GLIDING

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QUARTERLY

GLIDING

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Cover Photograph.—Scottish Gliding Union's T-21b two-seater comes into land at Balado airfield. On the ground, the Krajanek and Olympia. *Courtesy of "Scottish Field" photographs.*

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Two-Way Instruction

TIME was when the statement "glider pilots must know a lot about meteorology" was bandied about on all sides, without anyone knowing how to set about gaining meteorological knowledge or even knowing what kind of knowledge was available to be gained. Mostly, in fact, it was not available, because nobody realized that a two-way traffic in ideas was wanting: meteorologists needed information from pilots before they could digest it and hand it back in scientific form.

A circulation of this kind would be self-perpetuating, once started, but it took years to get going. Less than twenty years ago, a leading meteorologist could be heard telling a meeting of glider pilots that soaring in lee waves was impossible—two years after it had actually been done!

In the present issue of GLIDING are three items of special interest on this theme. Munitalp, a curious word which suggests munificence on an Alpine scale, but is really no more than "platinum" spelt backwards (or is this a coincidence?), is the name of a Foundation to which Dr. Paul B. MacCready, Jr., is a consultant. Needless to say, one can detect his hand in the drawing-up of a Meteorology Competition in which prizes are offered for papers on "Upcurrents", incorporating knowledge gained by "simple observations".

As an example of failure to recognize simple observations as a means to knowledge, we might recall that in 1932 a British glider pilot flew a Klemm light aeroplane to the Wasserkuppe and, while there, took up an expert who made him fly round and round a small cumulus cloud to observe how long it lived for. He returned to England to pass on what he had learned from the expert over there, and gliding people felt ever so grateful for all the trouble it had cost him to get this important piece of information—which any one of them could have discovered without stirring from his armchair, by merely looking out of the window at a cumulus cloud for a few minutes.

Secondly, in this issue is an announcement of a new book written by Mr. F. H. Ludlam and Dr. R. S. Scorer, two meteorologists who have been touring many of the gliding clubs in the last year or two and, as a result, set going in earnest a two-way flow of information which, as emphasized above, has been lacking for so long.

Thirdly, there will be found on page 153 an announcement of a lecture course by Dr. Scorer, to be given in London on ten consecutive Thursday evenings, starting on January 20th. Here, the two-way flow will be established by time-table, for the information will pass from lecturer to audience until half-time, whereupon its direction of travel will be reversed. The same two-way rule will apply during each intervening week, when not only will the lecturer be preparing for his half of the next lecture, but the audience, too, will be encouraged to make systematic observations, ready to turn up again primed with all they have discovered. These lectures must not be missed by any reader who can possibly attend them.

B.G.A. News

Annual General Meeting

THE Annual General Meeting of the British Gliding Association will be held on Saturday, March 12th, at 2.30 p.m. in Londonderry House, Park Lane. The Instructors' Conference will be held on the morning of the same day, also in Londonderry House.

Gliding Ball

At this Ball, to be held in Londonderry House on Friday, March 11th, from 8 p.m. to 2 a.m., the Annual Awards will be presented; Eric Wakefield and his band have been engaged, and there will be a Cabaret by gliding personalities, including Calypso music. Tickets, £1 each, inclusive of cold supper, may be obtained from gliding clubs or from the Association at Londonderry House, 19, Park Lane, London, W.1.

Presentation to Mrs. Orde

Many people connected with gliding who came in contact with Mrs. Orde while she was secretary of the Association have expressed their gratitude for the magnificent job she did, and their desire to give her something as a tribute. Contributions to the Alex Orde Presentation Fund may be sent to the British Gliding Association. The presentation, which will include a list of donors, will be made at the Gliding Ball on March 11th.

Records Homologated

BRITISH NATIONAL: SPEED OVER 100-KM. TRIANGULAR COURSE.—D. A. Smith, Leszno-Rawicz-Gostyn-Leszno (Poland) in a Jaskolka on June 25th, 1954: 59.897 km. (37.218 miles) per hour.

U.K. LOCAL: SPEED TO 100-KM. GOAL.—P. A. Wills, Lasham to Detling in a Sky on July 4th, 1954: 60.83 m.p.h.

WOMEN'S BRITISH NATIONAL AND U.K. LOCAL: DISTANCE.—Mrs. E. Deane-DRUMMOND, Lasham to Tewkesbury in an Olympia on September 5th, 1954: 77 miles.

Greig Library of Slides

The Association has quite a large selection of coloured and other slides available to clubs and individuals for lectures. These include two sets of the International Contest in Switzerland by D. F. Greig and Mrs. Welch, D. F. Greig's collection of British slides, and various large pre-war lantern slides.

Accident Reporting

The Chairman of the Accident Analysis Panel draws the attention of clubs and instructors to Paragraph H. of the B.G.A. Operational Regulations:—"All accidents, and all incidents which might have caused damage to machine or pilot, as laid down in the B.G.A. accident/incident procedure, must be reported on the forms supplied by the Association for the purpose in less than a month from the occurrence." It is necessary, if useful statistics are to be compiled, to receive reports of all accidents and incidents, and it is therefore requested that if clubs have outstanding reports, they may now be sent in.

Fauvel AV-36

M. Fauvel has informed the Association that he has carried out certain modifications to improve the landing characteristics of the AV-36 "flying wing". It is hoped that a representative of the Technical Committee will have an opportunity to fly this machine some time in 1955, and meanwhile intending constructors are advised to postpone building of the aircraft until this has been done.

J.C. & MRS. RICE

JACK Rice, who with his wife Mildred was killed in a flying accident in Switzerland while on the way to an aeroplane rally, was active in British gliding for many years and one of its most generous benefactors, especially to the Leicester Gliding Club. He organised four notable aero-towing meetings near Leicester, three at Ratcliffe aerodrome and one at Rearsby; they were held during the Easter holiday period, two before the war and two after, and that of 1946 was the first gliding meeting in this country after the war was over.

His contribution to the expenses of the British team at the World Championships in Spain was the largest donation after that of the S.B.A.C., and he brought his own Miles Messenger to the meeting in order to give aero-tows to our team during the practice period. While there, he celebrated his 60th birthday with his usual high spirits, and it

Not a Christmas party, but the audience at an informal variety show in the Competitors' Club during the World Championships, photographed by P. A. Lang

was exactly two years later, on his 62nd birthday, that he lost his life. His lively personality will be very much missed.

CORRECTIONS

AUTUMN ISSUE.—Article on OSTIV Meteorological Papers by P. M. Saunders, page 104, column 1, second equation:—the left-hand term should read:

$$E^{-1} \left(\text{or } \frac{1}{E} \right)$$

and in the right-hand term w^1 should read w^2.

On page 109, top of column 2, Ilchenko's aggregate height gains totalled 18,000 metres, not km.

In the list of "Donors of Equipment and Services" for the World Championships, on page 111, there was in important omission. Messrs. Slingsby Sailplanes loaned the T-42 sailplane and woodworking machinery, and gave repair materials and the use of a Landrover car.

SUMMER ISSUE.—While the Programme, issued as a supplement, was in the Press the entry list was changed as follows:—

Austria: No. 26, A. Hasenknopf flying Zugvogel; No. 43, 2nd pilot Erich Neumann; Team Manager, Hans Wolf.

Canada: Team Manager, W. Pound.

Denmark: No. 17, Olympia.

Germany: No. 44, entry cancelled.

Italy: No. 2, G. Ferrari flying Canguro: Team Manager, F. Greco.

Spain: No. 3, pilot F. Vicent; No. 21, pilot M. T. Ara; No. 38, Kranich III, 2nd pilot R. Bermudez.

United States: No. 18, 1-23E; No. 34, 1-23D; Team Manager, B. L. Wiggin.

Yugoslavia: No. 7, Orao II; No. 42 ,1st pilot Z. Rain, 2nd pilot B. Komac.

Leszno - and Subsequent Reflections

by Charles Ellis

My general impression of our visit to the International Gliding Contest at Leszno last June have already been described elsewhere (1), so I propose to give here only details and comments upon what I consider to be the distinctive features.

Tasks and Marking System

This must have been the first gliding contest in which the marks were awarded for one sole merit—*Speed*, and the tactics employed to achieve this dominated the whole meeting. The speed was measured over courses set each day by the Contest Commission, and the tasks actually accomplished were:—100 kms. triangle (two days), out-and-returns of 154 kms. and 182 kms. (two days) and a down-wind goal race of 305 kms. (one day). A contest day was defined as one in which the task was completed by at least three competitors, and this rule led to the invalidation of what was, to us visitors, the most interesting task of all, namely, a race round a 300-kms. triangle, as it was completed in extremely poor conditions by only two pilots.

One thousand marks were awarded daily to the fastest competitor, and the other pilots completing the course were marked in direct proportion to speed. Those failing to complete the course were marked in relation to the speed of the slowest man completing the course, their tasks being directly related to the amount of the set course which they actually succeeded in covering, e.g.,

Fastest man at 50 m.p.h. gets 1000 pts.
Slowest ,, ,, 25 ,, ,, 500 ,,
Pilot covering only half the course gets 250 pts.

I discussed with T. Gora, who was largely responsible for the formulation of the marking system, the advisability of awarding a lower scale of marks to those failing to complete the course, emphasising the view of the B.G.A. Flying Committee that, in racing, the main object must be to complete the course. He smilingly disagreed: "In racing," he answered, "the main object is to go fast. If you make the penalty too severe, nobody will go fast." A point of view with a truly sporting flavour.

There are two classes in the Contest: Individual and Team. The winner of the former was the pilot with the highest aggregate marks for the total number of contest days (five). The team award was decided by comparing the aggregate marks of the three pilots in each team; if the team had less than three pilots, no provision was made for adjusting or averaging their marks, as it was evidently considered useless to speculate upon what a non-existent third pilot might or might not have done.

Organisation and Rules

There was no handicapping and no two-seaters were permitted.

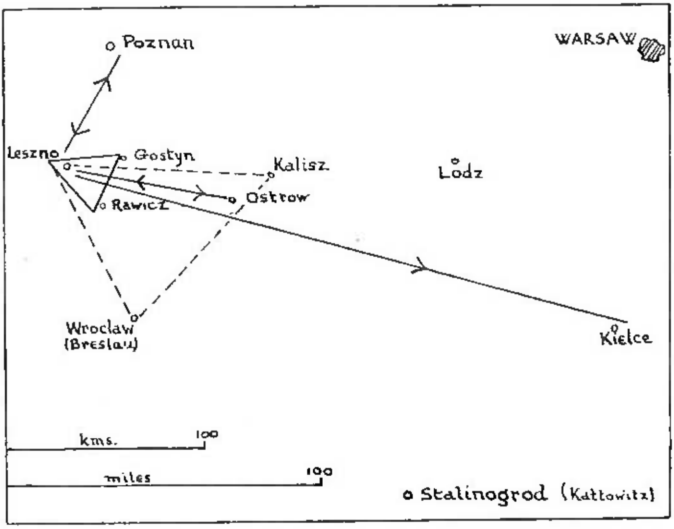
No radio was allowed.

All starts were by aero-tow, and it was usual to launch all 36 competitors in 35 minutes. Retrieving was also by air, trailers being resorted to in only exceptional cases. Checking and timing of competitors at the start and at turning points was done visually from the ground over carefully arranged lines of sight, with the aid of ×20 binoculars. The method of timing the start and finish of the races, and the procedure at turning points were as laid down by the F.A.I. The configuration of the 100 kms. triangular courses was also in line with F.A.I. requirements, and the 300-kms. triangle was proportionately similar (see accompanying sketch map).

Meteorology and Topography

A met. briefing was handed to the pilots each morning in a most detailed form. Information given in the first part of this was the usual particulars relating to cloud amounts, type, base and height, visibility, wind, icing, etc., etc. The second part of the form gave details of "lift" to be expected: type, characteristics, strength below cloud and inside cloud, and extent of non-thermal areas. The last part of the form asked for observations from the pilot. The details in the first two sections were divided vertically into two columns: before a certain hour, and afterwards.

In contrast to other international gliding contests, briefing seldom lasted half an hour, so that the first competitor could be launched at 09.00 hrs. if necessary.



Being centrally situated in a large land mass, and a flat one at that, forecasting at Leszno avoided many of the difficulties encountered at Camphill. On the other hand, the technical resources available were inferior and there was no Spitfire to carry out local ascents.

A very high standard appears to be expected from the Met. team, and they are subjected to severe criticism if their forecast errs in the timing of best conditions. This timing is, of course, of special importance in racing, as it decides the moment chosen by competitors for making the start of their timed "run". In my opinion the forecasting was very good, and I was most impressed by its accuracy in regard to the strength and distribution of "lift", which is something upon which I have found British forecasting, at the numerous National Championships I have attended, to be irritatingly misleading.

In a talk with W. Parczewski (leader of the Met. team from the Polish Institute of Hydrology and Meteorology—P.I.H.M.) he modestly declared that his success was not the result of any magic formula, but followed from ten years of intensive study of soaring conditions in the closest collaboration with pilots, to whom he gave warm praise for their diligence in collecting data. Certainly the manner in which the met. briefing was given catered so thoroughly for the requirements of the competitors that it left little scope for questioners, and was thereby largely responsible for the expeditious manner in which "briefing" was disposed of every morning. Parczewski shares the honour of the Polish two-seater record with the pilot A. Brzuska, having reached 9,293 metres (30,489 ft.), and he has recently published a very interesting work on gliding meteorology (2).

Leszno is situated in West Poland, about 50 miles S. of Poznan, and the district over which most of the flying took place is a rolling plain, with low relief, typical of that part of Europe, being well drained by numerous rivers and lakes, and has an altitude of 200-400 ft. Forests are numerous but not of unbroken extent, and the light soil is well tilled and intensively cultivated. Meadows are situated only adjacent to the rivers, and, being too soft for the towing planes, were usually avoided in forced landings. The only high relief traversed was on the goal flight to Kielce, in the neighbourhood of which wooded hills rose to 1,500 ft. a.s.l.

We were surprised to find that soaring conditions were only equivalent to a good summer day in England. Cloud base was usually about 1,200 m. and only once rose to 1,500 m., giving the best lift upon that same day, namely, a fairly regular 3 m/sec. Thus perished the long-cherished belief that Polish performances were a product of conditions never experienced in Great Britain. Apart from thunderstorms, which occurred in late afternoon or evening, and produced the only rain, wind speeds never rose above 35 km/h (22 m.p.h.).

Results

These have been exhaustively analysed by Prof. Humen (3) and one of his diagrams is reproduced here (Fig. 2). Considering that the Polish pilots had practised at Lezno during the three weeks preceding the contest, special praise is due to the three visitors who appeared in the first ten. These are G. Mezö, of Hungary, flying a Junius 18, who came second; M. Finescu of Rumania, in IS-5, placed eighth; and H. Lambert, of France, in Air-102, ninth. Miss W. Szemplinska, who teaches aeronautical engineering in a Warsaw technical college, was seventh, and Mme. Choisnet-Gohard, the French women's champion, was thirteenth. The first nine pilots (i.e., one-fourth) succeeded in completing every task set, which I think reflects considerable

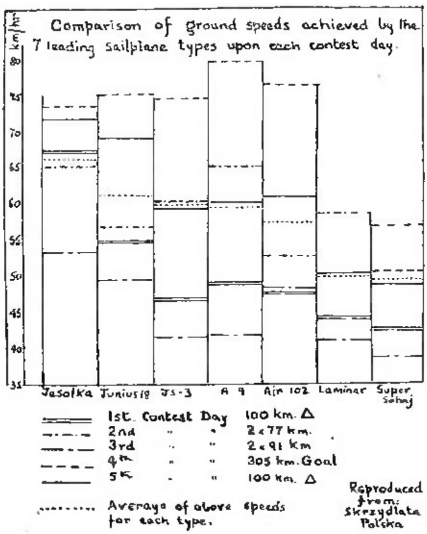


Fig. 2

credit upon the Contest Commissioners also.

In consequence of these Contests, no less than seven National Records were established for speed over the 100-kms. triangle.

Rumania (M. Finescu)	72.9 km/h
Hungary (G. Mezo)	69.1 ,,
Czechoslovakia (J. Kumpost)	65.1 ,,
France (Mme. Choisnet-Gohard)	61.5 ,,
Great Britain (D. A. Smith)	59.8 ,,
Bulgaria (G. Petrow)	51.5 ,,
East Germany (H. Schmiedeke)	45.7 ,,

The full list of final marks is given below. I attribute my own poor showing not to flying a strange machine (as was so generously suggested by the Poles) but to inexperience in the tactics of racing. Thus I found myself doing one of two things: having decided at the start that, at all costs, I must complete the course, I would duly arrive to find I had made the slowest time; or, having decided that "today, I *race*!", experiencing the exhilaration of passing everything in sight, only to end up in a field somewhere round the course.

It is impossible to look back upon Lezno without comparing it with the F.A.I. Championships at Camphill, especially as regards the type of contest and method of marking. It has always seemed to me that the F.A.I. has been unimaginative in these matters, and lags behind, instead of stimulating its sportsmen to develop new skills. The 300-km. triangle race sponsored at Lezno would not have been declared "no contest" under the Camphill rules, and it is by setting such ambitious tasks that the standard of skill is most likely to be raised. For some strange reason the F.A.I. has set itself against a Team Championship, despite the fact that the Team Spirit is considered a virtue in most other fields of sport. Lezno showed that a new field for skill can be opened up by team flying.

Not only has the F.A.I. rejected the British proposals to abolish the superfluous title "World Champion of two-seater gliders", but it has done nothing to avoid the development of bigger and more expensive two-seaters requiring bigger and more expensive launching devices. The same applies to equipment. No sooner had skill at navigation been accepted as a desirable quality in a World Champion, than radio is installed to relieve him of this tiresome chore! If any reader thinks that the Poles are going too far in banning radio from Championships, I must point out the danger of more and more outside aid being fed to the pilot via more and more expensive instruments until we are uncertain whether the pilot won the contest or some electronic "brain" (costing £*n* millions) installed in a five-storied block 10,000 miles away.

Individual Classification

	Pilot	*Country*	*Points*
1.	Edward Makula	Poland	4698.99
2.	György Mezo	Hungary	4610.33
3.	Jerzy Popiel	Poland	4480.40
4.	Marian Gorzelak	Poland	4452.43
5.	Tadeusz Gora	Poland	4377.06
6.	Zbigniew Kirakowski	Poland	4367.06
7.	Wanda Szemplinska	Poland	4348.21
8.	Mircea Finescu	Roumania	4333.64
9.	Henri Lambert	France	4131.04
10.	Adam Witek	Poland	4029.34
11.	Wiaczeslaw Jefimienko	U.S.S.R.	3960.63
12.	Wiktor Ilczenko	U.S.S.R.	3833.66
13.	Marcelle Choisnet-Gohard	France	3704.73
14.	Julian Nowotarski	Poland	3702.02
15.	Michal Wierietiennikow	U.S.S.R.	3678.39
16.	Stanislaw Skrzydlewski	Poland	3667.56
17.	Henryk Zydorczak	Poland	3494.85
18.	Jerzy Adamek	Poland	3434.22
19.	Jaroslav Kumpost	Czechoslov.	3271.23
20.	Antoni Smigiel	Poland	3228.75
21.	Frantisek Svinka	Czechoslov.	3208.01
22.	Roman Zydorczak	Poland	3011.39
23.	Jerzy Wojnar	Poland	2601.81
24.	Augustin Smehyl	Czechoslov.	2578.06
25.	Helmut Schmiedeke	E. Germany	2573.48
26.	Daniel Smith	Gt. Britain	2537.72
27.	Georgi Pietrow	Bulgaria	2334.23
28.	Gheorghe Galca	Roumania	2324.32
29.	Istvan Takacs	Hungary	2318.93
30.	Wilhelm Leinemann	E. Germany	2184.74
31.	Heinz Fischer	E. Germany	1937.99
32.	Charles Ellis	Gt. Britain	1867.15
33.	Todor Iwanow	Bulgaria	1789.94
34.	Endre Karsay	Hungary	1693.01
35.	Mihai Iliescu	Roumania	1683.03
36.	Iwan Karapanczew	Bulgaria	602.02

References

(1) C. Ellis: The Curtain Raised. *Flight*, July 23, 1954, Vol. 66, p. 105.

(2) W. Parczewski: Meteorologica Szybowcowa, 1953.

(3) W. Humen: Analiza Miedzynarodowych Szybowcowych, *Skrzydlata Polska*, No. 32 (162).

OBITUARY

Sir Roderic Hill, Rector of Imperial College, whose death on October 6th, at the age of 60, we regret to record, had been President of the Imperial College Gliding Club for some years. That was not, however, his first connection with gliding, for he and his brother, Professor G. T. R. Hill, built and flew a home-made glider in 1911; subsequently he devoted his career to aviation.

In his book, "The Baghdad Air Mail", published in 1929, he described how a fellow-pilot invented a primitive variometer to enable the Vickers Vernons to overcome their poor climbing characteristics by finding thermals.

He made several flights in the Imperial College Club's Kirby Cadet at Redhill "with astonishing precision", but later, to his disappointment, became far too busy to follow up this promising beginning.

A.E.S.

We deeply regret to record the death of Flying Officer J. E. A. Jenkins in a flying accident in Germany on September 26th, 1954.

Jenks had always been interested in gliding, but had no opportunity to practise it until he came to Germany at the end of 1952. In the late autumn of 1953 he founded the R.A.F. Bruggen Gliding Club and a few months later, last May, led it to victory in the Second T.A.F. annual competitions, incidentally completing his Silver C with a 237 km., 5 hr. 15 min., flight in a Weihe from Scharfoldendorf almost to the Zuider Zee in Holland. He recently joined the London Gliding Club.

He had a terrific enthusiasm for our sport and boundless energy, and he will be sadly missed by all who knew him.

J.S.R.S.

Cloud Flight

by Tony Deane-Drummond

Cloud flying in gliders is a fascinating and exhilarating branch of the art of soaring. Forces are at work which produce up-currents normally more than 10 ft. per second and frequently up to half a mile or even a mile in diameter. Pity that there are comparatively few days in England which produce good-size clouds, and as a result most gliders and their pilots are inadequately equipped to make use of them.

August 15th was such a day. It was my turn to fly our Olympia, and already by 11.30 a.m. clouds were beginning to build up in a most satisfactory manner. Cloud base was only about 1,500 feet above Lasham, but cloud tops were going up to 6-8,000 ft., although the life cycle of a forming cloud was obviously still very short. I watched one cloud build right up from a small wisp to maximum altitude in only 15 minutes. On such a day it is usually better not to take off till mid-afternoon, when there will be more energy available to keep the clouds going for a much longer time. The danger of leaving it too late is that dissolving cumulus may spread over the sky as a high stratus and stop any further clouds forming.

Rather against my will and better judgment I was persuaded to take off at midday by aero-tow. Clouds looked promising, but were still obviously short-lived. I released at 2,000 feet (all heights above sea level: Lasham is 600 feet) after the variometer had shown maximum rate of climb for several seconds. The thermal was wide and easy and we were borne upward at 5-10 ft./sec. Cloud base was reached at 2,500 ft. and I straightened up momentarily to uncage the horizon which was due to keep running continuously for the next 4 hours.

After only about 1,000 ft. climb in the cloud, the thermal started to peter out, and in spite of a little diligent searching around, nothing more could be found. I straightened up on a course of about 280 degrees, and in a few seconds was clear.

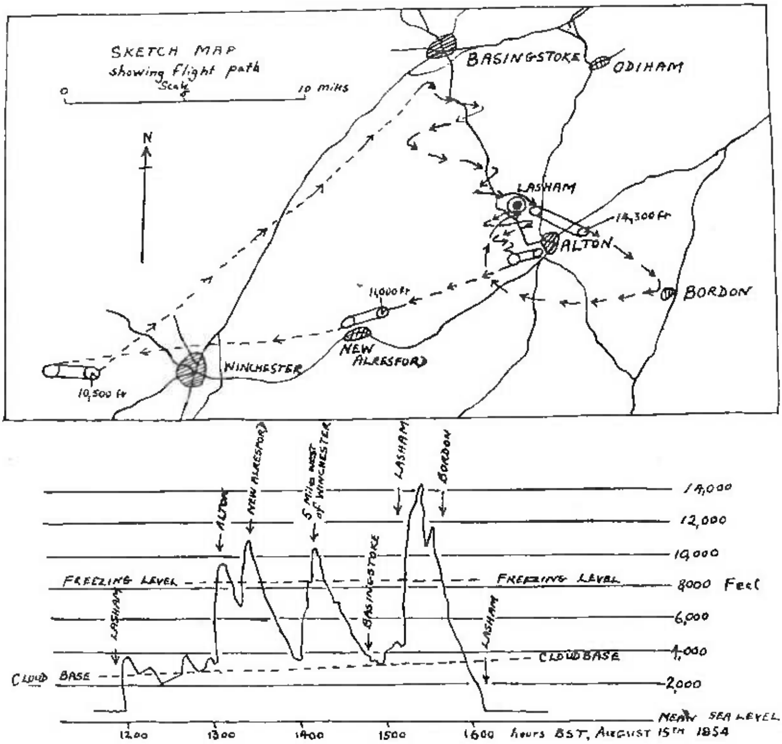
For the next hour I had quite a struggle to keep aloft in a series of small clouds, none of which took me higher than 3,900 feet. Between each I would steer for the next likely one upwind, which was within gliding distance. The airway corridors to the east of Lasham forced me to keep flying west between clouds as there was a 5-10 m.p.h. westerly wind. I cursed my early take-off, though a convenient low point was registered on the barograph at 2,000 ft., followed by a 15-minute struggle to climb only 500 feet to cloud base.

At last, after an hour's flying, I managed to reach my first really good cloud just upwind of Alton, which took me up at 15 ft/sec. to 6,000 ft. and then steadied down to 10 ft/sec. up to a maximum of 9,500 ft. At the top of the climb there was the usual slight turbulence which caused the Olympia to rock both laterally and fore-and-aft. After a few seconds flying west, I broke cloud to find half an inch or so of jagged ice along the leading edges, whilst the total energy venturi and static head looked like a small snowman perched up in front of me. During the climb both the variometer and the A.S.I. failed at about 8,000 feet, but recovered again as soon as the taps connecting the instruments to cockpit pressure were opened. Dive brakes had also frozen shut and could not be opened.

To the west again and near New Alresford I entered another promising-looking cloud about half way up its gleaming white face. After flying straight for a few seconds, I hit the expected thermal which eventually was worked up to 15 ft/sec. to just 11,000 feet, when power suddenly failed again.

My next cloud was a surprise. Again I charged a towering white cliff at about 8,000 ft. and half a minute later came out on the far side, having not felt any turbulence, and having pierced what was apparently the deepest part of the cloud. It must have been a ghost of its former self, hanging like a white sheet ready to attract charging gliders.

Further west again beyond Winchester, and looking deceptively close, another good cloud was apparently forming. The Olympia seemed to stand still amongst the cloud giants which never came closer although the A.S.I. showed 60 m.p.h. At



last after 25 minutes flying straight from my ghost cloud, I reached my choice only just above cloud base and some 7 or 8 miles west of Winchester. At 6,000 ft. the ice had melted and dive brakes became unstuck, though I kept the instruments on cockpit pressure to avoid any further trouble.

I had taken such a long time getting to the cloud that its edges were now not looking at all crisp, and the cloud was probably on the point of dissolving. I had no choice but to enter and take what height I could. Eventually it pushed me back to 10,500 feet although at two points I had to straighten up and find another thermal. The climb back up had taken 18 minutes and once again left me with an inch-thick coating of jagged ice and the dive brakes frozen shut.

I was still flying but had not yet achieved a climb of 10,000 feet above my lowest point, which I had set myself as a target for the day. Looking around from the top of my last cloud near Winchester, I could see that back towards Basingstoke there was a large area of sunshine on the ground, and beyond, the beginnings of something much bigger. A series of smallish cumulus were joined together at their base like a well-developed cloud street running north and south. Edges of the clouds were hard and sharp and the base looked very level and black, even from 20 miles away. I set course at 50 m.p.h. and half an hour later arrived over Basingstoke just above cloud base, having clipped through the tops of several smaller cumulus on the way back.

The next 25 minutes was spent flying blind in large zig-zags in an attempt to locate the core of the real lift that I knew must be somewhere about. Several small thermals were tried but none kept going for more than a few hundred feet. Whilst testing one of these, I found myself in one part of the circle right above the launch point at Lasham, which I could see down through a freak chimney of clear air in the cloud.

It was almost like looking through a railway tunnel of cloud and not much wider. It flashed through my mind that if I hit good lift near by, I might have half the gliders of Lasham to keep me company, so I turned on a compass course downwind and a few seconds later hit very strong and powerful lift.

Resolutely I counted off 20 seconds before starting to circle and was soon going up at a steady 20 ft/sec. and the altimeter winding up in a most satisfactory way. At 5,000 feet it started to hail, with the hailstones cracking against the cockpit cover in a varying volume of sound. At one point of the circle it was particularly noisy, but the variometer still showed a steady 18-20 ft/sec. climb all round the circle.

At about 10,000 feet the noise of hail suddenly stopped and was replaced by a wispy rustling noise, a light feathery sound quite different from crashing hailstones. Snow started to come in through the cracks round the edge of the cockpit cover, but still we were going up as fast as ever. The altimeter crept past the magic 12,000 feet and on beyond up to 13,000, when the usual smooth climb was replaced by violent turbulence for most of the circle. In addition to the normal lateral movement of the wings, there was also quite a violent fore-and-aft tilting of the fuselage. If I had been flying on turn-and-slip alone, this would have been the point to steer clear, but with the faithful electric horizon still running smoothly, I continued the climb to a maximum of 14,300 feet before all lift ceased, leaving only the turbulence behind. Full movement of the controls was required to keep the Olympia on a fairly even keel, and my peace of mind was not helped because the divebrakes were of course frozen shut again. I decided to steer clear of the cloud on a southerly course to see how big it really was, and was soon tumbling down a cataract of air with the variometer showing maximum sink.

After five minutes, to my astonishment, I felt I was being pressed hard down into my seat although the horizon showed I was still flying level. At the same time it started to hail with an incredible intensity. The variometer by now was back on maximum climb and we were still going south. The noise was as though I was flying at 500 m.p.h. through a solid wall of pebbles, but the instruments said otherwise and I slowed down to 50 m.p.h. to soften the blows. I even shouted as hard as I could, to see how noisy it really was, and I could not hear my own voice, drowned by what sounded like a thousand pneumatic drills working thei fiendish will on a fragile plywood and fabric glider. I had several times flown in hail- storms before in gliders, but this wa something quite different. I expected to se holes in the leading edge when I landed, bu unfortunately, or fortunately, there was n evidence to substantiate my ears.

I continued to fly straight for two minutes during which time the noise was continuous and I climbed 1,000 feet back up to 11,80 ft. If it had been the beginning of the flight should have investigated it further, but I wa now very cold and wanted to get back t Lasham. My dive brakes being frozen shu also worried me a little, and I did not war to be so tossed by the turbulence that th horizon toppled. Just before reaching th downcurrent I felt a tingling in my finger which my imagination told me might b lightning, and confirmed my desire f terra firma. Onwards I steered on a sout erly compass course, and at 9,000 feet car out of a dark mass of cloud over Bordo some eight miles south of Lasham. I fle back, skirting the storm to the east a landed at Lasham, which the north side the storm cloud had just cleared.

Some lessons which I learnt and which a worth passing on are:

INSTRUMENTS.—Cloud flying is not dangerous or a very difficult pastin provided adequate instruments are carri which can be guaranteed to work even very heavy icing conditions. Any form metal mast sticking out into the slipstre will collect ice and put the instrument of action. The minimum essential inst ments must include an electric turn-and-s (with spare batteries), a compass, and ice-proof A.S.I. The type of A.S.I. fitted my Olympia was the nose "pot" pitot t and worked perfectly, except that the nor type static tube became iced up. The sm electrically heated pitot fitted to so gliders has failed to prevent really bad ic and is an unnecessary complication. ice-proof A.S.I. is essential for safe fly in a "noisy" cloud if no horizon is install The venturi head fitted as a total-ene device to variometers is a wonderful collector, and I believe we must revert some form of fuselage blister, which has never yet been known to ice up. If you must use sticking-out venturis or static tubes, it must be possible to vent these to cockpit pressure, and some form of watertrap should be included.

The compass is one of the weakest links in the chain and a lot of time can be wasted turning on to the correct course whilst the figures swing lazily around. Fortunately the Cook compass nearly gives the same facilities as the gyro direction indicator and will soon become an essential instrument for cloud flying. Unfortunately I have not yet had any experience with this instrument.

DIVE BRAKES.—These must be so designed that they cannot freeze shut. Peace of mind is worth a lot in cloud.

On Being a Bard

by Lionel Alexander

I FIND it extremely difficult to sing in tune—I suppose this makes me a typical glider pilot. However, my voice defects do not deter me at all from singing at the top of my voice, both on and off the flying field, and I suppose that this, too, makes me a typical glider pilot.

For most of us, an early working knowledge of nursery rhymes, hymns and popular songs, from Shakespeare to Coward, has been supplemented by the effective but often bawdy adaptations of these sources by members of the Armed Services, for the purpose of complaint, admonition, good cheer or just plain sex. The unpalatable truth is that whenever a gathering of adult males is assembled for jollification, the later the hour, the more sex triumphs over wit. The advent of women on the gliding scene in large numbers has raised this regrettable situation to the status of a catastrophe. For myself, a desire to sing myself from G to B flat minor during the course of an evening, coupled with a distaste for anything on the bony side of "Angeline", led me to the writing of gliding songs, even at the risk of falling sometimes a little flat in more senses than one. The technique is to drink the odd glass of beer, survey the company and the frustrations of the day with a moderately jaundiced eye, and then to compile thereon a series of vaguely singable rhymes, however atrocious, which your wife may pass if she is in a good mood, but your solicitor certainly will not.

Let it not be thought that this is an advertisement for my own products, an auto-encomium or even a potted autobiography. Far from it. It is merely to urge the reader to search his soul and, having listened to some of my efforts, not only to murmur: "Anything you can do I can do better," but to get on and do it Skill, or even imitation, is unnecessary. Of the three clubs—Surrey, Cambridge and Derby and Lancs—in full or partial production, Surrey tends to the "Bellow together" type of song, like "B . . . y Competitions," while we at Cambridge go for the ephemeral, topical, one-man concert performance. The two genres are as alike as "Der Ring" and "Eine Kleine Nachtmusik," and there must be dozens of others. Every now and then, someone writes a lyric worth preserving, viz., "A glider pilot bold was he" or "Fairy Lift and Fairy Sink," but this is rare. Most of my production has by now been consigned to the waste paper basket (alright, don't say it); but I liked writing it, others liked writing their effusions, and so will you. What does get me down is the frequency with which gliding parties are reduced to transatlantic capers of which the words are unknown and the allusions obscure and outdated for sheer lack of good gliding material.

Where are the Druids of Dunstable (which so conveniently rhymes with "unstable")? Are there no Berlins at Balado, no Rogers at Roundway, no Shakespeares at Sutton Bank? (There is, of course, Slingsby.) If you feel you aren't good enough, try reading the lyrics of any popular song. You'll be surprised how it gives you confidence.

ENVOI

Prince, if you weary too much of your smut
Or find that "Eskimo Nell" is rather strong,
Don't drown your sorrows in Drambuie but
Think out the lyrics for a gliding song.

Gliding Certificates

Silver C

No.	*Name*	*Date of completion*
444	H. S. S. Trotter	19.7.53
445	P. A. E. Jefferey	9.4.54
446	D. Hendry	2.4.54
447	W. N. Tonkyn	18.4.54
448	W. Verling	20.4.54
449	A. Stagg	19.4.54
450	J. Shepherd	8.5.54
451	B. W. Warner	27.4.54
452	J. S. R. Salmond	28.5.54
453	J. E. A. Jenkins	29.5.54
454	J. J. Ellis	29.5.54
455	Mary Deane-Drummond	30.5.54
456	R. Holmes	17.8.53
457	W. S. Cumpston	17.5.54
458	B. B. Sharman	25.5.54
459	F. F. Durr	28.5.54
460	D. C. Kerridge	22.6.54
461	G. T. Collins	17.6.54
462	P. G. Hardie-Bick	27.6.54
463	E. D. Blake	21.6.54
464	N. C. Preston	27.6.54
465	D. W. Stowe	20.6.54
466	V. Huggett	27.6.54
467	E. P. Brisco	3.7.54
468	T. J. Primrose	3.7.54
469	A. A. J. Thorburn	25.7.54
470	M. A. Garnett	31.7.54
471	D. C. L. Chidell	10.8.54
472	L. A. Cox	30.7.54
473	R. V. Watson	15.8.54
474	H. J. Prowse	12.9.54
475	J. V. Inglesby	28.8.54

C Certificates

March, 1954

13121	F. D. Thomas	No. 64 G.S.
14731	M. Clubb	No. 64 G.S.
15062	L. Bellamy	No. 64 G.S.
16076	C. Carmichael	No. 188 G.S.
17238	H. C. G. Cartwright-Taylor	R.E. G.C.
17356	P. C. Pirow	Oxford G.C.
17593	B.B.C. Watson	London G.C.
17635	C. T. Kirk-Smith	Oldenburg G.C.
17646	G. A. Wapling	London G.C.

April, 1954

3582	G. J. R. Saunders	No. 44 G.S.
10583	P. G. Plows	No. 122 G.S.
11695	P. G. H. Mann	Army G.C.
13144	D. C. Wilson	Hereford G.C.
13232	D. H. J. Lake	Midland G.C.
14519	D. M. Clewer	R.A.F. Brugger
14903	D. A. Smith	No. 141 G.C.
15058	J. N. King	Cambridge G.C
15087	C. Ellam	Col. of Aeron.
15112	P. J. Sullivan	Oxford G.C.
15130	J. Goddard	Col. of Aeron.
15147	T. Coldwell	Col. of Aeron.
15349	J. K. Lumsdon-Taylor	No. 31 G.S.
15496	A. H. Burnage	No. 142 G.S.
15738	J. M. G. Bennett	No. 203 G.S.
15756	C. Yarker	No. 64 G.S.
16389	S. Chenna Keshu	Col. of Aeror
16548	J. A. Wignall	Avro G.C.
17272	J. L. Weatherley	Moonrakers G.
17389	D. Collings	Avro G.C.
17481	D. Bailey	No. 89 G.S.
17617	C. L. Barnfather	No. 125 G.S.
17660	B. J. F. Able	No. 84 G.S.
17721	L. W. Redding	London G.C.
17724	R. Griffiths	No. 142 G.S.
17748	J. L. Vanderpost	Derby & Lanc
17768	Mary G. Poole	Surrey G.C.
17769	R. J. Bickford	Wessex G.C.
17806	A. H. Lomas	London G.C.
17813	G. J. Stevens	Cambridge Ur
17821	J. P. Armstrong	Derby & Lanc

May, 1954

3660	G. A. Pentelow	No. 44 G.S.
5387	P. J. Salmon	G.I.S. Detlin
15002	R. H. Gales	Oxford G. C
15344	M. Lacey	No. 126 G.S
15713	C. N. M. Rountree	Ulster G.C.
15778	N. L. Hendren	No. 64 G.S.
15902	C. R. Adams	No. 80 G.S.
13490	J. D. Light	London G.C
13606	D. L. Nicolle	No. 89 G.C.
13981	F. Masson	No. 68 G.C.
16078	V. B. Godrich	No. 64 G.S.
16421	W. F. Hamilton	No. 203 G.S
16452	J. Tolley	Oxford G.C
16748	R. P. Galyer	No. 143 G.S
17010	Anita R. Schmidt	Oxford G.C
17043	P. G. Tydeman	No. 104 G.S
17128	W. B. Farmer	R.A.F. Bos-combe Dow

17154	R. C. Barber	Fassberg (B.A.O.R. 30)
17205	D. B. Clark	Surrey G.C.
17271	Z. Bar	Scharfoldendorf
17513	G. G. Moss	Brüggen G.C.
17733	D. M. Hartas	Surrey G.C.
17931	R. K. Jeffrey	Oldenburg G.C.
17855	E. K. Fisk	Perak Flying C.
17864	D. A. Sear	Oldenburg G.C.
17895	M. J. Richardson	No. 126 G.S.
17905	E. W. Ellis	Hq. 2nd T.A.F.
17924	T. A. Sidey	No. 126 G.S.
17969	C. Allsopp	Geilenkirchen
17971	B. H. Lance	No. 89 G.S.
18004	P. G. Gibson	London G.C.
18005	C. Newbald	Hq. 2nd T.A.F.
18011	I. G. Wood	Yorkshire G.C.
18021	Hilary C. Blanchard	Surrey G.C.
18027	I. D. H. Gibbins	Hq. 2nd T.A.F.
18028	R. Hill	No. 45 G.S.

June, 1954

3893	D. J. Lawrence	No. 123 G.S.
5210	B. B. Sharman	Fassberg
10463	P. A. Shepherd	No. 141 G.S.
14142	J. Steel	No. 1 G.S.
14677	B. S. Woodhall	No. 104 G.S.
15002	R. H. Gales	Oxford G.C.
15117	J. A. Arscott	No. 84 G.S.
15171	J. E. Wells	Southdown G.C.
15270	J. B. Adams	No. 146 G.S.
15789	B. A. Crowdy	No. 141 G.S.
15790	J. R. Lowey	Derby & Lancs.
16417	May H. Lawson	Yorkshire G.C.
16529	H. J. Mayhew	No. 146 G.S.
16814	E. Haswell	Yorkshire G.C.
16927	M. R. Jeffery	Wessex R.A.F.
17133	J. Lawson	Yorkshire G.C.
17198	A. H. Mann	Oxford G.C.
17252	D. W. S. Gordon	No. 80 G.S.
17336	B. F. Hurst	No. 80 G.S.
17585	V. J. L. Alexander	Surrey G.C.
17757	R. I. Lloyd	No. 84 G.S.
17795	C. J. Robinson	No. 23 G.S.
18045	A. B. Mills	Luneburg G.C.
18053	J. Corbishley	R.A.F. Little Rissington
18068	P. Burgoyne	No. 143 G.C.
18082	B. E. Warner	Cambridge Univ.
18083	S. Woolston	Cambridge Univ.
18093	M. A. McNeile	R.A.F. Detling
18100	P. J. Neilson	Cambridge Univ.
18127	W. Storey	No. 168 G.S.
18142	A. G. Reid	No. 23 G.S.
18178	G. P. Gray	Surrey G.C.
18192	C. Green	Midland G.C.
18193	E. D. Blake	Scharfoldendor

July, 1954

5406	J. J. Macklin	No. 89 G.S.
6421	V. D. Longman	No. 89 G.S.
10608	R. W. Paverley	Deversoir G.C.
11750	K. R. Biggs	No. 104 G.S.
12274	J. F. Rhodes	RAF Cranwell
12288	A. M. Wright	RAF Cranwell
12376	D. Percy	No. 2 G.S.
12457	M. J. E. Adams	Roy. Engineers
14984	K. M. Lazarus	No. 22 G.S.
15049	J. P. Corrigan	No. 80 G.S.
15108	J. E. Curtis	Coventry G.C.
15397	M. Harden	Army G.C.
15504	J. R. G. White	No. 168 G.S.
15673	J. Woodward	Oxford G.C.
15760	B. W. Wilkie	No. 2 G.S.
15813	J. L. Brimfield	London G.C.
16065	J. R. Tudgey	Midland G.C.
16101	F. R. Stache	No. 168 G.S.
16369	K. P. Butcher	No. 146 G.S.
16594	B. B. Bowles	No. 122 G.S.
16749	B. A. Briggs	No. 80 G.S.
16917	J. T. Francis	No. 80 G.S.
16952	J. D. Gray	Derby & Lancs.
16957	G. A. Cox	Surrey G.C.
17216	B. Fuller	No. 80 G.S.
17333	P. G. Kelly	No. 31 G.S.
17385	S. J. James	Bristol G.C.
17442	C. Knaggs	Newcastle G.C.
17530	G. A. Bushell	London G.C.
17531	A. J. Pike	Surrey G.C.
17573	Pamela Birds	Surrey G.C.
17586	D. H. Williams	St. Athan G.C.
17621	A. W. Strong	No. 80 G.S.
17665	J. R. Gilbert	No. 168 G.S.
17871	A. J. R. Oldfield	Surrey G.C.
17912	J. R. M. Hawkins	Southdown G.C.
18223	A. Sambale	Scottish G.U.
18227	E. W. Shearer	No. 31 G.S.
18234	W. J. Sutcliffe	London G.C.
18238	Sheleagh Aldersmith	Derby & Lancs.
18239	J. C. Deans	Surrey G.C.
18240	C. A. Gough	London G.C.
18244	B. J. Woodman	R.A.F. Oldenburg
18257	B. Brownlow	R.A.F.G.S.A. No. 7 Area
18266	H. V. Satterly	Deversoir G.C.
18270	J. J. Lasenby	No. 89 G.S.
18288	A. J. Fraser	Geilenkirchen
18296	J. A. Oskenpen	London G.C.

18313	H. Greig	R.A.F. Wessex
18311	J. J. Daly	Yorkshire G.C.
18314	L. R. Johnson, G.C.	No. 166 G.S.
18315	Ethel Tooby	Midland G.C.
18339	A. L. Hruska	Moonrakers
18342	R. W. Millward	RAF Cranwell
18367	C. A. T. Davies	Midland G.C.
18376	J. J. Brock	Surrey G.C.
18378	L. J. du Preez	Surrey G.C.

August, 1954

8740	K. A. J. Lockwood	Army G.C.
13832	D. H. Bryce	Scottish G.U.
14565	R. Lowrence	R.A.F. Wahn
15624	E. C. Littlejohn	Midland G.C.
16667	A. J. Hammond	London G.C.
16773	J. D. Beckett	Bristol G.C.
16816	I. Kerr	Scottish G.U.
16817	I. Paul	Newcastle G.C.
16846	R. S. Tuxworth	London G.C.
16987	J. Forrest	Yorkshire G.C.
17023	D. J. Dulborough	No. 80 G.S.
17052	J. C. Burgess	Midland G.C.
17360	M. Berry	Scottish G.U.
17365	J. E. Torode	Army G.C.
17436	R. Elkins	No. 80 G.S.
17615	A. W. Newton	No. 92 G.S.
17689	Daphne M. Wright	Oxford G.C.
17713	P. L. Harris	No. 105 G.S.
17823	J. M. Reid	Scottish G.U.
17869	A. Scott	No. 42 G.S.
17952	J. E. Wilson	Yorkshire G.C.
18051	B. Tailby	Midland G.C.
18064	C. R. Phipps	No. 80 G.S.
18081	V. P. Snodgrass	Southdown
18138	B. G. Gunter	Midland G.C.
18190	R. A. Smith	Southdown
18284	J. Lattaney	Midland G.C.
18382	H. A. Waller	R.A.F. Deversoir
18384	H. E. F. Savage	Perak F.C.
18407	C. Vinten	London G.C.
18412	K. B. Eyton	Surrey G.C.
18414	F. R. Dawson	Yorkshire G.C.
18419	G. C. E. Bircham	London G.C.
18420	R. J. E. Conant	London G.C.
18468	H. Corney	R.A.F. Oldenburg
18482	F. H. Stirling	Midland G.C.
18483	T. B. W. Heaslip	No. 203 G.S.
18489	R. A. F. Farquharson	Midland G.C.
18551	A. Fairman	Derby & Lancs.
18556	Margaret Miéville	London G.C.
18560	J. C. Green	London G.C.

September, 1954

18625	J. H. Wagstaff	Perak F.C.
18646	G. W. Mackworth-Young	Army G.C.
18650	M. J. Jobling	R.A.F. Deservoir
18692	C. Naylor	R.A.F. Fassberg
18701	G. H. Crump	No. 43 G.S.
18702	F. E. Eastwick	Southdown
18719	C. R. Charrington	G Surrey G.C.
18720	C. Heginbotham	Derby & La
18721	J. E. Rickett	Midland G.(
18722	Frances M. Wilson	Midland G.(
18731	D. Clarke	London G.C
18732	S. P. Welch	Perak F.C.
18748	J. R. Duggle	Midland G.(
18771	J. A. Allsop	Derby & La
18786	R. A. Young, Jr.	Surrey G.C.
18792	M. L. Hall	Southdown
6431	G. Brown	Royal Naval
9610	A. J. Peters	No. 122 G.S
10788	Wendy S. Price	Midland G.(
12175	G. Nelson	Southdown
12854	A. F. Murray	Midland G.(
13096	J. W. Wisbey	Scharfoldend
13533	P. C. Dirs	London G.C
13896	J. G. S. Temple	No. 31 G.S.
14098	F. G. Maccabee	Coll. of Aer
14333	C. A. McMillan	No. 1 G.S.
14881	M. E. S. Evans	Midland G.(
15953	K. R. Pearson	No. 44 G.S.
16121	G. Haigh	No. 45 G.S.
16533	M. Revell	Newcastle G
16554	P. Cowling	64 Group Summer G.C
16665	A. G. Bound-Pearce	Bristol G.C.
16804	W. E. Yuille	Scottish G.U
16926	D. Bradley	64 Group Summer G.C
16970	F. Adams	London G.C
17026	C. J. Horsley	No. 80 G.S.
17219	D. L. McQuillan	Yorkshire G
17268	A. Laird-Philip	Scottish G.U
17393	J. A. Lockie	London G.C
17446	P. Trist	No. 80 G.S.
17622	J. D. Tweedie	Scottish G.U
17666	J. W. Thom	Scottish G.U
17691	P. L. Folkes	Coventry G.(
17897	D. A. Bishop	Army G.C.
18020	J. N. Young	No. 31 G.S.
18070	R. Dodd	64 Group Summer G.C
18133	J. Fields	R.A.F. Kabr
18776	R. O. Barnes	Southdown

Waviness and Surface Finish of Glider Wings

by F. G. Irving

Imperial College of Science.

WITH the increasing use of low-drag aerofoils for the wings of gliders, constructors have gone to greater lengths to ensure that the surfaces of the wings are more or less free from ridges, bumps and hollows and are well-finished. To the onlooker, it is not always clear that the constructors appreciate what constitutes an acceptable degree of accuracy, and in the case of some machines at the 1954 World Championships, it would seem that an excessive amount of labour, weight and money had been applied to produce wings which, although beautiful to behold, were probably unnecessarily perfect. Indeed, had some of this effort been diverted to improving the rigging and mechanical design of the control systems, the final result would, in some cases, have been a much more practical contest glider.

As explained below, a few calculations have been carried out, based on well-known references, which imply that the required degree of accuracy can be obtained by quite normal techniques of construction applied with reasonable care. Further refinement is probably of negligible aerodynamic value: for example, a preformed stabilised skin is probably unnecessary if this construction is only used to get a smooth surface and to take the torque. If, however, it is a by-product of designing the skin to take some of the bending moment, it becomes more logical.

Since the introduction of "low drag" aerofoils into glider design, there has been a tendency to regard the older sections (e.g., the Gottingen family) as being "high drag," and to suppose that efforts to maintain some laminar boundary layer are likely to be in vain. The "low drag" sections are designed to give more extensive regions of laminar boundary layer than the older sections, but there is evidence that on an ordinary Olympia, the boundary layer is laminar to about the mainspar position. The kink at the edge of the fabric then inevitably causes transition to occur and, of course, odd blobs of paint on the leading-edge ply produce wedges of turbulent boundary layer. Hence, even on such a conventional machine, it is worth keeping the wing smooth and clean.

Waviness

Other things being equal, the profile drag of an aerofoil is determined largely, but not entirely, by the chordwise position at which transition occurs from a laminar boundary layer to a turbulent one. It is usual to speak of the "transition point," although strictly transition occupies a region of finite extent. For reasons which need not be explained here, the profile drag decreases as the transition point moves further aft. Given a smooth surface, the position of the transition point is largely determined by the Reynolds Number and the pressure gradients to which the laminar boundary layer is subjected. A "favourable" pressure gradient from this point of view is negative (i.e., the pressure decreases in the downstream direction), and low-drag aerofoils are designed so that the region of favourable pressure gradient extends as far back from the leading edge as is reasonable over a suitable range of lift coefficient. The use of vague expressions such as "reasonable" and "suitable" is intended to imply that in practice there are other considerations in designing an aerofoil, such as the attainment of an adequate maximum lift coefficient. Now for practical wings, local departures from the theoretical profile, in the form of ridges, bumps or hollows, modify the local pressures and hence may affect the laminar boundary layer to the extent of altering the transition point. Such effects are not amenable to theoretical treatment, but wind tunnel experiments were carried out by Fage (Ref. 1) to determine just how large a waviness in the profile would not affect the position of transition. These experiments were carried out at Reynolds Numbers appropriate to glider wings, so doubtful extrapolations are not involved. He found an empirical relation for the maximum tolerable single spanwise corrugation to be as follows:—

$$\frac{h}{B} = 9.0 \times 10^6 \left[\frac{U_c L}{\nu}\right]^{-\frac{3}{2}} \left[\frac{L}{B}\right]^{\frac{1}{2}} \quad 1.$$

$$\text{when} \quad \left[\frac{B}{L}\right]^{\frac{1}{2}} \quad \left[\frac{X}{L}\right]^{\frac{1}{2}} > 0.09$$

where h = height of corrugation
L = length of laminar boundary layer
Uc = velocity outside layer at corrugation
B = chordwise width of corrugation
X = distance of corrugation behind leading edge
ν = coefficient of viscosity of air

The first term in brackets has the form of a Reynolds number and the limitation means that this expression does not apply very near the leading edge.

It was also found by experiment that, since the first of a number of spanwise corrugations exerted the maximum influence on the boundary layer, the above expression applied when there was more than one corrugation. The exact form of the corrugation is unimportant, and it may be either a bulge or a hollow. For glider wings covered with diagonal-grained ply, the corrugations will not be spanwise, but will run at about 45° to the spar. The resultant local variations in the pressure gradient will lead to secondary flows in the boundary layer in directions other than chordwise. The present writer would be inclined to suspect such effects to be of minor importance, but there is no experimental evidence.

To consider a representative case, suppose that transition occurs at 50 per cent chord on a wing whose root chord is 4½ feet at 80 m.p.h. E.A.S. at sea-level. Then the "Reynolds Number" term will be of the order of 2.0×10^6. Suppose the width of the corrugation is likely to be of the order of the rib spacing, 4 ins., say. Then "h" is found to be 0.033 ins. If "B" is 2 ins., then "h" is 0.023 ins. Towards the tip, where the Reynolds Number is lower, the size of the maximum corrugation increases considerably, and suitable values may be readil[y] calculated. Flight tests (Ref. 1) showe[d] that the agreement with this empirica[l] formula was quite good, but to be safe i[t] would be advisable to think in terms o[f] 0.025 ins. for a 4-inch corrugation or 0.01[?] ins. for a 2-inch corrugation. Howeve[r] the maximum permissible waviness i[s] appreciably greater than appears to b[e] generally thought acceptable.

The next consideration is the datum fro[m] which one measures the waviness. Should i[t] be the theoretical profile of the aerofoil, o[r] a mean smooth curve corresponding to th[e] aerofoil as actually constructed? In genera[l] these will not be the same, and the latter i[s] much easier to use in practice. At glide[r] Reynolds Numbers, it is probably quite a[n] acceptable datum.

Roughness

The usual assumption which enables t[o] be calculated the maximum surface roug[h]ness which will not affect transition is th[at] the particles should be too small to she[d] vortices (Ref. 2). For a flat plate at zer[o] incidence, this leads to the relationship:–

$$\frac{h_L}{c} = 10 \left[\frac{x}{c}\right]^{\frac{1}{4}} R^{-\frac{3}{4}}$$

where h_L is the critical roughness heig[ht] at
x downstream of the leadin[g] edge
c being the chord of the pla[te] and
R its Reynolds number.

This ceases to be accurate for an aerofo[il] where the conditions are modified by t[he] local pressure gradients, but the result [is] probably of the right order. If we consid[er] conditions at, say, 5 per cent chord on t[he] wing previously taken as an example, h_L [is] of the order of 0.003 ins., and at 50 per ce[nt] chord about 0.005 ins. A wing with such [a] degree of roughness would feel high[ly] abrasive to the fingers, but as happens [,] this is not quite the whole story, since [a] roughness of this order would increase t[he] drag due to the turbulent boundary laye[r]. It has been found that, at a given Reynol[ds] number, roughness of less than a certa[in] critical height has no appreciable effect [on] drag. It has been suggested that th[is] roughness corresponds to the thickness [of] the viscous sub-layer. From some celebrat[ed] experiments by Nikuradse, it was deduced that:

$$\frac{h_T}{c} = \frac{4.0}{R\sqrt{C_f}} \qquad 3.$$

where h_T is the maximum roughness height which does not affect the drag due to the turbulent boundary layer

C_f is the local skin friction coefficient, and

c and R are as before.

Again, this strictly applies to flat plates but can be applied approximately to wings. If one assumes a mean value of C_f to be of the order $\frac{1}{2}$ C_{DO}, then for the wing previously considered, h_T is of the order of 0.001 in.

We therefore come to an interesting conclusion: that whilst the transition point may not be affected by roughness of the order of 0.003 ins. on the leading edge, roughness greater than 0.001 in. aft of the transition point will lead to an increased drag. This result has been confirmed by a flight test (Ref. 2) in which the drag of a smooth wing was increased by 6 per cent by applying camouflage paint, although the transition point was not affected. It therefore follows that a cursory wipe over the top of the leading edge with a duster is not quite enough to keep the boundary layer at its best.

Now, 0.001 in. roughness feels pretty rough to the fingers, but is probably of the order of roughness obtained when fabric is sprayed with insufficient care to ensure that the little fibres are stuck down and the pores filled. This can usually be fixed by rubbing the surface with a cloth damped with thinners before applying the top coat. A well finished surface is far better than this, and a properly polished one, whilst elegant, is excessively good. In general, of course, it will be necessary to finish the whole wing to the standard indicated by equation 3.

To summarize, therefore, this article indicates acceptable degrees of waviness and surface finish, refinement of which will not decrease the profile drag. These are as follows:—

(a) WAVINESS: Under typical conditions, this should not exceed about 0.025 ins. for a 4-inch chordwise length or about 0.018 ins. for a 2-inch length at the wing root. It may be greater towards the tip. This applies forward of the transition point. Presumably greater waviness can be tolerated under the turbulent boundary layer, but if excessive may lead to increased drag. Strictly, these figures should apply when the wing is loaded as in normal flight.

(b) ROUGHNESS: The roughness which will not affect the transition point is of the order of 0.003 ins. under typical conditions, but should be less than 0.001 in. if there is to be no increase in drag compared with a smooth wing.

(c) RECOMMENDED TECHNIQUES: These requirements can probably be met by normal methods of manufacture, provided reasonable care is taken. They imply that care in finishing the surface is important over the whole wing. (The lower surface is less important than the top, since it contributes less to the profile drag, but it cannot be entirely disregarded.) The greatest difficulty in meeting the waviness requirement will arise in trying to avoid a kink where the surface ply is glued to the mainspar. It is difficult to estimate the effect of a "step" in the surface due, say, to a spanwise lap joint in the fabric, but it is probably best to avoid such discontinuities. Similar considerations apply to spanwise lengths of serrated-edge tape, and to colour schemes involving different colours fore and aft of the mainspar. There is usually a "step" at the junction of at least 0.002 ins., and the writer knows of one machine on which it was fully 0.010 ins. Blobs of paint and drip marks should also be avoided. Legends proclaiming the virtues of wool are also probably as aerodynamically undesirable as they are aesthetically offensive. Before flight, the wing should be cleared of flies, particles of hangar roof and other foreign bodies.

(d) BRAKES: Dive brakes, particularly with unsealed gaps, can only have a deplorable effect on the local boundary layer. Several World Championship pilots found that the performance was improved and the noise reduced by taping up the top surface slots. But this may be very dangerous indeed, since even if it is done with great care, it may be quite impossible to open the brakes (even with two pilots available!).

One solution is that of the HKS-1: not to have wing brakes. Another is Mr. Kahn's suggestion of taping a thin piece of paper over the brake, so that opening the brake tears the paper instead of trying to unstick the tape. But the best is to have brakes with suitable internal seals, which really fair-in with the aerofoil contour. Not particularly easy to design, but probably well worth-while.

Measurements of Waviness on Glider Wings

A measuring device was constructed, consisting of a dial micrometer fixed to a base so that its spindle was mid-way between a pair of fixed points two inches apart. This was applied to the wings at one-inch intervals along chordwise lines marked at suitable positions on the wing. The micrometer readings enable the local curvature to be calculated, if required, but for the present purposes the readings were plotted against distance along the surface and a mean line was drawn. To a first order, the difference between the plotted points and the mean line may be taken as a measure of the local waviness, provided care is taken in drawing the mean line.

Measurements were taken on four gliders: two "low drag" prototypes, and two conventional medium-performance machines. In each case the measurements were taken at about two feet from the wing root, both on a rib and between a pair of ribs. In all cases the measurements were taken to a point a little behind the mainspar, a little aft of where transition would be expected.

LOW DRAG PROTOTYPE "A".—Wing covering: thick ply with spanwise grain to rear spar on ribs at conventional spacing. The waviness between ribs was only slightly greater than on a rib, and was of the order of 0.003-0.005 ins. over the leading edge. The greatest ripple occurred at the rear face of the mainspar, and was about 0.014 ins. From the previous calculations, this would appear to be a quite acceptable degree of waviness, and except for the ripple at the mainspar is of the same order as that of the RJ-5 (Ref. 3).

LOW DRAG PROTOTYPE "B".—Wing covering: fairly thin ply with diagonal grain to rear spar; ribs a little more closely spaced than "A". The waviness on a rib increased from about 0.002 ins. near the leading edge to about 0.005 ins. at 30 ins. from the le ing edge (measured along the top surfa Between ribs, it was of the order of 0.(ins. near the leading edge, increasing 0.008 ins. at 30 ins. aft. This construct produced more little ripples than "A", is entirely acceptable.

CONVENTIONAL PRODUCTION GLIDER "(—Wing covering: diagonal ply; conv tional rib spacing (6 ins. forward of sp Both on a rib and between ribs, the wavin was small (0.003 to 0.005 ins.) up to mainspar. Due partly to local distortior the spar, and partly to a spanwise strip serrated-edged tape, the effective wavin near the spar was of the order of 0.030 0.050 ins. One may conclude that, in absence of other reasons (pressure gradie etc.), the laminar boundary layer will extend aft of this ripple, and there is limi evidence that this is so in fact.

CONVENTIONAL PRODUCTION GLIDER "I —Construction as for "C", but leading-e ply has a spanwise grain. On a rib, waviness was small (0.002-0.003 ins.) up the mainspar. Between ribs it was appr iably greater (0.008-0.013 ins.). At the s there was a spanwise scarf joint where diagonal torsion-box ply was attach which produced a local ripple of the or of 0.030 ins. Conclusions as for "C".

Some miscellaneous measurements w as follows:— Fabric lap joint on ply gi a "step" 0.004 to 0.007 ins. high. A pa edge, not rubbed down, gives a "ste 0.002 to 0.003 ins. high. A scarf joint, b manufacturer, smoothed with filler, p duced a local slope of 0.025 ins. in ½-in In the spanwise sense, a leading edge rib a conventional glider with diagonal produced a local wave of 0.025 to 0.030 i for a 2-inch base. The dive-brakes of gli "C" introduced a local effective waviness up to 0.060 ins. chordwise.

Conclusions

Whilst different methods of manufact lead to various types of waviness, th would appear to be little difficulty in obta ing an acceptable degree of wavin forward of the mainspar. If the ply attached to the mainspar, the local wavin produced in thin ply is not acceptable, may be within the maximum permissibl thick ply is used with care. Scarf joi along the spar, strips of tape, etc., sho be avoided. Fabric lap joints, paint lir etc., produce "steps" in the surface wh may be large enough to cause an increase in drag even if the local boundary layer is turbulent.

Suggestions for further work

The above calculations of waviness are based on wind tunnel measurements at suitable Reynolds Numbers, supported by some flight tests. The roughness criteria are rather less satisfactory, but there would seem to be so little difficulty in getting a good finish that they are not important. What is not known, for example, is the effect of the inevitable gaps due to hinged ailerons, even when an internal sealing blind is incorporated, and whether lap joints in fabric have any appreciable effect on drag. Since it is notoriously difficult to measure the performance of a glider, it is unsatisfactory to attempt to assess the effect of refinements by finding the improvements in performance. It is far quicker and simpler to find the profile drag of a wing by a pitot traverse, and there is need for a series of such experiments to determine just what degree of refinement is worth-while.

References

1. FAGE, A. (1943): "The Smallest Size of a Spanwise surface Corrugation which affects Boundary-layer Transition on an Aerofoil." R. & M. 2120.
2. YOUNG, A. D. (1939): "Surface Finish and Performance". *Aircraft Engineering*, Vol. XI, p. 339.
3. RASPET, A. (1951): "Systematic Improvement of the Drag Polar of the Sailplane RJ-5". *Soaring*, No. 5, 1951, 17-21, 25.

Variometry

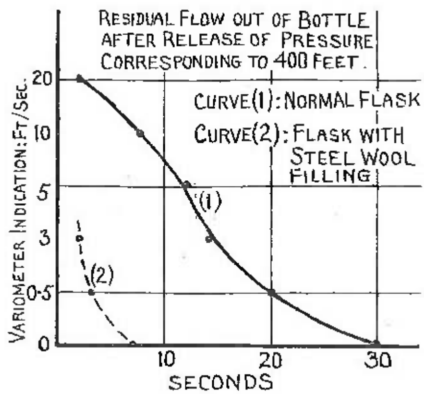
by John Byrne

A CHARACTERISTIC of most variometers is the time taken for the instrument to settle down after a rapid change of height, such as a winch or auto launch. Even with total-energy venturi fitted, the green ball floats for an unconscionable time after release, making it difficult to recognize lift at this most critical point. Similarly, after touch-down, the red ball may be observed subsiding gently for quite a few seconds. In flight, the contacting of lift after a period of severe sink takes a long time to register. Experiments indicate that the bottle (of the variometer, please note) is the main culprit, and that stuffing it with steel wool or similar material provides a cure.

Rapid changes of altitude tend to cause adiabatic temperature changes in the air within the bottle, but these will be opposed by heat transfer from the inner glass shell, which has more heat capacity than the enclosed air. After a rapid climb, for instance, the cooled air will receive heat from the walls of the bottle, causing more air to be driven out, and the instrument (of whatever type) will continue indicating climb.

The effect was simulated on the ground by opening to atmosphere a variometer bottle which had been kept some time under pressure equivalent to 400 feet of height, and then connecting up to the variometer. The full-line curve in the diagram shows the result obtained with two quarts of capacity and a small pre-war type Cobb-Slater instrument. This capacity is about right for the instrument. It will be seen that 30 seconds were required for the green ball to settle completely, and that for 14 seconds the reading was over 3 feet per second. An interval of about one second was allowed between releasing the pressure and connecting up to the variometer.

The same bottle was then filled with



several ounces of steel wool, to speed up heat transfer to the air, and make the action more isothermal. The dotted curve shows the very much reduced delays obtained when the test described in the last paragraph was repeated. The total settling time was 7 seconds, and the reading exceeded 3 feet per second for only 2 seconds.

These tests simulated an instantaneous climb. For practical rates of climb or sink, the "bottle error" should be almost negligible, and certainly less than the natural lag of most instruments in current use. The volume of steel wool introduced does not appear to cut down the sensitivity of the variometer. Provided too much wool is not used, there should in fact be an increase in transient sensitivity due to the isothermal instead of adiabatic conditions.

The only flight test done at time of writing was with a Kirby Cadet on 500-foot autotow. Sink of 5 feet per second was indicated with no apparent lag, on settling down to speed after release. Tests in a car over hilly country gave very satisfactory results. (For this, a static pressure connection should used and a calm day chosen.)

We have not had the arrangement lo enough to find the snags. It is advisable use a filter pad over the steel wool to sa guard the variometer. Glass wool, ru proof, should be as effective as the steel, b has not yet been tried. The basic requi ment is a mass of fair thermal inertia intimate contact with the air in the bottle.

Added later:—Some tests have been ma in a Slingsby Kite II at the Curragh, miles from Dublin. A modern Cobb-Slat instrument was used for comparison, bo variometers being connected to a Temp type total-energy venturi. Freddy Heinzl the Kite syndicate, who kindly made t tests, reported that the miniature variomet with the steel wool bottle indicated si immediately after release in every one three car launches to 1,200 feet, and alwa read zero after landing, whereas the oth instrument lagged considerably, taking to 20 seconds to settle down complete after landing.

Clutching Hands II

by P. M. Saunders

Imperial College of Science

In a previous article*, Dr. R. S. Scorer described the nature of the air flow which occurs on the lee side of a sharp surface edge when a strong wind is blowing normally against it. This is the site of the phenomenon known as "clutching hands", a region where a landing glider may sink rapidly or even stall.

Subsequent investigations into the pattern of the air flow on the lee side of the west-facing escarpment at Camphill have confirmed the general picture presented previously. Summarising these results we may say that, whereas in an unstable airstream the flow is uni-directional over the ridge, in a stable airstream "curl over" occurs. This latter pattern, which has been revealed by smoke-puff investigation, is illustrated in Fig. 1 and has for its salient feature a reversed or back flow at the surface on the lee side of the ridge top. The phot graph shows windsocks set up some 50 from the escarpment edge at Camphill, t upper (12 ft. above the surface) lying in t mainstream flow, the lower (6 ft. above t surface) lying in the back-flow. At its mo marked the back-flow may be detect extending up to 50 yards below the edge w an estimated speed of up to 5 knots in shallow layer about 10 ft. deep. Within t region fluctuations in barometric press as registered by a sensitive aneroid indic that the flow is extremely unsteady, and t behaviour of the lower windsock a surface grass that a considerable co ponent parallel to the ridge edge exists.

Back-flow in a fluid is a phenomen commonly observed in the laboratory an occurs at a boundary surface only wh there is a decrease in the velocity of flow the direction of the flow, i.e. a region wh a reversal of the normal downstream fall pressure occurs. A reversed press

* Clutching Hands, by R. S. Scorer. GLIDING, Autumn, 1951, p. 119.

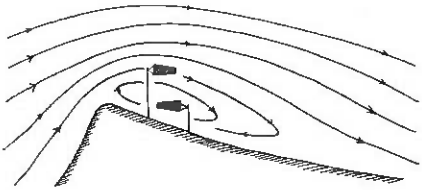


Fig. 1.—"Curl over". In stable conditions on the lee surface of the ridge, both back-flow and transverse spreading-out of the flow occurs

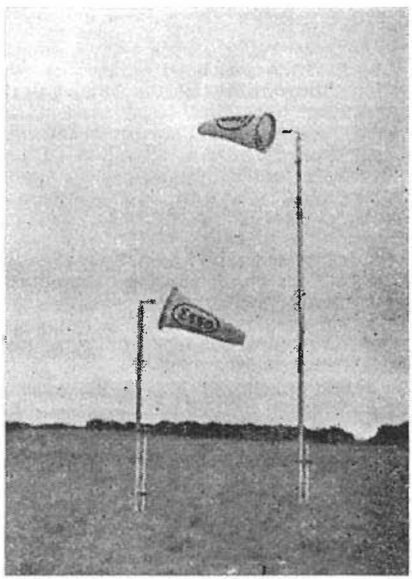
gradient may then produce in the surface friction-retarded layer a back-flow, with a consequent separation of the mainstream flow from the surface at the point of maximum penetration of the back-flow.

The vertical motions associated with a ridge or obstacle on the scale visualised in this article (hundreds of feet) are, except in special cases, confined to the lowest levels of the atmosphere. Just as the disturbance in the atmosphere due to the presence of a glider dies away at a sufficient distance from it, so does the disturbance due to a ridge (or valley) die away at a sufficient height above it. Thus over a ridge there will be a contraction and speeding up of the flow and in a valley an expansion and slowing down of the flow. Both the lee slope of a ridge and the up-wind side of a V-shaped valley are regions where deceleration of the flow occurs and accordingly where separation is possible. When, however, the streamline spacing becomes steady again (as over level ground) the back-flow is destroyed and uni-directional flow obtained.

The observations at Camphill indicate that, given the required wind direction, the back-flow regime is strongly marked when the air is stable and that with the advent of strong sunshine and thermal activity the flow becomes uni-directional with height. This is due to the continual influx of energy into the lower surface layers from above, brought about by thermal stirring, a process counteracting the retarding effect of surface friction which is essential for the occurrence of back-flow. The thermal turbulence of atmospheric flow appears to be analagous to the turbulence of laboratory or aerofoil experience in that both may cause a re-attachment of the separated flow or a prevention of it altogether.

There is no sudden transition from the "curl over" to the uni-directional flow regimes. It is revealed by the gradual predominance of the downstream flow at the surface interspersed with both cross-ridge and back-flow gusts, making for a dangerous landing site. In this region the fluctuations in the flow around the controlling surfaces of the glider may make them temporarily (or possibly permanently) inoperative. The airspeed too fluctuates in these gusts and may fall below the stalling speed.

The astute reader will have realised the value of certain of this information to the camper. The best site is not the most obvious. At the International Championships this year, whilst the competitors' tents lay in the path of a howling south-westerly wind, members of Imperial College were lulled to sleep in a gentle easterly wind in an "exposed" position at the hill top.



Back-flow on the lee side of a ridge. The upper wind-sock lies in the main-stream flow, blowing out steadily. The lower wind-sock lies in the fluctuating back-flow. *Photo by R. S. Scorer.* (*Courtesy of "The Aeroplane"*)

Tricks with the Tephigram : I

by C. E. Wallington

"WHY call it a tephigram?" and "Why not plot a simple temperature-height graph?" are the two questions I am usually asked by pilots just starting to take a real interest in tephigrams.

The answer to the first question is that T stands for the air temperature; the Greek letter ϕ (phi) is normally used to denote the entropy of the air, and the T-ϕ gram, usually written as tephigram, is simply a piece of graph paper having the two quantities, temperature and entropy, as axes. The concept of entropy is not easy to grasp but can conveniently, though not with strict accuracy, be thought of as the potential thermal energy of the air.

The second question is best answered by showing how easy it is to use the tephigram in its present form; so let us study it in more detail.

The basic lines of a tephigram (see the section shown in Figure 1) include vertical temperature lines (isotherms) marked in degrees Fahrenheit, and horizontal entropy lines. For every pair of values of its temperature and entropy, air has a particular pressure which can be calculated, so that it is possible to construct on the diagram lines of equal pressure. Because pressure decreases with height, these slightly curved isobars stretching from top right to bottom left of the tephigram give a rough indication of altitude. Thus pressure at M.S.L. is often about 1,000 millibars; the 10,000 feet pressure is roughly 700 mbs. and the 20,000 feet pressure, about 500 mbs.

We can represent the pressure and temperature of a parcel of air by a dot on the tephigram. If, for example, its pressure is 1,000 mbs. and temperature 51°F, then point T in Fig. 1 is the appropriate dot. Suppose this parcel of air rises to the 900 mb. pressure level adiabatically, that is without gaining or losing any of its heat, either by radiation or by mixing with its surroundings. It will expand and cool as the pressure decreases and the representative dot will trace out a line on the tephigram. But what sort of line?

It is one of the fundamental laws of thermodynamics that, for dry air, this li will be parallel to the entropy lines; other words it must be the straigh horizontal line TP in the diagram. If tl parcel descends again adiabatically, the d will move back to point T along the san line. Hence the rate at which temperatu decreases or increases when dry air rises descends adiabatically is always represent by a straight horizontal line on the tepl gram.

So far only dry air has been considere but we must now introduce the meteor logical gremlin, water vapour. It is possit for our parcel of air to contain invisit water vapour up to a certain limit whi depends primarily upon its temperatu

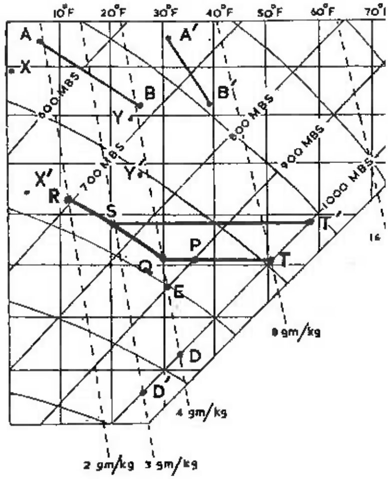


Fig. 1. Part of a tephigram show isotherms as vertical lines and dry adiabat as straight, horizontal lines. The curved li stretching from the bottom right to top l of the diagram are saturated adiabati Dotted lines indicate the capacity of dry to hold water vapour.

The limit in this case is indicated by the value of the almost vertical pecked line running through point T. The label 8 gm/kg means that if the parcel of dry air weighs 1 kilogram it would take 8 grams of water vapour to saturate it. Relative humidity would then be 100%, and if any more water vapour were added, it would immediately condense into water drops and become visible as cloud or fog. Saturation water vapour content lines for other temperatures and pressures are usually printed as pecked lines such as those shown in Fig. 1. Notice that the cooler the air, the lower is its capacity to absorb water vapour.

Of course the parcel of air at T may not be saturated with water vapour; it may contain, say, only 4 grams of water vapour per kilogram of dry air, in which case the point D at the same pressure level and on the 4 gm/kg water vapour content line can be taken to represent the moisture content of the air. The temperature at D. 33°F, is then the dew point and the relative humidity of the parcel is

$$\frac{\text{actual water vapour content}}{\text{max. water vapour content}} \times 100 = \frac{4}{8} \times 100 = 50\%$$

If the air, together with its 4 gm. of water vapour per kg. of dry air, rises again to the 900 mb. level, the dot representing the dew point will move from D to E along the pecked line, since no water vapour is added or subtracted in the process. It so happens that the adiabatic lapse rate for all except saturated air is represented by horizontal lines, so that P will again indicate the temperature of the rising air at 900 mbs.

Only when the air is completely saturated does the temperature lapse rate change, for in this case, since cooling decreases the air's capacity to absorb water vapour, excess moisture will be condensed into water drops during any ascent. The resultant release of latent heat tends to raise the temperature of the air so that the lapse rate of standard air is less than that of dry air. It is in fact represented by the curved lines stretching from bottom right to top left in Fig. 1.

Let us see what happens now if we take the parcel of moist air higher still. Its temperature will still follow a horizontal line but only as far as the point Q, on the 4 gm/kg. water vapour content line, where saturation is attained. From there on, the temperature will fall at the saturated adiabatic lapse rate, thus tracing out the curve QR. From Q upwards, the condensed excess moisture will be visible in the form of cloud. Fig. 1 shows that at R the parcel can contain only 2 gm. of water per kg. of dry air as vapour; the remaining 2 gm/kg. will be in the form of water drops.

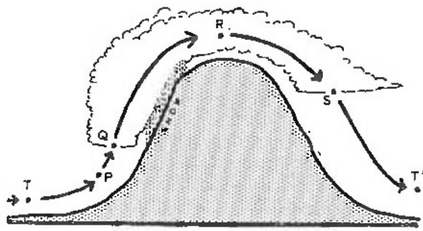


Fig. 2. The Föhn Effect. The state of the air flowing across the mountain is represented by the corresponding letters on the tephigram of Fig. 1.

We are now in a position to relate these elementary manoeuvres on the tephigram to some actual weather phenomena.

The Föhn Effect

In the phenomenon known as the Föhn effect, air flowing across a mountain range is forced to rise and form cloud; it then precipitates rain or snow on the mountain before descending as a comparatively warm dry wind. We can take the history of our parcel of moist air in Fig. 1 as typical of the first stage. During its ascent to about 10,000 feet (700 mbs.), cloud was formed at about 4,500 feet (860 mbs.) and the final temperature was indicated by point R. Now suppose 1 gram of water per kilogram of dry air falls out in the form of snow (the temperature being below the freezing point). Only 3 gm. of water per kg. of dry air will be left, so that during the descent the parcel will become unsaturated on passing the point S, on the 3 gm/kg. water vapour content line. Therefore the subsequent descent will be along the dry adiabatic to point T'. Meanwhile the dewpoint will move down the 3 gm/kg. pecked line to point D'. Thus the air will be warmer and drier than it was on the windward side of the range. Figure 2 may help to illustrate the process.

Subsidence

Intensifying anticyclones are usually accompanied by subsidence: that is, sinking of the air aloft. At low levels this subsidence may be slight, but above about 8,000 feet it is sometimes very pronounced. As an illustration let us consider its possible effect on a short column of air in which temperature and pressure is represented by a series of dots forming the T-ϕ curve AB in Fig. 1. Suppose the air represented by A sinks to the 650 mbs. level while that represented by B subsides only to 750 mbs. The resultant T-ϕ curve will be A'B', while if X and Y were the original dew points, the final dew points will be X' and Y'. It is worth noting that the transition could be completed in three hours by mean sinking speeds of as low as 0.5 ft/sec. from A to A', and 0. ft/sec. from B to B'.

Juggling with other combinations c imaginary Tϕ curves, rates of ascent o descent, and hills and mountains can b interesting and is recommended befor tackling the problem of convection cloud: which will be discussed in the next article i GLIDING.

EDITORIAL NOTE.—We have published number of tephigrams in GLIDING, mostl to illustrate accounts of wave flights. I these are compared with Mr. Wallington' article, it should be pointed out that w have, for considerations of space, rotate the tephigrams through about 45 degree: so that the isobars are approximatel horizontal, and the direction of increasin height is, in general, from bottom to top.

The Car Tow Launch

by Tony Deane-Drummond and Charles Dorman

THE car tow method of launching gliders requires less special equipment and is easier to operate than by the more normal winch. It is ideal for flat-site clubs operating from disused airfields which have tarmac or concrete runways. Suitable cars can now be bought quite cheaply and the cost per launch to a given height is about the same as winching, although much less capital equipment is required. With a proper system in operation, one car tow launching line should give 50% more launches each day in comparison with a winch line.

The System

An efficient system for car, wire, driver and pilot is essential if launches are to be reliable and frequent. The aim of a flat-site club must be to give launches to at least 1,000 ft. so that proper two-seater instruction can be given and in experienced pilots provided with a reasonable chance of thermal soaring. A hill-site club may get away with inefficient launching methods, but a flat-site club cannot afford this luxury.

The Car

The car chosen must be capable of starting under load and accelerating to 45 m.p.h. without changing gear. Any For V8 will meet this requirement if the rigl gearbox, back axle and wheels are fitted.

It is essential to use the Ford four-spee lorry gearbox. Third gear on this gearbo is the same ratio as second gear on th normal three-speed car gearbox, but bein more robust will stand up to the load. Th car gearbox will sooner or later collaps under the strain.

Fords make various back axle units wit ratios varying from 4.5 : 1 to 3.5 : 1. Th ratio chosen will depend on the over-a diameter of the wheels fitted. For exampl with 13-inch wheels and 900 × 13 tyres, th 4.5 : 1 ratio has been found to be the bes

War surplus "Heavy Utility" Ford V cars can be obtained quite cheaply. The: are very suitable after modification. Mo: of them already have the 13-inch whee and 4.5 : 1 differential fitted. The thre speed gearbox can be replaced by a fou speed gearbox, provided that either th engine is raised about 1½ inches, or the fror axle radius arms are dropped to leav clearance for the larger gearbox. All th back end of the car body behind the driv should be removed and a heavy wood c metal beam securely bolted across the re:

of the car to carry an Ottfur hook, which should be fitted so that the driver can release the wire at any stage of the launch. Additional weights may have to be placed over the rear wheels to prevent the aircraft lifting them off the ground.

The Wire

Many types of gauges of wire have been tried. The cheapest so far is a single solid untempered steel wire to the following specification:—

"Black Spring Wire 100/110 tons per square inch 0.102 inches diameter".

It can be obtained from The Speedwell Wire Co. Ltd., Speedwell Wire Works, Coatbridge, Scotland, and the price is around 25s. per 1,500 ft. length.

The length of wire which should be ordered is about one-third of the length of the usual runway. Under average conditions a T-21 two-seater can be launched to about 1,200 feet on a 1,500-yard runway using 1,500 feet of wire. With a strong wind the whole 1,500 feet can be converted into height, but this practice should be discouraged as it strains the wire and materially reduces its working life.

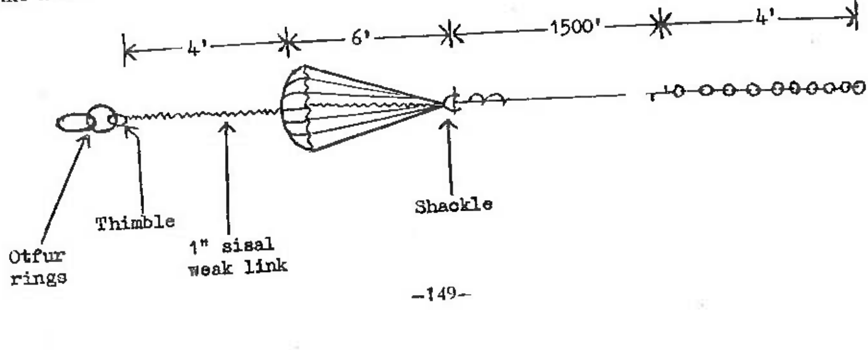
When first laid out, the breaking strain of the wire is approximately one ton, so a weak link of 1-inch sisal rope should be inserted at the glider end of the wire together with a 3-ft. light parachute. The wire arrives in coils approximately 3 feet in diameter, and it is essential to lay it out flat without loose coils or kinks before starting to launch. The only practicable method is to anchor the free end of the wire and roll the coil out barrel fashion. The car end of the wire should have at least 4 feet of reasonably heavy chain, the last link of which can be inserted into the Ottfur hook. The purpose of the chain is to keep the wire straight when being towed back along the runway after a launch. The whole wire may look something like this:—

The parachute and weak link assembly may be unscrewed at the shackle after a day's flying and the wire "parked" along the side of the runway.

The Car Driver

The car driver is an important person and a little instruction and understanding of the problems involved is necessary if launches are to be trouble-free. In general, the procedure will be for him to hook on the parachute or glider end of the wire, tow it to the glider where it is released, and then drive slowly back to the chain end, inspecting the whole length for kinks and loose coils. On arrival at the chain end, he hooks it on and awaits the launching signals. When he gets "take up slack", he selects the appropriate gear for the whole launch (i.e., 2nd gear in a three-speed gearbox or 3rd gear in a lorry-type gearbox) and takes up the slack in the wire. As soon as "all out" is given, he accelerates hard and slips the clutch slightly to give a smooth getaway. It will be normal to accelerate flat out until the glider is airborne and the glider's tail is seen coming down at the beginning of the climb. The driver must then progressively reduce speed according to weather conditions and the type of glider. During the whole launch the driver must look backwards at the glider, but, of course, taking occasional glances down the runway. As soon as he reaches a point 100 yards from the end of the runway *or* the wire is at an angle of about 75° to the horizontal, the driver *must* stop the car and the glider should then release. When the driver sees the parachute drop away, he should drive on slowly until the parachute drops on the ground, when he should immediately release the wire and drive to the parachute, hook it on and take it back to the next glider.

The really important points to note are that the driver should inspect the wire before each launch, and that he stops the launch



early enough. It is a great temptation to give just that little more, but it only results in an over-strained wire or one that falls in coils and kinks after being released. Either way will result in many more wire breaks and fewer launches per wire. With proper treatment, on a really rough and abrasive runway, the wire should last at least 400 launches. On a smooth runway as many as 1,000 launches are possible. If the wire is not properly laid out or the drivers do not obey the rules, a wire will not last more than 50-100 launches. Wire breaks are almost always the fault of the driver. If they occur, a reef knot is the easiest method of repair. Knots will wear quickly and should be inspected every 5 or 6 launches. For this inspection the car must be stopped and the knot picked up and examined closely. Any doubtful knots must be re-tied. With a little luck, knots should last 30-100 launches before being worn out. It is a wise practice to re-tie all knots before starting a day's flying.

The Pilot

The pilot must also understand the car driver's problem and co-operate to avoid wire breaks. After slack has been taken up and the "all out" given, the pilot must attempt to balance the glider on its wheel, keeping it in a level attitude until flying speed is reached. The first part of the climb must also be taken very gently, as the car will not accelerate the glider as quickly as winch. As soon as a reasonable margin c air speed and height has been obtained, th pilot can bring the glider's nose up graduall into a steep climbing attitude. If he doe this too quickly, the car driver will not hav time to slow down and the pilot will get to fast a launch, straining both glider and wir At the top of the launch, as soon as the a speed begins to drop off, the pilot must pu the glider's nose down and release the wir without any delay. During the launch th wire will be stretched under load and ac like a spring. If the wire is released unde tension it tends to return to its original coi and kink, thus causing a break which th car driver can do little about.

If all members observe these simple rule car towing can be a very efficient method c launching gliders. The launch is muc smoother from the pilot's point of view an puts less strain on the glider. The wire about a third of the weight of the norm winch cable and thus very high launches o long runways are possible without ove loading the glider. The height obtained about the same as a winch if the same lengt of run and the same engine power are use

Finally, we might mention that this artic is designed to help clubs who are havin trouble with car towing. Much of ou technique has been gleaned from oth clubs in the first place, for which we a truly grateful.

A.T.C. Continuous Gliding Course

by Peter G. Binder

THIS account of a short continuous gliding course at No. 44 Gliding School, Cottesmore, Rutland, is written with three objects in mind: first, such courses are gaining increased popularity not only at civilian clubs but at Air Training Corps gliding schools also; secondly, to explain in brief detail some of the activities at A.T.C. schools which are practically unknown to many civilian club members; and thirdly, to show what can be achieved on a school's first attempt at such a course with a limited number of staff to organise it and see it through.

Gliding schools in the A.T.C. operate normally on Sundays only and are run on a yearly competitive basis: that is, for eac certificate awarded, or for each acciden points are gained or lost accordingly. A schools have their own peculiarities, suc as hold-ups due to powered flying, poo weather conditions and waterlogged fiel during winter months, temporary airfiel obstructions and insufficient instructors, n to mention occasional shortages of aircra and unserviceable equipment. The scho in question had been troubled by powere flying and bad weather during the fir months of the year, and the suggestion of short continuous course at Easter met wi enthusiasm, as it might be possible to pi on a few points after a poor start to the yea

The fleet available for the course. From near right to far left: Sedbergh, two Mark 3's (T-31), one Mark 2 (Tutor)

We had not previously tried to run a continuous course, and if we did there would be a number of difficulties to overcome, such as accommodation, catering and, of course, providing cadets who would be free for about five days. However, a week or two before Easter a telephone call came from Group Headquarters asking if we could cope with a course, as Uppingham School Combined Cadet Force could provide the necessary pupils. We had just two days to make the usual arrangements with school instructors and staff regarding availability, etc., before replying.

The course was due to start on Good Friday, and by the previous Sunday morning practically all the arrangements had been made. However, by Sunday evening things looked black and it seemed probable that the course would have to be cancelled. Everything seemed to go wrong. One glider was damaged as a result of winch failure on take-off. The other winch (there are two per school) was not behaving as well as it might, either. Further, we were still without a second Bedford retrieving truck (there are two of these per school also) which had been promised some time previously and was really a necessity in case of possible unserviceability of the other one. Fortunately, during the next few days a glider was borrowed from the nearest school, our second Bedford arrived towing behind it a fresh winch, and the other one was rectified. This was all very satisfactory and a great relief, as it was essential that everything should be available and in good order if we were to get anywhere.

The object of the course was to train six cadets to the Proficiency Standard, which means that each cadet has to fly on four different days, carrying out a total of not less than 30 launches, and incorporates the B.G.A. A and B certificates. We thought six cadets was the optimum number in our case, based on the fact that this was our first attempt, the course was to last a maximum of five days only, the weather might be poor—as it so frequently is during holidays, especially so early in the year—and, last but not least, we had only four staff people available for the full period consisting of two "A" category instructors, a winch driver who had never driven a winch previously, and a civilian instructor we had not seen before who generously volunteered to travel about 150 miles from his own school in order to help out. Three other instructors turned up whenever possible.

We hoped to achieve 200 launches during the five days, as 180 was the minimum for all the cadets to get their Proficiency. However, we set a target of 50 per day to make an allowance of one day for bad weather. To us, 200 was optimistic, but anyhow, it was something to aim at.

We assembled during Thursday afternoon and evening, and after everyone had arrived we decided to spend a couple of hours going over the usual formalities and completing a large part of the ground instruction. None of the cadets had previously done any gliding or were familiar with gliding school aircraft or procedure.

The equipment, which is the standard set-up at schools, consisted of 1 Sedbergh (T-21), 2 Cadet Mk. 3 (T-31), 1 Cadet Mk. 2 (Tutor), 2 Bedford trucks and 2 Wild winches. Cottesmore is a permanent R.A.F. station, giving good launching runs in six directions parallel to the three runways. There are no ridges in the vicinity and soaring conditions over this area do not occur very often. In any case, our hope was fine, calm weather so that we could complete the training syllabus. It should be noted that A.T.C. schools do not normally instruct beyond the circuit stage.

A schedule was prepared which enabled one to get a complete picture of the training progress at a glance and to maintain a balanced amount of flying per cadet in addition to ensuring a high glider utilisation rate. Spaces were left on the schedule (a sheet of double foolscap on a writing board) for instructors' comments on the cadets' flying, initials and date. As far as possible cadets flew always with the same instructor.

Normally, the Sedbergy is used to teach how to handle a glider, and the Mk. 3 for instruction on circuit procedure in readiness for solos. However, during the early stages of the course, in order to keep two lines running at a fair rate instead of the second cable having to wait until the Sedbergh landed each time, four cadets received their air familiarisations in the Mk. 3 while the others were being pushed on through various exercises in the Sedbergh, so that after learning effects of controls, turns and stalls they could then transfer to the Mk. 3 for circuit procedure, leaving the Sedbergh free for the others who, up to this point, had only done air familiarisations in the Mk. 3.

Cadets changing a skid on the Mark 3

Later on, everyone would come back to the Sedbergh for spinning and unusual attitudes. This may appear rather confusing on paper, but the sequence of instruction was satisfactory and both lines were kept in full use.

Training continued until all the cadets had reached the Proficiency Standard, having during this period been taught and practised effects of controls, turns, stalls, spins, circuit procedure, recovery from unusual attitudes, cable break procedure, high and low approaches, and in most cases had some experience at soaring aerobatics. By the end of the fourth day all the cadets had completed their training successfully and, as the objects of the course had been achieved, members of the school staff had an opportunity to practise soaring. During the fifth day there were again a number of formalities to deal with, and, as most people started drifting away, little flying was done, and in any case the winches were now causing some trouble.

During the course a number of points cropped up which are worth mentioning. One cadet, who soloed after 20 flights (the minimum allowed), soared solo for 24 minutes in a Mk. 3 on his 29th flight, which was actually his sixth solo. This is probably a unique performance, considering he had had no previous gliding or powered flying instruction, and he was flying from a flat site.

The average number of flights to complete A and B certificates was 32, ranging from 23 to 37.

The weather was favourable during the course; the wind was always between north and east, usually at about 10 knots, and cloud base 4,000 ft. On the fourth day (Easter Monday) conditions were ideal for soaring, and this was the opportune moment for instructors and helpers to be rewarded for their services, at the same time giving cadets soaring experience. The accompanying table shows that on this day the average duration of flights was 10 minutes, which from a flat site and with training gliders was exceptional. Quite a number of flights exceeded 20 minutes and three C's were obtained. The Mk. 3 with two on board was soaring at 3,500 ft.

Also shown in the table is the launch rate based on the number of operational hours per day. It clearly shows the changing picture as the days passed, i.e., a steady rate at the start followed by a speeding up after the settling down period together with

Day	*No. of Launches*	*Flying Time hrs. mins.*		*Launch rate per hour*	*Certificates gained A*	*B*	*C*
Friday	61	6	22	7½	—	—	—
Saturday	70	4	03	10	1	1	—
Sunday	63	4	40	9	3	3	—
Monday	50	8	17	6½	2	2	3
Tuesday	22	2	08	5	—	—	—
Totals	266	25	30		6	6	3

a greater proportion of Mk. 3 flying, again followed by a low rate due to soaring conditions.

Summing up: it was evident to all concerned that continuous training has much to be said in its favour. It was unnecessary to repeat exercises, and the frequency at which the cadets flew enabled them to absorb their instruction more readily. Further, everyone had something to achieve in a limited time.

This is not intended to be a line on what to do on a gliding course and how to do it, because other schools have probably done better; but anyway, for our first attempt we were quite pleased.

Lecture Course on Meteorology & Flight

A COURSE of ten lectures, to be given once weekly on Thursdays between 6.30 and 8.30 p.m. by Dr. R. S. Scorer in the Department of Meteorology, Imperial College, London, S.W.7 (in the Huxley Buildings, opposite the Science Museum, Exhibition Road; nearest underground station South Kensington), is announced, to begin on Thursday, January 20th, 1955.

The course will deal with the study of air movements on the scale of a few yards to a few miles. It is concerned mainly with those vertical currents capable of carrying up insects and other small solid objects from the ground and of supporting soaring birds and gliders and of affecting powered flight.

Syllabus

1. STUDY OF THE TEPHIGRAM.—The tephigram is the most useful instrument for the understanding of these motions and it is therefore studied in considerable detail, and many examples of its use are discussed. Discussion of what determines cloud forms, contrails and other phenomena (3 lectures).

2. RELATION BETWEEN PRESSURE AND WIND.—A brief discussion of how air currents are produced (1 lecture).

3. MOUNTAIN WAVES.—Detailed discussion of what happens in an air current blowing over a mountain. Main attention is given to the properties of waves and the problem of forecasting them. The eddies, rotors and turbulence that accompany them are described, and their exploitation by gliders, their effect on powered planes and airborne insects is discussed (3 lectures).

4. CONVECTION IN THE ATMOSPHERE.—Classification of the various types of convection and the circumstances which produce them. The growth of convection elements and the effect of condensation and precipitation. The study of cumulus clouds in particular. Diurnal variations, effect of topography, tornadoes, dust devils, soaring birds, insects, etc. (4 lectures).

The treatment will be mathematical where necessary, sufficient to guide people to the reading of more thorough discussions where desired, but a careful exploitation of the meaning of the mathematics will be given, and *though the understanding of the mathematics is obviously a great help, it will not be essential.*

The meetings will consist of a lecture of about one hour's duration followed by discussion and from time to time the showing of films. Those taking the course will be invited to do one or two pieces of outside study suggested by or appropriate to the course. A wide choice in this will be presented from mathematical problems to field observations, photography, interpretation of observations reported in periodicals, etc.

There are no books which cover the material of the course, but the following two books will provide useful background:

"Meteorology for Aviators", by R. G Sutcliffe (H.M.S.O.).

"Further Outlook", by F. H. Ludlam and R. S. Scorer (Wingate).

Applications and further enquiries to: Deputy Director Extramural Studies, Senate House, London, W.C.1. (Phone MUSeum 8000).

Enrolment can take place on the first evening; a fee of 10s. will be charged for the whole course.

Munitalp Meteorology Competition

BECAUSE of its interest in stimulating the accurate observation, reporting and interpretation of meteorological phenomena, the Munitalp Foundation is inaugurating a competition for written papers on a meteorological subject and offering prizes totalling $400. The subject of the papers for the competition is to be "Upcurrents". Glider pilots and free-flight model fliers are in a unique position for making appropriate observations, so they in particular are being invited to participate, but anyone may enter. Judging of the papers will be primarily on originality, interest, and effective use of the data or observations available; a rather technical paper resulting from a heavily sponsored research project will be given less weight than a less technical paper based on simple, unsponsored observations.

Rules

1. Anyone may enter, but the papers must be written in English.

2. Prizes: First, $200; second, $100; third, $50; fourth, $50. If, in the opinion of the judges, there are not enough deserving entries to warrant awarding of all of the above prizes, the prize money not awarded will be held for a later competition.

3. All prizewinning entries and photographs will become the property of the Munitalp Foundation who will endeavour to place them in appropriate popular or technical publications. Non-prizewinning entries will be returned only if accompanied by a stamped, self-addressed envelope.

4. Entries must be postmarked before May 1st, 1955. They should be sent to:— Dr. Paul MacCready, Jr., Consultant to Munitalp Foundation, 1202 E. Green Street, Pasadena 1, California.

5. The prize awards will be announced at the American National Glider Contest, the location and date as yet undetermined, and in those journals publishing this announcement.

6. The subject must involve "Upcurrents", with special reference to atmospheric phenomena which might be capable of sustaining the soaring flight of birds or gliders. The paper may consist of a description of a spectacular or unusual meteorological happening, or be an analysis of observations.

7. The paper may be of any length, though it should be noted that a concise paper will probably appeal more to the judges than will a long paper. Photographs may be included.

8. The competition excludes those professionally engaged in meteorology.

9. The competition excludes work previously published.

The competition judges will be:— Captain H. T. Orville, Adviser to Friez Instrument Division of Bendix Aviation Corporation, and ex-Chief of U.S. Navy Aerological Service; Mr. Barney Wiggin Meteorologist in charge of the U.S. Weather Bureau Office, Buffalo, New York; Dr Vincent J. Schaefer, Director of Research of the Munitalp Foundation.

The Munitalp Foundation is dedicated to performing and aiding fundamental research in meteorology. The Foundation hopes that this competition will further its aims by stimulating those who are already watching the weather to "watch more closely", and by developing the meteorological interest of others (particularly the younger people). The competition is designed to recognize the value of simple observations as opposed to ones involving expensive and complicated equipment.

Here are a few examples of the sort of topics which might be prizewinning ones:—

The characteristics of thermals under various conditions as indicated by the flight of soaring birds.

The relation between turbulence and upcurrent size and shape as noted during sailplane flights.

The strength and size of thermals near the ground as demonstrated by the soaring of models.

Descriptions of dust devils, and their relationship to clouds overhead.

Periodicity of thermals.

Wave motions over water or flat ground

The shapes of the bases of cumulus clouds.

This competition is being conducted with the co-operation of the American Meteorological Society and the Soaring Society of America.

Highest in the Commonwealth

by S. H. Georgeson

With this flight in New Zealand Mr. Georgeson has not only beaten his previous altitude of 22,000 *feet which he reached on March* 25*th*, 1953, *but has exceeded the British National record for absolute altitude* (22,430 *ft.*) *set up by Philip Wills in Spain in* 1952, *and has therefore reached the greatest height yet attained in the British Commonwealth. The pilot's wife, Mrs. Helen Georgeson, climbed to* 13,200 *feet in the same Weihe sailplane on October* 9*th*, 1954.

On March 16th I was able to take the Weihe to 26,000 feet with a gain of approximately 21,000 feet, all, of course, subject to the New Zealand Gliding Association's approval. This was done in a lee wave which lay off the foothills. Take-off time was 10.30 and I was hoping to be able to travel down the Island to Taieri in an effort to gain a Gold C. However, once in the air I realised that this was impossible, as the wind was far too strong to make any progress south, and was also not producing the desired waves. The tow was very slow as it took considerable time to make much progress towards the foothills.

While on tow we lost 1,000 feet in one place, and when next there were any signs of lift, I decided to release. This I did, and found weak lift which varied in strength to approximately 12,000 feet. Then for the next three-and-a-half hours I persistently worked an area of some 10 by 20 miles in an effort to obtain better lift. I met with varying success; sometimes I could pick up small waves which would peter out, and sometimes I would have no success at all, and would then return to the first point of release where a standing wave seemed to be lying. This worked with great regularity and was effective as returning to a hill. However, lift always petered out at somewhere between 12,000 and 14,000 feet. There was no cloud formation to indicate that lift lay in this area, and it was only by locating myself over a certain point that I could pick this wave up.

After about three-and-a-half hours I seemed to be getting nowhere, so had decided to return to Harewood. However, I then noticed two clouds lying about three miles apart, one up-wind of the other. These clouds were stationary, but did not have the usual lenticular shape about them but were fairly ragged. As they were stationary, I knew them to be produced by waves, so I therefore headed in this direction. I was then flying about five miles north-east of this set-up, and a direct line taken from the nose of the Weihe pointed almost to the valley between the two clouds. The Weihe was trimmed to fly at about 60 miles per hour, and very little progress was made towards these clouds. However, I was able to obtain my position with the nose of the Weihe pointing at the cloud valley. The clouds were at approximately 10,000 feet and I was roughly about 9,000 feet. The Weihe soon began to go up, and it was as I hoped: the wave apparently continued as far as my existing position. The Weihe was then turned into wind and the speed trimmed to 45, which made the aircraft stationary over one point. Lift was then from 10 to 20 feet a second and typically "wave" as it was absolutely smooth.

At 16,000 feet I put on my oxygen mask, and it was at about this stage that the canopy started to ice up on the inside. The lift continued steadily to 22,000 feet, when I was somewhat startled by a loud "pop". For one moment I thought that the oxygen tube had ruptured or that there was some failure in the oxygen mask. However, after quick examination this seemed to be in sound condition, but I thought it advisable to find a downdraught in case there was a fault. Five minutes downwind soon produced a good downdraught, and after further examination of the oxygen equipment, I decided to head back to the lift. This was encountered easily, and I decided at this stage to give up the flight at 25,000 feet, which would give a sufficient gain of height for a Diamond C height with a nice margin. I was still somewhat worried as I was unable to find out what caused the "pop".

Lift continued at approximately 10 feet a second up to 25,000 feet, when I decided I had flown high enough. At this stage I thought I would try and fly up the Island, as the wind was more favourable in that direction. However, it soon became apparent that it was going to be most uncomfortable as my feet were very cold indeed, and also it would be a matter of flying most of the time on compass courses as it was impossible to see with a thick layer of ice which completely covered the inside of the canopy. After flying some twenty odd miles, discretion became the better part of valour, and I headed back for Harewood aerodrome. I realised that the trip was going to be a most uncomfortable one, and decided that if I could not enjoy the flight the Gold C was not worth having.

At this time I was approximately 26,000 feet according to the altimeter. I therefore pulled out the spoilers and trimmed the Weihe at 70. Forty minutes later we were back at Harewood and it was very pleasant to set the Weihe down on the aerodrome after four-and-a-half hours in the air.

The air was not unduly turbulent except on the tow, when once or twice it looked as though it would be wise to release. Odd patches of turbulence were met; one was when gaining height in the first wave encountered. This was apparently due to a thermal which started off somewhere and pushed its way up through the wave. At this particular time I was almost at the top of the wave, and was very glad to gain the assistance of the thermal to get more height. I promptly started circling when I encountered the turbulence and it took me to 16,000 feet, where cloud formed and the thermal gave up. This combination of thermal with wave does not seem uncommon in New Zealand. Peter Renshaw has quite a lot of information on these set-ups which he calls "thermal waves".

On landing to check the time, I found that I had no watch-glass on my wristlet watch. Apparently the pop had been caused by my watch-glass being blown off. It was a watertight watch and apparently the drop in pressure had been too much for the glass. I was very relieved when I found out that this was the cause of the trouble. If I had known that I might have continued longer in this wave, as I feel sure that went over 30,000 feet. It was interesting to notice that there was no major indication of a wave in the upper clouds as the sky was almost clear overhead. There was a layer of cirrus with a sharp leading edge about twenty miles long and slightly forward of my position. I did not consider that this cirrus had anything to do with the wave I was in, but was caused by the main wave produced by the westerly wind hitting the Southern Alps.

It was a very interesting flight indeed; once again cold was the trouble. The Met seem to think that it was approximately 27° below zero Fahrenheit at 25,000 feet. Next time I tackle a wave I will make sure that I have a clear vision panel and also plenty of warm socks available.

Correspondence

FIRST SOLOS ON TWO-SEATERS

Dear Sir,

We are very interested in John Free's article (GLIDING, Spring, 1954, p. 18) on training, as all of his suggestions have been used with great success by the Waikerie Gliding Club for some years.

The evolution of training by this Club can be summed up as follows: primary training started 1937; two-seater training started in 1941, and primaries were discarded 1944; two-seater fitted with enclosed canopy 1947, and *all* aircraft fitted with enclosed canopies 1952.

Our present two-seater, a Slingsby T-35 is used for first solos, and the pupil has between two and six flights solo in this machine before graduating to a Grunau Baby 3b. Both of these aircraft are fitted with spoilers and their use taught from the beginning, so that the transition period is made easy for the pupil.

A fairly high standard is required and some pupls gain their C certificates while still in the T-35; the best flight in the pre Grunau stage being over one hour, and at least one pupil in the last six months has gained his C on his first flight in the Grunau. Instruments, including a variometer, are "must" if the pupil is to make the best us of his time in the air.

Ability is the only criterion by which a pupil can be sent solo, and the number of launches must be absolutely disregarded. However, ab-initio pupils take between 50 and 120 launches, the usual being about 65 before going solo. Every launch is by winch from a flat site.

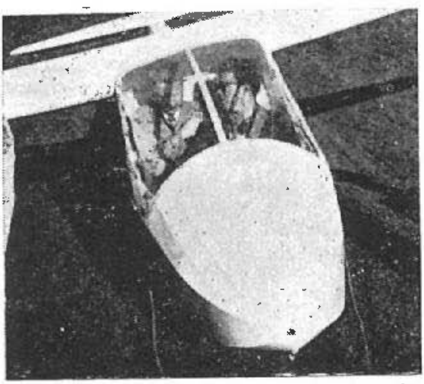
It must not be thought that these methods represent the ultimate in training or economic efficiency, but we have been hampered in the past by lack of suitable aircraft.

No power plane instructor would dream of converting a newly soloed pupil to a single-seater aeroplane, and it is a fact that most power pilots gain their Private Licence in the machine in which they started ab-initio.

In the same way there is no reason why the glider pilot should not gain his Silver C in his two-seater trainer. A pupil's relief upon converting to a solo machine is not a reflection on two-seaters as such, but on the comparatively low performance and poor handling qualities of the "strutted barge" type of trainer.

At the other end of the scale, Kranichs, etc., are too expensive. However, now, a new and very welcome type of two-seater has been made in the Schneider "Kookaburra". Fully cantilever with a 40 ft. span and staggered side-by-side seating, this machine weighs only 350 lbs. empty, 700 loaded, and can be flown solo with 15 lbs. ballast in the nose. It is very responsive to the controls and is a joy to fly. Its gliding angle of 1 : 20 and very low sinking speed, plus the fact that with two up it is in the same aerobatic category as the Grunau, makes it eminently suitable for club use, dual or solo, and the price is less than £100 more than the Grunau.

Kookaburra training two-seater sailplane. Harry Schneider is holding the canopy



Cockpit of the Kookaburra, showing the "staggered" seating

Taking the Waikerie Club as an example, it is logical to replace the present two-seater and the Grunau with two Kookaburras. The advantages being:

1. The pupil has no transition period at all in the early stages and can do his first 30 or 40 hours in the one machine.
2. Minor faults observed after solo can be easily corrected by a check flight, particularly those concerning take-off and landing. This cannot be done satisfactorily check-flying in another type of machine.
3. On "training only" days, two trainers are available, where previously there was one.
3. On good soaring days all machines can be in the air. At present the two-seater sometimes stays on the ground if the instructor takes the Olympia.

Thus full utilisation of machines is achieved with less risk than by any other method. It is the logical way of flying, the way aero-clubs have been flying for years, and in the long run it would be the cheapest.

K. J. GILLESPIE,
President, Waikerie Gliding Club
South Australia.

CHAMPIONSHIP WINNERS

Sir,

Nobody, I think, is going to quarrel with Betsy Woodward when she says: "Pierre wins the Championship, no matter how we look at it." But what *I* want to know is, "Who is the better man, Pierre or Rajn?"

CHARLES ELLIS.

Reviews

Further Outlook: by F. H. LUDLAM and R. S. SCORER. Published by Allan Wingate (Publishers) Ltd., 12, Beauchamp Place, London, S.W.1. 1954. Price 15s.

BOTH authors of this book are well known in gliding circles, and readers who have heard them lecture will not be surprised to find a great deal of interest to sailplane pilots. They will indeed find much more than is covered by the title, which itself refers not only to weather forecasting, but also to future developments in meteorology as shown by present trends.

The first of the eight chapters, "The Weather We Observe", starts off with the onset of a depression and before long has ranged over a whole hemisphere and up to the stratosphere. It is exceedingly up to date; for instance, the cross-section of the atmosphere in Fig. 1 includes the polar front, jet stream, large-scale circulation, two tropopauses, and the full range of cloud structures from pole to equator.

"Atmospheric Processes", the second chapter, goes into weather systems in more detail, and deals especially with how rain forms in clouds, a subject which has been revolutionised in the past few years.

Nothing like Chapter Three, "The Turbulent Atmosphere", has ever been seen before. Most people understand by "turbulence" the sort of eddies which throw aircraft about, but this chapter treats the word as covering the entire range of sizes and periods from the random motion of air molecules at one extreme to geological climatic changes at the other. Some sizes of eddy are more frequent than others; but, we are told on page 47, there is no limit to their minuteness, so one wonders how much the aerodynamicists know about those which are too small to show on instrumental records.

Chapter Four, "Exploiting the Atmosphere", is almost entirely concerned with soaring—thermals, hills, waves, dynamic lift, and, among other things, how to soar from Oslo to Turkistan in two days. The authors say: "To glider pilots we owe the recognition of many important aspects of air motion described in this chapter, and although there is necessarily a limit to what can be discovered in this way, it is by no means nearly reached yet."

We then have a chapter on "The Art of Forecasting", followed by one on "The Science of Forecasting" which includes the present and future use of electronic calculating machines for the purpose. "Weather Control" is mostly about artificial production of rain, a subject so new that it has not, we believe, got into a text-book before. Finally comes a rather philosophical chapter called "Uncertainties".

A. E. SLATER.

Aircraft of the 1914-1918 War: compiled by O. G. THETFORD and E. J. RIDING; edited by D. A. RUSSELL. Published by Harleyford Publications, Marlow, Bucks. 1954. Price 42s.

THIS magnificent book is a revision of one which sold out when first published in 1946. Eighty types are described with photographs and three-view scale drawings, and many more with photographs only, while much history is included in the text.

From the gliding point of view it is sad to see how the drag-reducing principles of sailplane design were ignored in these aeroplanes; attempts to apply them were even officially frowned on in Germany, the country where sailplanes were first developed a few years later. Junkers had produced experimental all-metal cantilever monoplanes in 1915, but the High Command ordered a strutted biplane from him. Fokker's D.VI biplane and Dr.I triplane were both designed as cantilever machines with thick aerofoils, but the authorities demanded struts. Only in 1918 was Junkers allowed to deliver cantilever monoplanes.

The "Taube" type, with wings based on the shape of a Zanonia leaf, had them clear-doped and in consequence was "almost impossible to see" above 1,000 feet. It is curious that military gliders were not similarly treated in the following war.

A notable gliding feat is described on page 2: Captain Williams, descending to land at Gosport in an Avro 504K with motor stopped, came to rest inside the hangar. Another piece of information of particular interest to gliding people is that the Maurice Farman Longhorn, a pusher biplane with front elevator and box tail, took five men 9 hours 29 minutes to rig, and four men 3 hours 6 minutes to de-rig.

A.E.S.

Gliding in Malaya

by R. L. Akers

Past President, Perak Flying Club

After the Japanese occupation the flying clubs established in the early thirties at Kuala Lumpur (Selangor), Ipoh (Perak) and Penang considered re-starting. They had played their part nobly in the closing phases of the Japanese campaign in 1941-42. All pilots were mobilised into the Volunteer Air Force and the aircraft belonging to clubs were handed over to the Government and became operational alongside units of the Australian and Royal Air Force. The three flights were used as communication flights and filled a vital role of plotting day by day the movement of Japanese forces, particularly along the East Coast. As our forces retreated down the mainland, the aircraft were evacuated first to Singapore island, then to Palembang in Sumatra, and finally to Batavia. The aircraft were destroyed and the lucky members of the crews escaped to India and Australia whilst the remainder were captured.

His Majesty's Government accepted the claim made by all the Flying Clubs for the payment of compensation for aircraft and installations lost during the occupation. Singapore and Kuala Lumpur were lucky in having certain buildings—notably their clubhouse and hangars—standing, but the Perak Flying Club had nothing, except one small building, 20 by 60 feet, which was pre-war—the tool shed to the club hangar.

When it was known that compensation of around $80,000 would be received, the club held its first meeting on February 12th, 1948, to decide future policy. It was lucky to have amongst its members J. D. Mead and R. J. Morton, who were founder members of the club in 1934, and Mr. T. S. Haynes, who, although a new member, had extensive experience after the war in the organisation and development of a R.A.F. gliding school in Germany.

Flying costs pre-war were of the order of $6 per hour solo. In 1949 costs had risen severalfold, but there was little indication that wages would rise to the same extent. There was also no hope of obtaining the subsidy which the clubs obtained pre-war.

The Perak Flying Club made a bold move. It decided that as its policy was to promote airmindedness in the youth of Perak, and as power flying would be too expensive to attract the youth, they would operate a gliding club instead of a powered flying club. In 1948-49 five gliders were purchased from Elliots of Newbury. The fleet consisted of one Olympia high-performance glider, two slab-sided secondary gliders (Grunau Type) capable of soaring in thermal lift, and two primary gliders for training purposes. Mr. H. G. Oates, now O.C. Singapore M.A.A.F. Wing, constructed a launching winch on a 15-cwt. Ford V8 chassis, and the club started training in September, 1949. It was most unfortunate that the one man with previous experience who could have directed training, Mr. Haynes, was transferred within a few weeks of the arrival of the aircraft. The burden of learning how to glide and train pilots fell on Mr. Oates, Mrs. Wood and Mr. Channer; they did a magnificent job. There were several minor mishaps and one serious one which wrote off one of the secondaries.

At this time, and for the following two-and-a-half years, no ground staff were employed. All repairs were carried out by the members in addition to the handling and winching and retrieving. This was an incredible achievement when it is remembered that the air temperatures are in the nineties and there is a very high humidity. Mr. Oates was transferred in late 1950 and the work was carried on by an enthusiastic team, including Messrs. Channer, Akers, Weller, Robertson, Delme Radcliffe and others. The strain was very great, and as comparatively little soaring was achieved the club showed a steady financial loss.

In 1949 the Emergency started. Other clubs with powered aircraft soon adapted themselves to a very useful role by dropping money by air to estates and mines, thus avoiding the necessity of heavily escorted convoys taking money through dangerous bandit areas. The Emergency activities of these clubs enabled them to pay their way against rising costs and subsidise the club flying and bring it within the pocket of the upper salary bracket man.

At the end of 1951 the Perak Flying Club made another bold decision. They decided to purchase two second-hand Tiger Moth aircraft and employ a ground engineer. The aircraft arrived in May, 1952, and powered flying commenced in June, 1952. Immediately the finances of the club took on a healthier note, the losses per month dwindled and by the middle of 1953, providing there was no serious accident, a small profit was being shown.

In May, 1952 the Air Training Corps formed its first unit in Ipoh and in August the Perak Flying Club accepted responsibility for the glider training of the Squadron. Eight cadets obtained their "A" and "B" certificates before the end of 1952, but early in 1953 one of them had a serious accident and completely wrecked one primary glider. The second was damaged a week later and training came to a standstill until the middle of the year. The Perak State Government took a keen interest in the Air Training Corps and in May, 1953, voted funds for the purchase of a Slingsby T-21B two-seater training glider. This was a tremendous help to glider training. It had long been realised, as in other countries, that the single-seater method did not give the trainee a sufficiently high standard of instruction, particularly on turns, stalls and spins.

The use of the two-seater gave the instructor the ideal tool for ab-initio flying training. The glider was delivered at Ipoh in August, 1953, and christened by H.H. the Sultan of Perak the "Sultan Yussof" on September 27th, 1953. By the end of the year the change-over in training schedules had been completed and cadets were receiving the full course of instruction on the two-seater before going solo.

The normal standard of training is to the Royal Aero Club C Certificate. Cross-country flights have not been encouraged, although a triangular course of 50 kilometres, centred around the aerodrome, has been mapped to enable pilots to attempt their Silver C certificate.

The period of soaring conditions so far encountered in the vicinity of the airfield is usually confined to midday to 5 p.m. It is therefore very difficult to attain Silver C duration. Cloud base is usually between 2,500 to 4,500 ft. and it is the exceptional day when heights of 5,000 ft. can be obtained except under nimbus conditions. Blind flying is being approached with great caution. Because of the Emergency and the lack of landing places in a country 70% covered by rubber plantation and jungle, it is always necessary to remain within gliding distance of the airfield. Our present knowledge of local meteorological conditions, and particularly the direction and strength of wind under storm conditions, is still elementary. However, as experience and skill develop it is expected that the Olympia will explore the local large cumulus developments which are so common in this country.

A summary of glider flying to the end of 1953 is given below.

Year	*Launches*	*Flying Time*
1949-50	1,279	70 h. 8 m.
1951	893	77 h. 31 m.
1952	1,637	93 h. 6 m.
1953	884	85 h. 26 m.

The original single-drum winch is still in action. The development of a two-drum winch is in progress. It is powered by a V8 engine driving through a lorry back axle to two drums fitted instead of wheels. Difficulty is being experienced in fitting clutches to the steel axles so that each drum can be driven independently.

The activities of the club during the past four years have proved that there is a large potential of youths in Malaya ripe for introduction to the mastery of the air as their fathers were introduced to cars and mechanisation of industry. The Air Training Corps is an excellent medium for fostering the yearn for knowledge in this direction, and no better practical introduction to it can be found than that of gliding. The first steps to the Malayan Air Force of the future are being laid in the Air Training Corps and the glider training of the Perak Flying Club.

Wing Commander A. A. J. Sanders, writing to the Editor while on the way home from Malaya, says:

A T-21b and a Primary winch and glide at Ipoh grass airfield. There is seldom any wind, but cumulus nearly always forms over the district, at about 2,000 feet—rather too low for continuous clear-air-soaring—and on the sides of the near-by mountains, 3,000-6,000 feet high. No-one soars inside clouds with such hills nearby. The ground is very bad in Malaya—solid forest or walled rice fields 30 yards square.

Hong Kong seems all mountains and sea, hardly any flat ground at all; and the small air-space is too busy with fighter aircraft and civil transport to permit gliding as well.

Generally, however, there is little or no prospect of soaring anywhere in the Far East outside the circuit zone of an airfield; the ground is too bad and the natives may be unfriendly.

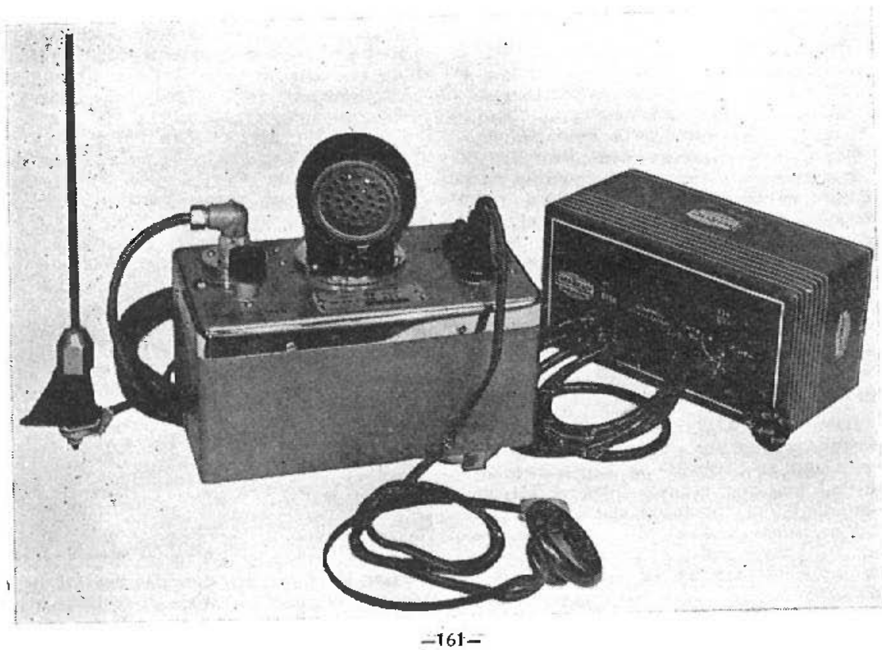
Pye Gliderphone

A SMALL very lightweight set is needed for gliders and small aircraft, and to meet this requirement the Pye "Walkiephone" has been used as a basis for a new design. Its size is much reduced by separating the batteries from the set and stowing these away into a convenient space. The very small radio set can then be sited for easy access by the pilot.

In the case of wooden gliders a whip aerial with suitable ground plane straps can be installed within the fuselage, resulting in a very neat installation.

Using an efficient ground plane with a whip aerial, remarkable ranges are possible with airborne Gliderphones operated in conjunction with 15-watt fixed or mobile stations, and distances of 80 miles and more have been reported.

With its own power supply the Gliderphone has obvious advantages in aircraft as an emergency set or in light aircraft for radio telephone contact with airfield control towers. Gliders can maintain contact with their recovery crews by means of this set, and receive messages regarding weather etc.



Clubs & Associations

Federation of Rhodesia and Nyasaland

THIS should have been the best year ever for Central African gliding, but as it draws to a close, the 1,000% increase in gliding hours is offset by the doldrums in which two, at least, of the clubs find themselves.

Gwalo.—With the closing down of the R.A.F. Rhodesian Air Training Group early in the year, the few civilian members found themselves unable to continue activities in this small town of less than 5,000 population.

Umvukwes.—The first of our rural clubs, started with a flourish three years ago by Jim Harrison, one of the tobacco barons of the area. But tobacco farming experienced a bad year just after the arrival of the T-31 kit, which caused such a financial setback in the area that all enthusiasm, except Jim's, waned. Now Jim has a half finished T-31, his own airfield, and no club. We all wish him a speedy recovery.

Umtali.—This pretty little town in the mountains was the cradle of Rhodesian gliding long before it was realised that our dust devils were thermals and "good things." Unfortunately a new machine suffered mild prangery just when many members were posted away, resulting in a temporary dearth of enthusiasm and of technical ability. The Cadet, purchased from Salisbury, also lies unflown. However, there is talk of aero-tows in co-operation with the flying club. Ben Prescott is chairman.

Northern Rhodesia.—An embryonic club may come to life with the arrival of Ted Pearson, formerly of the Rand Gliding Club and more recently of the Salisbury Club.

Bulawayo.—At last we come to some positive good news. Operations started two years ago, and two SG-38 primaries made several hundred ground-slides at Heany, until the R.A.F. moved out but the S.A.A.F. did not move in. Then this station became an army camp and the club was gradually squeezed out, but moved to hangarage at Kumalo airport with flying at the old Induna field. About this time Eric Bone, key man of the Salisbury Club, was transferred to Bulowayo and also got married, but so far from this putting an end to his gliding, he has become C.F.I. and his wife is secretary. Among the committee members is Paul Hoeniger, who was at the university with the immortal Kronfeld and learned to glide with him.

Recently a syndicate acquired the Kite from Jack Wall of Salisbury. It was flown at Bulowayo Agricultural Show, and by the close of the show the club had three new members and Mr. Caldicott, Federal Minister of Agriculture, had enrolled. Amalgamation with the flying club is proposed, and aero-tows could be made into the thermal from a large cement factory near by.

Salisbury.—Maurice Pike writes that aero-towing has been paying such big dividends that the winch has not been trundled out since June. Although membership is only 20, a new high-performance two-seater is being considered in place of the T-31. On July 3rd, the regular tug pilot, Ivor McCormick, won the Round Rhodesia air race and gave the proceeds, £100, to the club.

No cross-country flights have been

Maurice Pike and his Grunau Baby II at Mount Hampden (Salisbury) "Gliderport"

recorded this year, mainly due to retrieving difficulties, but hardly a week-end goes by without at least one flight of over an hour. All three private sailplanes—H-17, Grunau Baby IIb, and the new Kite—are flown regularly. Eric Burditt, D.F.C., has recently flown the H-17 for 3 hrs. 40 mins. to equal his own and the Rhodesian duration record.

At an air rally at Gatooma the population was shaken by the arrival of the Tiger towing both the H-17 and Grunau Baby—the first double tow in Central Africa.

Central African Gliding Association

The above is condensed from an account sent by Robert Mitchell, Hon. Secretary of the Central African Gliding Association, who writes that the C.A.G.A. has entered on its third year. It is hoped that, as a result of Federation, a Government subsidy is just round the corner. Meanwhile: "the Department of Civil Aviation is doing its best to aid by non-interference, and is as helpful as can be expected with airfields and hangarage, considering the many demands on the budget of so expanding a country as this."

London Gliding Club

Two cross-countries in September and one in October bring the total mileage for the year to 1,052 miles. Lawrence Wright went 18 miles up-wind in an Olympia to Thame on September 11th, and on September 25th Peter Fletcher made a downwind dash of 25 miles in 29 minutes, leaving the site in a Grunau at 1,200 ft. and landing at Stoney Hills. On October 30th A. W. Kay flew 13 miles to Caldicott, near Hitchin. On the same day Walker, briefed for his fourth solo circuit in a Tutor, was told he was not yet experienced enough to soar on the hill; so he caught a thermal and circled up to cloud base, from which he could look down upon the experts over the hill vainly searching for extra lift.

The winter cross-country competition for greatest distance, organized on the same lines as last year, starts on November 1st.

The club prize for the best out-and-return flight has remained unclaimed this year. For next year a competition for cross-country flights against the wind has been announced. The wind at 2,000 feet, as given by the Dunstable Met. Station, must blow at not less than five knots from a direction not more than 40 degrees to one side of the average line of flight, and the overall loss of height must not exceed one per cent of the distance. Sailplanes will be handicapped according to type, and pilots with less than 100 miles cross-country experience get ten per cent bonus.

In the first ten months of the year the club has done 1,678 hours' flying from 7,043 launches; the peak month was September, with 325 hours from 1,039 launches.

The Annual Dinner is fixed for February 5th at the "Sugar Loaf", Dunstable, followed by a dance at the Club.

Southdown Gliding Club

Once again we are caught without up-to-date figures, but approximately they read 370 hours for 2,500 launches. We have had a fair share of soaring at Friston.

Our course, held rather late in the year, produced 186 launches with 21 hours flying and two C certificates. This is not so bad as it would appear, as flying finished on the Thursday, due to wind and rain which held the machines on the ground until Sunday. However, the members enjoyed themselves.

Our Olympia has been at Kidlington (Oxford) for some time; we left it there at the latter end of July and removed it the last week-end of September. It was hoped that members would be able to obtain their necessary distances and heights for Silver C. Unfortunately no distances in this category were obtained, the longest leg being John Holder's cross-country to Silverstone and a short one to the outskirts of Oxford by Roger Sweatman. This flight of Roger's, however, was a record for the Club, as he had a gain of height of 9,020 feet. He made an ascent in a heavy cumulus cloud to obtain this height, but due to a heavy formation of ice was forced to descend early, thus spoiling his chances of a distance flight. It was a very good flight nevertheless, as it was his first attempt at serious instrument flying, and we hope to see it taken as a lead by other members in the future.

Several soaring week-ends have been had at Friston lately, the most recent being 23rd-24th October. On the Saturday Chris Hughes had the doubtful honour of being the first to take the Cadet to Beachy Head and back. He had a 54-minute flight at a cost of 4s. 6d.—truly remarkable in this modern day and age.

We are continuing wth full week-end flying, several members coming along Friday nights so that an early start may be made on Saturday morning. Pupils who can manage to attend will receive undivided attention during the morning and early afternoon, before the arrival of crowds of fly boys and girls requiring immediate ascent to the heavens.

R.T.W.

Surrey Imperial College and Army Gliding Clubs

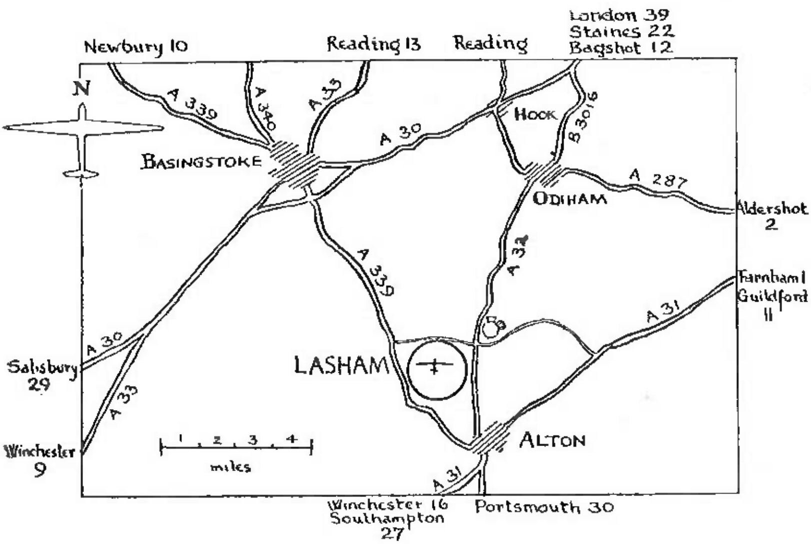
Having by the end of October passed the 14,000 mark, we are well within sight of our target of 15,000 launches for the year. From a cursory glance at the flying log it seems as if the ratio of auto-towing to winch launches is about 3 : 1. The high proportion of auto-tow is due to the ease of operation, and it has been especially useful for mid-week flying, which has gone on throughout the summer and will continue during the winter if there is sufficient demand. Except on zero wind days, auto-towing also produces higher launches, and in fact, on one launch the T-42 got to within 20 feet of 2,000 without having to kite. The Tiger Moth, presented to the Club i March, has also contributed to the numbe of launches and should have done 500 b the New Year.

A welcome innovation on the field, no that winter reduces the visibility, is the fiel telephone together with a cable-layin trolley designed and built by Ray Ducket which incorporates an electrical re-winde It must be some time since we last used telephone, as the following conversatio was recently reported on a day whe winching had been going on for some time

The bell on the winch telephone rang–

Winch driver: "Yes?"
Voice: "Is that the winch driver?
Winch driver: "Yes."
Voice: "I thought so!" Rings of

The Clubhouse has been undergoing series of internal upheavals—various wal have been knocked down and doorway bricked up. The kitchen has been reorgar ised and repainted, and a separate wash house has been put up behind the bunk houses. All these improvements will d much to make Lasham pleasantly habitab during the winter months. We are also ve pleased to report that Bill Gotch will b coming as Club Manager and he is due t start at Lasham in the New Year.



The C's of A. have been started, and to encourage members to turn up there is a programme on the Club board of various entertainments for Saturday evenings. The Club Vanguard, re-sprayed recently by Jim Simpson, the chairman of the M.T. Committee, and with the Club crest on the doors, will be running a bus service between Imperial College and Lasham during the winter, going down on Saturday mornings and back on Sunday evenings.

A new private owner group has been formed, owning a Kite I bought from Bill Crease. We gather that two other groups are being formed but they are hoping to buy Skylark II's. The Club's first Skylark II should have arrived by the time these notes appear, being a replacement for Pongo, the Army Club's Olympia.

H.T.

Scottish Gliding Union

APART from the World Championships period, when Balado's bird-men enjoyed fine conditions, what flying weather there has been this summer appears to have been confined to the land of the Sassenachs. Our last soaring day was August 7th! Since then our flying has been very unsensational, and the Tiger Moth has been doing brisk business towing frustrated members to great heights, to help them keep the weight off their feet a little longer. Bishop Hill is a mere six minutes' tow time from the airfield, which makes the securing of duration legs a much less burdensome business. The subsequent retrieves, however, continue to provide some interesting moments, as when the trailer had its axle wiped off by a boulder. We blocked the road—a narrow cart-track—for half an hour, and enraged a surprising number of motorists. We have high hopes that, with aero-tows laid on, we shall at last be able to do something with our Wave when it next appears.

In common with many other clubs, we found the demand for courses this year to be exceptionally heavy. Only shortage of available instructors restricted the number we were able to arrange. In all, seven courses were held, and already we have bookings from satisfied customers who want to come again next year. A particularly pleasing feature this year was the number of new members which the courses produced.

An old A.S.I., with a venturi fitted to the static side to increase sensitivity, was recently fitted experimentally to one of our launching vehicles. It was proved a great success, and with its help inexperienced drivers can give consistently good launches. The venturi produces an exciting scientific whistle, which never fails to impress non-technical visitors.

A 16-mm. colour film is being made at the Club, starring John Paterson and our photogenic C.F.I., Tom Davidson, who comes out a very tasteful mahogany in Kodachrome. The film will cover a wide range of gliding activities, and already some good air-to-air shots have been obtained, including an aero-tow sequence.

Classified advertisements can now be accepted for this Magazine. Rates on application to The Trade Press Association Ltd., 57-61 Mortimer Street, W.1.

FOR SALE

£135 or near offer — Tutor, C of A expired, but in excellent condition. Trailer available. Russell, 6, Ryton Street, Worksop, Notts.

For Sale Fuess Barograph 6 Km with 150 Charts. Offers. Box. No. A.164

Bargains. Due to re-organisation, the Army Gliding Club offers for sale an ideal training or intermediate glider in excellent condition and with C. of A. to Spring 1956. 7 year old Grunau Baby II b. British built (Hawkridge), Aerolite glued, fitted with built-in wheel, back release nose and belly hooks, basic flying instruments. £260. Aluminium skin Trailer in first class condition to take Prefect or Grunau. £85. Further details from Deane-Drummond, 8 Bungalow, Staff College, Camberley, Surrey.

Royal Naval Gliding and Soaring Association

CLUB gliding activities have been regrettably curtailed due to the loan of Association gliders and winches to the annual Dartmouth Cadets Gliding Camps mentioned in the previous issue. However, to encourage future Naval Officers to take an active interest in gliding the Association feels that any assistance it can provide for these camps is well worth while. As nearly all the cadets attending went solo it feels that this object may well be achieved.

Now that club gliders have been restored to their rightful owners it is hoped that the weather for the remainder of this rather wet year will enable clubs to catch up on lost hours.

Condor Gliding Club, Arbroath

This club, under the expert guidance of Lieutenant Commander (E) Leeson, has built itself up into a most promising concern since it began its activities earlier this year. We hope that the enthusiasm engendered may be carried on with the same success into 1955

Seahawk Gliding Club, Culdrose

This club has only just started under the energetic guidance of Lieutenant Apps, who has recently returned from Malta. We feel sure that once the teething troubles are over, this club has a promising future ahead.

Gamecock Gliding Club, Bramcote

Club gliding has started here on completion of the Dartmouth Cadets' .Camps under the supervision of Lieutenant-Commander Monk, who has managed to obtain two Kirby Cadets to add to the Club's "fleet". This club has one of the very few reasonable soaring sites in the Navy and we hope to see many good flights in the near future.

Portsmouth Naval Gliding Club, Gosport

This has always been one of the better patronised clubs in the Navy, principally due to its situation, and more flights have been accomplished here than at any other naval club. The club's fleet of gliders is expanding in a most gratifying manner, and talk of high-performance gliders has been heard in the clubhouse, where Mr. Pinniger manages to convert the most impossibl masses of tangled woodwork into beautifu new machines!

It is with great regret that we learn tha the Heron Gliding Club at Yeovilton ha had to close down due to the ever-increasin flying commitments of the station. We hop that if possible in the future, the Hero Gliding Club will again "take the air".

The Secretary of the R.N.G.S.A Lieutenant (S) Hallam, has recently bee appointed abroad and is handing his dutie over to Lieutenant (S) Stanley, Office of th Flag Officer Air (Home), Wykeham Hal Lee-on-Solent, Hants.

Bristol Gliding Club

ALTHOUGH negotiations between the loc authorities and the Ministry have n yet reached a definite stage towards makir Lulsgate into the active Bristol Airport, w have been continuing our search for permanent hill site in the local Cotswold Mendips and the Huish areas.

A more active stage was reached c 18th September when, following a displ at the Filton "Battle of Britain" show, t Olympia was aero-towed to Haresfield, c the Cotswolds. Trials showed that whil the site has bowls which can be soared all but east winds, the boulder-strew operating area and lack of emergency fiel at the bottom would be major hazards.

The following week-end, therefore, t expedition moved south to Nympsfield, st on the Cotswolds, and promptly enjoy some comfortable soaring. We found very co-operative farmer who allowed to use fields which gave direct access to three-mile beat on the west slope, and shorter beats on slopes facing south-e and north, and there we were able to opera for the following six weeks or so. Co pletion of our universal trailer allowed t T-21 to join the Olympia, and enabled t farmer and his family to enjoy aerial vie of the estate. Unfortunately, the arrival the T-21 coincided with negligible wi strengths, but even so, the light airs in t bowls prolonged the circuits to eight nine minutes each.

The Mendips are planned as the n port of call, and they offer a south-west b only, but of between seven and nine miles. T A.T.C. has used the ridge with fair succ for some years, and on good days they ha maintained 2,000 ft. above the ridge (3,000 ft. a.s.l.) and soared from the Severn down to Wells. Snags with the site include the prevalence of low cloud with south-westerly winds, whilst the upwind Cheddar country is low-lying and wet, and thermals from the valley tend to be poor.

At Lulsgate, we have just concluded another successful season of courses, when we ran 18 weeks and had 153 bookings out of a possible 160. Out thanks are due to Instructor Michael Royce, and Manager Bill Gotch, for producing so many satisfied customers, whilst several hundred solo man-hours by Jack Houghton reduced vehicle unserviceability to negligible proportions. Clutch life on the auto-tow vehicles was increased tenfold by the adoption of the "angled" launch technique, devised by Bill Gotch. Here, slack in the wire is taken up manually, and the wire eventually hooked onto the car with the latter facing diagonally across the runway. Final slack is taken up as the car accelerates across the runway, and a gentle turn then starts the launch proper.

After the spell of activity in August, soaring at Lulsgate seems to have ceased after September 4th, when Mike Hodgson, after doing a 40-minute test flight in the T-21, proceeded to soar the Olympia to 6,100 ft. a.s.l. during a flight lasting 90 minutes. Both the T-21 and the Tutor made flights of over 30 minutes or so whilst the Olympia was airborne. Since then, however, circuits have been the order of the day.

M.G.

Midland Gliding Club

SINCE our last report the tempo of flying activity has inevitably slowed down, but we are still hoping to top 2,500 hours by the end of the year. One of our major problems is winches; we have three reasonably serviceable now and plan to convert one of these into a two-drum device this winter.

Friends to the Mynd will be pleased to hear that we have offered to organise the National Championships in 1955.

The Kite I, which has lived at the Mynd for many years, will now return to its birthplace in Yorkshire, where a syndicate has been formed to fly it. David Ince brought along Slingsby's new T-42 high-performance two-seater on 21st August.

The Club's final camp commenced on 28th August with David Martlew in charge. The first day's flying promised well for the holiday with a total of 43 hours in 73 launches, one cross-country (David and Anne Ince in T-42) and heights up to 4,700 ft., and, incidentally, over 2,000 hours in the bag for the year so far. Soaring was available on most days of this camp with sufficient circuiting days to get ab-initios off solo. Mary Wilson got her B and C on successive flights, Miss Bosely her B, and Mrs. Prue Murray and Rickett got C's.

The T-42 stayed on at the Mynd during the camp, so Hickling could give many people their first taste of flying a high-performance aircraft. This machine, he soon discovered, was of infinite value compared with a two-seater of lower performance, in that its penetration widened the scope of flying, particularly in marginal and plain hill-soaring conditions. The positive handling qualities and high natural stability, particularly directionally, meant that pupils could be taught to fly on the roughest days instead of being flown. The gliding movement might well benefit from this aircraft and its successors.

September 12th produced a good brew of weather with a 270° 20-knot wind and excellent thermals up to 4,300 ft.: fifty-seven hours for 69 launches with Gaunt and Barber doing a five-hour flight each. The 19th, with an oblique 200° wind variable in intensity from 10 to 20 knots, produced good flying for most people, and Allan Pickup reached 4,000 ft. Harran took his C and Allan Jones his B.

The R.A.F. Gliding & Soaring Association and Weihe visited us during the week-end 25th-26th September, and we w pleased to welcome this very keen party l by Air Commodore Paul. Thermals w strong on the 26th with a suggestion of wa lift in between them; Wind 270°, 35 kno

October started well when Doc Cott contacted a wave in a south wind on t 2nd from a winch launch. The remain of the club fleet was soon dispatched into and Hickling travelled westwards for sev miles to a point near Corndon and w only prevented from going further gathering darkness. Sunday, 10th Octob might well have been a good day in Ju with a 10-knot, 270° wind most of the d small cumulus dotted the sky and heig up to 4,500 ft. were the order of the d The week-end 16th-17th provided about t first complete week-end camp for ma months, while Sunday, 23rd October, g us good soaring again in a west wind 20 knots.

Several club members, led by Jo Harnden, constructed two concrete bun launching points during the week and a spread 12 tons of ballast around them, t result being a nice clean launching a instead of a morass. One advantage of t new points is that aircraft are much m nose-down prior to a launch and a therefore unlikely to be blown over.

J.H.H.

Kettering & District Gliding Syndicate

AT the end of our first year of operati using one Dagling and two of our sev ex-R.A.F. Kirby Cadets purchased from t Air Ministry, we have obtained 12 A a eight B certificates from scratch. We h also four competent winch drivers, excl ing the Chief Flying Instructor, who l achieved all this, flying and winching. T winch was made from a 30-cwt. 28-h Bedford lorry and was converted by vari syndicate members.

There are now 14 members. The S dicate operates at Sywell aerodrome Sundays, and averages 25 launches. T C.F.I. is T. C. Phillips, who obtained hi certificate in 1954 during his five years as "A" category instructor training A.T cadets. The Assistant Instructor, A. Cla son, had never flown till he joined Syndicate.

One of our Kirby Cadets has been converted to a belly-hook machine and has reached 1,400 ft. and stayed up eight minutes from release.

D.V.P.

Cambridge University Gliding Club

RECORDS of Club flying this year show that this cold wet summer has caused little reduction in the number of hours' soaring done. Between September 30th, 1953 and September 30th, 1954, there were 3,300 launches on 200 days with about 450 hours flown. Twenty-one cross-country flights, the longest 75 miles, produced a total of 904 miles distance across the English and Welsh countryside. All the Club aircraft went away on cross-countries during the summer months.

The last of eight camps held so far this year was from September 13th to 17th, when D. R. Clayton and W. E. Crease, with L. Vandome as assistant, flew from several sites in North Wales. On the 13th Crease went from the Clwyd Gate to Hawarden. Next day Clayton was bungy-launched from the summit of Great Orms Head and hill-soared for a time before landing on the beach below. Finally, Crease hill-soared twenty-five miles from Moel Rhwyn to Abergelly in the Vale of Clwyd.

An expedition was made to Edge Hill in September by the Olympia, with J. W. S. Pringle, K. E. Machin and A. Stephenson as pilots, and a party from the Oxford Club with their Grunau. Two hours of hill and thermal soaring were done although the wind was not quite on the hill.

Among recent cross-countries from Cambridge have been H. Hudson's 59-mile flight to Leiston in the Prefect on August 30th. On the same day M. Pleasance took the Olympia 37 miles to Wattisham. Both these flights earned distance legs of the Silver C Badge.

J. W. S. Pringle, the President, made his first cross-country since emerging from a hibernation from gliding by going 66 miles in the Olympia to Ludham on the Norfolk Broads, taking 4½ hours on the way. Pye radio was carried and helped the retrieving party to film Pringle's approach and landing at Ludham. Shots were also taken of that charming feature of the post-landing procedure; warding off the crowd enthusiastic small boys that seems to spr out of the ground.

The last flight of note was K. Ki Silver C height in the Olympia on Se ember 27th. This is the latest in the sea that a thermal height leg has been obtai for some years.

Club membership is still increasing an greater number of members fly the Olym than ever before. The Skylark, which expected at the end of December, will, i hoped, substantially increase the num of hours' soaring done by the Club n season. Camps are already being plan by members hoping to fly from more, as unsoared hills in Britain.

Yorkshire Gliding Club

TRAINING still goes on in spite of win weather. Keith Moorey, living alm on the doorstep, took a day off work to his A and B. John Daly, working ni shifts, came along one Tuesday to do five-hour Silver C duration, and Da Rennison, another new C pilot and young flying member, truly earned his five ho in an open Cadet on a gusty day wh experienced pilots in high-performa machines were glad to be on the grou after a mere half-hour. We understa Dave had difficulty in sitting down for next day or two!

At the Annual General Meeting, Her Doktor was presented with the Harkn Cup for the best all-round performa during the year. It was reported that aims of the Development Sub-Commit for this season, thanks to the hard work the Resident Instructor and many ke members, had been achieved. The Club now on a very sound footing. Intens training has resulted in many new pil going solo on the hill, making room for many others on the ever-growing waiti list.

The Club has purchased a tractor, a work on levelling the airfield with plou cultivator, bulldozer and roller is well hand. Drainage channels are being cut drain marshy areas.

An enjoyable evening was spent at Ge Wood's on 16th October at a show gliding films made by Jack Lawson a Ewie Haswell. Eventually we hope to ma

the activities of the Club (or some of them) known to the public through this medium.

John Forrest was startled the other day to hear sounds issuing from the loud-speaker he has rigged on the hangar roof. We now need not hire one and can entertain week-end crowds *on* the air if not *in* it.

The Club dance will be held on Saturday, 4th December, at the Golden Fleece Hotel, Thirsk. All are welcome (tickets available from the Hon Sec.), and to an informal party (place to be announced) on the Saturday before Christmas.

SUE.

Handley Page Gliding Club

OUR flying activities have been confined since the return of the T-31 from Dunstable, to the steady round of training circuits for the 75 per cent of our members who have not yet gone solo. Good progress has been made during the year, and there is also a reasonable prospect that a number of pilots who went solo last year will soon be capable of flying the Rhonbussard. This machine is now being extensively overhauled, the wings have been completely re-covered, and work has been started on the normal C. of A. overhaul.

During circuits with the Super-Tutor, attempts have been made to classify the lift-producing qualities of the local landscape. On each side of the airfield there is an area of sandpits, each of about five acres. These have been found to be good thermal producers, in spite of their being liberally sprinkled with pools of water. Presumably the surrounding trees shelter them from the wind, allowing them to absorb enough heat to start thermals. Some of the airfield buildings have also proved quite useful in this respect. A four-acre group of hangars has been known to give quite useful lift, except in moderate winds from certain directions, when all that are found are downcurrents and much turbulence. Unfortunately, no one has yet found any evidence of a standing wave in the region of our railway embankment.

On one day in September experiments were made to find the launching loads required by the T-31 and Tutor. The loads, measured by spring balance between the tow car and launching wire, were found to vary between 200 and 300 lbs. during a T-31 launch, and between slightly lower values for the Tutor. Launches were made directly into a 10-knot wind, and the aircraft were flown at maximum permitted speeds. The wire used was 1,500 ft. of 11 S.G.W. piano wire, and the heights reached were consistently 1,100 ft., after a run of about 1,800 yards by the tow car.

L.J.F.

Coventry Gliding Club

AFTER a comparatively quiet summer witl little apparent progress, the Club ha suddenly taken on a new look. The Vikin and a Tutor have been brought into use giving solo pilots a pleasant change from th Cadet, now pensioned off. The Tutor ha recently been fitted with a belly hook whicl makes its launching characteristics com parable with the T-21's, heights well ove 1,000 feet being obtainable on the winch This means that the average circuit nov lasts about five minutes, twice as long as i the case of the Cadet which seldom reache more than 650 feet. Also, we have con siderably improved the smoothness of th winch launches by modifying the drum making it shorter and increasing th diameter of the flanges; this has reduce the bunching tendency caused by the absenc of pay-on gear.

October 10th proved to be a good day a Baginton: there were several soaring fligh in the T-21 and Peter Walsh earned his badge with a 22-minute flight in the Tuto Peter Folkes also earned his C during th recent course at Lasham.

In spite of the bad weather this summe the flying statistics are showing a reasonab improvement over last year. For the peric of the year up to October there have bee over 2,300 launches for a total flying tin of nearly 200 hours. With the rece enlargements in the Club's fleet, and give any reasonable weather conditions, ne year should show a great improvement o these figures.

All attention is now being given to t problem of providing more launchi equipment. The Ford V8 wagon is bein attacked with renewed vigour and it hoped to use it for auto-towing; failing tha it will be made into a winch.

Serious thoughts are being given to t idea of arranging a course at Baginton ne year, and every avenue is being explored find suitable accommodation.

M.S.H.