3	2	1	2184	2058	766	100	55	142	5
HERON	3	2	6	1	1600	1304	747	5757	60	70	10
PORTSMOUTH	6	1	–	6	6293	4166			250	1048	50
RAFGSA											
ANGLIA*	2	3	1	0	3886	196	1080	17 243	56		
BANNERDOWN*	3	4	6	1	3625	274	1106	19 205	100	140	
BICESTER*	7	6	21	4	15 474	6439	8636	234 384	220	720	
CHILTERNS*	2	3	7	0	5416	148	2017	13 763	77	450	
CLEVELANDS*	3	4	13	2	4891	1583	1941	29 184	107	150	
CRANWELL	2	3	7	2	3707	396	938	13 053	67	47	10
FENLAND*	2	4	4	0	4934	132	1487	14 985	95	136	18
FOUR COUNTIES*	3	3	5	0	5827	149	1771	24 692	63	80	
FULMAR*	2	3	1	1	2373	115	386		23	94	
HUMBER*	2	3	3	0	2525	63	631	2315	52	200	
LOMOND	0	1			See SGU		80	200	10	0	0
PEGASUS									50	100	3
PHOENIX	3	4	3	–	4563	54	1177	7200	56	360	10
WREKIN*	2	3	4	1	6270	737	1573	16 873	90	206	
SERVICE CLUB TOTAL	49	58	91	20	77 401	17 931	25 063	415 454	1602	4513	115
CIVILIAN CLUB TOTAL	231	198	1397	89	374 205	128 393	124 250	1156 955	8523	41 697	644
GRAND TOTAL	280	256	1488	109	451 606	146 324	149 313	1572 409	10 125	46 210	759

** Incomplete or no statistics received – previous figures used.*

SITES – Planning Approval, Appeals and Developments

In the 1991 Yearbook Bill Scull gave advice on "Establishing a Gliding Site". This year he writes about the continuing problems of getting planning permission and making appeals and, on a more positive note, some of the development successes

New sites are not easy to find and it is increasingly difficult to get planning permission. Generally it is much easier to get permission to winch launch than for a mixed winch/aerotow or, worse, an all aerotow operation.

The granting of a winch launch permission by the CAA has also been proving more difficult. The change during 1991 has been to issue a "Specimen Draft Permission" which may be subject to negotiating letters of agreement (LoA) with other "nearby" airfields – anything up to 20 miles away. The onus to negotiate the LoA is now on the gliding club. The problem is that as soon as a permission proper is issued the military avoid the site even though the gliding may not start for some months, which is frustrating for the military.

Also the CAA seem reluctant to address the circumstance when the management of the "other airfield" refuses to negotiate, although they have been prepared to act as honest broker. It is amazing really because the whole concept of the permission was to create a known environment which had actually existed prior to the requirement for a permission with sites marked on maps and listed in the **UK Air Pilot**. Also one might have thought that there would be a presumption in favour of granting a permission (the principle in planning approval), especially in the "open FIR", but not so!

Vital to prepare a fairly detailed study to predict the number of members, gliders and launches

Given these various difficulties an offer to buy land for a site *must be conditional on getting the various permissions.* Even more importantly the planning permission must be acceptable in terms of conditions that might affect the operational and hence financial viability of the club. This raises a further consideration. What is the eventual capacity of members, gliders and launches for a particular site? (The figures in brackets after each club's name give this information in that order). It is imperative to prepare a fairly detailed study.

All that said the basis of a successful planning application is a small team of highly motivated club members who will progress the planning application and undertake the necessary PR to promote/defend the proposed development. The various skills needed such as a lawyer, planning consultant, accountant or financier may not be available but the BGA can help – up to a point.

A "brainstorming session" with members of the BGA Development Committee is probably the best way. But, if local expertise is lacking, then find advice from planning consultants, noise measurement and other specialists. Noise is increasingly a sensitive aspect of any flying operation. With the government considering possible changes in noise regulations this will only exacerbate matters. And the environmental health officers (EHO) and departments are now in on the act.

At a recent meeting the EHO required noise measurements for the tug and even the winch to be submitted with the planning application. One wonders if the datum noise level might be based on a chainsaw or garden mower! It seems that planners would like gliding to be quieter than other local sources of noise.

Incidentally we have been very fortunate in discovering a noise measurement engineer and glider pilot who has given invaluable advice on several planning issues. Thank you Ron!

Any club with this problem has to look at all possible means of decreasing the noise from tugs such as four-bladed propellers, silencers and carefully planned climb-out routes. Even so, a new application may have conditions imposed. Some may seem unreasonable and/or be restrictive; even though they might be withdrawn on appeal there are no guarantees. Conditions, especially on aerotowing, are forcing some clubs to rely more on winching as their main means of launching. However, on a more positive note, there are some encouraging examples.

Blackpool & Fylde GC [90, 26, 3743] has been at Chipping for 19 years as a winch only operation. Five years ago it got planning approval to operate a motor glider, with a limitation of no circuits, *ie*, touch and goes. In 1991 it got a temporary permission to operate a tug which, if members handle the operation sensitively, should lead to a full permission in due course. The club is likely to remain predominantly winch launch – you don't need a tug to lob gliders on to the hill.

Staffordshire GC [74, 8, 2518] has been successful in negotiating a lease and getting planning permission on part of a disused airfield at Seighford, just to the west of Stafford and the M6. It sold the club owned site at Morridge because of its launching and soaring limitations, terrain and airspace problems. Despite the new site being leasehold the potential benefits will make the move worthwhile.

Marchington GC [88, 10, 1476] has had its problems. After buying land in 1982 it failed to develop to the extent we all had hoped, being caught in a "poverty trap", lacking the funds for development. However, it was fortunate. The Home Office wanted to buy the site to build a prison and were prepared to pay in excess of £500000. Obviously the club is seeking to buy an alternative but suitable land (the right length, shape area, location etc) is proving difficult to find, particularly a location clear of dwellings.

Cranfield Institute of Technology GC (CITGC) [39, 13, 1299] is having to relocate because of the development of Cranfield aerodrome.

They have found a site to the west of the M1 which seems like a good prospect to lease from a friendly farmer, his son a pilot. The land has an east-west run of adequate length and the club has cultivated the ground at significant expense pending planning approval. The various objectors are par for the course. British Rail because the overhead-electrified railway line passes nearby, 250 metres from the western end of the strip. Another objector claims an overflying limitation extant since WW2 to prohibit aerial photography. They also have aerials which are not tall enough to warrant lighting or inclusion in the **UK Air Pilot** list of high-intensity radio transmission areas. Such objectors don't of course qualify or quantify the risk; problems arise if planning committees are similarly emotive.

Lasham Gliding Society [c800, 156, 42,285] is regarded by many as a permanent part of the scene. It has had one 21 year lease, the second expires in 2003; there is a pre-emptive right to buy the site when the MoD decide to dispose of it. This three-month option clause is the time during which the deal will have to be completed. Think of the forward planning required to meet this circumstance. What might the price be? At the moment MoD have offered to sell a 56 year lease, still with the pre-emption clause. So as well as raising money to buy the lease, they must not deplete reserves in case the option to buy comes sooner rather than later.

Lasham, it should be noted, provides for 10% of the UK membership, 8% of the gliders and 11% of the launches. An important facility indeed but some of the members have needed some convincing!

Any club without site security may have problems concerning its future. In the case of somewhere like Lasham re-location is inconceivable (because it's impossible!). For smaller clubs the problems are different. There may not be enough members to support the expense of buying a site and meeting the development costs. They may lack the resources of sufficient member effort and/or a management team to mastermind the move. Also it is a very different matter buying a

Rattlesden GC make a start on their hangar foundations. The superstructure and foundations had to comply with building regulations and the foundations are steel reinforced.

Further progress on the 30x30m hangar. Because of the shape the concrete base is thinner at the edges. The cost of the concrete was negotiated downwards from £52 to £39 a cubic metre and the total cost, including doors, is about £20 000. Incidentally the construction team was lead by an OAP.

site as a sitting tenant compared with finding and buying a new one.

There does not appear to be a common denominator as the table of sites purchased shows. The surprising factor is how a relatively small club such as Rattlesden [63, 14, 4668] (the average club has c100 members) can buy their site and still undertake the development of refurbishing the control tower/clubhouse (see photo) and building a hangar of almost 10 000sq ft (30m x 30m).

Wolds GC [260, 39, 11 744] has gone from strength to strength. After it bought two runways and adjacent grass strips and land for the clubhouse and hangar in 1983 all seemed well. The club developed steadily and kept costs down, nevertheless a motor glider and tug were replaced and the facilities improved. Then came the drama. The prospect was an industrial development right up to the runways' edges could have restricted or even stopped the gliding. There was a battle with planners who wanted it and negotiations with the landowner resulting in the acceptance of the development up to 100ft from the runways; the trade off was another 35 acres of land to allow winching from the grass.

In 1990 it was the sixth biggest club in terms of launches; it now has a Supacat winch and the activity is increasing. The steady improvement of facilities continues (see photo) and a dining area has recently been added to the clubhouse. There is a catering franchise and their "Desperate Dan" mixed grill would, in harder times, have fed a family of four (Audrey, it still would!).

Southdown GC [229, 36, 4800] does not own its site and the lease has only ten years to run. Nevertheless, it is one of best examples of its size not employing any professionals – a deliberate policy decision. When the club came down from the hill (Firle Beacon) it was a winch launch only club. In the ensuing years it metamorphosed into an aerotow operation but still with some winching (75-25%), partly because of the limited site length. However, winching has been re-discovered with the acquisition of a Tost winch (see photo); launch heights have increased by 30 to 40% – it will be interesting to watch developments.

Norfolk GC [171, 36, 4365] has made the largest capital investment in land of any club and has considerable development potential. For various reasons it effectively became an all aerotow club. It bought the runways in 1988 but operating from them does not lend itself to an auto-tow/aerotow mix. With the acquisition of more land and grass strips alongside each runway winching is now possible. The new Supacat winch will undoubtedly bring changes to the style of the operation. It will be interesting to see the proportion of winch and aerotow launches at the ➡

The vehicle for Southdown GC's new Tost winch which has an extra axle. The whole unit cost £43 000 and has given a 30% improvement in launch height – a K-13 to 900ft plus in no wind from a 700 yard run. Before acquiring this winch 75% of launches were by aerotow but after six months the ratio was 68/32%.

Wolds GC's wooden clubhouse which was a disused bungalow, surplus to requirements and free! The cost of erecting, extending, exterior texture finish and fitting out was £4000. The four bedrooms, each sleeping four, and toilet block to the left of the photo cost a further £8000. Needless to say there was a considerable amount of member effort.

The Wolds GC's clubroom and bar are very well appointed and have memorabilia commemorating the airfield's history, incidentally with good PR benefits. The dining area, added later, is to the left of the picture. Captions by Bill.

LIST OF SITES BOUGHT BY CLUBS SINCE 1981

SITE/Club	*Date*	*COST* Initial	*COST* After on-Sales*	*GRANT/LOAN* Grant	*GRANT/LOAN* Loan	*MEMBERS Before/After Purchase* Before	*MEMBERS* After
RUFFORTH/Ouse	'81	95 000		40 000			56
ASTON DOWN/Cotswold	'82	150 000	108 000	20 000	8000	160	178
POCKLINGTON/Wolds	'83	1 000 000		50 000		100	125
MARCHINGTON/Marchington	'83	82 000		20 000		70	70
RINGMER/East Sussex	'83	80 000		10 000	10 000	99	132
MILFIELD/Borders	'84	125 000	47 000	10 000	5000	66	66
RHIGOS/Vale of Neath	'86	15 000			7500	45	50
TIBENHAM/	'88	200 000		20 000		170	220
Norfolk				28 000		[S Norfolk DC]	
	'91	120 000		28 000	100 000	[members loans]	
RATTLESDEN/Rattlesden	'90	100 000		29 000	5000	60	90
					7500	[Local Councils]	
CAMPHILL/Derby & Lancs	'91	200 000		15 000	10 000	237	237
					2200	[English Heritage]	
RIDGEWELL/Essex	'91	115 000		13 000		150	150

*On-Sales=land sold on after initial purchase.

end of this season. Well done the Norfolk GC!

Welland GC [50, 14, 3124] have been at Lyveden (five miles east of Corby) for a couple of years now. The motivation for the move was a soaring course run by John Williamson when he was national coach. The club has a 35 year lease on land owned by the Duke of Gloucester who has been tremendously helpful. The club is renovating an old building as a clubhouse and are building a hangar. The length of the site allows high winch launches, to the extent that they can manage without the expense of aerotowing, a luxury they perhaps cannot afford in their present development phase.

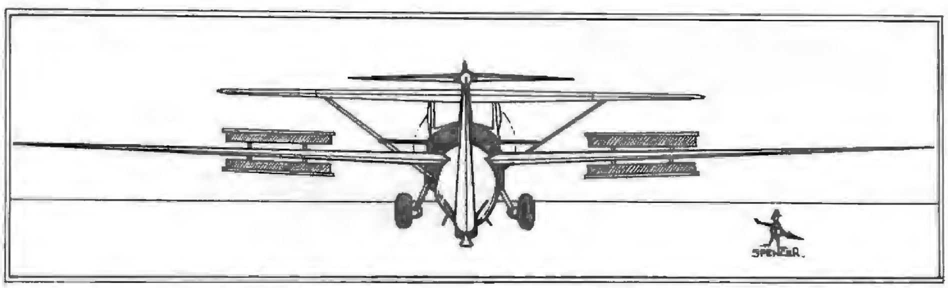
It might be appropriate to finish with a regional overview. With secure sites anything is possible – look at the area around York with Burn GC, Wolds GC at Pocklington, the York Gliding Centre at Rufforth and the Yorkshire GC at Sutton Bank, all within 15 or so miles of York. They provide for 800 members, have 140+ gliders and make 35 000 launches a year between them.

By way of contrast there are areas where smaller clubs proliferate, some of them at or near the critical minimum number of members. Of course this may be due to a site size limitation but if there aren't enough instructors and students to operate for at least the whole of the weekend one wonders whether there might be an alternative – such as two clubs amalgamating.

The BGA is encouraged by the number of club owned sites and the increasing number of long leases (Lasham, Seighford, Lyveden etc). Congratulations to Derby & Lancs GC which has bought Camphill, Essex GC which has bought the Ridgewell site and Norfolk GC which has extended theirs, all in 1991!

Footnote: *On going to press we heard that the Glyndwr Soaring Club have been successful in their appeal against a refusal and failure to determine an application for aerotowing at their Lleweni Parc site.*

This success opens up the potential of the site which has already shown its exciting wave soaring prospects. Congratulations to Rod Witter!



"ALL OUT!" Cartoon by Mike Spencer.

CLUB DIRECTORY

Compiled by Steve Longland

SCOTLAND

1 AILSA
2 ANGUS (Arbroath)
3 ARGYLL & WEST HIGHLAND (Connel)
4 CAIRNGORM (Feshiebridge)
5 CONNEL
6 DEESIDE (Aboyne)
7 DUMFRIES & DISTRICT (Falgunzeon)
8 FULMAR (RAF Kinloss)
9 GRAMPIAN (Laurencekirk)
10 HIGHLAND (Dallachy)
11 LOMOND (Arbroath)
12 SCOTTISH GLIDING (Portmoak)
13 STRATHCLYDE (Strathavon)

IRELAND

96 ULSTER (Bellarena)

ENGLAND

14 ALTAIR
15 ANGLIA (Wattisham)
16 AQUILA (Hinton-in-the-Hedges)
17 AVON (Bidford on Avon)
18 BANNERDOWN (RAF Hullavington)
19 BATH & WILTS (Keevil)
20 BICESTER (RAF Bicester)
21 BLACKPOOL & FYLDE (Chipping)
22 BOOKER (Wycombe Air Park)
23 BORDERS (Galeswood Farm)
24 BRACKLEY (Turweston)
25 BRISTOL & GLOUCESTER (Nympsfield)
26 BUCKMINSTER (Saltby)
27 BURN GLIDING CLUB (Burn, Selby)
28 CAMBRIDGE UNIVERSITY (Gransden Lodge)
29 CHANNEL (Waldeshare Park)
30 CHILTERNS (RAF Halton)
31 CLEVELANDS (RAF Dishforth)
32 CORNISH (Perranporth)
33 COTSWOLD (Aston Down)
34 COVENTRY (Husbands Bosworth)
35 CRANFIELD
36 CRANWELL (RAF Cranwell)
37 CULDROSE (RN Culdrose)

38 DARTMOOR (Brentor)
39 DERBY & LANCS (Camphill)
40 DEVON & SOMERSET (North Hill)
41 DORSET (Old Sarum)
42 DUKERIES (Gamston)
43 EAST SUSSEX (Ringmer)
44 ENSTONE EAGLES (Enstone)
45 ESSEX & SUFFOLK (Wormingford)
46 ESSEX (North Weald)
47 FENLAND (RAF Marham)
48 FOUR COUNTIES (RAF Syerston)
49 HEREFORDSHIRE (Shobdon)
50 HERON (RN Yeovilton)
51 HUMBER (RAF Scampton)
52 IMPERIAL COLLEGE (Lasham)
53 KENT (Challock)
54 KESTREL (Odiham (*Army*))
55 LAKES (Walney)
56 LASHAM
57 LONDON (Dunstable)
58 MARCHINGTON
59 MENDIP (Halesland)
60 MIDLAND (Long Mynd)
61 NENE VALLEY (Upwood)
62 NEWARK & NOTTS (Winthorpe)
63 NEWCASTLE & TEESIDE (Carlton Moor)
64 NORFOLK (Tibenham)
65 NORTH DEVON (Eaglescott)
66 NORTHUMBRIA (Currock Hill)
67 OXFORD (Weston on the Green)
68 OXFORDSHIRE SPORT FLYING (Enstone)
70 PETERBOROUGH & SPALDING (Crowland)

WALES

97 BLACK MOUNTAINS (Talgarth)
98 GLYNDWR (Denbigh)
99 NORTH WALES (Rhualt)
100 OVER T21 CLUB (Abergele, Clywd)
101 SOUTH WALES (Usk)
102 VALE OF NEATH (Rhigos)
103 WEST WALES (Templeton)

68 OXFORDSHIRE SPORT FLYING (Enstone)
[illegible]
70 PETERBOROUGH & SPALDING (Crowland)
71 RAE BEDFORD (Thurleigh)
72 RATTLESDEN
73 RAE FARNBOROUGH
74 RSRE (Pershore)
75 SACKVILLE

76 SHALBOURNE (Rivar Hill)
77 SHENNINGTON (Edge Hill)
78 SHROPSHIRE (Sleap)
79 SOUTHDOWN (Parham)
80 STAFFORDSHIRE (Morridge)
81 STRATFORD ON AVON (Snitterfield)
82 STRUBBY
83 SURREY & HANTS (Lasham)
84 SURREY HILLS (Kenley)
85 THRUXTON

86 TRENT VALLEY (Kirten in Lindsey)
87 UPWARD BOUND TRUST (Thame)
88 VALE OF WHITE HORSE (Shrivenham)
89 VECTIS (Sandown, Isle of Wight)
90 WELLAND (Lyveden)
91 WOLDS (Pocklington)
92 WREKIN (Cosford)
93 WYVERN (Upavon (*Army*))
94 YORK (Rufforth)
95 YORKSHIRE (Sutton Bank)

CLUB DIRECTORY

Gliding Club	Site	Clubhouse Tel
*ANGLIA	Wattisham	0449 720631 ex299
ANGUS	Arbroath	0241 74001 (sec)
AQUILA	Hinton-in-the-Hedges	0295 811056
ARGYLL & WEST HIGHLAND	Connel	0631 71243
AVON SC	Bidford on Avon	0789 772606
*BANNERDOWN	RAF Hullavington	06663 233
BATH & WILTS	Keevil	0380 870411
*BICESTER	RAF Bicester	08692 43030
BLACK MOUNTAINS	Talgarth	0874 711463
BLACKPOOL & FYLDE	Chipping	0995 61267
BOOKER	Wycombe Air Park	0494 442501
BORDERS	Galewood Farm	06686 284
BRACKLEY	Turweston	0280 704470
BRISTOL & GLOS	Nympsfield	0453 860342
BUCKMINSTER	Saltby	0533 303804/0602 307737
BURN	Burn, Selby	0757 270298
CAIRNGORM	Feshiebridge	05404 317
CAMBRIDGE UNIVERSITY	Gransden Lodge	07677 7077
CARLTON MOOR	Carlton Moor	0642 778234
CHANNEL	Waldershare Park	0304 824888
*CHILTERNS	RAF Halton	0296 623535
*CLEVELANDS	RAF Dishforth	09012 2147
CONNEL	Connel	0369 81256 (sec)
CORNISH	Perranporth	0872 572124
COTSWOLD	Aston Down	0285 760473
COVENTRY	Husbands Bosworth	0858 880521
CRANFIELD	Cranfield	0234 750111 Ex2567
*CRANWELL	RAF Cranwell	0400 61201 Ex7230
*CULDROSE	RN Culdrose	0326 574121 Ex2275
DARTMOOR	Brentor	0752 862961 (sec)
DEESIDE	Aboyne	03398 85339
DERBY & LANCS	Camphill	0298 871270
DEVON & SOMERSET	North Hill	040484 386
DORSET	Old Sarum	0202 576467 (CFI)
DUKERIES	Gamston	0909 501032
DUMFRIES & DISTRICT	Falgunzeon	038776 601
EAST SUSSEX	Ringmer	0825 840347
ENSTONE EAGLES	Enstone	0608 72462
ESSEX	North Weald	0378 822222
ESSEX & SUFFOLK	Wormingford	0206 242596
*FENLAND	RAF Marham	0706 337261
*FOUR COUNTIES	RAF Syerston	063685 300
*FULMAR	RAF Kinloss	0309 72161
GLYNDWR	Denbigh	0745 813774
GRAMPIAN	By Laurencekirk	0241 53232 (CFI)
HEREFORDSHIRE	Shobdon	056881 8908
*HERON	RN Yeovilton	0935 456390
*HUMBER	RAF Scampton	0522 730421
HIGHLAND	Easterton	0343 820834 (treas)
IMPERIAL COLLEGE	Lasham	025683 270
KENT	Challock	023374 307
*KESTREL	Odiham (Army)	0256 703157
LAKES	Walney	0229 471458
LASHAM	Lasham	0256 381322
*LOMOND	Portmoak	0334 839471 Ex7645 (chm)
LONDON	Dunstable	0582 665744
MARCHINGTON	Marchington	0283 820009
MENDIP	Halesland	0749 870312
MIDLAND	Long Mynd	058861 206
NENE VALLEY	Upwood	0480 301316 (sec)
NEWARK & NOTTS	Winthorpe	0636 707151
NORFOLK	Tibenham	0379 77207
NORTH DEVON	Eaglescott	07693 404
NORTH WALES	Rhuallt	051 3274760 (sec)
NORTHUMBRIA	Currock Hill	0207 561286
OXFORD	Weston on the Green	086989 265
OXFORDSHIRE SFC	Enstone	0608 677208 (CFI)
PETERBOROUGH & SPALDING	Crowland	0733 210463
*PORTSMOUTH	RN Lee-On-Solent	0705 550502
RAE BEDFORD	Thurleigh	0234 261079
RAE FARNBOROUGH	Farnborough	0252 24461
RATTLESDEN	Rattlesden	0449 737789
RSRE	Pershore	0684 567588 (sec)
SACKVILLE	Riseley	0234 708877
SCOTTISH GU	Portmoak	059284 543
SHALBOURNE SG	Rivar Hill	0264 89204
SHENINGTON	Edge Hill	0295 888121
SHROPSHIRE SG	Sleap	0939 32882
SOUTHDOWN	Parham	0903 742137
SOUTH WALES	Usk	0291 690536
STAFFORDSHIRE	Morridge	053834 369
STRATFORD ON AVON	Snitterfield	0789 731095
STRATHCLYDE	Strathaven	0357 20235
STRUBBY	Strubby	0507 450698
SURREY & HANTS	Lasham	0256 381322
SURREY HILLS	Kenley	081 7630091
THRUXTON	Thruxton	0264 773274
TRENT VALLEY	Kirton-in-Lindsey	0652 648777
ULSTER	Bellarena	05047 50301
UPWARD BOUND TRUST	Thame	0442 61747 (sec)
VALE OF NEATH	Rhigos	0685 811023
VALE OF WHITE HORSE	Shrivenham	0793 783293 (sec)
VECTIS	Sandown IOW	0983 405125
WELLAND	Lyveden	0406 22480
WEST WALES	Templeton	0239 614756
WOLDS	Pocklington	0759 303579
WREKIN	Cosford	090722 2393 Ex255
*WYVERN	Upavon (Army)	098063 351 Ex386
YORK	Rufforth	0904 83694
YORKSHIRE	Sutton Bank	0845 597237

**=Service clubs.*

BGA COMPETITION NUMBERS

The following Competition Numbers are registered with the BGA

1. T. J. Wills
2. A. E. Jones
3. J. D. Bally
4. W. A. H. Kahn
5. G. D. A. Green
6. G. H. Herringshaw
7. D. B. James
8. C. L. Withall
9. C. A. P. Ellis
10. P. Newall
11. P. Potgieter
12. AGA
13. R. May
14. J. D. Jones
15. G. D. Ackroyd
16. RAFGSA
17. M. T. A. Sands
18. C. R. Ellis
19. BGA
20. Carrow & Ptns
21. M. I. Gee
22. T. S. Zealley
23. P. Redshaw
24. RAFGSA
25. I. C. Woodhouse
26. RAFGSA
27. RAFGSA
28. D. S. McKay
29. J. D. J. Glossop
30. J. E. New
31. C. Garton
32. P. Hawkins
33. H. Johnson
34. T. Murphy
35. J. Kingerlee
36. B. B. C. Watson
37. K. Blake
38. N. Marriott
39. W. Stephen
40. B. Fitchett
41. R. Rutherford
42. G. N. D. Smith
43. J. M. Gentry
44. A. H. Warminger
45. Lasham GS
46. M. Pope
47. S. J. Hill
48. D. E. Findon
49. D. C. Austin
50. R. Illidge
51. G. W. Camp
52. AGA
53. M. J. Silver
54. R. Jones
55. D. B. Eastell
56. S. J. Redman
57. M. J. Young
58. E. R. Lysakowski
59. B. T. Spreckley
60. S. H. C. Marriott & Ptns
61. C. Borrill
62. J. Kane
63. S. G. Olender
64. P. Jeffery
65. A. K. Lincoln
66. J. Delafield
67. K. R. Mansell
68. B. L. Cooper
69. E. C. Wright
70. R. Knight
71. E. R. Lysakowski
72. J. A. P. Evans
73. B. Chadwick/ K. Scott
74. A. Linee
75. W. Kay
76. A. M. Blackburn
77. M. Hudson
78. M. Pocock
79. J. Randle & Ptnrs
80. A. & D. Davis
81. J. R. Upton
82. R. Jones
83. T. J. Harrison
84. G. J. Print
85. D. Robertson
86. J. Peck
87. RAFGSA
88. D. G. Roberts
89. J. A. K. Miller
90. Foot & Ptnrs
91. R. K. Hendra
92. T. Perkins
93. Smith & Ptrns
94. Nine Four Aviation
95. J. G. Bell
96. Imperial College GC
97. BGA
98. N. Gaunt/M. Smith/ J. Grainger
99. T. I. Quinn-Hall
100. R. Starling
101. P. Ramsden
102. R. Cousins
103. C. J. Mayhew
104. G. Metcalfe
105. A. P. Moulang
106. A. & J. Garside
107. J. E. Cruttendon
108. C. R. Simpson
109. B. Fairston
110. R. Jones
111. M. P. Seth-Smith
112. J. Ellis
113. G. & A. Johnson
114. S. J. Reynolds
115. J. M. West
116. N. J. Ashworth
117. J. W. Evans
118. D. Byass
119. E. W. Richards & Ptnrs
120. A. Snow
121. W. R. Longstaff
122. I. Godfrey
123. D. J. Dimmer
124. J. A. F. Barnes
125. R. Lynch
126. J. Dobson
127. K. S. Matcham
128. R. J. Marriott
129. A. J. Chappell
130. R. Lemin
131. W. J. Dean
132. T. Harrington
133. Not to be released
134. P. Purdie
135. T. Lipscombe
136. A. & J. Miller
137. S. Parsonage
138. C. J. Evans
139. C. M. Davis
140. R. D. Payne
141. R. E. Cross
142. J. N. Wardle
143. K. S. Davis/ G. C. Beardsley
144. R. J. Baker
145. N. L. Jennings
146. C. Law/M. Conrad
147. P. Hawkins
148. A. J. Burton
149. K. L. Marham
150. G. D. E. Macdonald
151. B. Marshall & Ptnrs
152. L. S. Hood
153. Surrey & Hants GC
154. R. Andrews
155. J. A. Lewis
156. G. R. Davey
157. E. J. Dent
158. A. L. Harris
159. J. A. Rollason
160. A. Townsend
161. H. Tarnow
162. B. H. Owen
163. N. Goulding
164. G. Dale
165. A. J. Rooney
166. K. Kiely
167. B. C. Marsh
168. J. Moore
169. J. L. Smoker
170. G. Corbett
171. M. Thick
172. G. D. Morris
173. R. J. H. Fack
174. R. H. Wright
175. J. B. Ransom
176. D. S. Innes
177. M. J. Evans
178. R. H. Prestwich/ L. Kirkham
179. P. Fenelon
180. A. Jacobs
181. D. J. Freeman
182. P. L. Poole
183. Surrey & Hants GC
184. S. E. Evans
185. R. A. Holroyd/ F. P. Wilson
186. I. J. Metcalfe
187. A. Parker
188. I. D. Smith
189. D. Garrard
190. J. Rees
192. M. A. Gale
193. Bristol & Glos GC
194. R. Elwood-Wade
195. S. Bicknell
196. K. Hartley & Ptnrs
197. R. C. Sharman
198. C. K. Davis
199. P. H. Turner
200. P. G. Cook
201. C. Lowrie
202. D. A. Hatfield
203. R. W. Abrahams
204. E. Drew
205. L. G. Callow
206. Yorkshire GC
207. J. W. Wren
208. M. P. Brockington
209. R. J. Nicholls
210. P. R. Jones
211. R. Housden
212. AGA
213. K. S. Matcham
214. D. Jeffries
215. Angus GC
216. B. S. Vickerman
217. Paterson & Ptnrs
218. P. Hurd
219. C. Ireland
220. E. H. L. Shore
221. W. R. Longstaff
222. M. F. Brook
223. B. R. Forrest/ A. Hallum
224. C. J. Robinson
225. H. Gowdy
226. R. Baines & Ptnrs
227. A. T. Farmer
228. M. J. Seseman
229. P. H. Fanshawe/ E. A. Smith
230. N. H. Wall
231. G. J. Hindmarsh
232. M. F. Cuming
233. Kingswood Synd
234. C. A. D. Paterson
235. R. C. Bridges
237. R. C. Haddon
238. N. Francis
239. L. Noad & Ptnrs
240. P. J. Haseler
241. A. I. Mawer
242. R. A. Sandford
243. W. M. Kay
244. S. G. Hunt
245. J. L. Bridge
246. J. P. Gorringe
247. B. C. Marsh
248. A. M. Walker
249. R. Harris
250. W. J. Murray
251. P. J. Hall
252. Cirrus Group
253. T. A. M. Bradbury
254. D. A. Smith
255. J. Claxon
256. D. S. Towson
257. Yorkshire GC
258. V. C. Carr & Ptnrs
259. M. S. Chana
260. P. Pozerskis
261. A. French
262. V. S. W. Dawson
263. K. Sleigh-Ives
264. N. Parry
265. A. O. Harkins
266. Highland GC
267. J. A. Johnston
268. J. Gatfield/C. Purvis
269. T. R. F. Gaunt
270. R. I. Hey
271. C. Armstrong
272. M. Carolan
273. J. H. Fox
274. E. R. Duffin
275. M. R. Fountain
276. C. D. Lovell
277. S. J. Ferguson
279. D. LeRoux
280. M. Strathern
281. J. Wesley/D. J. Langrick
282. K. Kingsland
283. S. Bennett
284. P. Rice & Ptnrs
285. Coventry GC
286. J. M. Beattie
287. J. W. Murdoch
288. R. Boyd
290. M. C. Russell
291. J. D. J. Glossop & Ptnrs
292. T. Norrie
294. S. C. Foggin
296. Imperial College
297. J. C. Bailey
298. M. B. Hill
299. L. J. Hartfield
300. G. Busby
301. J. Burry
302. Polish AFA
303. S. G. Olender
304. Z. Marczynski
305. M. J. Haslakiewicz
306. A. MacGregor
307. L. F. Parris
308. G. Bennett
309. G. F. Fisher & Ptnrs ➡

310. P. G. Sheard/
C. J. Shawdon
311. P. C. Gill & Ptnrs
312. Booker GC
313. Surrey & Hants GC
314. Booker GC
315. Booker GC
316. Booker GC
317. M. G. Maydon
318. Booker GC
319. G. Bennie
320. D. Hatton
321. M. D. Wells
322. J. Forrester
323. A. J. Hulme & Ptnrs
324. J. Warbey
325. P. F. Brice
326. J. A. Denne
327. I. A. Masterton & Ptnrs
328. A. Young
330. Aquilla GC
331. C. G. Taylor
332. M. Newland-Smith
333. P. Stafford-Alan
334. J. R. Ayers
335. C. Morris
336. A. Adams
338. S. Turner
339. C. Broom
340. A. D. Purnell
342. R. Partington
343. M. G. Phillips
344. W. B. Andres
345. I. P. J. Carmichael
347. G. R. Glazebrook
349. P. G. Heptingstall
350. M. Collingham
351. T. Randall
352. D. G. Roberts
353. L. R. Bennett
354. Surrey & Hants GC
357. M. Uphill
360. C. White
361. J. Beringer
362. D. M. Steed
363. D. K. Gardiner
365. A. W. F. Edwards
366. A. J. Kite
367. B. T. Pratt
368. J. Lewis & Synd
369. S. North
370. D. R. Campbell
371. D. Holmes
372. R. F. Tindall
373. M. Birch
374. A. D. W. Hyslop
375. V. Chambers
377. A. W. Doughty & Ptnrs
378. R. Smith
379. J. Wilson
380. A. J. Baldwin
382. C. R. Appleyard
383. M. Foreman
384. L. E. Beer
385. D. Bowes
387. H. A. Torode
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390. D. Shrimpton
391. Surrey & Hants GC
392. Davies & Ptnrs
393. G. C. Keall
394. Surrey & Hants GC
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398. Surrey & Hants GC
399. Surrey & Hants GC
400. Glaser-Dirks UK
401. R. Ward & Ptnrs
402. F. N. James
403. J. Ayres
404. D. Stabler
405. C. Hyett
406. D. J. Eade
407. McCullagh
408. D. Triplett
409. N. Clements
410. R. Jones
411. C. M. Robinson
412. Army GA
413. J. & D. Hoolahan
414. R. A. Sandford
415. V. G. F. Tull
416. P. A. Cook
417. J. Bennett & Ptnrs
418. Titterton & Ptnrs
419. M. L. Boxall
420. G. E. McAndrew
421. M. C. Costin
422. P. Gentill
423. M. G. Stringer & Ptnrs
424. R. A. Hall
426. H. G. Loftus
427. G. B. D. Brown
428. I. Biggs
430. S. Jobar
431. Univ of Surrey GC
432. T. Hutching
433. W. Grundy
434. A. P. Walsh
436. L. S. Thorne
438. Woodman-Smith
& Ptnrs
439. ASW-15a Synd
440. G. L. Boaler & Ptnrs
441. R. T. Moses & Synd
442. Southdown AS
443. J. C. Bastin
444. D. A. Benton
445. J. S. Weston
446. P. J. Griffiths
447. J. Kettelty
450. P. J. Coward
451. G. H. Costin
452. E. Smith
454. B. H. Owen
456. M. B. Jefferyes & Synd
458. C. L. Lagden
460. North Wales GC
461. T. J. Parker
463. J. Cloke
464. R. Ashurst
465. Green/Wills
466. A. T. Hirst
468. T. W. J. Stoker
470. S. R. Lynn
471. M. P. Dale & Ptnrs
473. J. Nunneley
474. Surrey & Hants GC
475. C. Hughes
476. J. Cowie
477. A. Hobbins
479. R. Parsons
480. Heron GC
481. J. M. Woodford
482. R. Jones
483. F. L. Cox
484. L. E. Beer
488. P. A. Taylor
490. S. Parker
494. L. Astle
495. Cambridge Univ GC
496. Surrey & Hants GC
497. N. Stratton
500. J. S. Halford
501. A. B. Dickinson
503. E. Bromwell & Ptnrs
504. L. P. Woodage
505. R. W. Harding
508. A. Priestley
510. P. B. Merritt
511. C. J. Stothard
512. K. Mitchell
513. D. Almey
515. Sampson & Gee
516. A. H. Baker
517. K. Small
518. A. Mainds
519. A. Brind
520. P. Naegeli & Ptnrs
521. J. Herd
522. G. Green
523. C. Townend & Ptnrs
525. J. Fisher
527. J. D. Cardiff
528. P. G. Marks
530. A. Maitland
531. A. Pickles
534. Wolds GC
535. M. Day
536. R. Mortimer
540. M. Evans
541. C. J. Clarke
542. R. S. Hawley/
S. Y. Duxbury
543. D. C. Phillips
545. C. V. Heames
548. M. Taylor
549. M. Wright
550. L. G. Watts
551. P. Duffin
554. Cambridge Univ GC
555. R. S. Maxwell Fendt
560. B. Nicholson
565. P. C. Hassan
566. F. R. Stevens
567. P. A. Bailey
568. A. Johnson
569. M. R. Dawson
570. H. Kindell
571. D. C. Rich
572. R. J. Whittaker & Ptnrs
573. N. C. Lynchehaum
574. C. Warman
575. P. Brightman
576. Devon & Somerset GC
577. M. J. Hastings & Ptnrs
579. G. W. Craig
580. W. Aspland
581. E. R. Davis
582. P. G. Becker
585. Midland GC
587. P. Blackburn
590. R. G. Furley
593. D. Breeze
594. T. Parker
595. S. W. Bennett
596. D. D. Copeland
597. M. Robertson
599. B. Lumb
600. A. A. Carnegie
601. J. D. Spencer
602. D. Manser
604. F. K. Russell
606. P. Gray & Ptnrs
607. J. E. Cruttenden
608. Gardner & Ptnrs
609. South Wales GC
610. G. R. Seaman
611. R. Johns
612. J. Bradley & Synd
613. R. Putt
614. J. Douglas
616. R. Matthews
617. H. F. Brown
618. P. & D. King
619. A. J. Pettitt
620. D. McCarthy
621. T. Stuart
622. C. Smith
624. I. Ashton
625. D. Cheetham
626. L. Bleakin
629. J. R. Reed
630. A. & H. Pentecost
631. F. P. Wilson
632. A. L. O'Regan
633. A. J. Beard & Co
636. G. C. Bell & Ptnrs
637. Lovegrove & Dowty
638. R. M. Evans/M. Toon
639. G. Neill & Ptnrs
640. R. I. Cowderoy
642. T. Meaker
645. Tanner & Ptnrs
646. C. J. Alldis
648. D. Tait
649. R. B. Witter
650. B. Scougall
651. R. B. Witter
653. J. S. Wilson
654. R. Strange
656. M. B. Jefferyes & Ptnrs
657. J. L. Bleasdale/
A. D. Tribe
658. ACCGS
659. A. J. Manwaring
660. R. A. Cheetham
661. G. Macdonald
662. T. J. Scott
666. M. Kemp
667. T. J. Scott
669. G. Macdonald
670. D. Hill
672. K. J. Towell
673. D. Lilburn
674. D. N. Hayes
675. C. Jones
676. M. Jordy
677. K. Fairness
678. H. Pantin
680. B. Pocock
681. M. P. Weaver
682. C. Pike
683. J. Reid
686. A. S. Edlin
688. L. Dent
689. J. T. Phillips
690. S. Adlard
693. Foss & Ptnrs
694. McDermott Row & Ptnrs
695. A. Truman & Ptnrs
696. C. J. Batty
697. P. Ryland
698. A. L. Harris
699. W. R. Brown
700. S. McNeil
701. L. P. Smith
702. Young/Carnegie
703. G. W. Burge/D. Foster
704. A. J. Watson
705. A. J. Stone/P. G. Sheard
706. T. G. B. Hobbis
707. G. Lyons
708. M. C. Fairman
710. A. Clutterbuck
711. R. Johns/M. Chant
712. J. A. Stirk
713. L. Clark
714. T. Hurn
715. C. C. Smith
716. Imperial College GC
717. S. Sampson
718. P. A. Gaisford
719. D. J. Macpherson
720. P. Walker
721. E. Johnston
722. D. B. Andrews
724. M. Kingston
725. M. Kochman
727. T. P. Docherty
728. R. Madelin
729. P. O'Donald & Ptnr
731. P. J. Walford
733. C. G. Slat
734. F. Bradney
737. E. R. Duffin
740. H. B. D. Jeans
741. R. M. Neill & Ptnrs
742. E. K. Stephenson &
Ptnrs
743. Babb/Emerson
744. G. F. Read
745. M. Wylde & Ptnrs
747. F. J. Sheppard
748. D. R. Hurley
749. R. Grey
750. G. M. Cumner
751. G. D. Wilburn
753. T. A. Quigley
754. R. B. Witter
757. M. C. Fairman
758. I. R. Cook/
N. C. Morland
759. Black Mountains GC
761. C. T. Spiers
767. A. J. Bardgett
768. R. Blackmore
769. H. E. Birch
770. A. Veitch
771. I. Champness
772. C. Worrell
773. S. J. McNeil
774. G. D. Ankers
775. Lasham GS
776. N. Hackett
777. D. Mulhall
778. Lasham GS
779. J. P. Ashcroft
780. P. J. Wild

781.	D. D. Copeland
782.	B. R. Bartlett
786.	P. T. Reading
787.	A. F. Webb
788.	C. K. Lewis
789.	The B Syndicate
790.	D. Booth
791.	M. J. Thompson
794.	J. Houghton
797.	Midland GC
798.	A. Cooper
799.	P. R. Norrison
800.	C. A. Marren
806.	A. Wild
807.	D. H. Felix
808.	A. R. Milne
810.	G. G. Coppen
811.	M. Burlock
812.	D. Jarvis & Ptnrs
813.	B. L. King
815.	A. Mackintosh
817.	Yorkshire GC
818.	D. Starer
820.	E. Giles
821.	D. J. Minson
822.	M. Blake
823.	D. I. Waldron
824.	T. J. Mitchell
826.	P. Croote
828.	T. A. Sage
829.	P. & D. Cannon
830.	P. I. Whitt
832.	C. A. Weyman & Ptnrs
841.	G. F. Lloyd
844.	R. Hawtree
845.	P. B. Jones
848.	R. J. Middleton
849.	F. Townsend
850.	York GC
851.	J. L. J. Smith
852.	W. R. Mayo & Ptnrs
855.	R. C. Bromwich
860.	B. J. Szulc
861.	L. R. Merritt
862.	C. W. Stevens
864.	J. C. R. Rogers
873.	S. M. L. Young
875.	R. B. Christy
876.	N. A. Taylor
877.	D. Hughes/K. Laidlaw
878.	J. Dannatt
879.	D. Steele
880.	R. N. Dall
885.	J. Ellner & G. Ross
886.	E. W. Johnston
887.	Surrey & Hants GC
888.	R. S. M. Fendt
890.	C. H. Griffiths
891.	E. A. Arthur
892.	A. Preston
896.	D. Asquith
899.	G. Lynch
900.	M. Grant
901.	G. W. Kirton
902.	P. Light
907.	P. Neilson & Ptnrs
909.	G. Huggins
910.	S. Hammond
911.	A. G. Reid & Ptnrs
912.	A. K. Lincoln
913.	Bristol & Glos GC
915.	D. G. Brain
916.	J. T. Chambers
917.	S. T. Bonser
918.	D. Caunt
919.	P. W. Lever
920.	K. Neane
921.	S. J. McNeill
922.	R. Jones
924.	K. A. Moules
928.	S. Barker
930.	D. Adams
931.	R. L. Fox
935.	M. Crooks
937.	N. A. Dean
939.	Williams & Ptnrs
941.	A. W. A. Kay
942.	A. E. Kay
944.	D. Hilton
945.	Stratford GC
949.	A. Hegner
950.	K. G. Smith
951.	J. Kaval
954.	G. O. Wynne
955.	R. C. Adams/ P. Robinson
959.	D. W. Evans
960.	A. Pozerskis
964.	G. Lobb
966.	S. Roberts
969.	S. Roberts
971.	E. F. Davies
973.	J. P. Galloway
974.	ACCGS
975.	ACCGS
980.	K. Harris
981.	C. Nicholas
982.	D. Zarb
983.	P. C. T. Whitmore
985.	F. J. Davies
987.	M. Meagher
988.	M. Kemp
989.	G. O. Avis
990.	L. E. N. Tanner
995.	P. R. Gardner
996.	P. J. Wild
997.	K. Wilson

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PHYSIOLOGY OF GLIDING

A major concern in world gliding, writes Walter Cannon, are the number of accidents from obscure causes. In this article he highlights some of the psychological and physical stresses

The natural and appropriate response is to look carefully at pilot training to find if there is a common thread to these accidents. Although some training has been poor, generally instructors are a dedicated, careful and responsible group who do a remarkably good job. But unfortunately accidents do happen.

Pilot error and poor judgment are the probable causes in many cases. It is of significance that often the pilots have a good flying record. Some progress has been made but more is needed to reduce these accidents.

The pilots and crew I gave a talk to during the last World Championships impressed me with the precautions they had taken – most made sure they had enough to drink during their flights and wore protective, cool clothing ideal for the very hot environment. But as I'm not convinced this information has been well distributed throughout the world I present the following discussion.

Although there are many factors to the accident problem, one must be concerned about the psychological and physical stresses while soaring. Cross-country, competitive and even local gliding needs far more information processing and concentration over an extended period of time than any other kind of flying. Exceptions might include crop spraying and flying the Voyager around the world.

Gliders don't have auto-pilots and are not particularly stable, few have navigational aids and they are not easy to keep aloft. As a result, enormous amounts of information must be processed before making any decision. And decisions must be flexible so that further changes can be made.

Working memory must be unimpeded so that the pilot's attention may be divided between many tasks. Getting lost or, for a beginner, worrying about a glider on the active runway may take so much attention the cognitive system becomes overloaded. This leads to a loss of concentration resulting in an undesired landing for the expert or possibly an accident for the beginner. Pilot performance is dependent on higher intellectual thoughts and judgment. Variations of brain function at this level are subtle and sensitive to stresses associated with gliding. Cockpit workload may overload the ability to process this information, leading to poor decisions and, worse, an accident.

Hostile environment

Although we don't think gliding is done in a hostile environment, there are many factors which can produce a hostile and stressful setting. Outside air temperatures, especially in the desert, can easily rise above 100°F and runway temperatures to more than 140°F and it can reach 120 to 130°F in the cockpit. And relative humidity may be less than 10% or even higher than 90%, which is a perfect set-up for dehydration and body over heating.

Shade, water and ice wrapped in a towel draped over the shoulders helps. Some pilots have actually fainted in such temperature extremes.

One of the physiological mechanisms to counteract such vast changes in temperature is the rapid shift of blood to the skin for cooling or to the central core for warming. A barely hydrated pilot at altitude who descends rapidly into hotter, lower altitudes will shift moderate amounts of blood to the skin away from the central core, leading to relative dehydration, possible lower blood pressure and lack of tolerance for *g* forces.

Walter, a physician at Stanford University Hospital, California, went solo at 14 and became an instructor at 18. Now he flies his ASW-20 almost exclusively in Regionals and Nationals – his highest placing was 3rd in the US Nationals – and has all three Diamonds.

(Walter explains that water is lost through urine, skin and respiration. Losses through respiration increase with decreasing humidity, especially with very dry aviation oxygen, and it is possible to lose gallons of water during a flight.)

G forces

Another area of stress taken for granted is *g* forces that are unique to gliding. There is no other endeavour where the human is subjected to constant low level increases of *g* (1.3-2*g* at 30-60° bank). Glider pilots spend 20 to perhaps 50% of the time circling. The heart has to work harder to pump the blood with oxygen to the brain and dehydration will increase cardiac work to keep the proper blood pressure. It takes more effort to move in the cockpit and to keep the head upright.

Psychological stress

This needs special attention. The subject is enormous and not well understood. However, under certain psychologically stressful situations, pilots develop very cavalier attitudes towards safety and have reduced cognitive capabilities. Measure your own heart rate after a low save in a turbulent thermal and you will be amazed at how fast it is.

Hypoxia

This isn't a real problem for those who stay below 10 000ft but can be for those flying in wave and desert thermals. While we are required to use oxygen above 12 500ft, pilots over 40 years, those with heart or lung disease or who smoke are strongly recommended to use oxygen at 10 000 or even 8000ft.

Additive effect

Although the individual stresses may well be tolerated, the additive effect of all these conditions can have considerable effects over a length of time. It isn't surprising to see pilots do well at local contests, or around their airfield only to fail miserably at longer national meets or during a short cross-country over unfamiliar terrain by the inexperienced. They are simply not handling the additive effect of stress very well.

Solutions

What can be done to make ourselves better and safer pilots? Fortunately a great deal.

Exercise – Physical condition is of utmost importance. Glider pilots don't have to be conditioned at the level of a marathon runner. However, moderate exercise such as jogging, swimming or using an exercise bicycle for 20 or 30 minutes a day can have major effects on your tolerance level.

Diet – A proper diet to maintain one's expected weight will add to this tolerance. Large meals just before a flight will lead to a shift of blood flow to the gut and should be avoided.

Hot environment – It is important to be well protected from the sun by wearing a wide brimmed hat, a long sleeved white shirt, light coloured trousers, sun glasses and comfortable shoes. Excess water loss from the heat can't be made up easily before the flight so avoid heavy physical work, such as rigging, in the heat of the day.

Hydration – Water is the best to solve and prevent this problem. Salt loss isn't significant and can be replaced after a flight with a regular diet. Two gallons of water a day in hot soaring weather isn't unreasonable.

G forces – The steeper the bank the harder the heart has to work to get blood to the brain. It is up to the pilot and his physical condition to determine his comfortable angle of bank.

Physiological stress – This is a problem that can't be well controlled. It comes with territory. However, careful flight planning with well thought out contingencies can help to reduce the stress during critical times. Avoid dangerous weather conditions such as thunderstorms or low clouds over mountains that can produce high anxiety, psychological stress and subsequent fatigue leading to poor judgment. An efficient crew or instructor can reduce stress significantly and check on the physiological condition of the pilot before take-off. Family and business concerns must be resolved before flying. Remember, the sport should not be considered a way to relax. Concentration and higher intellectual function are essential for successful and safe gliding.

Drugs – Alcohol and recreation drugs may play more of a role in poor flying than was previously known after two recent studies. Pilots given a cigarette containing marijuana were measured in simulators 24 hours later and their performance showed significant impairment. Perhaps more disturbing, they weren't aware of any change in their performance.

In the second study pilots drank five to seven glasses of wine and when tested 14 hours later, with no trace of alcohol in their blood, their performance had also deteriorated.

In conclusion, most of us enjoy the psychological stress of gliding and accept it as part of the fun. However, the additive effect of all the other stresses over prolonged periods add an ominous element of danger to the sport. If we avoid preventable stress, we can bring the fun and safety back.

International Gliding Organisations

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ARGENTINA: Argentinian Federation of Aeronautical Sports, Anchorena 275, 1170 Buenos Aires. Tel: 54 (1) 87 23 20 - Telefax: 88 33 14.
AUSTRALIA: Gliding Federation of Australia, Building 130, Bullard, Essendon Airport, Victoria 30341. Tel: 0061 (3) 379-7411. Telefax: (3) 379-5519.
AUSTRIA: Austrian Aero Club, Prinz Eugen-Strasse 12. Tel: 43 (222) 505 10 28-505 10 29. Telefax: 43 (222) 505 08 45.
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BULGARIA: Federation of Air Sports of the People's Republic of Bulgaria, Bd. Christo Botev 48, Sofia 1000. Tel: 359 (2) 88 02 61.
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RUSSIA: Federation of Aeronautical Sports of the USSR, POB 395, Moscow 123362. Tel: 7 (095) 491 86 61.
SOUTH AFRICA: Aero Club of South Africa, PO Box 1993, Halfway House, Midrand 1685 (Transvaal) Tel: 27 (11) 805 31 06/7.
SPAIN: ROYAL AERO CLUB OF SPAIN, Carrera de San Jeronimo 15, 28014 Madrid. Tel: 34 (1) 429 85 34. Telefax: 34 (1) 429 71 21.
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SWITZERLAND: Aero Club of Switzerland, Lidostrasse 5, CH-6006 Lucerne. Tel: 41 (41) 31 21 21. Telefax: 41 (41) 31 14 53.
TURKEY: Turkish Air Association, Ataturk Bulvari n'33, 06100 Opera/Ankara. Tel: 90 (41) 310 48 40. Telefax: 90 (41) 310 04 13.
USA: Soaring Society of America, PO Box E, Hobbs, 88241, New Mexico. Tel: 001 (505) 392-117. Telefax: 001 (505)392-8154.
VENEZUELA: Venezuelian Association of Aeronautical Sports, Apartado 50088, Caracas 1050 A. Tel: (PtH): 58 (2) 292 12 62. Telefax: 58 (2) 241 20 96.
YUGOSLAVIA: Aeronautical Union of Yugoslavia, Uzun Mirkova n'4/1 - Postal Box 872, 11000 Belgrade. Tel: 38 (11) 626 235. Telefax: 38 (11) 627 290.
ZIMBABWE: Aero Club of Zimbabwe, PO Box 3371, Harare. Tel: 263 (4) 73 69 91. Telefax: 263 (4) 73 69 93.
OSTIV: International Scientific & Technical Gliding Organisation, C/- D.L.R. (Deutsche Forschungsanstalt für Luft und Raumfahrt) Institut für Physik der Atmosphare, D-8031 Oberpfaffenhofen, Germany. Tel: 49 (8153) 28 507. Telefax: 49 (8153) 28 243.

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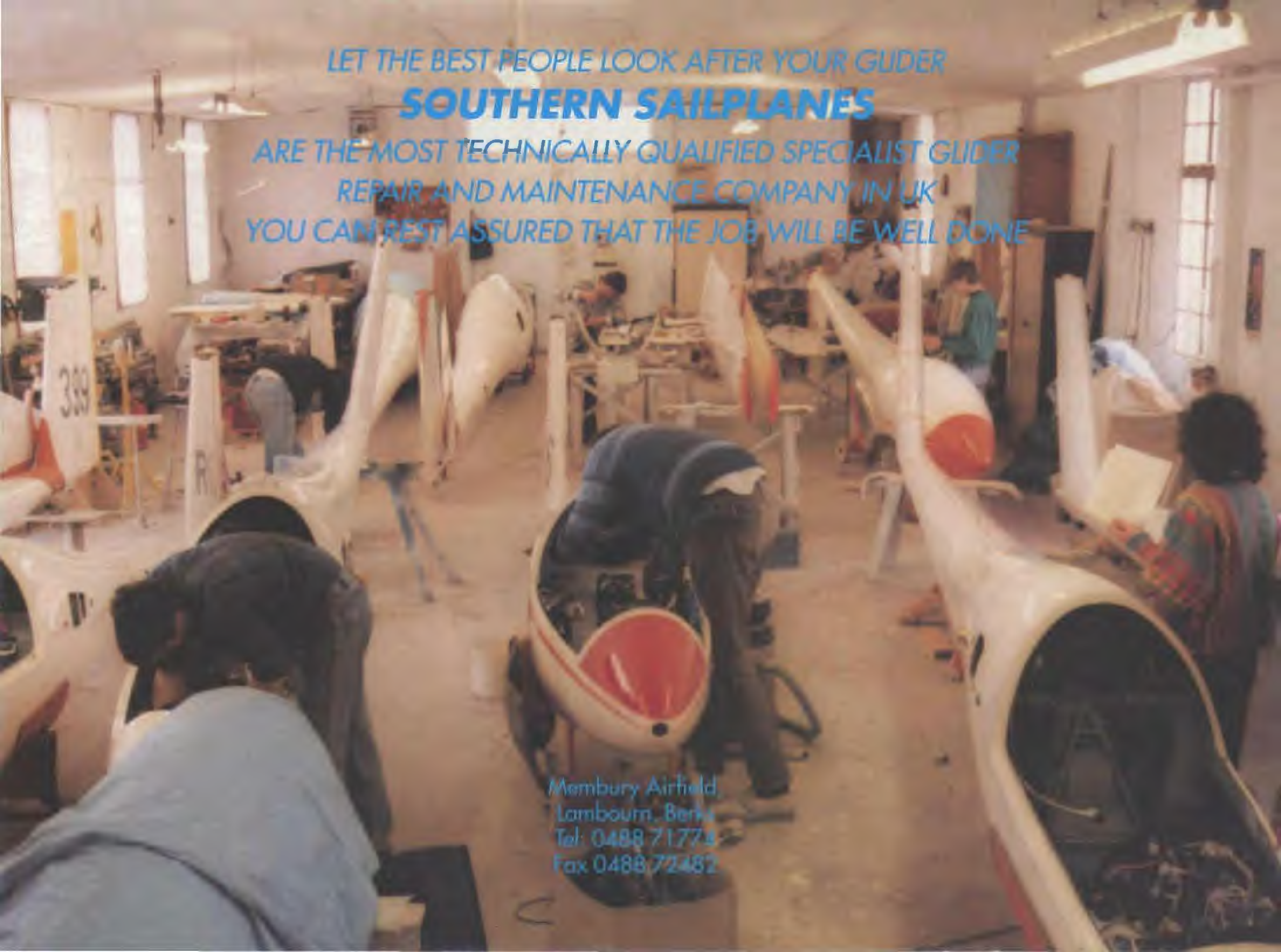

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