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Cover photograph: K-6 after coming out of cloud with ice-encrusted wings over Salisbury, Rhodesia. Photo by John McGeorge

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ON BEING A CANUTE

EVERY active airfield in Britain has a "cheese" into which aircraft not intending (or allowed) to land there must not venture. Judging by recent reports in the Continental aviation Press, there appears to be a strong danger that 50% of the airspace in West Germany, one of the world's leading gliding nations, will become a forbidden "cheese" to glider pilots.

The map, reproduced from *Aerokurier*, October 1971, shows three kinds of controlled airspace planned by the Flight Safety Department. In one, no gliding will be permitted. In the second, gliding will not be allowed above 1,000ft, and in the third, gliding will not be allowed above 1,700ft. The map is accompanied by an article by Gerhard von dem Hagen entitled "Will gliding still have a future in the Federal Republic?"

At the annual German gliding conference, held in Heidelberg from November 19 to 21, 1971, a great deal of time was devoted to airspace restrictions, as can be imagined. It was only at the previous conference, in Hamburg in November 1970, that the German gliding movement decided to set up an airspace committee. We can only hope fervently that our German friends have not paid attention to airspace problems too late, and that they can successfully combat this severe threat to the future of gliding in Germany.

It must be remembered that Germany has probably contributed more to the technological development of sailplanes than any other single country, and that if the movement were to be castrated there, soaring throughout the entire world would be the loser.

The present parlous situation in Germany highlights the often disgraceful history of free airspace erosion which has occured in most, if not all, of the developed countries since the end of World War II.

As commercial air traffic gets heavier, aviation technology becomes progressively more sophisticated and legislators are under pressure to put ever-increasing chunks of air under positive control to enable this flow of traffic to be managed easily. And experience has shown that, if left to themselves, legislators will, under pressure from commercial interests, put far more airspace under control than is really necessary.

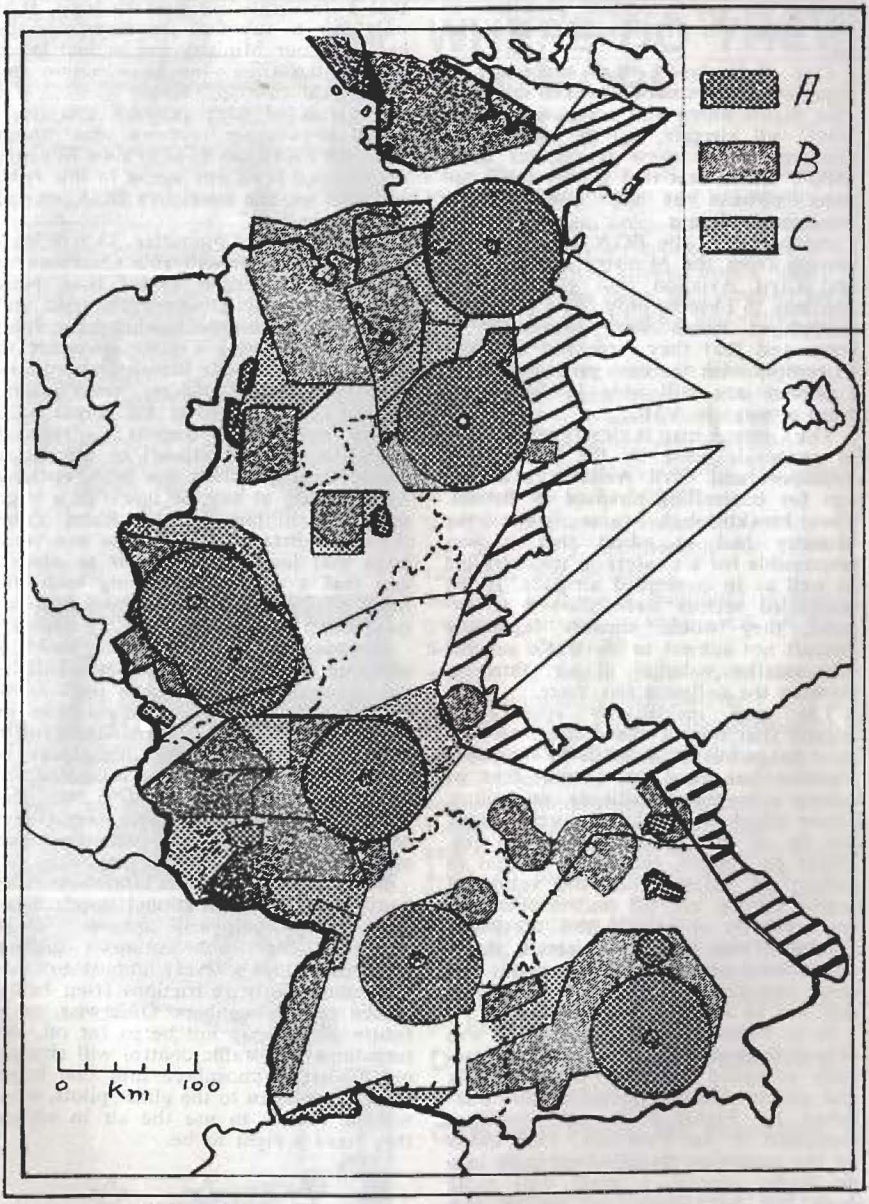
By their very nature, gliders are not amenable to the kind of air traffic control that is designed for large commercial aircraft. They are not able, for reasons of weight, space and cost, to accommodate very much electronic equipment. Indeed, until air traffic controllers are able to provide thermals of specified dimensions and heights at specified points and specified strengths at specified times, gliders are only able to follow approximate flight paths and can never maintain constant flight levels. They are, however, perfectly capable of avoiding controlled airspace and do so with meticulous care.

In spite of this, and the fact that glider pilots in the bubbles of their canopies are constantly scanning the skies and checking their positions, they will always tend to be regarded by air traffic controllers (surrounded by an impenetrable forest of equipment) as so many gnats cluttering up the atmosphere.

Therefore, administratively, it is far easier where gliders are concerned to let die than let live, even though much of the airspace of most interest to glider pilots is off the track of or underneath the bottom of the airspace which is really necessary to accommodate major air routes.

A feature which is common to many of the developed countries is a ban on cloud flying by gliders, even in uncontrolled airspace. Britain is one of the countries in which glider pilots are allowed to extend their thermal climbs into the cumuli themselves in uncontrolled airspace. How has this enviable situation been maintained? By the foresight, many years ago, of the BGA in recognising that the tides of air traffic control, both civilian and military, were likely to submerge Britain if not checked.

A King Canute was needed, and so an Airways Committee was set up in June, 1957. Its purpose was "to keep a watching brief on all matters concerning the airways and control zones as they may impinge on the interests of the gliding community, and to keep the Council in-



Gliding forbidden: A—above 1,000ft; B—above 1,700ft; C—completely

formed on any important problems as they arise, with recommendations thereon."

One of its first actions concerned an experimental restriction which said that "for flights along and across airways in VMC, all aircraft will be required to conform to the same procedures as in IMC". This meant that gliders could not enter airways at all, whatever the weather conditions.

Advocacy by the BGA gained a concession from the Ministry of Transport and Civil Aviation that gliders could continue to observe only those rules and procedures which were previously in force and that they were not expected to comply with the new procedures.

Gliders are still able in Britain to cross airways in VMC.

The German map is closely reminiscent of proposals made by the Ministry of Transport and Civil Aviation a decade ago for controlling airspace in Britain. The breakthrough came when the Ministry had to admit that it was responsible for air safety in uncontrolled as well as in controlled airspace. If the controlled sectors were allowed to expand, they would squeeze legitimate aircraft not subject to air traffic control into smaller volumes of air, thus increasing the collision risk there.

The map incidentally appears to suggest that one of the commonest and most dangerous errors made by the paper planners has been committed—that of setting a maximum altitude, or ceiling, above which uncontrolled aircraft may not fly. If this ceiling is too low (eg, 1500ft or 2500ft), the result is that in pursuit of safety from the result of engine failure, etc, all uncontrolled aircraft will fly at exactly this maximum altitude. Thus, for these aircraft, three-dimensional airspace will effectively become two-dimensional and the collision risk will be enormously increased.

In its February, 1964, issue, S&G was able to report, as a preface to a carefully compiled paper on collision risk and gliders, "Since the two articles published by Philip Wills and Nicholas Goodhart in the February, 1963, S&G on the campaign to introduce logic into air traffic control, a great deal more work has been done to develop this approach. And in case anyone may think that bureaucrats are deaf to logic, it is only fair to say that the reverse is the case and our Ministry has in fact taken great interest in (and even action on) the logical cases presented.

"This is of such primary and overriding importance that we must shout from the roof-tops that our own Ministry of Aviation leads the world in this field, and that we, the mouselike BGA, started the ball rolling."

The Airspace Committee, as it is now called, has under such able Chairmen as Geoffrey Stephenson, David Ince, Nick Goodhart, Tony Deane-Drummond and the present incumbent, airline pilot John Ellis, been fighting a constant battle to preserve freedom for British glider pilots. A constant and clearly never-ending battle. This year—after the threat of a future third London airport had receded from the South Midlands to the Essex coast—the Committee has been working hard to keep at bay the threat of a huge proposed military Special Rules Zone (Lyneham-Brize Norton). One can only hope that logic will continue to prevail and that a solution satisfying both the needs of glider pilots and the actual requirements of the military will be found.

Airspace, is not, however, a problem affecting only the boundaries of individual countries. Legislators will draw on the experience of and regulations in other countries when formulating their own rules. If bumbling officialdom is allowed to put through unnecessarily harsh restrictions on gliding in one country, the fact that these restrictions exist in that country will strengthen the arm of legislators in other nations.

As the world moves (however uneasily) towards international standardisation in technological spheres, it is important that each country's gliding movement does its very utmost to prevent unnecessary restrictions from being placed on its members. Otherwise, in a future which may not be so far off, international air traffic control will change our planet's atmosphere into one huge cheese forbidden to the glider pilots, who will be unable to use the air in which they have a right to be.











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LEE WAVE OBSERVATIONS BY HIGH-POWER RADAR

By DR J. R. STARR

The edges of thermals are characterised by sharp changes in temperature and humidity. These regions can be detected by high power radar, as described by Dr Starr in S & G, December 1971, p476. Regions of sharp changes in temperature and humidity also occur in the form of virtually horizontal layers, which can be used to trace atmospheric motion (such as that caused by lee waves) in their vicinity.

THE Defford radar (situated about 70km east of the lee slope of the Black and neighbouring South Wales mountains) has been used on a number of occasions to observe the three-dimensional structure of the lee waves downwind of these mountains. In these studies, the radar echoes are photographed on a Range-Height Indicator (RHI) display giving, effectively, a cross-section of the atmosphere along any chosen azimuth out to some 100km range and up to about 10km in height. By scanning in elevation up or downwind, the wavelength and amplitude of a lee wave system may be studied as a function of height and time. The three-dimensional structure of the wave train may be studied by making elevation scans every 10°, say, in azimuth through 360°.

A second "meteorological target" contributed to the echoes detected in the four cases studies reported here: Cirrus ice crystals. The cirrus often has a clear-cut base due to total evaporation in a dry layer, in which case the variations in the level of the cirrus base can be regarded as an indicator of the airflow there. This is confirmed by time-lapse movie films of radar data which show the height of identifiable cirrus wisps rising and falling as they travelled through systems of lee waves.

Layer echoes of one kind or another were often found to occur simultaneously at several altitudes. Thus the radar provided data on the lee waves simultaneously at several heights, sometimes to above 10km. Knowledge of the horizontal winds permitted updraughts to be inferred from measurements of the slope of echo layers where these were perturbed by steady state lee waves.

The interpretation of the lee wave pattern is aided by data from radiosondes released hourly during an operational period from RRE Pershore, some five miles NE of the Defford radar.

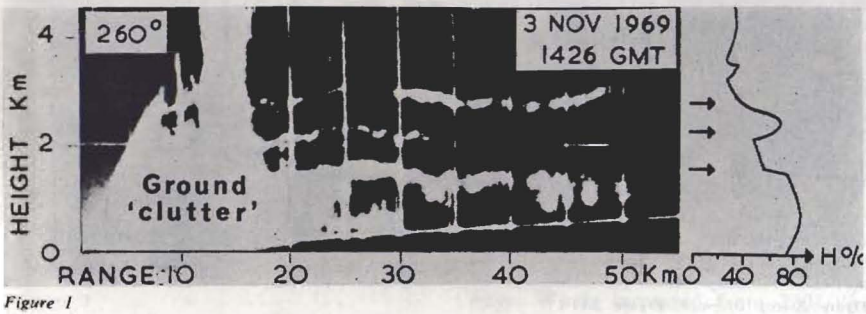
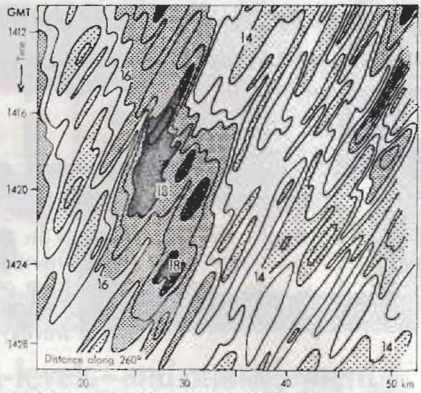


Figure 1

STEADY STATE LEE WAVE ON NOVEMBER 3, 1969

Observations were made of lee waves on November 3, 1969, in a strong westerly airstream 180km south of a cold front. A satellite photograph taken at 10:00GMT revealed two clearly defined wave trains extending 110km downwind from the mountains of south and central Wales. These waves were detected by the satellite as a result of the thinning of the stratocumulus cover in the wave troughs. The Defford radar obtained information on the southernmost wave train from 10:00 to 15:30. There were two marked temperature inversions, one between 1,500 and 1,700m and the other between 2,600 and 2,900m, with an approximately saturated lapse rate above and below.

An example of the kind of RHI data obtained is illustrated in figure 1. Three



distinct clear air layers occured at about 1,600, 2,200 and 2,800m, related to sharp humidity gradients as shown in the accompanying profile. These clear air

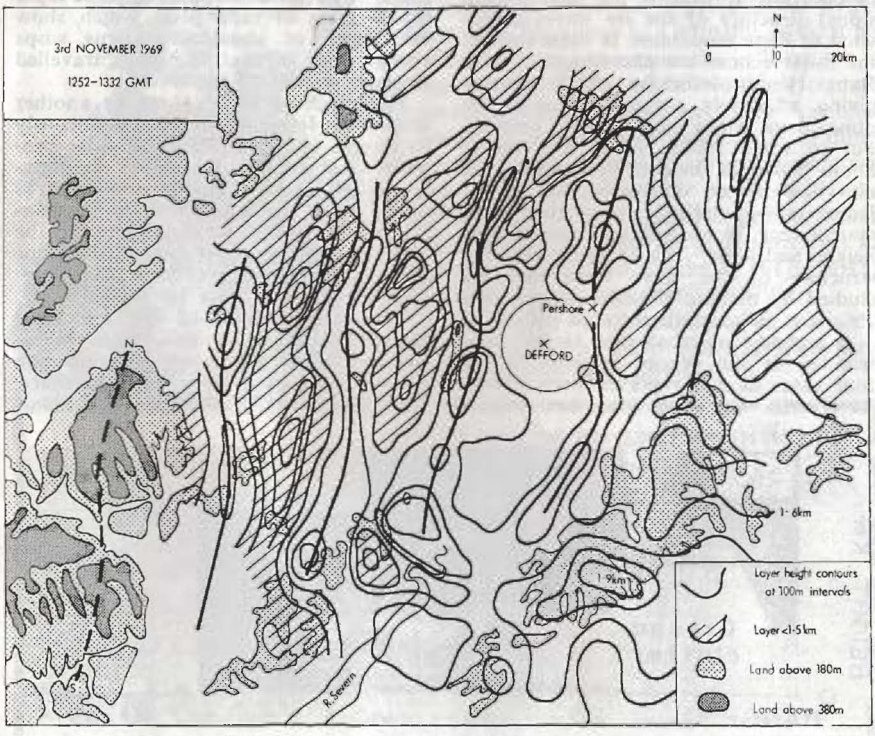


Figure 2 (top of page, Figure 2A)

echoes were perturbed by lee waves of wavelength about 20km and crest to trough amplitude of 300m. Nearly vertical alignment of crests and troughs is evident in figure 1, and this proved to be a feature of all our case studies. Convective circulations in the planetary boundary layer are thought to have been responsible for the smaller, 2km, perturbations in the lowest echo layer.

This lower level convective activity is shown in figure 2a. The fixed lee wave pattern can be seen to have a distinct crest at range 25-30km and an amplitude of up to 400m, but its detailed structure is modulated by the smaller scale convective activity. Individual small perturbations lasted for up to 10 minutes, and extended with diminished amplitude vertically through the stable layer up to 3km.

Figure 2 shows the overall lee wave pattern at about 1,600m—at the top of the low-level convective layer. This three-dimensional representation of the wave pattern is obtained as described earlier, and the contours—showing the heights of the radar-detectable layer of air

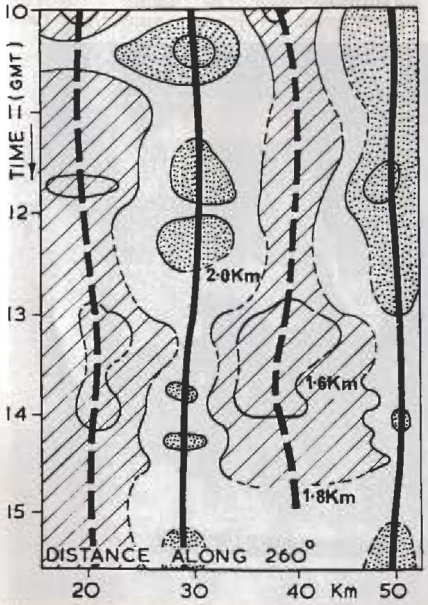


Figure 3

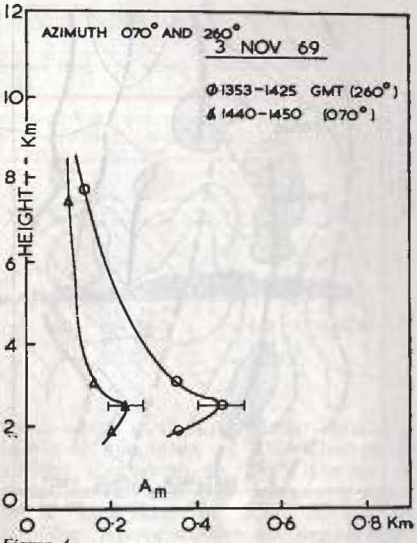


Figure 4

through the system—are at 100m intervals. Two major areas of high ground are also illustrated—the mountains of South Wales at the western edge of the figure and the Cotswolds south-east of the radar. A single, well-defined wave train with a wavelength of 20km and crest to trough amplitude of 400m dominates the figure. The waves are orientated parallel to the lee-slopes of the mountains and persist with virtually undiminished amplitude for at least 110km downwind from a direction of approximately 250° (corresponding to the wind direction at 1,600m).

Over the observing period the pattern was remarkably steady, (figure 3) with crests and troughs remaining geographically fixed. Updraughts of around 2-3m/sec may be inferred from the slopes of the waves. The wind varied from 250°/50kts at 1,000m to 256°/90kts at 11,000m. The variation of crest to trough amplitude (Am) with height is illustrated in figure 4.

UNSTEADY LEE WAVES ON FEBRUARY 3, 1970

The lee waves on February 3, 1970, occurred in a strong westerly airstream about 200 miles north of a frontal wave. Winds increased from 280°/17m/

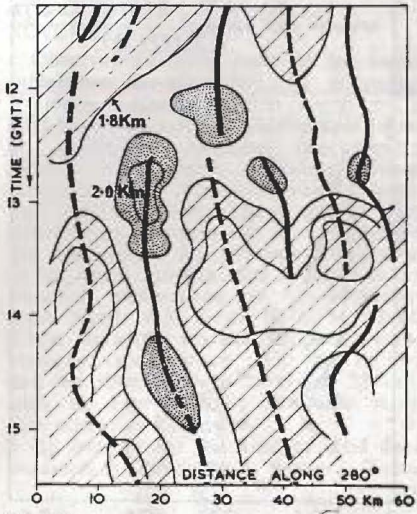


Figure 5

sec at 1,000m to 280°/75m/sec at 8,000m.

The radar this time revealed a more variable situation (figure 5) with a spread of wavelengths from 15 to 30km, the larger values dominating at close range and during the latter part of the observing period. There was a tendency for crests and troughs to travel gradually upwind throughout the day. At low levels, the wave pattern was confused, there being a variety of orientations of wave crests.

DAMPED LEE WAVES ON APRIL 22, 1970

Damped lee waves were observed on April 22, 1970 in a moist WSW airstream just ahead of a cold front. Winds increased from 250°/23m/sec at about 1,500m to a maximum of 260°/50m/sec at 11,000m. The stability structure was broadly similar to that of November 3, 1969, with a roughly isothermal layer between 2,000m and 3,000m and an almost saturated adiabatic lapse rate above and below.

The most striking characteristic of the lee waves on this day was their rapid decrease in amplitude downwind (figure 6). This wave train is shown diagrammatically in figure 7. The largest crest to trough amplitude (800

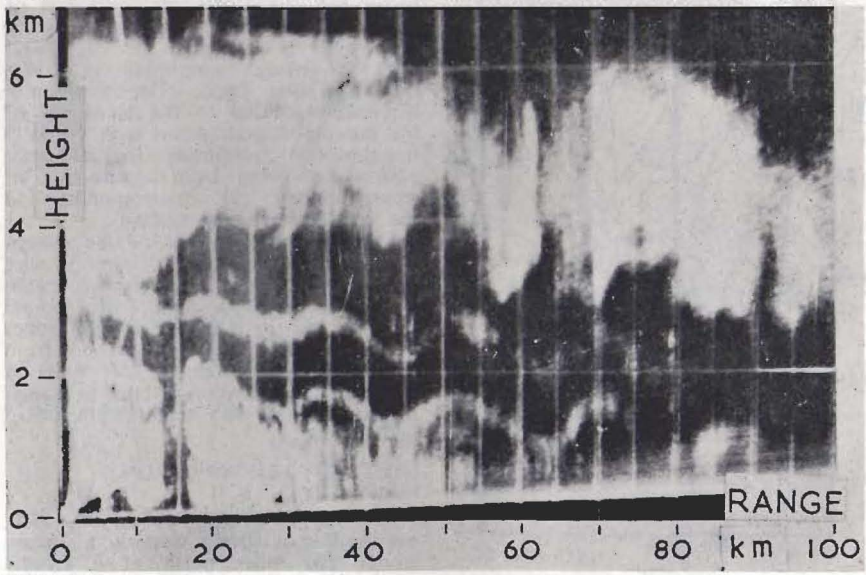


Figure 6

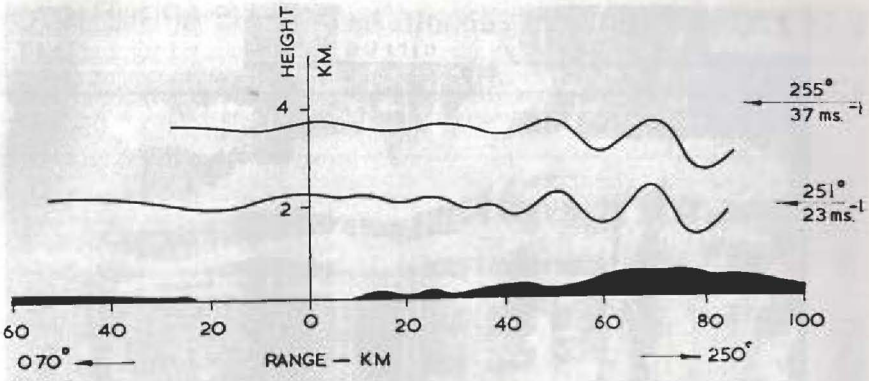


Figure 7

to 1,000m) was observed at a radar range of 60 to 80km, confirming the Black Mountains to be the source of the wave train.

Only one major wave crest (50km from the radar) was observed to the lee of the mountains. The pattern maintained a virtually steady state from 09:00 until at least 13:30GMT.

TRANSIENT LEE WAVES ALOFT ON APRIL 15, 1970

On April 15, 1970, transient lee waves aloft were observed within a moist WSW warm-sector airstream. Winds attained a low-level maximum of 250°/20m/sec at 1,500m decreasing to 265°/12m/sec at about 4,000m and then increasing again to a maximum of 300°/30m/sec at 10,500m. Above 4,000m the temperature lapse was close to saturated adiabatic; below 4,000m it was rather more stable, although nowhere did it approach isothermal.

Examples of the kind of RHI data obtained are shown in figures 8 and 9. Many echo layers were present, those below 4,500m being from the clear air, those above 6,000m from cirrus particles,

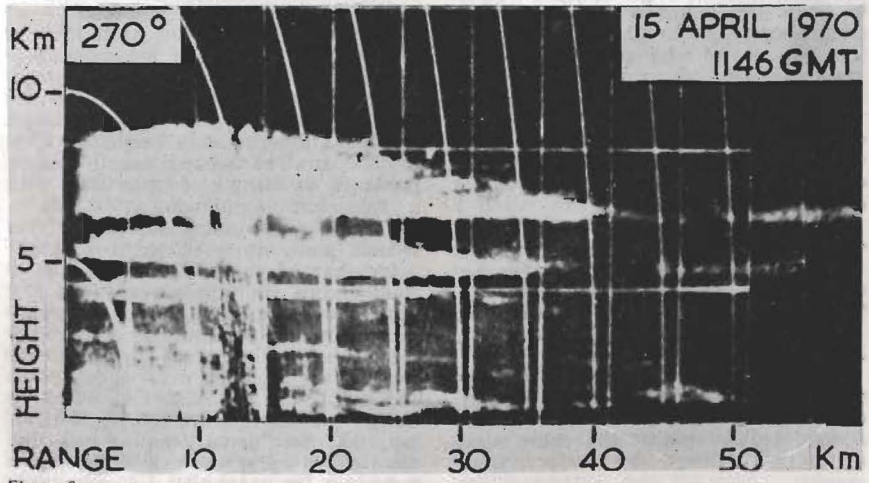


Figure 8

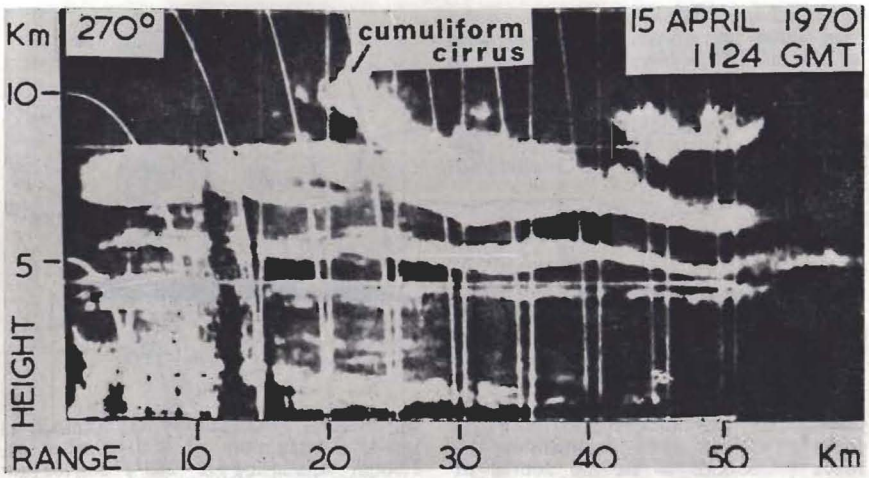


Figure 9

with those in between probably arising from both causes. For much of the time, the echo layers exhibited waves of only very small amplitude, with an ill-defined wavelength between about 8 and 10km.

However, during the period 11:15 to 11:40GMT there was a dramatic growth and decay of lee waves at between 5,000 and 7,000m height. Time-lapse film revealed that the process was apparently associated with the passage of a patch of cirrus with cumuliform tops extending from about 7,000 to 12,000m. Following the passage of the cirrus, the wave motion decayed (figure 8), only to be re-initiated at 11:54GMT in association with the passage of further cumuliform cirrus. The wavelength of these waves was observed to be about 16km, with a crest to trough amplitude of 700m at between 5,000 and 7,000m.

In contrast, the layer between heights of 2,000 and 5,000m was characterised throughout by waves with a shorter, but relatively ill-defined, wavelength of, typically, 8 to 10km, with a corresponding crest to trough amplitude of only 200m.

The crests and troughs of both families of waves remained geographically fixed even as the cirrus passed through the system, indicating that the entire wave system was driven by surface topography.

It is possible that local and short-lived reductions of static stability aloft, as indicated by the intermittent nature of the cirrus tops, may have been responsible for the sudden growth of the latent high level wave system.

Characteristics of lee waves within the troposphere have been estimated for all four case studies, using a simple, mathematical model. This model often predicts the occurrence of two wave families attaining maximum amplitudes at different heights. Only on April 15 were two realistic families of lee waves predicted to occur within the troposphere. The first family had a predicted wavelength of 6 to 10km with a maximum amplitude attained at a height of 1,300 to 2,500m. The second family had a predicted wavelength of 14 to 22km with a maximum amplitude at 4,500 to 8,300m. The maximum amplitude of the second family was predicted to be about twice that of the first, and this is in good accord with the observations.

These photographs of lee waves together with the observations of the variable behaviour of such systems may confirm the experience of glider pilots and perhaps at the same time stimulate further interest in wave soaring. I hope, too, that they have demonstrated that the Defford radar method is an elegant technique for measuring lee wave pro-

perties. Since a combination of radiosonde observations plus theory cannot adequately predict the major changes that can occur over a short period, continuous monitoring of actual lee wave systems is the only source of information. Unfortunately the cost and size of the necessary radar system means there is no possibility of every flying club being equipped with its own lee wave detection system.

The author is grateful to the Royal Meteorological Society for permission to reproduce the figures which appear in the above paper. This article is published with the permission of the Director, RRE, and the Director General, Meteorological Office.

For further reading see Starr, J. R. and Browning, K. A. "Observations of lee waves by high power radar", *Quart. J.R. Met. Soc.*, Jan. 1972.

A DROLL RETRIEVE

By BRENNIG JAMES

ON MY first attempt at a task during a competition some years ago, I only flew as far as Basingstoke. After a considerable struggle and delay my crew got to me, we derigged the aircraft and took it back to Lasham for a relight.

By this time the weather had deteriorated considerably and although I was able to reach my first turning point at Thame I could not make much progress across the wind towards Norfolk. I finally came to earth somewhere near Bedford.

I got out of the machine, a Dart 17R, turned the wing into wind and sheltered under the other wing waiting for the rain to ease off.

After a while a car drove up the lane nearby and the driver ran across towards me with a raincoat over his head. "I suppose you want to use the telephone."

"Thanks very much," I said. I rang back to Lasham and told them where I was, then returned to mind the aircraft.

Later the motorist returned with a flask of tea and sandwiches which I ate under the wing while the rain poured down around us. He seemed uncommonly well briefed on the habits and requirements of glider pilots so I asked him whether he had any experience in that direction.

Being the father of eight children he could not afford to join a gliding club. However, he bought a second-hand glider from the ATC and taught himself to fly. His friend drove a car and launched him at the end of a long length of wire on a disused aerodrome. At first he did little hops, and as he got more proficient he went higher and higher until now he could fly a complete circuit. Having no instruments in the machine he could not do any thermal soaring.

I asked him if he had had any crashes.

Several. In fact, he was now on his third machine.

What about insurance?

Not worth it as the machines only cost him £50.

When the RAF contingent heard my story my kind host was made an honorary member of one of their clubs.

At last my crew arrived. We derigged the glider and drove home south along the motorway. By now it was dark. At some lights on the North Circular road, a car stopped beside me and the driver gave me a supercilious stare.

All right, I'll show you, I thought and let out the clutch for a smart get-away. It was surprisingly good, I thought, with a trailer on the back. A few hundred yards on I was waved down by a passing car: "Something has fallen out of the back of your trailer."

We got out and peered into it. Everything looked normal except for one thing —the fuselage was missing. We returned to the traffic lights where we found the fuselage tucked behind a transport cafe. The hook which secured the fuselage had become unscrewed, so that when the trailer shot forward the fuselage stayed where it was and dropped tail first, like a breech delivery, into the road.

an introduction to BALLOONING

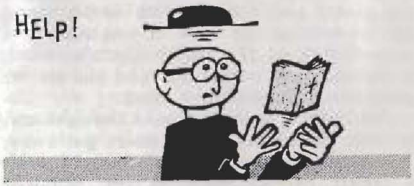


By Platypus

The following impressions of a first experience of a lighter-than-air flying machine were first published in 'The Aerostat', the Journal of the British Balloon and Airship Club, 75 Victoria Street, London, SW1.

ONE good thing about heavier-than-air flight is that you just can't go on being terrified for very long. The cause of the terror gets you in the next few minutes and you exchange fright for oblivion and/or shock, quiet contemplation of next year's insurance premium, arguments with policeman/farmer/US airman/owner of greenhouse. Alternatively, you escape the anticipated peril and all's well. That's why I have always disliked being on top of mountains or high buildings—the feeling of being stuck there scared stiff and likely to go on being in the same situation and same frame of mind for the next hour or so.

It was altogether too late when I realised that being in a balloon ascending almost vertically to 1,800 feet in a clear blue sky over Lillingstone Lovell in Buckinghamshire is the ultimate blend of all the instant perils of gliding with the drawn-

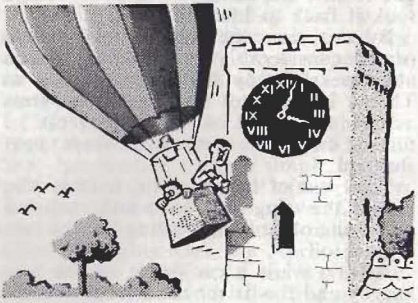


instant perils . . .

out vertiginous terrors of mountaineering and/or climbing out of fifth-storey bedroom windows at three in the morning.

In spite of 21 years and 500-plus hours of gliding, it took nearly 20 minutes before I could bring myself to stand up in the navel-high basket and to exchange royal-style waves with the citizens below. As I waved to the right the basket swung sharply to the left and I promptly sat down in the bottom again for a few more minutes.

I found navigating a good cure for passenger-anguish (as it is in two-seat gliding) and was astonished to discover that we were bowling along at about 15-20mph. Navigating in the brilliant visibility was reasonably simple and I imagine should not normally be a big problem in balloons since violent changes of wind direction or speed are rare (except in thunderstorm conditions!). However, it was worthwhile being very precise in pinpointing positions on a one-



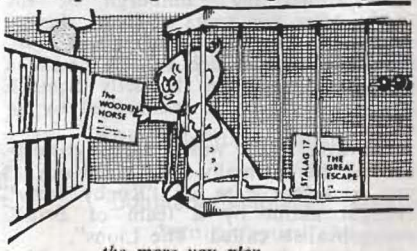
noting down the times . . .

inch-to-the-mile map and in noting down the times, since this gave us a clear notion of the different wind velocities at different heights. The veer to the right as we climbed and the backing to the left as we descended was quite marked—I would guess a difference of 15° or more. A fascinating experience for a glider pilot was actually to feel the wind gradient as a gentle puff in one's face lasting a few seconds as we slid down through the 200ft to 100ft band.

This particular combination of envelope and burner seemed very efficient—on average a 10-second burn kept us going for about three minutes, which is a pretty satisfactory ratio of noise to silence. The

angle of the sun lit up the contours of the countryside perfectly, revealing the effects of medieval strip-farming of 900 years ago, and throwing the shadows of naked trees for hundreds of yards across the harrowed fields. It wasn't until the evening, when the flight was over, that I reflected on the fact that if Roskill had had its way, all this would have soon been obliterated by concrete and uproar.

The preparation for landing was especially interesting to a glider pilot. Just as an approach requires more planning in a glider than in a power-plane, so in a balloon the approach requires even more careful planning than in a glider. A para-



the more you plan . . .

dox indeed—the less control you have, the more you plan. (Was it Marx or Trotsky who said "Freedom is the recognition of necessity"? Not a bad motto for bloated balloonists.) First of all, because we were flying along a line of power pylons south of Aylesbury we had to veer to their right by climbing, while taking into account the amount of drift back towards the wires if we made a slow descent.

In the event the dilemma was resolved by our seeing the pylons march off to the left a couple of miles ahead. The choice of fields began to improve—but not for



London Control Zone. . .

long. A mile or so beyond lay the steep slopes of the Chilterns, not to mention the London Control Zone. I heaved up on to the edge of the basket the massive ball of trail rope which I had laboriously wound (then rewound, having started at the wrong end) at the dark and chilly hour of 8am. About two fields before the chosen meadow I followed the order to roll the ball out into the void, at which point I discovered why they are rolled up so carefully. Apart from it unravelling fairly neatly into a long sea-anchor to slow us down, it was also designed not to loop around a balloonist's foot. A beginner, I had carelessly let a loop of rope drop on to the bottom of the basket. and as the lower end of the rope snagged in trees and hedgerows a hundred feet beneath us that loop was whipped out of the basket at lightning speed. Lesson learned!



snagged in trees and hedgerows . . .

The angle of descent is of course something that is quite alarming to the glider pilot—or anyone else for that matter. We ripped at about 80ft, then began what can be described as a gentle plummet. "Hang on, this is going to be rougher than I expected," yelled Roger Quiller Barrett as a green blur leapt up to meet us.

The expected teeth-grinding crunch into soft pasture came. Then there was an eternal pause of about three seconds while everything lay still, with ourselves sprawled outside the basket on our backs, but still hanging on. The envelope swayed over horizontally like a dead whale but at that second, as the wind seized it, came alive and galloped across the meadow dragging us for a hundred feet or so before it expired. No damage to balloon, air-



mass sports . . .

crew, property or livestock; all in all it was considered a pretty good arrival.

It would seem churlish, if practical, to mention that the frustration index in ballooning is much the same as in gliding, yachting or playing the violin. Perspiraton exceeds inspiration by 10 to one. Thank Heaven for that—unless you wish them to become mass sports.

"AEROSTAT" EDITOR'S NOTE

Platypus's flight was in the basket of the London Balloon Club's London Pride but with the 84,000cu ft envelope of the Club's Fiery Queen, so I suppose that makes the balloon London Queen (or Fiery Pride if you prefer). The burner was London Pride's. The combination of a large envelope with a small, light basket was delightful; as Platypus remarks, relatively little burning was necessary. The balloon was very responsive indeed—quite skittishly so in fact.

Now about that "gentle plummet". More years ago than I care to remember your editor was in a two-seater glider piloted by Platypus, and his angle of descent on approaching to land that day was also quite remarkable. It would be unfair to call our touch-down a "teeth-grinding crunch" but a somewhat bruised passenger did emerge from the slightly bent fuselage. It was *my* seat that was directly over the glider's wheel which took the full force of Platypus's vigorous landing on this occasion. I had been waiting a long time to take Platypus up. . . .

R.Q.B.

SHAGGY DART STORY

DUNEDIN, New Zealand, is sometimes called the Edinburgh of the south. After two years of living there I can vouch for the number of soft, Scottish accents which can be heard in the streets and the distinctly Scottish atmosphere which is encouraged by all its citizens.

However, there was a recent disturbance in this normally staid, quiet city. It was a severe case of "Rugby fever" brought about by a team of British evangelicalists called "The Lions".

It must be realised that in New Zealand, Rugby football is more a religion than Christianity (rather like that smaller one, gliding, is to the converted). A "test match" brings out the peak of religious frenzy, so much so that thousands of good, solid Dunedin citizens, their senses aflame, actually paid good money to attend the ceremony known as "the first test".

But in the canny Scots manner there were some who didn't quite reach this peak of frenzy. They made use of the various natural and man-made Scotsmans grandstands around the holy ground at Carisbrook—the railway embankment, road, hillsides.

But one can always count on glider pilots to be one up on others though, and sure enough, one of the instructors from the Otago club capped the lot.

With his transistor radio on his lap and his Dart 15 safely sitting on a smooth wave 4.000ft above the roaring populace, this pilot sat in restful comfort and watched the entire match. Think of it! Warm and comfortable, with no-one's head in the way and no-one threatening to knock your block off because you support the "other" team.

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UP OR DOWN THE LOW AND SLOW

By ANN WELCH

CREEPING towards us from the West is what might become a great extension of gliding—with more fun and flying for more people—or, alternatively, an inconsequential red herring. The inconsequence might be due to it not catching on at all, or as a result of a splitting of ranks into a them-and-us demo. I refer to the growing "Low and Slow" movement in America. The people who want to fly, but in a simple and personal way, without the expense and sophistication of gliding as most of us now take it—although we still tend not to leave it.

There are, at the moment, two distinct branches of "Low and Slow": The highly technical man-powered (pedal) flight projects, and the highly amateur hang-glider boys, or "Sky Surfers", as they call themselves. Although starting with different aims and methods, both sides have much to give the other.

We hear quite a bit about the man-powered flight experiments because accounts appear in scientific journals of 120ft span gliders weighing less than 50kg, all trying for the Kremer prize. We hear much less about the hang-glider revivalists because they are apt to go off and fly by themselves, and anyway they are virtually non-existent in this country—yet.

But they are flying regularly in the States, hill-soaring their sailwings, such as the Rogallo, and latter-day "Chanutes", with flights of over half-an-hour, carrying their gliders up the hill on one pair of shoulders, having meets and competitions, and even running their own magazine. The more enterprising of the "new designers" have sold no less than 5,500 sets of plans for home building, and one type can even be bought over the counter in sports goods stores. In France an ex-World Champion is building a hang-glider so that he and his family can enjoy flying together, out on an open hilltop, rather than leave them shut up in a retrieve car or waiting back at base.

It is not necessary to look far for reasons for the hang glider revival; to fly like the birds has always been one of man's dreams, and we have succeeded —but too well. Spacecraft, jet travel, instrument ratings, and even the exotic super-gliders have swept us literally off our feet, when what many of us wanted was just to float about in gentle mastery of the air. Now it has become a possibility again; a reaction reinforced with new materials. The early hang-gliders were crude, made without knowledge of aerodynamics, and of bamboo, porous fabric, non-waterproof glue, and natural-fibre string. Today more than 1,000 man-years of technology is available to the designer, and slim aluminium tubing, pop riveting, mylar and polyethelene sheet, expanded polystyrene, plywood and foam sandwich, polyester and epoxy are all readily available to the constructor.

The hang-gliders now flying are basically of two sorts, the rigid structure, with or without a tail, but with a conventional double surface wing of known section, and the sailwing. This simply has cloth stretched across the wing frame



The Rogallo Sailwing
The Soaring Society of America

in such a way that it takes up an aerofoil shape when airborne. One advantage is that the aircraft can be rolled up at the end of the day's flying and carried home.

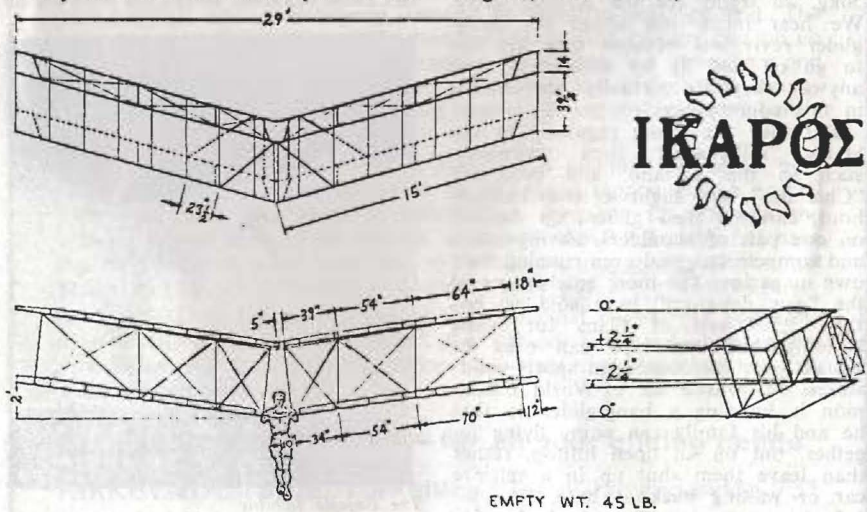
In the old hang-gliders of Lilienthal and Pelzner the pilot was literally doing just this, and very tired his arms must have been after even a straight descent from the hill; but again things have changed. On a trapeze, similar to those with which thousands of dinghy sailors are familiar, and which can be bought from any ship's chandler, it is now practicable to shift the body weight to control the wing more effectively as well as in greater comfort.

With the growing enthusiasm for hang-gliders that there already is in the States, rapid improvement in both design and performance can be expected. If flights of nearly an hour are possible now, it may not be long before slope soaring in cheap hang-gliders is common practice. Having run down the hill to take off means will be devised to "retract the undercarriage". Some hang gliders now have conventional control surfaces, some have special audio ASI's—and others, needless to say, have been aerotowed and car-launched.

So here we have it: The distinct possibility of a new movement just around the corner. A fresh way of flying which could range from one or two nut cases being watched with derision, to the other extreme of a doubling of motorless flight within five years. It might be either; it will be interesting to see. But we should not forget the early days of gliding in this country. It was generally not the flying club members who abandoned their Cirrus Moths for a bumpy toboggan ride in a broomstick Primary, but different people who for one reason or another had not been previously involved in aviation. Suddenly gliding appeared to be the answer to their hopes or ideas of flight. It was not, therefore, remarkable that gliding started here with some pretty funny ideas about aircraft and above all about how to fly them.

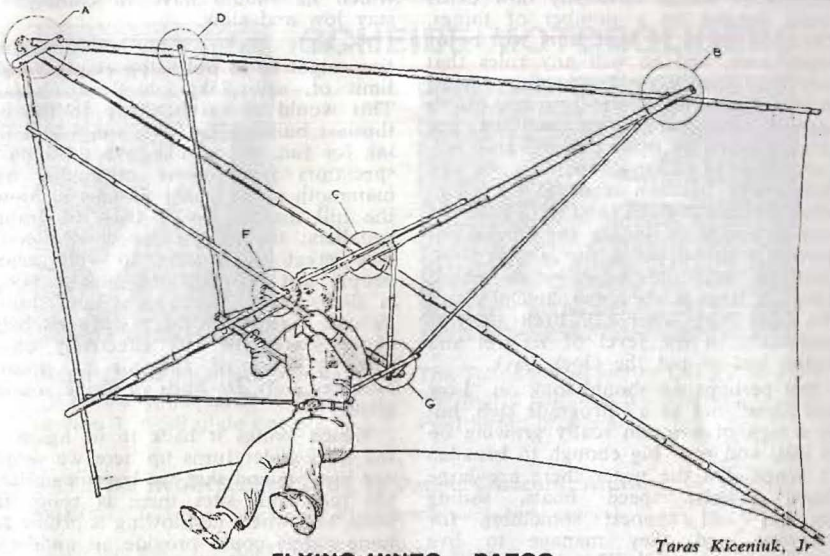
Today, in the States, it is new people who are the thrust behind the hang-glider movement, and even in that great continent of aviation many of the "new pilots" know little about flying. The hang-glider magazine is full of hints about how not to lose speed in a turn, and constantly warns "Don't fly higher than you're prepared to fall". There have been accidents and there will be more, but they are unlikely to deter the present impetus of "Low and Slow".

What will finally develop from the Rogallo, the Icarus, and from the



Icarus

"Low and Slow" magazine



Taras Kiceniuk, Jr

FLYING HINTS — BATSO

"Batso" has been flown at many locations. The best were moderately steep (slopes of 1 in 3) grassy hills that had a steady breeze of from 5 to 8kts blowing. To get off the ground we would hold the hang bars near the front of the cradle and run as fast as we could down the hill. When we got up to speed we would slide back slightly and rise into the air. The best flying speed was fairly fast. If one slid back, causing the craft to fly slower, the wing would mush and tend to come down faster. Others who have flown similar craft have warned against letting the nose get too low. When this happened to them, the sail would sometimes go slack and cause the craft to lose height quite fast. We have not noticed any problems of this kind that cannot be cured by sliding aft.

To turn "Batso" we would stick our feet to the side we wanted to turn to. The increased air drag seems as important as the weight shift. Note that the craft tends to tighten its turn because of dynamic effects. So we would stick our legs to the outside of the turn to keep it from tightening.

The craft can best be launched in slight cross-winds by pointing it exactly into the wind, then running "crab-wise" down the hill.

As "Batso" is about to land (pilot's feet are about three feet high) we would slide back in the cradle to raise the nose and slow the craft's descent. In this way very soft landings are made, if the pilot remembers to run at touchdown! It is important to be sensitive at all times to small changes in direction and attitude and to apply small corrections early rather than gross corrective effort later.

Good boots help save ankles from sprains or breaks.

Dimensions of "Batso" are based on a pilot weight of 150lbs. Each leading edge member is 16ft long, and the keel 23ft.

Making the sails too taut may improve the glide angle, but the craft becomes unstable. The same is true of keel length. Many Rogallo winged craft have been built with the keel length equal in length to the leading edges, but such a craft is not nearly so forgiving as it is with the longer keel.

enthusiasm which obviously now exists could depend on a number of things. The view taken by legislators will be of importance, and so will any rules that they may dream up in the States, and in other countries where "Low and Slow" appears. Another factor will be the attitude taken by other aviation interests, and that, of course, includes us. In Britain our aviation tends to be somewhat compartmented and it would be easy to spurn or ignore the simple enthusiast who arrives in our gliding orbit clutching rolls of polyethelene sheet, tubing, a trapeze and some sketchy plans. We have not, after all, built up our movement to the level of Kestrel and Sigma just to put the clock back.

But perhaps we should look on "Low and Slow" not as a retrograde step, but as a sign of aviation really growing up at last, and now big enough to broaden its scope. On the water there are large ships, yachts, speed boats, sailing dinghies and canoes; something for everyone and they manage to live together pretty well. This is, of course, the point at which some may take fright; the official mind's eye will quickly visualise the headlines: "Disaster. Sailwing ingested by RB211, 241 passengers, etc, etc", and the rule-makers will get to work. So, perhaps, they should; but not to stop this thing. Only to *safeguard* its genuine elements, and to prevent the fringes that any new movement attracts getting in the hair of commercial aviation. The "Low and Slowers" generally want only to implement their name, so let them work out their own salvation below 500ft—the low flying minimum for other aircraft.

There are, I think, only two other rules that might be useful. If the sailwings, hang-wings and man-powered pedalos are prohibited the use of aerotows, winches and other ground- or airborne infernal machines, they will stay simple. Flying them is likely to be no more hazardous than parachuting or white water canoeing—the choice of the individual concerned, but with negligible risk to rescuers. If, or when, someone builds a high performance sailwing and wants an aero-tow to go thermal soaring, then there is a perfectly sound existing framework of glider requirements with which he should have to comply—or stay low and slow.

The only other possibly helpful regulation might be to put a top empty weight limit of, say, 75kg on these aircraft. This would be no hardship to the enthusiast building his own wings and flying for fun, but would save third party spectators from some misguided and mammoth aerial yacht thundering down the hill manned by a team of frantic pedallers; the hang-glider revival could give great satisfaction to very many people just provided the lunatic fringe is discouraged. Any legislation should be such that it does not restrict but helps "Low and Slow" to effectively enjoy those regions of the air at present occupied only by birds or slope soaring gliders.

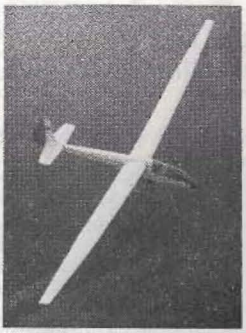
Which brings it back to us again. If the hang-glider turns up here we should not just pretend that we haven't noticed. On most hill sites there is room for both, and where aerotowing is prohibited hang-gliders could provide an invigorating element. If their owners are not already glider pilots, but people starting flying this way, with little more than their own enthusiasm, they will need help, and we can give it better than anyone else, If we ignore them and they have unnecessary accidents, any bad publicity is bound to reflect on our own type of gliding. Perhaps the "Low and Slow" movement will never catch on here. We are, after all, much less of a do-it-yourself aviation country than the States. But if it does, it will be because these people want something that we all once wanted and have now got—just to get airborne and fly.

To BRENNIG JAMES

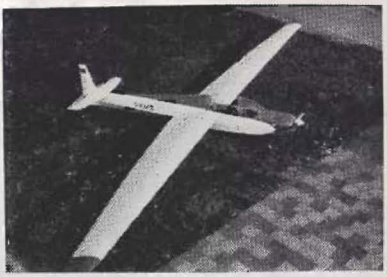
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COMPUTER CALCULATIONS OF GLIDER PERFORMANCE

By NICHOLAS GOODHART

DURING the last 10 years, a number of new wing sections have appeared, particularly those due to Wortmann and Eppler, which have been specially tailored to glider requirements. The result has been a great leap forward in glider performance. There is, however, another aspect of these airfoils which is a bit of a leap in the opposite direction. They simply don't conform to the nice straightforward performance calculations which are found in most books.

The nub of the problem lies in the calculation of wing profile drag. In the good old days, you simply found out the profile drag coefficient, and then at sea level—and for some reason one nearly always talks about sea level performance —profile drag was easily calculated from

$$D = \cdot 0012 \times SV^2C_D$$

where 'S' is the wing area in square feet, 'V' is the forward speed in ft/sec and 'C_D' the profile drag coefficient. This was quite reasonably accurate at all except the highest lift coefficients.

If one now examines the wind tunnel results for the new laminar sections, one finds that the profile drag coefficient varies widely, not only with lift coefficient (C_L), but also with Reynolds Number (R_E). No convenient mathematical way of coping with this variation presents itself, and yet the amount of variation (which can easily be more than a factor of 2) has far more effect on performance than any other component of the drag. Fortunately, the availability of computers has made it relatively easy to deal with complications of this sort by simply storing the wind tunnel results in the computer, and making the computer look up and interpolate between the appropriate drag coefficients for each performance point, having first calculated C_L and R_E.

The computer program we developed for Sigma does this process successfully (though it took some time to develop a satisfactory interpolation method) and makes possible detailed calculations of wing profile drag which would otherwise be intolerably tedious by manual methods.

THE SIGMA PROGRAM

The Sigma program determines the total drag of the glider (at each performance point) by calculating and adding together four separate drag components, ie, three more in addition to the wing profile drag mentioned above. The first of these is the induced drag which, unlike profile drag, is still amenable to mathematics, the induced drag coefficient being given by

$$C_{DI} = \frac{kC_L^2}{\pi A}$$

where 'A' is the aspect ratio and 'k' is a mystic factor which represents the degree to which the lift distribution across the span is not ideal. The ideal distribution is elliptical and implies an elliptical wing plan form, but this is rarely designed in practice, and the actual wing plan form will depart to some extent from the ideal. Also, there is a gap in the middle where the fuselage comes, which detracts considerably from perfection.

The next drag contribution we consider concerns the tail surfaces. Since their contribution is a relatively small part of the total, it is not necessary to go to the same trouble as with the wing in determining profile drag coefficients. Instead, a suitable drag coefficient is determined at a speed when the wing Reynolds Number is 1×10^6 and this is thereafter varied arbitrarily with change in wing R_E.

The final drag contribution is the very important fuselage plus miscellaneous drag addition. This is assumed to vary as 'V^2' and takes no account of R_E at all. It covers all leaks, slots, gaps, protuberances, imperfections, interference, etc, etc, as well as the actually wetted surface drag of the fuselage. It is simpler and makes comparison between gliders easier if this figure is not quoted as a drag

coefficient but simply as a drag figure at an arbitrary speed; we use drag at 100ft/sec which is normally written as D_{100}.

Using the Sigma program for performance calculations therefore involves the following items (in addition to the actual geometry and weight of the glider):

1) The availability of accurate wind tunnel data for the appropriate wing section covering the full C_L range and appropriate RE's;
2) The determination of a suitable value of 'k' to cover the degree to which the spanwise lift distribution is not ideal;
3) The selection of suitable profile drag coefficients for the tail surfaces;
4) The choice of a suitable D_{100} value for the fuselage and miscellaneous drag.

Obviously the program only works out the performance correctly if the values chosen for all these items really represent the values actually achieved in flight. The most difficult one is the miscellaneous drag item which can be as low as 2.5lb for a very well shaped fuselage on a beautifully built glider with practically no imperfections or interference drag, to as high as 10lb on a glider with a large fuselage wetted area, a non-retracting wheel and a good few leaks, slots, protuberances, etc, and perhaps some interference drag as well.

Having calculated the straight flight performance, the Sigma program then manipulates the figures to obtain the turning performance, and using this, it examines the cross-country performance in a range of 26 different thermals ranging from narrow to wide and strong to weak. Of course, this immediately poses the question which, if any, of these thermals are representative of the ordinary day-to-day thermals of actual cross-country flying. Our feeling is that a thermal with 4.6kts absolute vertical velocity at the centre and a radius of 600ft is representative of ordinary UK conditions, and we call this thermal the British Standard Thermal.

RESULTS

Table 1 shows a few selected performance points from a run on an imaginary glider having the following characteristics:

Span (m)	15
Aspect ratio	20
Wing area (ft^2)	121
Weight (lb)	650
Fuselage & misc. drag D100 (lb)	3.5
Wing Section	FX61-163
k	1.05
Horiz tail area (ft^2)	12.4
Vert tail area (ft^2)	9.3

By making the computer print out separately the various components of drag, it is immediately apparent which are the most important sources at different speeds.

Down near the stall, induced drag (col 5) is the most important, but leaving out the relatively small variations due to differing values of 'k', there is nothing you can do about it. Induced drag at any particular speed depends only on span loading, ie, pounds per foot of span. It has no direct connection with wing loading or aspect ratio. Thus for 15m gliders

TABLE 1

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Drag contributions in lbs						
Speed kts	*Sink kts*	*Glide ratio*	C_D x 1000	*ind*	*wing*	*tail*	*misc*	*total*	*Reynolds number*	C_L
*34.9	1.207	28.9	13.1	14.1	6.5	0.6	1.2	22.5	9.2 x 10^5	1.3
40.2	1.170	34.3	8.9	10.6	5.9	0.8	1.6	18.9	1.06 x 10^6	.98
45.0	1.245	36.2	7.8	8.5	6.5	1.0	2.0	18.0	1.19 x 10^6	.78
†49.7	1.363	36.5	7.2	6.9	7.3	1.1	2.5	17.8	1.31 x 10^6	.64
55.2	1.552	35.5	6.6	5.6	8.2	1.4	3.0	18.3	1.45 x 10^6	.52
62.9	1.926	32.6	6.1	4.3	9.9	1.7	3.9	19.9	1.66 x 10^6	.40
72.6	2.593	28.0	5.8	3.3	12.5	2.2	5.3	23.2	1.91 x 10^6	.30
84.8	3.791	22.4	5.6	2.4	16.6	2.9	7.2	29.1	2.24 x 10^6	.22
99.4	5.847	17.0	5.6	1.7	22.8	3.8	9.9	38.2	2.62 x 10^6	.16
114.8	8.778	13.1	5.6	1.3	30.3	5.0	13.2	49.7	3.03 x 10^6	.12

*Just above stall †approx max glide

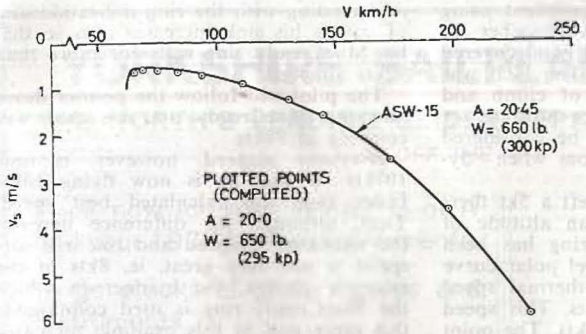


Figure 2—computed polar of imaginary glider compared with that of ASW-15

(or any fixed span) we come down to one variable only—weight. The immutable situation is that for a fixed span (and ignoring 'k' still) at any particular speed induced drag is fixed by the weight, and nothing else.

Turning now to cruising speeds, it will be seen that wing profile drag (col 6) is increasing rapidly in importance and has overtaken induced drag as the most important source of drag. It would have been an even higher contributor but for the fact that the wing profile drag coefficient (col 4—divide figures by 1,000 to get the actual coefficient) is decreasing rapidly as C_L (col 11) decreases and R_E (col 10) increases.

Finally, look at the high speed end of the performance. Here it will be noted that the wing profile drag coefficient has come down to its lowest value, but the wing is nevertheless making the major drag contribution. However, the contributions of tail (col 7) and miscellaneous (col 8) drag are also quite important while the induced drag has come down to a very low value.

Purely coincidentally, and after doing the run referred to above, it was noted that the characteristics of the imaginary glider were almost exactly those of the ASW-15. A comparison was therefore made between the maker's figures for the ASW-15 and the results of our computer run. This is shown in Fig 2 (there is no Fig 1).

ARE WE ALL FLYING TOO FAST?

By GEORGE BURTON

I am not trying to stop you getting into a flutter incident; my thoughts in the following article arose as a result of some flight testing I undertook on the Kestrel and could explain a phenomenon we all have experienced.

Imagine you are in a competition. You have read all the books and the word of Moffat is your gospel, so you are flying your triangle strictly to the book. You streak off at the top of each thermal flying your MacCready ring's every whim. John, whose Kestrel was with you in the last thermal, flies a good 10kts slower but lo! just after you have climbed 500ft in the next thermal, he comes wafting in 200ft above you. How does he do it?

In conducting the tests on the Kestrel, runs were done at constant indicated airspeed over height bands determined by the altimeter. Polar curves are normally presented as being applicable at sea level and hence the indicated airspeed had to be corrected for altitude. It occurred to me that the PZL variometer on which most "speed to fly" MacCready rings are used might itself have an altitude error.

I therefore set up an experiment using an instrument calibration chamber to check the PZL. The height band covered was sea level to 15,000ft. The PZL was found to read true rates of climb and descent, independent of the altitude!

This result should now be considered in relation to what one does when "flying the MacCready ring".

Imagine you have just left a 5kt thermal in a Kestrel 19 at an altitude of 5,000ft. The MacCready ring has been set at 5kts and the sea level polar curve calculations give an inter-thermal speed in non-thermic air of 92kts. This speed has a sea level sink of 3.5kts. The point to note is that these are "sea level" or true airspeed figures.

The PZL as determined experimentally reads "sea level" values of climb and sink regardless of altitude. Hence, as 3.5kts of sink is reached the vario will read 3.5kts and the MacCready ring speed indication opposite will be 92kts. The glider will be flying at 92kts *true airspeed* but the indicated speed will be only 84kts. Hence the pilot continues to increase speed in order to match his ASI reading with the ring indication and of course his sink increases also so that his MacCready ring calls for more than 92kts airspeed.

The pilot will follow the pointer down and the MacCready and his ASI will coincide at 98kts.

His *true aispeed*, however, is now 107kts so that he is now flying 15kts faster than the calculated best speed. Thus, although the difference between the indicated airspeed and the true airspeed is not very great, ie, 8kts in the example chosen, the manner in which the MacCready ring is used compounds this error and in this example increases it to 15kts.

The effect gets rapidly more severe as altitude goes up and I have chosen 5,000ft as being an altitude at which the difference between Indicated Airspeed and True Airspeed is not normally considered significant. I hate to think how much too fast I was flying at Marfa where flying altitudes were between 10 and 15,000ft ASL.

Since none of us fly at sea level, have we all been flying too fast?

PERFORMANCE, THE SAILPLANE AND SURF SOARING

By L. P. MOORE

DISILLUSIONMENT

THE performance of a very representative selection of the most advanced Open and Standard Class sailplanes in production in the world, most of them in glass fibre, has recently been scientifically evaluated in the USA. The results can be seen in the June 1970 and 1971 issues of our excellent contemporary, *Soaring*. Flown first against a carefully evaluated T-6 and then against one another, the tests revealed that the performance of the 16-17m Open Class machines was in fact no better than that claimed for the best Standard machines, while that of the latter came proportionately lower. All of which gives food for thought.

Thus, for example, the best optimum L/D amongst the Standard machines was that of the Cirrus at 35.2:1. The minimum rate of sink, however, suffered most and, more significantly, so did the speeds at which this occurred.

It is extremely difficult, if at all possible, to fault these evaluation tests, so thoroughly and objectively were they carried through. Nor is there the slightest reason to doubt the honesty of the "estimated" or "calculated" performance figures issued by designers and manufacturers. Thus I believe that we are bound to accept that there is something very amiss with the assumptions normally accepted for performance calculations.

One's first guess is that the wingroot/fuselage interference is a good deal worse than assumed, while the second is that

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laminar flow does not extend nearly so far aft of the wing chord and the fuselage as we imagine.

Maybe, therefore, we are spending a little too much money and weight on aft surface finishes and perhaps we should be thinking seriously about adjustable wing/fuselage incidence, at least in the Open Class (notwithstanding that performance flaps go a long way to achieving the same effect). The adjuster would not be simple to design but should not be more costly or heavier than a retractable wheel.

It is important that purchasers be given valid performance figures for the machine they wish to acquire and the present dilemma suggests that manufacturers should issue no figures other than those actually proved on test. However, tests requiring the weather and a hundred other things to coincide and persist can take months to complete and such delays in supply cannot be tolerated. Thus we may hesitate before claiming anything for "BG-135" (beyond being the best glider in the world) until she has been properly evaluated in flight.

PERFORMANCE FLAPS

The current discussion on the value of performance flaps is very relevant to the future of gliders. The secret of the efficiency of the later wing sections lies mostly in the change from straight wedge-shaped trailing edges, to curly "tails" over the hindmost 15% or so of chord. This curl is effectively a narrow-chord flap depressed about 8° to provide a significant increase in lift coefficient, without increase in profile drag—just as the ailerons of BG-135 do over that same range of depression. The highest possible lift coefficient is the foremost aim when seeking the best possible thermalling ability.

Conversely, the wedge-tailed section with its flap up is the equivalent of the reflexed trailing edge version of the basic section, having very low profile drag and making for improved penetration.

In either position, the deflected flap is not so purely effective as the smooth curly "tail" and what we really want is a flexible flap, such as has already been demonstrated.

It is true that a curly-tailed basic section having a higher lift coefficient (slightly) than its basic wedge-tailed rival is available, but I cannot see a case for flying a flapped section at its neutral zero-flap configuration, while the flap-up case of the latter will have the superior penetration. Where the flapped section stands best to score, in my view, is in its ability to align the wing's airflow with the axis of the fuselage for the two very different situations between low-speed nose-up and high-speed nose-down, imperfect as this effect may be, together with the relief of wing twist (and consequent distortion), provided by the flap-up at high speeds. It is quite practicable to combine a performance flap of this kind with a centre-chord, hinged, trailing-edge air brake and to integrate ailerons likewise.

THE SAILPLANE

The concept of the sailplane (S&G, December, 1971, p455) excited me when it first entered the sailing world years ago with its potential for the truly mini, self-launching glider. On getting down to earth with it, however, it soon became clear that it probably hadn't all that much to offer when one assumed the reality of having to persuade authority to give it a C of A and one's insurance broker to cover it.

In normal flight the centre of pressure would lie on the tail of the nose section but at higher speeds the wing torsion would be such that a very thick-skinned and heavy nose portion would be required to withstand the torque, while the creasing fabric would probably initiate a flutter. It seemed that in the end the wing would be as heavy as the conventional one and, if providing also for furling, a good deal heavier.

Nonetheless I do feel that a responsible pilot could waffle one of these around safely, from a hill launch, for a lifetime of pleasure, provided that he did so in fine lightish-wind conditions, never exceeded 50kts and didn't let Frank Irving know.

There is thus a similarity between the sailplane and the inflatable one. Yet I hope that someone with the time and money will one day take both seriously, especially for manpowered flight.

THE FLIGHT OF THE ALBATROSS—SURF SOARING

Chris Hughes' article, Surf Soaring, in the same issue of S&G, interested me greatly. I hold the same views about sea or surf soaring as he and I recently had to talk on this to our local Ornithological Club.

In no-wind and light-wind conditions, great swells, extending vast distances, may be triggered and maintained by most distant disturbances, their orientation and direction of movement being governed by their source. At other times, a local rising wind will reach a point where it takes over from swell or flat, to form waves transverse to it, moving before it, while at other times there may be complex combinations of both influences. And in tropical seas where consistent weather conditions prevail for whole seasons, the birds evidently know just where they can select the right course to give them, overall, the track they desire.

I can testify to seeing these migrants soaring waves in both no-wind and windy conditions but always when either swell or wave prevails and doing so on the one face or the other according to the wind. This year I watched oyster catchers flying (flapping) north to south along the windward side of waves, in a strong westerly wind. This may have been solely for gradient shelter or for protection from lee spray from the upwind wave but, judging by their impressive speed, I concluded that they were availing themselves of the uptrend on the windward side of waves, as one has seen the migrant soarers doing in similar conditions.

There is, however, another aspect of surf soaring which I believe to be of the greatest importance to migrant soarers, namely that of ground-effect. Quite apart from the use of the wind gradient for upwind flying, by flying at nearly sea level (or indeed ground level), within a distance of about half a wing span, the bird's induced drag can be appreciably decreased.

Nonetheless I do believe that the upwind turns of the albatross signify an element of true dynamic soaring, if only because of the feasibility and the prevalence of this practice.

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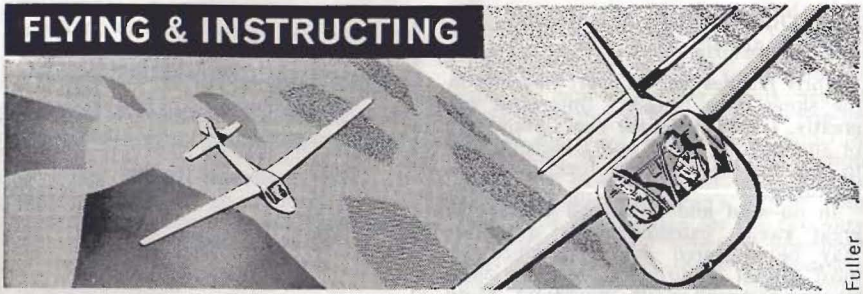
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ACCIDENT ANALYSIS

By W. G. SCULL

IT has become increasingly clear to me that however much we talk or write, we still remain highly unsuccessful when it comes to the subject of accident prevention. In part, the reason is that any analysis made is rarely done in sufficient depth and thus fails to pinpoint the real cause. Even when all the relevant factors have been determined, we may still fail in the task of communicating this information because we only, at best, write it down. The trouble is that, in writing it down, we will only communicate successfully with those who have, in fact, made their own satisfactory analysis.

The real need lies in communicating with those individuals, or clubs, that fail to realise that the accident has happened because of something that they have done or failed to do. Here, I fear, the accident investigator must point the finger and say the instruction or the supervision was inadequate. What then is required is a major change in our attitudes; yours, mine, those of all of us if we are to bring about any improvement.

The sequence under the existing system is: accident, report, analysis and recommendations to avoid a recurrence. It is the recommendations to avoid a recurrence which, perhaps, needs a close examination. Take the accident to Roy Cross in his SHK. Roy had the courage and honesty to make his own very thorough analysis and report it (S&G August 1971, p303). By any standards, Roy is an experienced pilot, and although in practice at aerotowing, soaring and cross-country flying, was caught out by a lack of recent practice at auto-towing and, especially, failed launches. Now, as a preventative measure either we rely on every individual to be aware of his own shortcomings, or instructors must remind pilots of these. Quite possibly if an instructor had said to Roy "thinking about cable breaks, are you?" the accident might have been avoided.

Many accidents are not so easily analysed, and the conclusions reached may not be entirely conducive to illustrating the nature of the problems involved. I propose here to analyse an accident.

AN ACCIDENT IN DEPTH

Flight: third solo taking place at about the time convection started, ie, two previous flights in undisturbed air. The pilot was of mature years and came to the point of solo after two consecutive five-day courses plus a couple of days. The majority of his flying had taken place in one wind direction. On the third solo circuit, he had come to the point where he had turned on to the base leg on the previous occasions and again turned on to base leg. He realised that he was too low and did the right thing by turning immediately towards the landing area.

He arrived at a point just inside the airfield boundary and then, instead of keeping a straight approach so as to land immediately behind the gliders wait-

ing for take-off, he turned again, so as to land in the direction of take-off. While making the turn, he opened the airbrakes. The glider's wingtip touched the ground first, it cartwheeled and was extensively damaged. Now let's analyse that.

(1) If the airbrakes had not been opened the turn would almost certainly have been successful. Why did he open the airbrakes? Because, probably, on all the landings he had made, he had done so—the "going in to land lever" syndrome (see S&G December, p484). That is, he was not using the control as an approach aid so much as a going in to land lever and just opening it a predetermined amount. Had he been taught approach control (aiming point technique)? Maybe, but almost certainly he had never attempted an approach in which the airbrakes were left closed.

(2) A successful landing could equally well have been achieved by continuing a straight approach from the base leg corner and landing at an angle across the landing area. Here the pilot was trapped by another habit, that of landing parallel to the take-off direction. Although the instructors training him may themselves have considered landing in any direction they had not, certainly, managed to put the appropriate considerations into the student's mind from the theoretical point of view. This in itself would have been insufficient safeguard unless reinforced in the student's mind by his actually landing in various directions.

(3) This circuit was almost identical to the previous circuits in its track over the ground, but not so in its height. The pilot was late in recognising how short of height he had become but having recognised it he took the correct action of turning towards the landing area. His late reaction can be attributed to different causes.

One is that he had never seen this sort of situation before.

Another is that in many similar circuits he had started to use secondary reference points (the primary one being the landing area). He may then have referred less and less to the primary, ultimately to use only the secondaries. The only way in which his instructor would have determined this would have been by flying left and right hand circuits for the same approach and if he had doubts by having the student make an approach to a different landing area altogether to determine use of the primary reference only.

The accident occurred not because of a single fault, but because of a series of faults, one compounding the other, and although the student pilot's circuits had exhibited a fair degree of uniformity prior to solo, circumstances quickly arose which produced an accident. The gaps in this pilot's judgment probably would have been found by putting him into a stressed situation prior to solo.

Several criticisms can be made of the instruction that this pilot received. The instructor was probably unaware of what he was failing to teach insofar as the student was making quite consistent circuits. The overall comment that can be made is that the accident occurred not as a result of what the instructor was failing to teach, but rather as a result of what he was "not teaching". It occurred because the things that the pupil picked up subconsciously like always landing parallel to take-off,

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always opening airbrakes and always making a lower than usual final turn when short of height.

Add to these factors the psychological ones such as the fact that the final turn will never appear as low to the pilot making it as it actually is. This is a built-in defence mechanism.

Incidentally, it will almost always look slightly worse to the observer than it actually is.

SUMMARY

(1) *Late correction to the circuit.* Poor judgment due to over-concentration on secondary references arising perhaps from too many similar circuits. Had the pilot been made aware of the considerations for sinking air, ie, speed increase and circuit adjustment and awareness of vario readings?

(2) *Unawareness of final turn criteria.* That is, that irrespective of position, the final turn must be completed at a safe height. Had he in the basic training been allowed to "stretch" the circuit when short of height, implying that this is a recommended procedure?

(3) *Wrong use of airbrakes.* Had he really been taught approach control judgment (aiming point technique)? Evidently the possibility of landing with airbrakes closed (if in his mind, an idea not related to real practice) was not strong enough to offset the habit of opening them.

(4) *Landing parallel to take-off.* An unconscious build-up in the student's mind which could only be broken by a number of landings in different directions.

That accident may have been passed off as "pilot error" but really most of the blame lies with the instructors—even, to some extent, with the instructor who taught the instructor in question to instruct; me in the case of one of them.

If it is agreed that we must avoid being superficial in our analysis, let's try to make a general analysis of a class of accidents.

STALLING AND SPINNING

There are so many factors here that we must confine our examination to a few primary ones.

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Consider the normal course of events in a pilot's training. The first exercise is effect of controls. He learns their effect and how to co-ordinate them. Somewhere during training the exercise "stalling" is undertaken. The pilot is taught to recognise the symptoms and how to recover, but—and it is a big but—can the limited amount of stall recovery practice hope to achieve the *correct* instinctive reaction?

The *incorrect* instinctive reaction is to try to raise the nose by moving the stick back. Now, in a calm and ordered stall practice when the pilot knows what to expect the correct recovery will be made. However, in the real situation where the pilot may be stressed, he will revert to the instinctive reaction which is to try to raise the nose.

In the course of his training the pilot will have been "programmed" to respond to the following sequence: Nose high—airspeed reducing—noise changing—controls less effective—buffeting—nose dropping (in spite of the stick being held back). And the recovery: Ease stick forward—regain flying speed—return to normal attitude.

In the real, inadvertent situation (trying to stretch a circuit or a soaring flight and in the latter case being concerned only with variometer and the time) he fails to notice the various symptoms for which he has been programmed and therefore fails to react correctly. He sits there trying to raise the nose, possibly compounding the error by trying to pick up a wing as well. What the instructor must try to do is convince each student pilot that it could happen to him.

ON FEAR

When a pilot is frightened his ability to think is impaired. It is already impaired in the flying situation by the unnatural environment. A pilot who is frightened may fail to take any action at all. It does not even require fear for this to happen—haste may be sufficient. Here is an example which has nothing to do with flying.

I re-hung a door at home a while ago so that it opened in the opposite direction. Now, as long as I go through the door in an ordered way I'll open it correctly. However, going through in haste, presumably thinking about something beyond, I'll try to open it in the way that it used to open—that is, reverting to a long-established pattern when acting in a hurry.

So training in stalling and recovery has to fight against instinctive and deep-rooted responses of the conventional use of controls and if you relate the amount of time spent on the exercise (say at best 20-30 minutes over a period of several months) to the amount of total flying experience, then the nature of the problem becomes more obvious.

The only thing which can hope to combat these problems is continuous practice of the exercise—not just during dual training but in solo flying as well. The further protection lies in making a pilot believe that it *can* happen to him.

Analysis in depth of accidents usually shows up deficiencies in either basic instruction or supervision, and although this may be very embarrassing, we owe it to the people we teach not to make the same mistakes twice. Very few accidents are without some message. Properly analysed, the message should be loud and clear.

GUST-INDUCED SPEED LOSSES IN TURNS

By J. C. GIBSON

AS A result of a stalling incident which occurred to an aircraft in a turn, in circumstances where a stall could not reasonably have been expected, W. J. G. Pinsker of the Royal Aircraft Establishment at Bedford developed a theory of the effects of turbulence in turning flight with surprising conclusions (ref 1). Gliders are not specifically mentioned but they operate in conditions which closely resemble those particularly affected by the theory. The consequences of this should be of the greatest concern to all glider pilots.

Common experience shows that horizontal gusts produce fluctuations in airspeed which tend to average to zero, so that the mean airspeed is little affected, provided that the pilot maintains the correct attitude and does not chase the ASI. This can be supported by simple theory assuming that the drag is not substantially altered by the gust, which is approximately true near the minimum drag speed where gliders frequently operate, and that the pilot makes no "thrust" changes to control the airspeed, ie, that he keeps the attitude constant in the usual way, and that the heading remains constant.

In turning flight, the same piloting technique is taught, and experience shows that this usually produces the desired result of a constant average airspeed. Most turning is of course carried out in thermals, where the mixture of vertical and horizontal gusts makes it much harder to contain the airspeed variations to the same limits as in straight flight. Even so, "airspeed chasing" is treated

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as a fault in turns just as in straight flight, and pupils are taught to pay major attention to their attitude. Pinsker's theory shows that in certain circumstances this concept can be a dangerous illusion. He concludes that aircraft can experience losses or gains in airspeed when performing turns in the presence of horizontal gusts, which persist when the turbulence ceases and which can be substantially larger than the gust speeds responsible for their generation. The larger the heading change, the larger is the possible final speed deficiency.

Using a very simple model of the gust structure, it is possible to make exact calculations from which the general inferences can be drawn. For example, a glider flying at 45kts in a 30° banked turn through 180° heading change, in a sinusoidal windspeed variation of plus and minus 5kts with a wavelength of 1,200ft, would have a one in ten chance of losing 19kts during the turn. There would be a one in five chance of losing at least 10kts and a two in five chance of losing at least 4kts. This gust model, which actually assumes that gusts are occurring simultaneously in two directions, eg, north and east, with the worst possible phasing, is not very like an actual atmospheric structure. Because of its random nature, statistical methods have to be used which do not lend themselves to easy handling of the problem, but they show that the real atmosphere does indeed produce the effects described.

The importance of these results is obviously of most concern near the ground, ie, below about 600ft or so where horizontal turbulence is greater, where turns are most often associated with circuit planning rather than with thermal soaring, and where the effect of wind gradient is an added hazard. The theory adds two special considerations to the normal rules for keeping alive:

(1) Make each turn through as small an angle as possible by planning to avoid 180° turns. This is of course a feature of the "square circuit", but many occasions arise where a 180 is used: To join the downwind leg after a cable break which then leads to a second 180 to turn into wind to land; or misjudgment leading to a too-close downwind leg leaving no room for a distinct base leg.

(2) In any turn at low altitude, monitor the airspeed closely (not exclusively, of course!) and be prepared to take *drastic* action to maintain it. Attitude reference is not enough even above the wind gradient height. As only a steep dive will regain airspeed quickly after a large speed loss, final turns in turbulent conditions should be made with two cumulative height allowances, one for a possible wind gradient as usual and another for a possible speed loss due to turning in turbulence. A precautionary speed increase somewhat earlier than usual seems advisable also.

About a year-and-a-half-ago I experienced an out-landing which made no sense to me at the time. Only after reading Mr Pinsker's report a year later did a credible explanation seem possible, as the theory, convincing enough in itself, fitted the sequence of events perfectly. I was over a slight rise to the side of the airfield near the downwind end, noted for reduced sink on many occasions and with no features which could cause a curl-over or heavy sink. The wind was moderate with patches of turbulence,

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with mediocre thermal soaring conditions. I turned downwind to join the circuit and became aware of apparently very heavy sink where none had existed seconds before. The rate of descent was so great that it was clear I would not reach the airfield if it continued, and I decided to complete a 360° turn and land in the fields below. The sink continued unabated and I completed the turn about 50ft above the ground suitably placed to land in a rather small field.

In the course of a single turn lasting some 20-25 seconds, I had lost about 400ft, an average sink of about 1,000ft per minute (a calculation supported by an impression that the ground had taken off and was climbing like a rocket!). Instead of being at the start of the final leg at a comfortable 300ft, I was being inspected by cows. I have experienced sink of over 600ft per minute below 1,000ft before in the general area, but it always eased off to near normal in the last few hundred feet, and there was never any difficulty in maintaining increased speed for maximum ground distance while scurrying back in straight flight. After this incident, however, an indelible impression remained through my general fog of disbelief about the whole thing: that it had been extremely difficult to maintain normal flying speed and impossible to raise it to a respectable approach speed. It is obvious that the sink could have been the result of the diving turn necessary to make good a severe speed loss.

By coincidence, on the same day a pilot on an evening hangar flight turned downwind over the airfield at 700ft and found himself sinking like a stone, in his words. For a while he thought it possible that he would not be able to complete a 360 before arriving on the ground, and he also found great difficulty in getting his speed back to normal even by diving steeply. He actually completed the turn at 300ft, where things returned to normal. He too had found no sink until he turned. Neither case can be explained as a too-slow turn, because without actually spinning the rate of descent would not have been much higher than normal, and neither case involved even so much as an incipient spin or wing-drop.

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I now believe that at least some of the approach stalling/spinning accidents are the result of this phenomenon. An insidious but possibly rapid loss of speed due entirely to the random interaction of an unknown wind structure and perfectly normal turning manoeuvres is most likely to pass unnoticed until too late in this most critical phase of the flight, when the pilot may be stretched to the limit of his judgment. If he does notice he may turn his concentration to regaining speed to the exclusion of the rest. Either way, the resulting accident will simply look like pilot's error. Training to avoid such accidents obviously cannot include demonstration, and because of the low probability of a really large speed loss most pilots who do experience the phenomenon may not realise what has happened, a few knots being neither here nor there in turbulence.

It is no new discovery for glider pilots that wind effects at low altitude can be dangerous, wind gradients and "clutching hand" curl-overs being old enemies. I hope that this brief exposition of Pinsker's theory of gust-induced speed losses in turns will at least persuade inveterate low-turners that they take their life in their hands, and that some way can be found in future training methods to take account of it.

I gratefully acknowledge the interest shown in this article by Mr Pinsker and the suggestion by him for a modification to the text, which I have used.

REFERENCE R & M No. 3672, "Possible losses in airspeed during turning manoeuvres," by W. J. G. Pinsker and J. G. Jones.

PREFERRED DIRECTION OF CIRCLING IN THERMALS

By O. M. BILANIUK

INTRODUCTION

GLIDER pilots are generally quite concerned about centering their turns in the core of a thermal. At the same time, no particular importance is attached to the direction of circling in thermals and in most instances it is simply a matter of chance. To be sure, the direction of thermalling is often determined when more than one glider circles in the same thermal, but this is done for reasons of safety rather than to optimize climb rate.

It is only recently that a possible relation between the direction of circling in a thermal and the climb rate has become a subject of discussion among soaring pilots. A frequent conclusion emerging from such discussions is that in the northern hemisphere it is preferable to circle in the clockwise direction (see 'Thermalling Clockwise—Wise or Otherwise' by D. W. McKay, *Soaring*, January 1971, p 4).

This problem is analysed below in some detail. It is concluded that better climb rates result when circling in a direction opposite to the circulation of the air mass of the thermal, but that this direction need not necessarily be clockwise.

CIRCULATION IN THERMALS

It is a well established fact that in the northern hemisphere anticlockwise circulation of air develops about areas of low barometric pressure. This circumstance is often taken to imply that circulation of air in thermals must also be anticlockwise in our hemisphere. It is argued that thermals have all the earmarks of barometric lows, with air rushing over the surface of the earth to fill the space vacated by the updraught. In the northern hemisphere such horizontal motions undergo a deflection to the right by the Coriolis force. This leads to an anticlockwise circulation of air about a low.

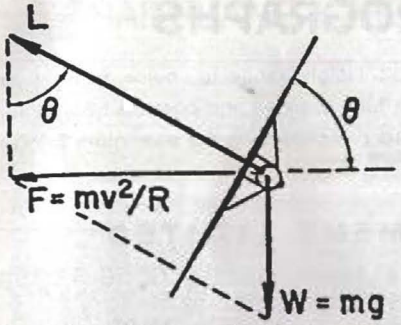
In actuality, the extrapolation from the case of circulation in a large scale low to that of a local low in a thermal turns out not to be justified. The rule about anticlockwise air circulation in cyclones (lows) holds only for large scale systems where the influence of terrain and effects of local non-uniform heating may be neglected. Although thermals are triggered by local lows, their circulation is determined by local factors such as the direction of rotation of a turbulence vortex at the instant of thermal triggering.

James G. Edinger, meteorologist with the University of California at Los Angeles, has made an extensive experimental study of thermals in the Mojave Desert using a light power plane loaded with appropriate instrumentation. A popular account of how he collected and processed over a million pieces of temperature and vertical velocity data may be found in his excellent paperback *Watching for the Wind* (Doubleday, Garden City, New York, 1967). He found no systematic preference for either clockwise or anticlockwise rotation in thermals; it is not even certain that all thermals are necessarily characterised by a twisting motion. The problem of the dynamics of thermals is still an open one: an excellent topic for further investigation using the sailplane as a research tool.

THERMALLING

The question concerning the preferred thermalling direction may be answered independently of the above considerations. Assume that you have somehow determined the direction of air circulation in your particular thermal. The question to be decided now is: do you thermal *with* the circulation of the thermal, or *against* it?

Before answering this question, let us review the physics of a co-ordinated level turn of radius 'R', in still air. In such a turn a horizontal force 'F' (the centri-



The diagram of forces acting on an aircraft in a co-ordinated turn

petal force) acts at right angles to the glider's velocity 'v', changing the direction of that velocity at a constant rate $a = \frac{v^2}{R}$ (centripetal acceleration) such that

$$F = \frac{mv^2}{R} \qquad (1)$$

where 'm' is the mass of the aircraft. The force 'F' is supplied by the component of lift 'L' directed towards the centre of the turn. As may be seen from the figure, for a bank of 'θ' degrees that force may be expressed as

$$F = L \sin\theta \qquad (2)$$

In a level turn (actually in any turn with constant rate of altitude change) the vertical component of the lift is equal to the weight of the aircraft,

$$W = L\cos\theta \qquad (3)$$

Weight is equal to mass 'm' times gravity 'g', so that we also have

$$W = mg \qquad (4)$$

Dividing equation (2) by equation (3), we obtain

$$\frac{F}{W} = \tan\theta \qquad (5)$$

Substituting expressions (1) and (4) for 'F' and 'W' in (5), we end up with

$$\frac{v^2}{gR} = \tan\theta \qquad (6a)$$

or

$$R = \frac{v^2}{g\tan\theta} \qquad (6b)$$

This last expression clearly shows that for a fixed bank 'θ', the radius of a turn increases as the square of the velocity.

Our next step is to assume that the aircraft is executing its turn in a concentrically circulating air mass. Now we must differentiate between the aircraft's *air* speed and its *ground* speed. Because our reference frame for the turn is the ground it is important to realize that the velocity in equations (1) and (6) above must be the *ground* speed. By contrast, the lift 'L' is determined by the *air* speed and not by the *ground* speed. That is why we take-off and land into wind; we attain sufficient air speed to be airborne at a lower value of ground speed.

Now we are ready to take up the case of circling in a circulating air mass. To consider one factor at a time, assume that all turning is done at *constant bank* (say, 60° for a load factor of 2), therefore also at constant air speed. Circling with the air mass leads to increased ground speed, hence results in a larger radius of turn according to equation (6b). On the other hand, turning in a direction opposite to the circulation of the air mass reduces the ground speed and results in a tighter radius of turn for the same value of bank. Equation (6b) also shows that increasing the bank will reduce the radius 'R' in each case. Therefore, for any given bank, circling in a direction opposite to the circulation of the thermal will definitely lead to a tighter spiral and will place the sailplane closer to the thermal's fastest ascending central core.

One final consideration may be in order: what about the rate of turning? All turns are executed with respect to the ground, whether by direct visual reference, or via reference to gyroscopic instruments. Thus the rate of turning ω (angular velocity) is related to the *ground* speed 'v' of the glider. The relationship (found in any elementary physics text) is

$$\omega = \frac{v}{R} \qquad (7)$$

Combining equation (7) with equation (6b) we get

$$\omega = \frac{g\tan\theta}{v} \qquad (8)$$

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which shows that if the ground speed decreases, as in our case, the rate of turning of the glider will actually increase. At first glance this conclusion may seem to be contrary to equation (7) where ω is seen to be proportional to 'v'. We must not forget, however, that according to equation (6b) the radius 'R' is directly proportional to 'v^2' so that, as a result, the angular velocity ω is in fact *inversely* proportional to the ground speed 'v'.

CONCLUSION

Can any practical conclusions be drawn from the above considerations? I believe so. If in an attempt at centering in a thermal you find yourself flying circles of a diameter which appears to be too large even if you hold a very steep bank (and it takes you entirely too long to complete a 360° turn), this is probably due to your circling *with* the air mass of the thermal. Reversing the direction of circling should result in a higher rate of turning and in a much tighter spiral. In a typical thermal with a narrow central vortex column of strongest lift this should also permit a considerably higher climb rate to be achieved.

O. M. Bilaniuk, PhD. is Professor of Physics at Swarthmore College, Pennsylvania, USA.

GLIDING CERTIFICATES

ALL THREE DIAMONDS

No	*Name*	*Club*	*1971*
21	S. A. White	Airways	28.4
22	P. D. Lane	Two Rivers	6.11

DIAMOND DISTANCE

No	*Name*	*Club*	*1971*
1/39	S. A. White	Airways	28.4
1/40	G. E. Burton	Imperial College	20.7

DIAMOND HEIGHT

No	*Name*	*Club*	*1971*
3/134	P. D. Lane	Two Rivers	6.11
3/135	R. P. Beck	Clevelands	11.12

DIAMOND GOAL

No	*Name*	*Club*	*1971*
2/408	B. M. Shadbolt	Canada	26.7
2/409	M. P. Seth-Smith	Army	17.7
2/410	R. C. Chesters	London	12.9
2/411	B. W. Davies	Surrey/Hants	13.7
2/412	R. A. Cashmore	Bicester	18.7

GOLD C COMPLETE

No	*Name*	*Club*	*1971*
313	M. P. Seth-Smith	Army	17.7
314	J. R. Monteith	Bicester	13.11

GOLD C HEIGHT

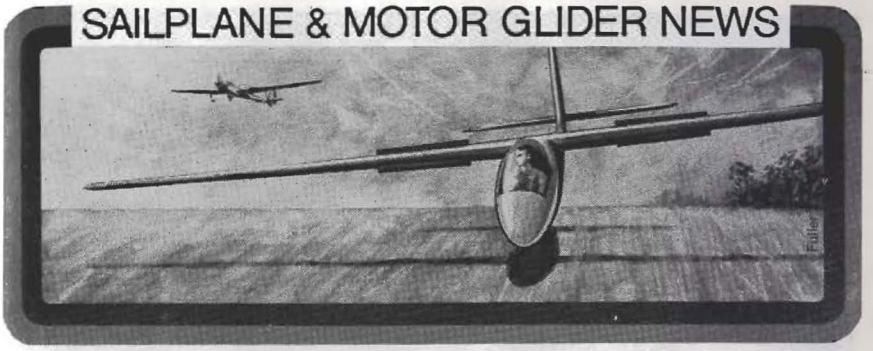
Name	*Club*	*1971*
G. M. Chinn	Four Counties	23.10
R. A. Wood	SGU	6.11
N. Meiklejohn	SGU	6.11
J. R. Monteith	Bicester	13.11
M. Edwards	Four Counties	25.7
D. W. Seed	Blackpool	3.7
P. G. Cook	Southern Command	4.7
M. J. Wood	SGU	10.12
R. W. A. Miller	Central GS	22.11

GOLD C DISTANCE

Name	*Club*	*1971*
B. M. Shadbolt	Canada	26.7
M. P. Seth-Smith	Army	17.7
R. C. Chesters	London	12.9
B. W. Davies	Surrey/Hants	13.7
R. A. Cashmore	Bicester	18.7

SILVER C

No	*Name*	*Club*	*1971*
3075	P. L. Cyster	Surrey/Hants	22.10
3076	R. E. Wingrove	Four Counties	11.9
3077	J. L. Simpson	Phoenix	17.6
3078	D. J. Carey	Crusaders	21.10
3079	G. Wilson	Trent Valley	5.9
3080	I. N. Busby	Airways	9.9
3081	M. J. Apps	Bristol	9.11
3082	T. J. Harmer	Transvaal	28.8
3083	E. J. Gunner	Airways	13.11
3084	M. B. West	Surrey/Hants	12.9
3085	K. G. Carvosso	Dorset	31.10
3086	T. A. F. Drake	Clevelands	5.12
3087	B. T. Spreckley	Lincoln	11.9
3088	T. H. Groome	Dorset	12.9
3089	R. G. Wilkinson	Airways	6.9
3090	B. Backhouse	Eagle	4.11
3091	W. H. Wintrip	Hambletons	11.12



THE SIGMA SAGA—Part 2

By FRANK IRVING

AS Ann Welch indicated in her post-script to the first report, Sigma's flaps had been retracted and extended in flight when the last issue of S&G appeared. Pilotingwise, flap retraction is straightforward but dramatic, since a marked nose-up rotation is required to keep the speed within reasonable bounds. Flaps-out, the attitude is rather Dart-like; flaps-in at 60kts, the horizon is somewhere around one's shoe laces. This, of course, is a very low speed in this configuration, since it stalls at about 50kts. The stall itself is very like the flaps-out stall—totally innocuous.

The first few flap retractions produced a cockpit noise-level around the threshold of pain, apparently because the lower-surface flexible flap fairings had taken a permanent set and were flailing about in the airstream without touching the flaps. They have since been temporarily bodged so as to stay in contact with the flaps and we now have a reasonably quiet cockpit, to the extent that it is difficult to judge the speed from either the noise or the attitude.

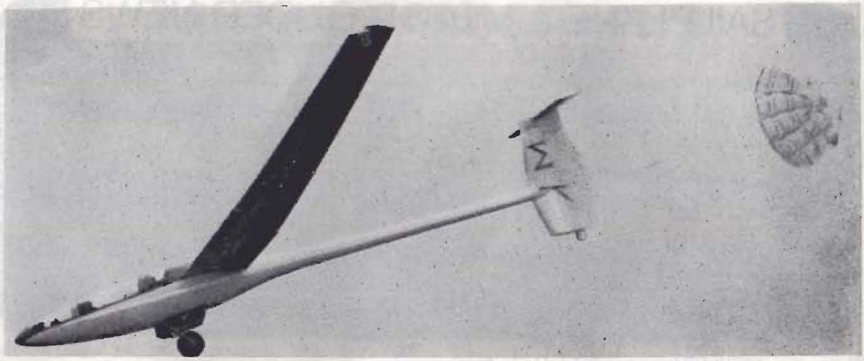
The temporary flap-fairing bodge has some rather tedious consequences. The friction between the fairings and the flaps is pretty high so we are having to use rather higher hydraulic pressures than intended. The pumping process (both feet together on the rudder pedals) requires correspondingly large forces, with the pilot restraint provided by his head pressing firmly against the canopy.

This is a by-product of our clever harness system, consisting of two separate straps, one across what is termed the lower abdomen in polite circles, the other running below the pilot's armpits and across his chest. This was evolved after much consultation with the Institute of Aviation Medicine and Irvin's, having noted that the conventional harness provides little constraint in the sliding-forwards sense to a recumbent pilot. So, given a rapid stoppage, the pilot is likely to do himself a mischief on the stick.

The under-arm strap is intended to discourage such a dire effect but, in the absence of shoulder straps, provides rather less restraint in the backwards sense. So, when pumping hard, the pilot tends to slide backwards and upwards, beating his pate on the perspex the while. Alternative arrangements are being considered, because the canopy isn't designed to deal with such loads and to alleviate the embarrassment of one pilot, who finds that pumping causes his trousers to slide down.

At the same time, a revised flap fairing is being contemplated to reduce the friction and hence the operating pressures. In fact, the pumping process isn't quite as awful as it sounds and there is no particular problem in maintaining a steady speed and course whilst pumping.

Flap extension seems to be a smoother



Sigma coming in to land *Photo: Ann Welch*

and more gradual process than retraction: the pilot simply has to depress the nose quite a long way to keep the speed up. The stick forces involved in the transitions are quite small.

The maximum speed attained so far is 105kts, mainly limited by lingering doubt about the rudder-flutter situation. Initial calculations on hydraulic dampers were rather too optimistic and it now seems that to eliminate the mass-balance completely would require a damper of such stiffness that full rudder would only be available next week. Moreover, it seems that more than 100% mass-balance is really required to ensure complete freedom from flutter. The other possibility is to use an irreversible drive from the pedals to the rudder, a matter which seems to involve equal proportions of witchcraft and engineering.

In general, the flying has been singularly free from drama, except when the undercarriage failed to come down. After a slightly agitated radio conversation, a brisk swoop was executed at a rather unseemly altitude which succeeded in shaking it down. Applying a straight-edge to a side elevation of the fuselage will explain the pilot's immense relief when the warning buzzer finally stopped. This was traced to a maladjustment of the door operating link, now rectified. The failure rate of the tail parachute is still rather high, which explains some curious arrivals in odd corners of Lasham. Obviously, this has to be sorted out.

BGA No 1 Flight Test Group has now recruited Chris Garton, Lasham's master tug-pilot, to help with the testing, and Peter Bisgood of RAE Bedford has also flown it, on one of the few clear days in December. With the help of Harold Drew's new wing-tip prop, rigging is less of a trial of strength than heretofore, but volunteers to help with the outer wing panels are always welcome.

So, while we still have our little problems and testing is temporarily in abeyance to enable some mods to be incorporated, we also have our little triumphs. Basically, most of it works quite well.

TWIN-ENGINED MOTOR GLIDER

THE Espe 37T, a new tandem two-seater motor glider fitted with two Hirth F10 engines, flew for the first time during summer 1971. It was designed by Peter Kürten and built at the workshops of pioneer Gottlob Espenlaub at Wuppertal.

It is of wood/steel tube construction and the engines are situated near the wingroot on either side of the fuselage. It has two outriggers and a nose wheel, which are retractable, and a fixed undercarriage. Profile is laminar and landing flaps are a feature. The weight of the machine lies at the maximum permissible for motor gliders (*Luftsport*, November 1971).

TECHNICAL DATA

Span (m)	16.8
Empty weight (kg)	500
Payload (kg)	200
Cruising speed (km/h)	175
Climb rate at 110km/h (m/sec)	5
Glide ratio at 110/120km/h	28

The American glass-fibre C-70, built by Arthur Zimmerman and Wolfgang Schaer, flew for the first time late last year



DO-IT-YOURSELF MOTOR GLIDER

THE Rebell, a single-seater motor glider with a "guest seat" (presumably a second seat but without controls) is being built by its designer, Gerhard Blessing of Germany.

It is designed for easy home-building and the construction is of steel tube covered with wood. Since no part is longer than 3.5m, it can be built in an empty room or garage.

The wing can be built in three different ways: (1) in four parts, each part 3.15m long; (2) in three parts (centre-section and two tips); (3) in two parts, for quick rigging if one uses a trailer.

Many of the parts are easily obtainable from the car industry: Petrol tank from Opel-Kadett; acceleration and trim components from Volkswagen 1300 and Bowden cables from the VW transport.

The prototype should be flying shortly (*Q-mulus*, September 1971).

TECHNICAL DATA

Span (m)	15
Wing section, Wortmann FX66-S-196 (1200mm) FX66-17A (700mm)	
Wing area (m²)	17
Empty weight (kg)	420
Pay load (kg)	200
All-up weight (kg)	620
Power unit, two-cylinder Hirth Motor 54ps	
Rate of climb (m/sec)	2
Cruising speed (km/h)	130
Take-off distance to 15m (m)	400

A LIBELLE IMPROVED 25% AT TOP END

WILL SCHUEMANN of Rawlings Heights, Maryland, USA, has improved a Libelle by 25% at the faster end of its range, making it better at 100kts than an ASW-12, it is claimed. The modifications include a new leading edge, a wing-fuselage fillet, a sharper nose and a changed ventilation system. The glide angle was improved at 100kts from 14/15:1 to 20:1.

MOTOR GLIDERS IN GERMANY

A FURTHER 98 motor gliders were registered in Germany during the period January to August, 1971, raising the total flying from 356 to 454. The main increases were: ASK-14, 4 (total now 33); RF-5, 8 (61); SF-25B, 74 (205); SF-27MA, 9 (16) (*Luftsport*).

MOTOR GLIDER FROM JAPAN

STUDENTS at Nikon University, Tokyo, have designed a single-seat motor glider, the N-70, "visibly inspired" (according to *Aviasport*) "by the ASK-14".

Construction is of wood. Wingspan is 15m, wing area 15m², and a Wortmann section is used. The wing is attached in the low position, yet there are Schempp-Hirth type airbrakes opening below as well as above the wing. The main wheel is retractable by hand.

The motor comes from a Japanese car called Subaro—four cylinders, 1100cc. 44hp, 3800rpm.

The aircraft weighs 345kg empty and 470kg all-up; it is therefore a little heavier than the ASK-14 with a wing loading of 31 compared with 28.4kg/m².

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EQUIPMENT NEWS

A NEW TOWING AIRCRAFT FROM FRANCE

By DEREK PIGGOTT

WITH the increase in aerotowing at many clubs in this country, any new type of tug is well worth considering seriously.

The new Avions Pierre Robin DR-300/180 R "Remorqueur" (tug) recently visited us at Lasham. This is a more powerful version of the "Knight" four-seater touring aircraft, fitted with a towing hook and a special fine pitch propeller. It has the normal Jodel-type wing with tip dihedral, a tricycle undercarriage, and is mainly of wooden construction. The finish, both inside and out, is outstanding and is more like a high-class motor car than the average American light aircraft.

The exceptional thing about all the Jodel family is their performance and good handling, and this is where the "Remorqueur" excels. On my tests the tug carried two pilots each over 170lbs, with almost two hours of fuel. Towing a fully loaded K-13 (two crew with 'chutes) we averaged tows to 3,000ft and down ready for the next launch in nine minutes. With good ground organisation this could mean a launch to 2,000ft with a fully loaded *two-seater* every six minutes—a considerable improvement on most currently used tugs, and close to the rate of launching to be expected from a winch.

I did not bother to fly the tug solo, or to tow a single-seater glider, but obviously the climb would be even more impressive. In fact, the angle of climb takes a little getting used to for both glider pilots and spectators.

For the average tug pilot, the "Remorqueur" will offer no problems. The cockpit lay-out is simple and straightforward and the visibility all round is superb. The glider is clearly visible in the normal tow position and a good mirror is fitted for pilots who do not like to look back over their shoulder.

The tricycle undercarriage gives an exceptional ride, and all the pilots who flew it agreed that it was the best tricycle they had met. It is fairly firm, but absorbed the worst of Lasham's bumps and undulations so that, from the cockpit, we might have been taxying over reasonably smooth ground. Steering is positive with some form of damping between the rudder and the nose wheel to give a pleasant feel. Full rudder applies one wheel brake to help the turning radius. There are no foot-operated brakes but just a hand brake for slowing down and parking. This seemed an ideal arrangement.

The plain trailing edge flaps are manually operated to lower them to the take-off position, used for all aerotowing,

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. . . . for the Crew Chief, too!

or full down for the descent and landing. With full flap and about 1,500 rpm to keep the engine from over-cooling, the average rate of descent at 80kts is about 1,000ft per minute. This can be increased by throttling right back and side-slipping to give a very steep approach for landing.

Take-off is simple. Just take up slack, open up the throttle fully and, as you gather speed, ease back to get the weight off the nose wheel. A firm backward movement is needed to lift off at about 50kts, the towing speed being reached within seconds, and that speed exceeded unless the nose is pulled up to the very improbable-looking position for the normal climb.

The noise level in the cockpit is very low, and I was relieved to note that from outside it was no worse than our Super Cub. Probably because of the newness to this particular machine, the controls were just a little stiff. Trimming, however, is positive and when the glider stays in a steady position, it is possible to tow hands off. There is obviously plenty of control to take care of the glider getting badly out of position and this was unintentionally proved on our flight.

The stalling speed of 45kts (IAS) power off, allows a reasonable margin for towing all our British gliders. The most comfortable speed for the K-13 seemed to be 55 to 58kts IAS.

Probably with a light single-seater the nose will appear rather high to the tug pilot and the occasional turn will be necessary to keep a look out ahead. Otherwise the all round view is exceptional.

The glider having been successfully released, it is just a matter of throttling back, applying hot air and lowering the full flap for the descent. The maximum flap lowering speed of 90kts makes the descent rapid and non-critical, though its a pity that there are no cowling flaps to help to avoid rapid cooling. The landing —well, its just another aeroplane to be held off well, and it settles without any bounce or swing, on the roughest ground.

A hidden bonus is the rapid climb away when towing which means that, in many cases, the aerotowing point could be in a position further up the field to eliminate any taxying. In any case, taxying is more like driving a car, and the positive control and good view save time—which is saving money at an active site.

Like me, you will probably react with despair at the price, £7,250 duty paid, and ask yourself what club could afford one. However, the economics of towing on a large scale do not prohibit a tug of this cost provided it is efficient and can be used for, say, 500 hours a year.

But this is not only a tug. It is also a good touring aeroplane. Four comfortable seats and luggage space, cruising at over 125kts or 140kts if you change to a cruising pitch propeller—and room for all the radio you could wish for. Wouldn't it be fun to own an aeroplane which could tow or tour, or carry the boss to his conferences? Contact Neil Jensen of Sportair Aviation Limited at Biggin Hill, Kent, if you would like more information.

MULTI-CHANNEL RADIO

COVERAGE of 360 channels is provided by the TM360 VHF transmitter receiver made by T. A. McMullin. The set weighs 2½ lbs. and is available on rental only—£40 per annum drawn from an initial deposit of £120. Minimum period, one year; rent after third year payable annually in advance.

Transmitter: Output, 2W at 12.5V; modulation 90% plus speech clipping; microphone input, suitable for magnetic boom or hand microphones; power consumption, 0.5 amps (approx) on transmit.

Receiver: Selectivity, suitable for 50kHz channel spacing; sensitivity, 1μV for 10db s/n; spurious signal rejection, better than 60db; audio output, 150mW

into 50 ohms; power consumption, 50mA (approx) on receive.

Accessories are available for sale. Mr McMullin states that the production rate is strictly limited at the present time. Details from him at 56 Attimore Road, Welwyn Garden City, Herts, telephone Welwyn Garden 23698.

SINGLE-SEAT GERMAN TUG

THE ESS-641, a German aircraft designed specifically for glider towing, made its first flight on September 17, 1971, and is currently undergoing flight tests. It was designed by members of the Flugwissenschaftliche Arbeitsgemeinschaft ("Flugwag") Bremen.

It is a single-seat, low-wing monoplane with a single engine (Lycoming 0-360) and non-retractable undercarriage. The wing and tail unit are of wood construction, while the fuselage has a steel tube structure. The tow coupling is in the fuselage rear section.

The machine was designed for safe, economical towing operation, and calculated performance figures include: Take-off run, 90m; take-off distance to 15m, 140m; level speed with towing propeller, 160km/h; rate of climb at ground level, 10.5m/sec; rate of climb towing two-seater (Kranich III) at 500m, 5m/sec; towing single-seater (K-6) at 500m, 6.5m/sec.

Production is likely to be contracted to a licensee. The price has not yet been fixed, and will be strongly influenced by the extent of the series. Details from FLUGWAG Bremen, Rockwinkeler Landstrasse 33, 28 Bremen-Oberneuland, West Germany.

NEW GLIDER REPAIR FIRM SET UP

CHILTERN Sailplanes Ltd has been set up to undertake repair and maintenance work (in both wood and glass-fibre) on gliders, including C's of A, instrumentation, etc. Trailers will also be built. Details from Dave Paton, 300 Luton Road, Dunstable, Bedfordshire, telephone Dunstable 64472.

TUG BEING DEVELOPED IN DENMARK

POLYT 5, primarily designed as a glider tug, has been developed by a polytechnic flying group in Denmark. Made of wood, it is powered by a single 200hp Lycoming 10-360-A2B engine. Features include an all-flying T-tail, a wooden propeller optimized to the low speed of 100km/h, tricycle undercarriage with steerable nose-gear and an electric winch which will retract the towrope after the glider has released.

Performance figures include: Cruising speed, 185km/h; stalling speed 72km/h; take-off distance to 15m, 140m; landing distance from 15m, 280m; rate of climb, 8m/sec; towing two-seater, 4m/sec; towing single-seater, 5m/sec.

The group is planning to produce a further prototype, and would be interested to see the machine manufactured under licence.

Details from Polyteknisk Flyvegruppe, Danmarks Tekniske Hojskole, Ostervoldgade 10, DK-1350 Kobenhavn, Denmark.

LASHAM 1972

GLIDING COMPETITION

B.G.A. Regionals — enter now

22 — 30 July

★

Task setting by:—
Derek Piggott

For details write:
Secretary
Regionals
Lasham Gliding Society
Near Alton, Hants.

PLACE SCORING FOR 1972 NATIONALS

By JACK HARRISON

DON'T blame me. The BGA actually asked me to write this. Place scoring is "in" for the 1972 Nationals and I have been asked to explain why and how.

At last year's Nationals, pilots were asked to voice their objections to place scoring; it could be their last chance, as the system might be introduced in 1972. The BGA wanted to give pilots the opportunity to object in advance, and perhaps influence the BGA's decision rather than complain afterwards. As expected, a substantial proportion of pilots had no particular views for or against place scoring. Most of those who did have strong opinions were very much in favour, and only a handful had any misgivings. So place scoring it is for 1972.

I must stress that this is not just "Jack Harrison's pet scoring system" (as I have heard suggested). The BGA Flying Committee is wholeheartedly in favour of place scoring and I have simply been co-ordinating views on behalf of the committee.

ARGUMENTS FOR THE PLACING SYSTEM

Surprisingly, it is not the simplicity of the system that is its main advantage. The poor scorer still has all the measurements, etc. to do. Its real advantage is that it is so much fairer in so many situations. That day at Husbands Bosworth when Don Hanson went so far while the rest of us barely made Silver distances was the final blow to the old system.

It was not suggested that Don hadn't flown brilliantly. But he gained such an advantage on that one flight that the contest was then cut and dried. He *had* done better than everyone else, but that was all one could say. Only the brave would attempt to put a numerical value on *how* much better, as is due with points scoring.

The other main advantage lies with the operational flexibility that place scoring offers. With points scoring it is desirable that the value of points per kilometre should be constant throughout the route. With place scoring this doesn't matter. So an into-wind first leg can be tasked. Lasham took advantage of this in their Regionals by setting tasks into strong westerly winds to get away from the London Control Zone. I may have to use this ploy when I task-set at Shobdon to keep competitors away from unlandable terrain in the mountains.

There are many other advantages of place scoring, such as the absence of an artificial cut-off at 60% speed, that have been fully discussed in the past.

AGAINST PLACE SCORING

There is still some feeling that the Don Hanson situation *should* be reflected in the scores, and that he *should* have gained a big advantage. This one will be argued as long as there are competitions.

The main objection to place scoring is that many pilots consider that it is still *thought* to be controversial. The attitude is "Well, I'm happy with place scoring, but I'm not quite so certain that everybody else will be." The "everybody else" is the anonymous other pilot. In fact, these other pilots are few in number, and place scoring is not so controversial as is usually believed.

CHANGES FROM PROVISIONAL 1971 RULES

Two minor changes are introduced. Each of these new rules will only need to be applied on rare occasions.

There is to be a maximum step of

four points between adjacent pilots on the daily score list, with all pilots in the list above the step having their scores reduced accordingly. The considerable step that would otherwise occur when many pilots achieve similar distances is avoided (S&G, December, 1970, p.488, explains the background). The application of this rule produces one additional advantage. When an *en-route* clamp causes a number of pilots to land close together, day-devaluation occurs, as indeed should be the case.

The other change is the introduction of a "tie-breaker" rule. In the final end-of-contest scores, more ties occur with place scoring than with points scoring as fewer total points are involved. The two or more pilots who tie are compared. The one who has beaten the others on most days is placed highest in the final list. Ties *will* still occur after application of this rule, but in such cases, it is reasonable to assume that there is in fact no appreciable difference between such pilots, and a tie is a true reflection of their abilities.

GENERAL SCORING RULES

The basic principles of the familiar 2-1-0 system are used, as explained in S&G (February 1969 and December 1970) and the BGA Competitors' Handbook.

CONCLUSIONS

Place scoring has not been introduced without considerable thought and research. The old points system will remain as an alternative for Regionals for this season at least. It must also be remembered that the 1974 World Championships in Australia is likely to use a form of place scoring.

PROVISIONAL HANDICAP LIST FOR 1972

THE Skylark 3 and K-6CR are taken as "Datum Gliders" at 100% and all other figures are in inverse proportion to cross-country speed extracted from an "average thermal", compared to the speed of the datum machines.

The "average thermal" is strong in the middle, and weak at the outside. Compensation for thermalling performance is made by feeding the minimum sink point of the glider's performance curve into a graph which gives an achieved rate of climb. For example, a Foka's speed at min sink is rather high, leading to an achieved rate of climb of 2kts from the "average thermal". A K-8, in contrast, has a much lower speed for min sink and so gets right into the middle of the thermal, achieving nearly 3kts.

These corrected climb figures are applied to the standard formula for cross-country speed, these speeds compared with that of the datum gliders and rounded off to the nearest even percentage for the list of handicaps. A full explanation was given in S&G 1967, p459.

H'cap %	*Sailplane type*
64	Sigma*
72	BS-1B*
74	ASW-12*, Kestrel 19*
78	Kestrel 17*
80	BS-1, Diamant 18
84	Cirrus, Phoebus 17, HP-14 (18m), SHK
86	Diamant 16.5, HP-14 (16.5m)
88	Standard Libelle, ASW-15, Standard Cirrus, LS-1, Motor Cirrus*, Phoebus 15*
90	Dart 17, Foka 5, Torva Sprite*
94	K-6E
96	Olympia 419, Foka 4, Vasama, SF-27M
98	Dart 15, Olympia 465, Skylark 4, Pirat
100	K-6CR, Skylark 3 (Datum gliders), Olympia 403
102	Olympia 463, M-100s, Fauvette, Super Javelot, K-14*
104	Standard Austria 'S'
106	K-8, Jaskolka, Regal, Olympia 460 Series 1
108	Skylark 2, SF-26, T-53*
110	K-13, Blanik, Eagle, Bocian
112	Sky, Weihe
114	Mucha Standard, Capstan, K-7, K-2
116	Skylark 1, SFS-31*
124	Meise, Olympia 2, Swallow, Gull 4
128	K-16*, Tandem Falke*
150	SF-25B Falke

NOTES:

(1) Asterisks * signify handicaps based on maker's figures. Later information

may influence the Handicapping Committee otherwise.
(2) Handicaps apply in BGA Contests at all AUW and CG positions cleared in the glider's C of A.
(3) Comments should be sent to the BGA for the Handicapping Committee. Changes will only be made as a result of tangible performance evidence such as polar curves, 'tested points' from calibrated glides, or well conducted formation runs with known types. Figures are required of min sink and a high speed point at 70–75kts (130–140km/h).

GUILD OF AVIATION ARTISTS EXHIBITION

"SOUTH Pacific" is the theme of the annual exhibition and competition of the Guild of Aviation Artists, to be held from February 1-12 at Qantas Airways Gallery, Piccadilly, London, W1 (corner of Bond Street); weekdays 10:30 to 17:00; Saturdays 10:30 to 13:00. The exhibition will be opened by Sir Francis Chichester, and the competition judged by Dr John Turner, Director of the RAF Museum and Walter Woodington of the Royal Academy with Frank Wootton, President of the Guild, as panel chairman. The Guild now has some 80 professional and non-professional members.

VISUAL AIDS—CLOUDS

A SERIES of visual aids on clouds and the weather has been produced by The BP Educational Service, Darby House, Bletchingley House, Merstham, Surrey. They comprise "The formation and types of clouds" (55 frames) and "Association of clouds and weather" (52 frames) and are available as slide sets (£2 per set) or filmstrips (£1.50 per set). Two wall charts on clouds are also available, 25p each (sectionised versions as card sets, 40p).

SHOBDON NATIONALS—REASSURANCE

IT HAS come to the notice of the organisers of the Open/Standard Class Nationals at Shobdon, that some pilots, unfamiliar with the area, are worried about field landing prospects. Tasksetter, Jack Harrison, wishes to reassure competitors that the local area has perfectly landable fields. Tasks will not be set over un-landable country, or indeed, over landable terrain which would result in impossibly complicated, lengthy retrieves. The only tasks that might be set into the Welsh mountains will be along routes which have been surveyed from the air, such as the valley from Hay-on-Wye to Brecon.

OVERSEAS ENTRIES INVITED FOR DAILY TELEGRAPH COMPETITION

THE Daily Telegraph Invitation Competition, to aid selection of British team pilots for the 1974 World Gliding Championships in Australia, will be held from August 19 to 28, 1972, at Dunstable.

It is proposed that members of the 1972 team, including the two reserves, will fly in this competition. In addition, further pilots will be selected after the Open/Standard Class Nationals and after the Sport/Club Class Nationals by panels of top pilots to fly in the team selection competition.

In late September, a panel of top pilots will select the team for Australia using the established system.

Invitations have also been sent to European nations, plus USA, Australia, New Zealand and South Africa, to send pilots to fly in the Daily Telegraph Competition.

KRONFELD CLUB ELECTIONS

RON WILLBIE was elected Chairman of the Kronfeld Club at its annual general meeting on December 1, to succeed Bill Goldstraw. Clifford Tippett and Diana Thomas-Ellam were re-elected Hon Secretary and Treasurer respectively. The club had a successful year financially and extensive renovations to its premises at 74 Eccleston Square (basement), London, SW1, are being carried out.

KRONFELD CLUB DIARY

February 2. John Blake, "The Victoria Air Race", 8pm.
February 9. A programme of gliding films, 8pm.

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KRONFELD ART COMPETITION

WINNERS of the Kronfeld Aviation Art Exhibition Competition 1971 were as follows: Kronfeld Palette (best overall entry), Margaret Kahn, "Kestrel"; BGA Goblet, Margaret Kahn, "Cross country"; Harry Cooper Memorial Trophy (best light aircraft), R. Crowte, "Tiger Moth"; best first entry, G. Naylor, "Off tow—Dunstable".

AEROTOWING AVAILABLE AT SHOBDON

HEREFORDSHIRE Aero Club now have a Rallye Commodore available at Shobdon airfield for aerotowing visiting gliders.

ASSISTANT TO NATIONAL COACH APPOINTED

JOHN HEATH has been appointed a national coach to assist Bill Scull, the National Coach. He was recently deputy CFI of the Copperbelt Gliding Club in Zambia, but had done his earlier gliding in Britain.

C of A FEE UP

THE BGA Certificate of Airworthiness fee is raised from £4 to £5, taking effect from February 1, 1972.

WANTED
One soft, padded flat cap and a pair of fully certificated braces.
Apply: Sigma team

AIR FORCES INTERNATIONALS

IT is proposed to hold an International Air Force competition in conjunction with the Junior Inter-Services Competition at Bicester this year. Air forces would include the German, American, etc, and there would be three entries from each. Dates: August 19-28.

FORTHCOMING EVENTS

May 7-15: Hahnweide Contest (including German Team for Yugoslavia).
June 3-11: Motor Glider Contest, Burg Feuerstein, Germany.
June 18-July 12: International Club Class Contest, Dinslaken/Schwarze Heide.
July 1-13: International Mountain Soaring Contest, Vinon, France.
July 27-August 8: Coupe d'Europe (Huit Jours d'Angers), France.

WAVE FLIGHTS

AS a result of the seasonal increase in wave flying, we have been forced to include in a single entry all notified flights done on a given day at a site. The heights columns now show the lowest height at which wave was contacted by any pilot and the maximum attained by any pilot.

Date	*Name of pilot(s)*	*Lowest height wave contacted (ft)*	*Maximum height reached (ft)*
Aboyne (Deeside)			
2-10	G. Neill	2800	6300
9-10	I. Jamieson	2475	3275
23-10	D. Lee	3900	6700
24-10	G. Neill	3500	4500
13-11	R. Rothnie; A. Middleton	2300	11500
14-11	A. Middleton; R. Lee	1750	12500
28-11	W. Clark; C. Lee	2000	4100
11-12	L. Joiner	2475	3475
12-12	L. Joiner; G. Neill	1575	3275
Bicester			
11-12	J. Glossop; I. Lancaster; D. Hanson; T. Oulds; J. Monteith; A. Chapman; Young	2300	6000
Burnford Common (Thunderers)			
27-10	J. Clark	2350	3850
Camphill			
20-6	D. Salmon	600	2500
8-8	D. Salmon	700	1400
9-10	D. Salmon	700	10200
23-10	D. Salmon	1300	1500

Date	Name of pilot(s)	Lowest height wave contacted (ft)	Maximum height reached (ft)
6-11	D. Salmon	700	2800
13-11	D. Salmon	700	2200
Condor (Angus GC)			
31-11	L. Joiner	1800	6600
4-12	L. Joiner	1700	1900
Dishforth			
13-3	A. St Pierre; R. Parker	2000	7000
18-4	A. St Pierre; R. Parker	2000	17000
19-4	A. St Pierre;	3000	*12000
21-8	A. St Pierre	3000	6000
16-10	B. Plenderleith	1600	4300
24-10	A. Arnold; N. Stagg	1800	10245
29-10	Shanaman	2800	4000
30-10	R. Parker	1900	6000
31-10	R. Parker; A. Swales; B. Nowells; C. Taylor; G. Kemp; R. Mortimer	1900	8300
7-11	N. Stagg	2000	5000
4-11	P. G. King	1800	7000
5-12	J. Earnshaw; P. G. King	3000	6100
11-12	B. Plenderleith	2400	13500
*540km cross-country flight.			
Hedley (Northumbria)			
4-9	D. Wilson	2800	3300
23-10	D. Ingle; D. Wilson; A. Brown; J. McBeth; J. Greenwell; T. Pitloh; D. Osborne; R. Robson; W. Fuller; D. Driver; J. Clark	1800	15600
24-10	A. Brown	1750	2350
30-10	J. Greenwell; D. Pattison	2300	8300
31-10	J. Mitton; W. Haley; A. Brown; J. Greenwell; N. Crawford; D. Pattison; J. McBeth; R. Robson; D. Driver; J. Head; D. Osborne; D. Ingle	1800	13500
14-11	J. Givens; B. Davies	2300	3800
27-11	J. Greenwell	3500	8200
Long Mynd			
20-6	P. Loewenstein	2000	14100
30-10	P. A. King	2400	5700
11-12	P. Sears; P. A. King; L. Forsey	2000	13700
Milltown (Fulmar)			
14-11	J. Howlett	1800	7500
Nympsfield			
11-12	M. Cleaver	3700	7100
Portmoak			
18-10	D. Heathcote	1850	3900
23-10	N. Dean	2000	3000
28-10	A. Newton; J. D. Jones; L. P. Smith	2150	8050
29-10	A. Hobkirk; Pentelow	2500	4000
31-10	G. Green	2400	6000
6-11	J. Hempseed; G. Green	2400	13800
7-11	M. Wilton-Jones; G. Green	2000	5650
9-11	A. Shelton; P. Lever	2000	14800
11-11	M. Wilton-Jones; P. Treadaway; A. F. Gough; P. Lever; A. Shelton; Ferrier	2000	9900
13-11	J. Stevenson; J. Monteith	1500	16500
14-11	G. Green	2500	5350
22-11	R. Miller; S. Easton	1900	14800
4-12	D. Irving	900	9300
7-12	J. Hempseed; D. Irving; A. Sambale	1000	7200
10-12	M. Wood	3500	14000
18-12	J. Dandie; G. Green	2350	7850
Shobdon			
11-12	M. Costin	2800	12000
RAF Spitalgate (Four Counties)			
14-7	R. Dixon	2100	3250
Strathallan (Perthshire)			
6-11	R. Pears	1500	15000
Sutton Bank			
23-10	G. Chinn; M. Sutherland	1800	14600
31-10	M. Sutherland; M. Carter; P. Lazenby	1500	9200
1-11	P. Lazenby	1200	5200
15-12	P. G. King	1600	4900
16-12	P. G. King	4400	16900
Usk			
7-11	I. Shattock; S. Thomas; E. Duffin	2300	11100
11-12	I. Shattock; P. France; G. Dorward; A. David; A. Thomas	2500	11200
12-12	G. Dorward; P. France	900	7080

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OVERSEAS AGENTS

CANADA:	I. R. Beasley, Soaring Supplies, PO Box 621, St Laurent 379 (MTL) PQ. (Single copies US $1.00 or $6.00 annually.)
HOLLAND:	J.Th van Eck, Noordvliet 6, Maassluis.
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Red Leather Cloth Binder, taking 12 issues (two years): £1.00 plus 10p postage. Will also bind your BGA Personal Pilot Logbooks.

ANNUAL STATISTICS 1st OCTOBER, 1970 — 30th SEPTEMBER, 1971

Gliding Club	Aircraft					Launches		Hours		Flying Days		Cross-Country (Km.) Gliding	Courses		Certificates					Membership		
	Club MG	Club 25	Club 15	PO	TUG	Gliding	By MG	Gliding	By MG	Total	Soaring		No.	Pupils	First Solos	S.C.	S.L.	G.C.	G.L.	Male	Female	Non-Flying
ALBATROSS		2	1			1248		77		50	16		2	18	4					26	4	14
ANGUS		2	1			4093		324		98	17				24	1	3			60	6	
AVRO		2	2			3833		337		115	45				6	3	8			157	13	5
BATH & WILTSHIRE		2	2	6	1	3480		728		83	51	2630			10	5	6		1	89	5	9
BLACKPOOL & FYLDE		2	3	1		3677		429		96	54				13	2	4			80	6	
BRISTOL & GLOUCESTERSHIRE		2	6	15	3	7569		1887		202	106	4134	20	160	20	2	12	1	2	223	20	64
BURTON & DERBY		2		5	1	3008		741		100	47	2300			5	5	8		1	75	6	
CAMBRIDGE UNIVERSITY		2	4	8	1	6158		2341		215	123	13414	9	54	17	4	12	2	7	190	12	20
CORNISH		2	2	5	2	4734		950		210	58	930	22	200	10	2	7			70	4	28
COTSWOLD		2	2	5		6120		1100		82	21	3500			17	8	21			128	12	12
COVENTRY		2	4	19	3	5592		2693		176	89	14367	19	115	12	4	18	3	4	254	18	42
CRANFIELD INSTITUTE OF TECHNOLOGY		2	2	5	2	1939		498		96		1250	1	16	5	3	10			105	5	
DEESIDE		1	1	5	2	1397		529		129	94	341			5				2	40	6	
DERBYSHIRE & LANCASHIRE		1	6	12		6854		1857		142	101		21	165	7	2	6	1	2	166		92
DEVON & SOMERSET		2	1	5	1	7230		1407		183	119	2476	9	99	17	3	18			154	11	24
DONCASTER & DISTRICT	1	1	3	8	1	4010	922	1024	336			1511	49	187	5	3	7			141	10	58
DORSET FLYING CLUB & AVIATION CENTRE		1	3	3	2	4083		1199					28	85	12	4		4	8	69	6	
DORSET		2	2	11	1	5748		1050		115	48	2100	2	19	16	5	24			147	9	94
DUMFRIES & DISTRICT		2		2		403		87		34	21		1	14						31	3	7
ENSTONE EAGLES (Not in Totals)		1	1	7	1	1075		478		58	34	1480			2	3	11			41	1	
ESSEX		4	1	13	1	4639		1244		116	50	4559			15	6	24	1	4	172	10	5
ESSEX & SUFFOLK		2	1	1	1	540		256		65	32	700			3	1	3	1	1	52	3	
GLAMORGAN		1	2			140		16												17		
GLASGOW & WEST OF SCOTLAND		1				898		45		32	10				2					28	1	
HAMBLETONS		2	2	1	1	4715		659		132	90	450			20	3	2			85	5	
KENT		3	2	9	1	8387		1482		217	160	3238	30	280	22	7	19		3	160	19	51
LAKES		2	1	2	1	2272		382		87	26	460	3	25	8		4		1	43	4	7
LASHAM GLIDING SOCIETY	2	4		52	3	15794	8689	1473	1413	300	170		51	311						291		
IMPERIAL COLLEGE			2			1133		485		140	92	1430	2	12	5	2	14			54	3	3
POLISH A.F.A.		1	3			380		270				2900								30		10
SURREY & HANTS			11			4726		2528				20270				19		6	18	293	17	

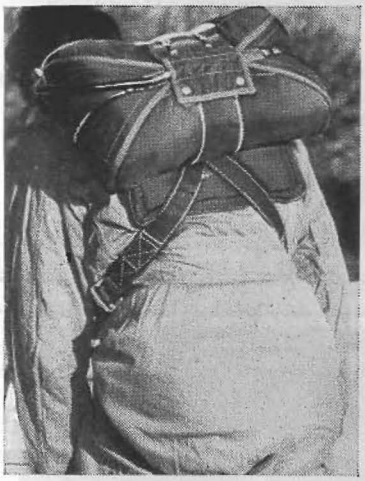
LEEDS		2	4			4291		260		130	40				12		1			63	4	
LEICESTERSHIRE		2	1	5	1	891		766		37	18	1750			4	4	5			55		1
LINCOLNSHIRE		3		6		4233		556		132	39	607	3	24	14	4	5			56	3	10
LONDON		3	5	44	2	16800		6238		279	190		17	156						430	20	56
MIDLAND		3	3	10		10026		3481		174	97	1422	21	304	28	2	31		3	145	18	70
NEWCASTLE & TEESSIDE		1	1	1		1456		246		91	66	150	3	30	3		1		1	63	2	10
NORFOLK	1	2	2	4		4301	483	627	189	185	43	1282	3	30	14	3	14			105	5	20
NORTHUMBRIA		3	1	10	1	4955		680		168	79		4	48	20	7	14		4	70	30	20
NORWICH SOARING GROUP			2		1	86		43		45	41	1500				2	5		1	13		7
OUSE		2	2	7	1	3758		665		108	25	1185			4	2	6		1	87	13	31
OXFORD		2	2	6		2400		790		83	32	4024			2	4	9		2	66	4	8
PERKINS SPORTS ASSOCIATION		1	1			1224		162		72	25	230	1	5	3		2			36	1	
PETERBOROUGH & SPALDING		2	3		1	852		386		75	63	300	3	18	5	1	1			40	3	
ROTHERHAM & DISTRICT		2	1	1		1901		165		63	19				7					38	2	22
SCOTTISH GLIDING UNION		4	4	13	2	11462		3738		315	213	1830	23	151	16	6	27		4	184	11	47
SOUTHDOWN		2	2	2		4410		830		111	46		3		9	5	9			115	16	40
SOUTH WALES		2	1	4		4029		725		100	70	2827	4	25	16	4	9		1	97	10	
STAFFORDSHIRE		1	2	6		2995		479		97	39	1130	1	25	6	1	6			86	5	1
SWINDON		1	2	4	2	4053		904		172	114	2850			6	1	10	1	1	83	2	4
TRENT VALLEY		2	2	4	1	5023		676		121		4200			15	1	3			64	15	4
ULSTER & SHORTS	1	1	3	1	1	1156	170	230	93	72	20	517			6	2	6	1	1	52	2	
UNIVERSITIES OF GLASGOW & STRATHCLYDE		2	2			609		43		34	12				1					25	2	
UPWARD BOUND TRUST		3	1			3215		262		81	33	140	Continuous		26	1	4			25		
VALE OF NEATH		2	1			1131		73		51	10		1	10	8					57	6	22
WEST WALES		2			1	2978		352		139	46	38								40	2	
WORCESTERSHIRE	1	4	3	9	2	4812		698				2370	18	152	7	3	5			110	10	20
WYCOMBE GLIDING SCHOOL				19		10100		6700		300	180		24	120	30	20	35	3	9			
AIRWAYS	1	1	5		3		750		281											185	30	
THAMES VALLEY		2	3																	200	12	
YORKSHIRE	1	2	2	20	1	5525	1150	3500	565	260	180	4251	19	228	15	7	26		3	270	12	54
CISAVIA																						
AQUILA		2	2			1411		167		67	17	94			5	1	2			36	4	1
RAE FARNBOROUGH		1	3	2		2436		522		90	32	953			6		8			75	3	11
RRE PERSHORE		1	4		1	1030		57		46	30				8					60		22
CIVILIAN TOTALS	9	118	140	371	49	249958	12164	62007	3107	6913	3459	116710	441	3186	591	178	485	24	85	6461	461	1026

KEY: MG = Motor Gliders, 2S = Two-seaters, 1S = Single-seaters, PO = Privately Owned, S = Silver Cs, G = Gold Cs, C = Complete, L = Legs.

ANNUAL STATISTICS 1st OCTOBER, 1970 — 30th SEPTEMBER, 1971

Gliding Club	Aircraft					Launches		Hours		Flying Days		Cross-Country (Km.) Gliding	Courses		Certificates					Membership		
	Club MG	Club 2S	Club 1S	PO	TUG	Gliding	By MG	Gliding	By MG	Total	Soaring		No.	Pupils	First Solos	S.C.	S.L.	G.C.	G.L.	Male	Female	Non-Flying
AGA																						
KESTREL		2	3	1		5176		965		79	50	4635			18	3	19	1	2	67	6	14
SOUTHERN COMMAND		4	5		1	3905		796		121	35				10					56	1	75
RAFGSA																						
ANGLIA		2	3		1	3533		555		104	45	581			7	3	14			71	8	
BANNERDOWN		2	4			3746		645		80	28	2489			8	4	19	2	4	63	1	
BICESTER	1	7	14		3	18747	1756	7047		342	184		8	96	48	12	31	4	11	242	21	
CHILTERNS		1	5			2281		649		76	41	4661			8	4	8	1	3	60	10	
CLEVELANDS		2	6		1	8860		1319		214	98				23					101	9	
EAST MIDLANDS		2	4			3048		640		96	73				9					57	2	
FENLAND		2	4		1	5490		1044		103	49	1981			22	6	23		1	66	8	
FOUR COUNTIES		2	8			6317		1797		142	78	10000			11		21	2	5	85	9	
HUMBER		2	4			4191		509		94	14	324			19		2			43	7	12
MENDIPS		2	1			2597		298		224	15	210	1	10	20	1			1	53	2	
WREKIN		2	5		1	6787		1090		220	54	4500	4	36	35	7	17	2	2	148	7	
RNGSA																						
CULDROSE		2	3		2	3779		379		87	18	114	2	20	16	1	3			60	3	1
FULMAR		1	2			3492		453		105	35	184	1	10	16		6			35	6	
HERON		2	3	2	2	3092		606		105	43	3070			12	4	18			34	8	
PORTSMOUTH NAVAL		3	3	1	3	2678		434		116	16	790			8		5			78	3	3
THUNDERERS		2	3			601		45		40	15		2	18	5					50		
SERVICE TOTAL	1	42	80	4	15	88320	1756	19271		2348	889	33539	18	190	295	45	186	12	29	1369	111	105
SERVICE AND CIVILIAN TOTAL	10	160	220	375	64	338278	13920	81278	3107	9261	4348	150249	459	3376	886	223	671	36	114	7830	572	1131
OVERSEAS																						
EAGLE (ARMY GERMANY)		2	4		1	3967		760		91	37				8					60	10	
PHOENIX (RAF GERMANY)		3	2			5050		566		122	35	256	2	9	9	2	6		1	30		
TWO RIVERS (RAF GERMANY)		2	5	2		6973		1123		104	49	3747	1	12	32	7	17			65	4	3
CRUSADERS (RAF CYPRUS)		3	4		1	5080		932		141	101	1910	3	24	11	2	12			56	5	
OVERSEAS TOTAL		10	15	2	2	21070		3381		458	132	5913	6	45	60	11	35		1	211	19	3
ATC																						
2 CENTRES - 28 SCHOOLS		140	13			167296									1201							

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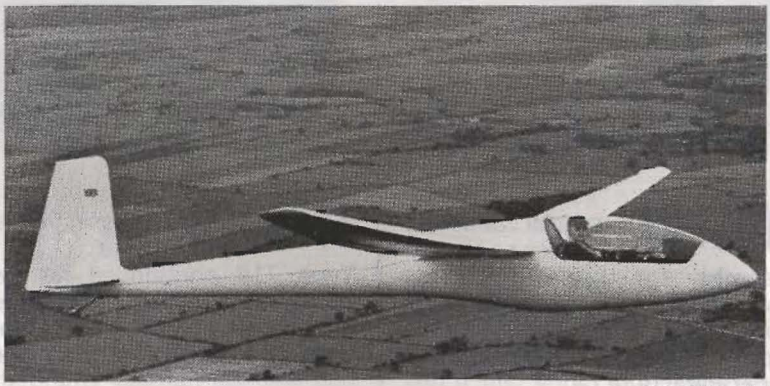
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OVERSEAS NEWS



POOR WEATHER AT RUSSIAN NATIONALS

THE Estonian team won the 33rd Soviet National Gliding Contest, held at Oriel in late July. Individual winners were: Men, Lev Kuznietsov (Kazachstan team); women, Eda Laan (Estonian team). There were 38 men and 19 women competitors; 12 teams of pilots in all.

The Ministry of Aircraft Production, the Moscow Aviation Institute, Moscow and the Central Gliding Club at Oriel were represented by teams as well as the Republics. A Polish team flew *hors concours*. (The pilots probably all flew Blaniks—CW).

For the first five days, it poured with rain, and only four contest days were possible: A 100km triangle completed by 52 of the 57 pilots; a 206km triangle; a 168km out-and-return, completed by 54 of the 56 contestants; and a 154km goal race via a single turning point, with 42 pilots reaching the goal.

On another day, a task was set when cumuli started to appear at 11:00 but competitors flew into complete overclouding after 60 to 70km and had to contend with a headwind which increased to 20kts. All 56 had to land in fields and it was decided to declare the day "no contest".

Nine pilots had points deducted on barograph evidence after the second day for circling below 300 metres. However, in the syllabus for the training of pilots, exercise 42 states that circling should be taught from 200 metres upwards. Why should, therefore, pilots at a National contest, who are better pilots, have their minimum circling height set at 100 metres higher, *Krilya Rodiny* asks.

The contest was good practice for all for flying in cloudless, weak conditions.

Final team results: 1, Estonia, 8,435 points; 2, Byelorussia, 8,208; 3, Lithuania, 8,071; 4, Central Gliding Club, Oriel, 7,931; 5, Moscow, 7,876; 6, Ukraine, 7,770.

Individual final results, men: 1, Lev Kuznietsov; 2, Panafutin; 3, Sarayev; women: 1, Eda Laan; 2, Ekaterina Anaxova; 3, Shibayeva.

Translated by C. WILLS

AUSTRIAN OUT-AND-RETURN RECORD

DR Alf Schubert, who came 3rd in the 1971 Austrian Nationals, has beaten his own Austrian Out-and-Return record of 690km by flying from Zell am See to Brig in the Swiss Rhone valley and back, 770km (478 miles).

TEN PERCENT GROWTH RATE IN CANADA

CANADA'S Ministry of Transport reports that there were 1,342 rated glider pilots in Canada in 1969 and 1,521 in 1970—a growth rate of about 11½% (*Soaring*).



Tim Biggs makes a low pass in his Std Cirrus

SOUTH AFRICANS DOMINATE RHODESIAN NATIONALS

SOUTH African pilot Peter Eich, flying the BJ-4, won the Rhodesian Gliding Championships, held at Warren Hills, Salisbury, during the first two weeks of October 1971. Ted Pearson and Tim Biggs, also from South Africa and both flying Std Cirrusses, were second and third respectively with Jimmy Harrold of Rhodesia (Std Libelle) fourth.

For the first time, the alternating "championships" and "competition" days system as used in South Africa was employed, to allow more than one pilot to fly the fifteen competing gliders over the fortnight.

Wesley Shields reports, however, that enthusiasm on the competition days was practically non-existent, and they proved to be very trying for all concerned, especially the time-keepers. "The pilots all seemed to agree that 10 days' championships flying was the only way to distinguish the men from the boys."

He had arrived in Salisbury with a new Std Cirrus in which he had had four flights and with certain pre-conceived ideas about what gliding in Rhodesia would be like. One was that outlandings were particularly hazardous. "Certainly, there were large stretches of bush country, and over the tribal trust areas there were small 'U'- or 'L'-shaped contour fields which would require a novel approach." But plenty of good fields existed and the usually high thermals which prevailed enabled most difficult stretches to be flown over at a safe height.

During the championships there were 13 flying days (seven championships, six competition), 46 out-landings (15 at

various airfields and rough strips and the others in ploughed or other fields). Apart from minor damage to undercarriage doors and skids no difficulties were encountered and no-one was prevented from making a start on any day through unserviceable aircraft.

Championships tasks were: Out-and-return, 210.46km; triangle, 301.62km; triangle, 311.5km; out-and-return, 204.58km; out-and-return, 312km; triangle, 301.62km and triangle, 103.54km. Peter Eich won three days, Paul Hodge (Diamant) two and Ted Pearson and Tim Biggs one each.

Competition tasks were: Out-and-return, 204.6km; triangle, 103.54km; triangle, 103.54km; triangle 102.5km; triangle, 301.62km and out-and-return 179km.

The weather was variable; inevitably the week following turned out to be typical Rhodesian gliding weather with the sky alive with bubbling cumulus and cloud streets.

THE USUAL STANDARD CLASS BATTLE

Ted Pearson, describing the "usual Standard Class battle with Tim Biggs", writes that his chief recollections of the competition were the incredible number of boobs he made, starting with the blunder of changing his whole variometer system a few days earlier. He had no time to adjust the new VW5KB, which gave crazy readings, as did the new Althaus venturi on the other varios. He finished up using solely an old PZL variometer, "while Wesley Shields laughed his way straight to cloud base on my former, reliable BSW".

On the next to last championship day, the contest seemed to be in the bag, however.

"Hitting boomers ideally placed all the way round the 300km triangle, I rocketted straight past Tim 30km along the last leg, ignoring the weak lift he was in, and on to the bush fire 10km down track that he had judged was too far to reach. I flew hard into the core where the smoke changed to a vertical climb, right alongside John Magner in the Vasama. The vario was pegged at 6 metres per second but I complained about the poor lift over the radio for Tim's benefit! Watched John's startled expression, then kept thumb ready over the mike button to jam him out if he said a word. Straight up to 8,500ft above ground, and redlined on to the big cumulus over the 'dyke' (the Umvukwes range). Topped up at 5 metres per second and flew the last 50km at 200km/h.

"Crossed the finishing line just as Tim had been forced to land near the dyke, after encountering a strong down-draught when he left the weak lift where I saw him and found nothing in the bush fire.

"I commiserated with Tim, pointing out that it could happen to me on the next and last day, but I didn't really think it would.

"The forecast of a late start and sudden over-convection left no alternative but a 100km triangle. Before we started there was a line of cumulus along the first, and last legs, converging on the airfield, and a solid overcast between them which looked completely dead.

"I started late and climbed slowly to 7,000ft then made a straight glide in occasional rain to the first turn point 40km away. The initial blunder became apparent: I was separated from the pack, there was no lift around and not a squeak on the radio to indicate whether or not they were finding any on the middle leg, which looked deadly. About 15km west of track a line of straggly grey shallow over the 'dyke' seemed to promise the only possible lift. I flew on to find it had moved out of reach and a desperate scrape in half-metre to regain height began.

"Now the only attainable sign of lift



L-R: Ted Pearson, Peter Eich, Tim Biggs


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was a faint grey line under the overcast back at the first turn point. Scrambled back to it as it faded away. No alternative but to land at Norton airfield, so called for crew. Saved by half-metre lift on finals. Still circling as crew arrived on road beneath, and simultaneously heard one competitor after another announcing their arrivals.

Now I realised what had been nagging at the back of my mind about the weather—it was identical to the last Trompsberg-Koffiefontein 300km triangle at Bloemfontein when I found the overcast wedge between two precipitating cumulus lines at Koffiefontein was a huge area of gently rising air. This must be the same or the others couldn't have crossed the middle leg.

"Off towards the second turn and so it was—no-sink all the way and a strong climb to a high base round the turn. Mentally calculated (wrongly) that my best possible time must throw my total points behind Tim, so flew last leg slowly, leaving lots of height for new start without relight. Had not realised that several pilots had landed away which would reduce speed penalty.

"I made a new start, strong climb to 8,500ft then glided round the first TP and along a now-dead second leg to a catastrophic landing near the second TP. I hadn't seen the old contour ridges in the lightly overgrown pasture. They were now as hard as iron and I was flung six feet skyward as I hit each one.

"Incredibly, there was no apparent damage, so I took back everything I said to Mr Schempp about the undercarriage mechanism and nursed the knee cap bashed by the edge of the panel right where I did it in on skis two years ago. There was a gloomy retrieve and copious ale to drown my sorrows. Ron Cosser then put the results through the computer and decided that, by twelve miserable points I had won the Standard Class. How lucky can you be, after flying that last leg in the first circuit fat, dumb and slowly to conserve height for a second start."

Leading final results

1 Peter Eich	BJ-4	6391
2 Ted Pearson	Std Cirrus	5839
3 Tim Biggs	Std Cirrus	5827
4 Jimmy Harrold	Std Libelle	5558
5 Harvey Quail	Std Libelle	5439
6 Paul Hodge	Diamant	5152

GERMANS TO HOLD RECORD CAMP IN KENYA

A PARTY of 20 German pilots, with six high performance gliders, are expected to arrive in Kenya in February with the object of setting world records.

The gliding movement in Kenya, which has had a thin period of activity for several years, has taken on a new lease of life. A Blanik and a Swallow have been imported to supplement the T-21, Tutor and privately-owned Schweizer 2-22 and K-6.

The Swallow, the celebrated "Penguin" of the British soaring scene of the sixties, celebrated its arrival at Nakuru (about 100 miles north-west of Nairobi) with a 180km triangle flown by meteorologist Mike Waller.

In recent years, gliding has been a sub-section of the Nakuru Aero Club, but with the sudden growth of activity it has become evident that a separate club would be in the best interests of both sides, reports Dave Treadwell. This is likely to be at Naivasha, about 50 miles from Nairobi on the Nakuru road.

Visitors are welcome; anyone passing through Nairobi or stopping over should contact Dave Treadwell on 29681 (office) or 53739 (home).

CAMERON TAKES AUCKLAND CHAMPIONSHIPS

ALAN CAMERON (Std Libelle) won the Open Class Auckland Provincial Championships, held from October 24 to 30, and characterised by rain and a consistent west wind. There were five

contest days. Ian Pryde (Kestrel) was second and Tony Timmermans (Std Cirrus) third.

Unfortunately, Cameron's water ballast tank leaked out in flight, and prevented him from winning the Standard Class title as well, which was taken by Timmermans. Maurice Honey (K-6BR) won the Sports Class.

On one day, a 200km triangle was set for the Open/Standard classes, and Air Traffic Control at Hamilton notified although the route did not infringe the control zone. The task setters were mystified by a request by the controller that the task be changed to a route that took the pilots smack over the centre of Rukahia airfield. This was done, leaving a lot of puzzled pilots to fly a revised (180km) triangle.

WEST GERMANS VISIT MOAZAGOTL SITE

THE site of the world's first wave flights, made by Wolf Hirth from his Grunau gliding school in 1933, and now in Polish territory under the name of Jelenia Gora, was visited last October by a party from the West Berlin Academic Flying Group. They took two ASK-13 machines equipped for high altitude flying under the so-called Moazagotl cloud. *Luftsport*, in a long account of the event, gives no details of what flights were made, but this may be the forerunner of many similar visits.

DANISH HEIGHT RECORD

RECOGNITION has at last been given to a climb made by Ib Wermuth Jensen at Colorado Springs, USA, on December 29, 1970, when he made Gold and Diamond height in a Libelle with a climb of 5,320m (17,500ft) to an absolute altitude of 9,450m (30,676ft), beating Klaus W. Nielsen's previous Danish National record of 9,125m (*Flyv*).

PROGRESS IN ZAMBIA

THE most recent outstanding flight from the Copperbelt Gliding Club at Mufulira, Zambia, was a 300km out-and-return made by John Pope in his Std Austria. The club's fleet consists of a Capstan, a Sagitta, a Grunau Baby and the syndicate Std Austria.

At present all launches are by aerotow, but the club hopes to make a winch available in the near future. Visitors are most welcome, writes John A. Teagles, PO Box 1229, Kitwe, Zambia.

VICTOR BOIN CHALLENGE TROPHY

THIS annual Belgian trophy for distance, which was once won by David Ince from Britain, took the form of a Cat's Cradle this year at Temploux on August 15 in poor weather. It had been postponed from the 14th, which was even worse. Several visitors from Holland were the only foreign contestants, and one of them, Dick Reparon, won with a distance of 57.5km in an ASW-15. Only 22 of 37 contestants got away. Cloudbase was at 1,000-1,3000m and thermals were 1-3m/sec maximum (*Conquête de l'Air*).

CARAVAN FOR PIONEER

HANNA REITSCH has raised a fund to provide Peter van Husen, one of Germany's earliest pioneers and Silver C

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No 13 in the international list, with a caravan so that he can maintain contact with gliding centres. He has retired as leader of the Aigen gliding centre in Ennstal, Austria, being replaced by Harro Wödl, the Austrian who was World Open Class Champion in 1968 *(Luftsport)*.

GEORGESON WINS NZ SOUTH ISLAND REGIONALS

DICK GEORGESON won the Open Class of the South Island Championships, held at Omarama, New Zealand, from November 6 to 13. He flew a new Slingsby Kestrel 19 which arrived one week before the competition, and competed in the first task without a variometer, having to rely on the seat of his pants and an altimeter. He won four of the seven contest days. Ivan Evans (Std Libelle) was second. A Sports Class contest was held concurrently, and was won by Ray Elvy in a K-6. R. MACINTYRE

OVERSEAS PILOTS FOR USA NATIONALS

FIVE places are available at both the USA National Open and National Standard Class Soaring Championships for overseas pilots. They will be held in Nevada (Reno or Minden) from July 18 to 27 and at Marfa, Texas, June 27 to July 6, respectively. Pilot entry fee will probably be about $200. Applicants should write to the 39th US National Soaring Championships. PO Box 273, Tiburon, California 94920, USA.

EUROPEAN CLUB CLASS COMPETITION

THE first European Club Class competition will be held at Dinslaken/Schwarze Heide from June 18 to July 2, 1972. Entries are limited to gliders not exceeding DM17,500 (about £2,100) in price for single-seaters and DM23,000 (about £2,800) for two-seaters (*Luftsport*, November 1971).

CLEAN SWEEP FOR RENNER IN AUSTRALIAN OPEN

INGO RENNER, flying a Kestrel 19, won the Open Class of the Australian Nationals, held from December 27 to January 9 at Waikerie. He was unbeaten and achieved an average score of 1,000pts.

Standard Class winner was Malcolm Jinks (Libelle H301 with the flaps locked) with 968pts and Sports Class winner Murray Evans (ES-60 Boomerang) with 775.

Bad weather caused cancellation of three days' flying, and no records were set.

An HP-14 was destroyed when the pilot lost control and bailed out at 8,000ft. The aircraft broke up in mid-air moments later, it is reported.

BOLIVIA GETS UNDER WAY

GLIDING in Bolivia is one-and-a-half years old, according to Eckart Knoerich, yet they are sure there that the Bolivian Highlands could become the El Dorado of sailplane pilots. Werner Stadtkowitz founded the first gliding club on a high Andean plateau at 13,200ft; the airfield is 2,000 yards long and they have a hangar, a winch, a K-7 and have ordered a Blanik. Up to mid-October, 1971, they put up 250 hours from 900 launches, earning 8A, 4B, 2C and a Silver C certificate.

The period from April to November is cloudless, but 8 to 24 inches of rain falls between December and March. In the dry period there is no day without thermals: They begin at 9am. or at noon in the so-called winter, and only stop shortly before sunset. Their strength in the best part of the day is 1 to 3m/sec near the ground and 4 to 8m/sec at greater heights. If there are clouds, their base is at 6,500 to 9,000ft. In the West Cordilleras, cloud base in the August-September "Monsoon" rises to about 15,000ft above airfield level—but the club has no oxygen yet.

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BOOK REVIEWS

Die Berühmtesten Segelflugzeuge. By Georg Bruetting. Published by Motorbuch Verlag, 7000 Stuttgart 1, Postfach 1370, Böblinger Str. 18, W. Germany. 10½in by 9in, 195pp. Price DM28.

THIS magnificent book is far more than a mere list of the most notable machines in the history of sailplane design. George Brütting, a veteran glider journalist, knows the inside story of them all, including the pioneer types which took part in the early Wasserkuppe contests, and the reasons behind each advance in design. For instance, the introduction of winch and aero-towing led to the nimble lightweight Windspiel for using the narrow, broken thermals to be expected over flat country.

But a doubtful point is in regard to Friedrich Harth's world record flight of 21 minutes in 1921; Brütting says it ended in a crash, but other accounts say the crash was on a subsequent flight, and although the record got into the world's newspapers at the time, none of them mentioned a crash. Brütting might also have mentioned that the flight was claimed to have been done mainly by using gust energy.

Besides many words of text, each machine is given three-view drawings, one or more photographs, and a list of data. There are 45 German single-seater types, finishing with the Cirrus and the SB-9, followed by 24 foreign, including the Sky, Skylark and Dart, then nine German and three foreign two-seaters.

A. E. Slater.

Proceedings of the 1971 Symposium on Competitive Soaring. Published by Soaring Symposia, 408 Washington Street, Cumberland, Maryland 21502, USA. Price: $5.25.

SOARING Symposia, who organise the annual symposia on competition soaring, are, quote: "dedicated to making good pilots better". Judging by the popularity of the proceedings of their earlier symposia they are satisfying a need in the gliding world for up-to-date information on modern gliding techniques. However, the information they publish is of much wider interest than their dedication might suggest, and their 1971 publication is no exception; it has something for everyone. It can safely be recommended as worthwhile reading for all glider pilots, no matter what their experience.

The spoken word is not necessarily effective when put into print, and in this publication, which is a transcript of the lectures and discussion at the symposium, this is all too obvious. In many instances the editors could well have expurgated much of the verbosity of their speakers, and in certain instances reorganised the material into a more logical pattern. There are a number of minor errors in the printing and layout. For example, the "figure" numbers in the text referring to diagrams do not always tie up with the diagram numbers. Even the frontispiece is in error; it entitles the publication as the "1970" proceedings. But these errors are errors of relative detail and do not severely detract from the overall effectiveness.

The highlights of the various transcripts are George Moffat's lecture on "Contest Strategy", which in a few words could be summed up as: "fly so as not to lose", Paul Bikle's most practical advice on "Sailplane Preparation for Competition", and Klaus Holighaus' ideas on "Designing for Competition". Klaus offers a number of good points about the optimum weight of water ballast for various thermal conditions. (He also states that he does not believe in the design concept of Sigma, but that a machine with variable span would be more promising.) The section on fibreglass glider repair by Fred Jiran could prove most valuable to those undertaking home repairs although his remarks are primarily orientated to North America, where repair organisations are relatively few and far between.

J. Delafield

CORRESPONDENCE

TRAILER BUILDING TIPS

Dear Sir,

I would like to make the following comments on the articles by J. Riddell and R. Ruck in the December S&G.

Firstly, Ruck. You may be lucky enough to pick up as much free gear as he does but his expenditure of man hours must be considerable. If he could sell his six ¼in sheets of 14ft by 9ft glass-fibre at their true value he could buy three trailers with the proceeds! Most people have a shortage of man hours, but can afford the cost (say £150) for proper raw materials and fittings. Another point is that all tasks should be possible single-handed; this rules out the skinning of the framework with one man outside with a hammer and nails and another inside with a brick.

To deal with Riddell.

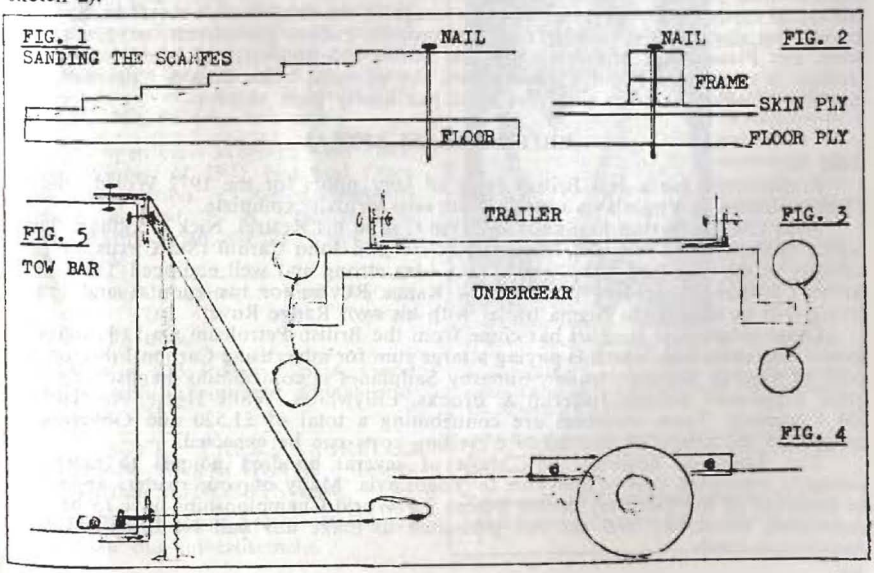
First, stressing. The main load is the hogging load when the wheels hit a bump. This is a tension load in the roof over the wheel. The area of ply here is 9 square inches which is quite strong enough to take this load.

Stressing the box frame is nonsense as 80% of the trailer is ply.

Ply sheets should be 4ft by 8ft, not 8ft by 4ft. This means that the main grain goes across the sheet and when the ply is bent over the roof the grain does not open up and let the weather in. All joints between sheets should be scarfed.

Nail up the sheets in echelon and sand them simultaneously (see sketch 1).

Firstly make a floor from 9mm ply planed up on its lower surface. Then lift it on trestles (soap boxes, etc) to make a table at proper working height. Use this to make the side and end walls by assembling the sheets on the flat, gluing them and then gluing the leaves on top using big long nails to hold the frames down while the glue hardens. The nails can be removed by a claw hammer in five minutes (see sketch 2).



Preferably paint the side walls while horizontal on the floor-table before assembly. If you have already got your glider, assemble it together with fittings, cradles, etc, on the trailer floor before you attach the side walls. This gives you much easier access and saves many, many man hours. Don't cut out the doors from your end walls until assembly of the side and end walls is complete.

Then attach the hoops and skin the roof. Make sure the hoops lie under each scarf joint for support. You should now have a complete box and only need to wire up and attach the under-gear and tow bar. These should be made as complete units (see sketches 3, 4 and 5). Note how the loads are fed into the trailer which should be reinforced at the top front end. The undergear is welded onto two pieces of angle iron about 3ft long. If the centre of gravity is wrong, it is a simple matter to unbolt it, move it fore or aft, re-drill and re-bolt.

A rack and pinion jack at the front is a costly (£5-£10) item but very useful. The rack is enclosed in a tube filled with grease when it is retracted.

Note that the tow bar and undergear are two separate, integral units. Paint and paint and paint them before assembly, then forget!

When wiring up, carefully paint a wiring diagram inside complete with cable colour identification code and the plug code. You will need it earlier than you think!

Marlow Common BRENNIG JAMES

EQUIPMENT NEWS

Dear Sir,

With reference to the Equipment News section on page 497 of the latest (December) *Sailplane & Gliding*, we feel rather left out of things and think that you have given an unfair advantage to these constructors. Naturally we consider our trailers to be the best in the movement. Our prices are also about 10% less.

It would have presented a truer picture to the public if all trailer constructors had been featured.

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WE take this opportunity to ask all manufacturers to send us details of all new and modified instruments and equipment for editorial use in the Equipment News section. We intend to provide a broad coverage of the field, from aircraft suitable for towing purposes, through trailers to instruments, radios, parachutes, oxygen equipment, etc. Please send information to the Editor independently of whether or not a product is mentioned in an advertisement; the editorial office does not normally see the text of advertisements until the issue has nearly gone to press.

BRITISH TEAM APPEAL

Dear Sir,

Preparations for a full British entry of four pilots for the 1972 World Gliding Championships in Yugoslavia next July are now virtually complete.

With George Burton flying for the 19m Cup in his Kestrel, Nick Goodhart flying Sigma in the Open Class and Bernard Fitchett and John Cardiff (Std Cirrus and Std Libelle) in the Standard Class, we have a very strong and well equipped Team. The Rover Company is lending us four new Range Rovers for two months and Frank Irving will be towing the Sigma trailer with his own Range Rover.

Other substantial support has come from the British Petroleum Co Ltd, and also from Courtaulds Ltd, which is paying a large sum for advertising Carbon Fibre on the sides of George Burton's trailer. Slingsby Sailplanes is contributing handsomely and other supporters include Justerini & Brooks, Lillywhites, White Horse, Amoco and 3M Company. Team members are contributing a total of £1,520 and Government support in the shape of two-thirds travelling costs can be expected.

The Team is, however, still short of several hundred pounds to meet the currently estimated cost of the visit to Yugoslavia. Many of your readers appear to be unaware of the fact that British Teams for World Championships have to be self-supporting financially and are not permitted to make any call on British Gliding Association funds.

May I therefore ask those gliding enthusiasts who believe in the importance of British Team appearances at World Gliding Championships to send a contribution, however small, to the British Gliding Association (World Championship Fund). A form is included with the index for the convenience of contributors.

In view of the *Daily Telegraph's* recently increased involvement in British gliding, may I also suggest that all interested supporters watch out for more extensive coverage of this year's British Team in the columns of the *Daily Telegraph* over the next six months or so.

GERRY BURGESS, TEAM MANAGER

Advertisements, with remittance, should be sent to Cheiron Press Ltd., 5 Crawford Street, London, W1 (01-935 2814). Rate 10p a word. Minimum £1.30. Box numbers 40p extra. Replies to Box numbers should be sent to the same address.

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PUBLICATIONS

NEW ZEALAND: "Gliding Kiwi" Official Gliding Magazine of the N.Z. Gliding Association. Printed October and alternate months. Write N.Z. Gliding Kiwi, P.O. Box 545, Tauranga, New Zealand. £1.80 sterling for year's subscription (inclusive of postage).

AUSTRALIAN GLIDING. Monthly publication of the Gliding Federation of Australia. Features a complete coverage of the Australian scene. Subscription $5.00 Australian, £3 Sterling or $7.00 U.S. to Box 1650M, G.P.O. Adelaide, South Australia 5046.

"SOARING"—official organ of the Soaring Society of America. Edited by Douglas Lamont. Address: Box 66071, Los Angeles, California 90066, USA. Subscription: $8.00 outside USA; apply to your post office for a form.

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It will, of course, be understood that the British Gliding Association cannot accept responsibility for the claims made by advertisers in "Sailplane and Gliding".

CLUB NEWS



Copy and photographs for the April/May issue should reach the Editor, S&G, British Gliding Association, Artillery Mansions, 75 Victoria Street, London, SW1, telephone 01-799 7548, not later than February 16.

Copy and photographs for the June/July issue should be sent to the Editor not later than April 19.

December 6, 1971

COVENTRY—CFI burnt in effigy

OUR very hard-working and popular chairman, Bill Fay, retired at the end of the year, feeling that he should make way for someone new at the "top". So ends a very successful term and I am sure everyone thanks Bill for all the terrific enthusiasm and energy he has put into the club. Another retirement is that of our famous "Hon Sec, chief cook and bottle washer", Adam Hepburn, who will be sadly missed.

November 6 saw the traditional burning of the CFI on Guy Fawkes Night (an effigy—we think). There was also the annual "moans and groans" meeting for members in November. A change of club name was suggested in view of our present geographical location at Husbands Bosworth. One suggestion was the "HB Scratching Society". It seems, however, that for the present we will remain the Coventry Gliding Club.

V.G.

DEESIDE—back-up tug acquired

A SPARE tug—an Auster formerly based at Aberdeen—has joined our fleet full-time. This has elevated our spirits as well as our gliders. A protracted C of A had kept our Super Cub away for far too long and an undercarriage defect had grounded it almost immediately upon its return.

Thus, we are glad to be back in business with gliders stacked up in the wave most flying days in November and one Gold height claim pending.

A Falke is expected soon and will relieve our hard-pressed Capstan of *ab initio* work. Negotiations are afoot to acquire a modern high-performance glider which would be available to suitably experienced visitors. Some of these turn up their noses at our club Swallow—they have to turn them up rather far to find it when it is at 12,000ft in wave and still climbing!

J.M.S.

DERBYSHIRE & LANCASHIRE—hosts to BGA dinner and dance

OUR headquarters at Camphill is now centrally heated and we find that the winter weekends are almost as busy as the summer ones. We enjoy flying over snow-covered hills in winter wave, which is often accompanied by bright sunshine and unusually good visibility, making our Peak District terrain even more beautiful than it looks in the summer.

Our annual dinner and dance had a change of venue this year when we met at the Red Lion Inn, Stonedge, Chesterfield, on January 21.

Several members visited Preston Air Traffic Control in early December where they were royally entertained with a conducted tour of the establishment followed by a film show and bun fight. Preston ATC is now being moved from Barton Hall to Manchester Airport.

This year we are to act as hosts to the BGA for the AGM and dinner dance, which is to be held at the Palace Hotel, Buxton, Derbyshire, on Saturday, March 25. We extend an invitation to all member clubs, and we are very busy making arrangements to receive all guests at Camphill on the following day.

P.H.

DEVON & SOMERSET— annual awards

ON Saturday, December 11, the private owners' fleet was augmented by a brand-new Cirrus which imparted a certain élan to the line-up at the launch point.

In the evening the AGM was held in the new clubhouse. In spite of unlooked-for expenditure on the tug aircraft, the accounts still showed a healthy surplus and statistics showed increases in membership, flying certificates, number of instructors, launches and hours flown.

Trophies were awarded as follows: President's Shield (for the pilot making the best progress), Dave Bailey; Francis Bustard trophy (greatest recorded gain of height), Roy Hodges; Kelsey Plate (best cross-country flight), Brian Weare; Brian Masters trophy (winners of task week), David Bindon and Roy Hodges; Kennedy trophy (top of club competition ladder), Rod Hobbis; special cup (first lady Silver C), Vivienne Fitzgerald.

The meeting was followed by a buffet supper and get together. An innovation was incorporation of the reports of chairman, secretary and CFI in the club magazine, the *North Hill News*.

A.E.R.H.

DONCASTER & DISTRICT— Burton Guest of Honour

THE clubhouse is being renovated, thanks to Frank Thompson and his fellow workers, who hope to have the work completed for the Christmas Party on December 18.

The annual dinner dance took place on November 26 and was a huge success. Chairman Donald Westerside welcomed the guests of honour, George and Kathie Burton. The club trophies were presented by George Burton. Bob Plane's 15,500ft climb won him the Chairman's Cup for the best gain of height. The Pennine Cup was jointly won by Tony Moon and Bob Plane, who had declared different turning points for Diamond distance attempts. After making their TP's, they had had to abandon the tasks due to weather deterioration, both landing at Husbands Bosworth. The 155 Award went to Britt Britton, who had persevered so very much in order to go solo and is now one of our band of Swallow pilots.

It was nice to welcome our friends from Camphill from time to time, who came over to fly the Falke and have aerotows. The Dart 17R teams have been with us for some time and we hope they continue to enjoy their stay.

A.P.M.

ENSTONE EAGLES— control tower into clubhouse

WE have now successfully completed our first season as a BGA full member club. Two members of the Olympia syndicate obtained all three Silver legs and the cross-country boys have put about 1,500km under their belts. Our task week (organised for the second week in June) was, unfortunately, a washout, but we will have another go in 1972.

We are at present erecting our new hangar at Enstone and the old wartime control tower is being steadily transformed into a most habitable clubhouse. Two outstandingly successful social events have already been held there. With the recent acquisition of a T-21, we are now in a position to extend our training programme utilising our Grunau III for early solo flying. We have a limited number of vacancies for *ab initio* new members and we can also accomodate just a few more syndicate aircraft; we have seven at present. Launch is by aerotow and winch, and we shortly hope to re-introduce reverse auto-towing.

Enstone airfield is situated just off the A34 about midway between Stratford and Oxford and, being on the edge of

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C.E H.

HAMBLETONS—review of the year

LOOKING back, 1971 has, badgewise, been the best year yet, although our wave at Dishforth has been sadly absent on many weekends. In April, however, it really excelled itself and gave us our first claimed Gold heights with Julian Earnshaw and John Glover in the club Olympias getting up to around 14,000ft.

July saw three Silver C's completed, by David Wass, Julian Earnshaw and Alan Swales.

On the technical side, our engineer Ray Harrison, with help from Messrs Watson and Morris, have been working hard converting an ex-Leeds City bus into a twin-drum winch. On November 6, the Hambletons and Clevelands clubs enjoyed a dinner dance at a local restaurant.

We have had a change of CFI's this year, saying goodbye and thank you to Gerry Kemp and welcoming his successor, Barry Nowells.

A.W.S.

KENT—circuit days

FLYING at the club lately has consisted either of circuits from a cable or gentle spirals down from 3,000ft. After the end of the soaring season we were expecting some of the ridge days normal for this time of year but have been disappointed. We have had only one Bronze C leg and five hours has never looked possible.

Even when flying is not possible we cannot relax, as John Harvey, head of the clubhouse committee, always finds us jobs to do. Our latest effort has been to sand all the polish off the floor (which we spent all summer putting on) and giving it a couple of coats of polyurethane varnish. We are continually improving the clubhouse and the general amenities but have not had the benefit of a full-time cook to run the kitchen for most of this year. The girls, particularly Janice and Elaine, have worked very hard at weekends to keep us fed.

R.J.H.

LAKES—trailer overturned

HALF-A-DOZEN members recently went on a club "outing" to Portmoak, but the famous wave did not make an appearance in strength, although Charles Boucher achieved a five-hour duration flight and some very pleasant flying was enjoyed. Thanks are due to Portmoak for a pleasant, well organised stay.

Unfortunately, our Skylark trailer overturned on one of the long descents during the return journey. Although there was little damage to the aircraft, the trailer was in a very sorry state. An epic retrieve of trailer and aircraft followed, from Betock Summit, highlighted by a journey over the old Shap road in a howling gale, with odd pieces of the damaged trailer tearing off and vanishing into the night. A jolly time was enjoyed by all!

We welcome Pete Gillette to our instructors list, after successful completion of an instructors course at Husbands Bosworth. Syndicate plans are also hatching which, if successful, will delight the eye with a view of yet another glass-fibre wonderbird, soaring sleek and majestic, over our gritty little slag bank.

R.R.H.

LONDON—chairman digs bungey launches

THE year 1971 was a difficult one from the training aspect due to the absence of one of our K-13's for some months, but even with all in fully serviceable condition it has been difficult to cope with public courses and club member requirements. We are hoping to obtain a K-7 to support 1972 operations, and a fifth K-8 has been added to the solo fleet. Sadly, our last T-21B has been sold to a private syndicate at Dunstable, marking the end of a 23-year training era.

The Nimbus two-seater should be back with us soon, after its accident at Booker, and the Kestrel two-seater is

now resplendent in its final colours. This should be cheerful news for its designer, Vic Ginn, now resident in Rhodesia. Both syndicates are hard at work building metal trailers. The Minimoa, too, will soon grace our skies.

The club chairman was recently observed hard at work on the Downs assisting the clearance of our so-called "landing strip". In conjunction with the Cambridge club, it is proposed to assert our rights and occasionally use our piece of land for bungeying. It will no doubt please the public to see this ancient means of launching in use, and amaze our more recent members.

Annual awards reflect the exceptional flying weather of 1971: the Dent Cup being awarded to Rob Harding for his late season 300km triangle; the Foster Boomerang jointly to Frank Pozerskis, Mike Garrod and Mike Bird for out-and-returns to Shobdon (334km); the Cellon trophy (best *ab initio*) to Gillian Case and the Dunstable trophy for the best flight in a club glider to John Woodford. M.P.G.

MIDLAND—long, low lenticulars

THE autumn gave us several moderate wave days at weekends, including a morning with the site in the down-current of a SW wave which led to some rapid circuits. Weekend flying in 1971 has benefited from Mike Ray's impeccable winching on Saturdays and, more recently, from the winch team of newly-elected committee member Graham Courtney and partners on Sundays. It would seem that specialisation pays.

In spite of considerable expenditure on new equipment, a healthy financial position was reported by Alan Parkinson at the AGM on November 14. The signs for 1972 were good; membership is up and total launches are ahead of the corresponding figures for the previous year. We hope to take delivery of a second K-8 early in the 1972 season, and the most recent privately owned aircraft is John Brenner's newly acquired SHK.

We hope to fly in the week following Christmas. All mid-winter arrangements on a hill-top site have to be tentative of course but, undaunted optimists, we're convinced that there will be no snow and long, low lenticulars . . .

W.J.T.

NORTHUMBRIA—seven days a week for 1972

IN 1972 we take the big step forward from being a weekends only club to a full seven days a week operation. We plan to run *ab initio* courses from March to November and hope to have a tug pilot available midweek throughout the year so that we can exploit our excellent wave system to its utmost limits. This wave works to over Gold C height almost every time the wind is south-west, but it has been soared in wind directions from south through west to north. We hope many pilots will visit us with their aircraft this coming year. In October there were several Gold C climbs, mainly by pilots who had done it before.

While the private fleet was revelling in the waves, the club fleet was dwindling until only the Capstan was operational. The T-21 was blown over but the damage assessment showed that it was just cheaper to repair than to write-off. The T-31 is undergoing a major C of A on the site, with the work being done by club members, and a new Grunau Baby awaits a final paint scheme and British certification. We hope to be at full strength by late January.

J.R.G.

SOUTHDOWN—instructors' seminar

AN instructors' seminar has again been held for instructors from Challock, Lasham and Firle. Lectures were given by John Williamson (on cross-country flying) and Derek Piggott. A series of monthly talks on various aspects of gliding have also been organised, by deputy CFI Jim Tucker.

October was mainly a month of circuits, low cloud and cable breaks, although Jim Tucker has been hunting the elusive minor wave which can occur in SW winds in his Olympia 460. He has met with varying degrees of success, giving him one prolonged flight on an otherwise non-soaring day and some

field landings. November's light north-westerlies have provided some marginal hill soaring.

A new syndicate Olympia 460, owned by Chris Berry, Jim Cornish and Derek Eastell, has appeared at the club.

K.I.P.M.

SOUTH WALES—swimming in the River Usk

WE are presently enjoying the most soarable winter season in the club's history. The best of the numerous recent wave flights were made by Adrian Thomas and Earl Duffin, who both exceeded 11,000ft.

Much interest has been aroused by the arrival of a new club single-seater, a Cumulus. My sources inform me that the Cumulus was made by the makers of the Grunau and the design is of the same vintage. The club wits have suggested that its tadpole shape makes it more suitable for swimming in the River Usk than soaring above it. Due to its low maximum cockpit load, many pilots have been seen clutching diet sheets around the site!

The new clubhouse nears completion, mostly due to the superb efforts of Lyn Ballard, and will provide welcome haven for those waiting to get frozen at 10 grand plus.

With quite a few wave months to go, we are looking forward to even higher things at our 12-month soaring season site at Usk.

S.P.P.T.

WYCOMBE AIR PARK—bus bought

PHILIP WILLS blessed us as guest speaker at the first ever Thames Valley dinner dance, held on October 28 and supported by some 100 Thames Valley and Airways members. It was an excellent evening and we look forward to a second helping next year.

Arrangements have been made to C of A the club fleet during the winter period in anticipation of an early start to the soaring season and our Regiona's in May.

The latest acquisition is a double-decker bus from Nottingham; it will be converted to house all the launch point requirements, including radio equipment, etc.

K.W.W.

SERVICE NEWS

CHILTERNS (RAF Abingdon)—cross-country mileage up 500%

A GOOD few hours of hill soaring have been achieved on expeditions to Chinnor in November, run in conjunction with the Almighty (who provides the required wind) and the Booker clubs (who provide the launches). We are indebted to Norman Smith and his staff, without whom these expeditions would be impossible.

The AGM was held at a local hostel on November 21, where it was reported that although hours and launches were down on 1970 (due to the fire which destroyed our fleet last year) our cross-country mileage was five times that of the 1970 total.

Wg. Cmdr. Eric Reeves was elected chairman, Wg. Cmdr. Harry Armitage retiring from the post. The Member of the Year trophy was presented to John Butler for his sterling work as MT member, a job which he has carried out against impossible odds at times. A mounted model of the club's Bocian, hand-carved to scale by club member Pete Simons, was presented to our previous CFI, Doug Bridson, to remind him (if he needs reminding) of the Chilterns and his spectacular aerobatic displays.

P.M.

CRUSADERS (Cyprus)—endurance rewarded

AT A time when thermals in Great Britain have become scarce, soaring achievements continue in Cyprus. Roy Heslop attained the island's seventh Gold C gain of height with a climb to

12,000ft in the Olympia 401, and two Silver durations were earned in thermals in November.

The following trophies were awarded at the annual dinner and dance, held in Limassol: The Andy Marshall trophy to CFI Len Barnes for the most work contributed to the club; the Pundit's Pot to Brian Murgatroyd for his eight-hour soaring marathon in the Olympia 401; the Novices trophy to Kevin Allen for progress from *ab initio* to instructor in under 12 months; the Scratchers trophy to Dick Bealer for sheer determination on his five-hour duration and the CFI's Cup to Roy Heslop for outstanding all-round service in support of club activities.

The AGM was held in the clubhouse at Kingsfield, Dhekelia, in a mood of optimism, though wary of complacency. Committee reports showed encouraging progress, not least the financial position which permits the club to continue as one of the cheapest—15p per launch plus 45p for an hour's soaring.

G.W.G.C.

FULMAR (Milltown)—RAFGSA club now operating

THE Fulmar club has been operating under RAF management since October 1, 1971. Chris Wright's solo and Jeff Howlett's 50 minute wave flight are the first achievements of the club in its new guise, Jeff's flight taking him to 7,000ft.

The club fleet grows steadily with a K-7 and a K-4 operating and an Olympia 2 and Dart on the way. Aerotows by courtesy of the Navy bring the elusive waves nearer and winter soaring looks promising.

The chairman of the RAFGSA, Air Vice Marshal Bird-Wilson, visited the club recently, and Wg. Cmdr. Don Hanson, RAFGSA vice-chairman, has taken up an appointment at RNAS Lossiemouth and joined us at Fulmar.

M.R.

HERON (RNAS Yeovilton)—Jag for auto-towing

A COMPREHENSIVE maintenance programme this winter includes major C's of A for our Swallow and Olympia, much-needed trailer refurbishing and the renovation of a newly acquired winch. It is hoped that the latter will provide the opportunity to exploit a few neighbouring ridge sites which, up to now, have largely been pipe dreams.

Further C of A work is in hand on our Beagle Terrier, whose withdrawal from the scene has been balanced by the arrival of a Chipmunk. Another arrival is a Skylark 3B from our confederates at Lossiemouth, restoring the strength of our soaring fleet.

Yet another acquisition is a Mk 9 Jaguar for auto-towing to replace our temperamental F100's which, though adequate for the job, have been expensive to maintain.

Our congratulations go to Mike Rothwell on achieving his Silver height and distance within two months of his first flight. Five members completed their Silver C's this summer.

P.J.O.

KESTREL (RAF Odiham)—statistics

WE are able to look back on our year's gliding achievements with some satisfaction.

We have found the year's soaring rather below average, with occasional bursts of excellent weather, and regret being able to fly only on weekends. We can only winch-launch, with a two-car back-up facility. Best launch rate this year was 113 in a day (club record is 118).

All four single-seaters were flown by club pilots in the Bicester Junior Inter-Services competition. A particularly noteworthy performance was achieved by Roger Clemo who flew the Kite II to 7th place out of 18 in the Club Class.

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Club pilots have taken 463 and K-6E to Shobdon and Portmoak respectively in October.

Like most Service clubs we have the ever-present problem of a "floating" instructor population. We lost Roger Clemo, Keith Daley and Phil Andrews last year on postings, but fortunately gained Mike Smith, Terry Culvert and Dave Dripps as new assistant instructors.

We had to partially vacate our old hangar, due to service reasons, late last year pending complete eviction. We have re-clad the roof of a small derelict hangar for MT and trailers, and a large, semi-permanent Bessoneau hangar is being put up alongside to house our gliders.

We are planning a fortnight's advanced training and soaring camp in April. Any visitor, by air or ground, will be most welcome at Odiham, but if you do come by air, watch very carefully for occasional service helicopter movements that occur at weekends. Please do not land at Odiham during the week—gliders and helicopters do not mix.

L.S.H.

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