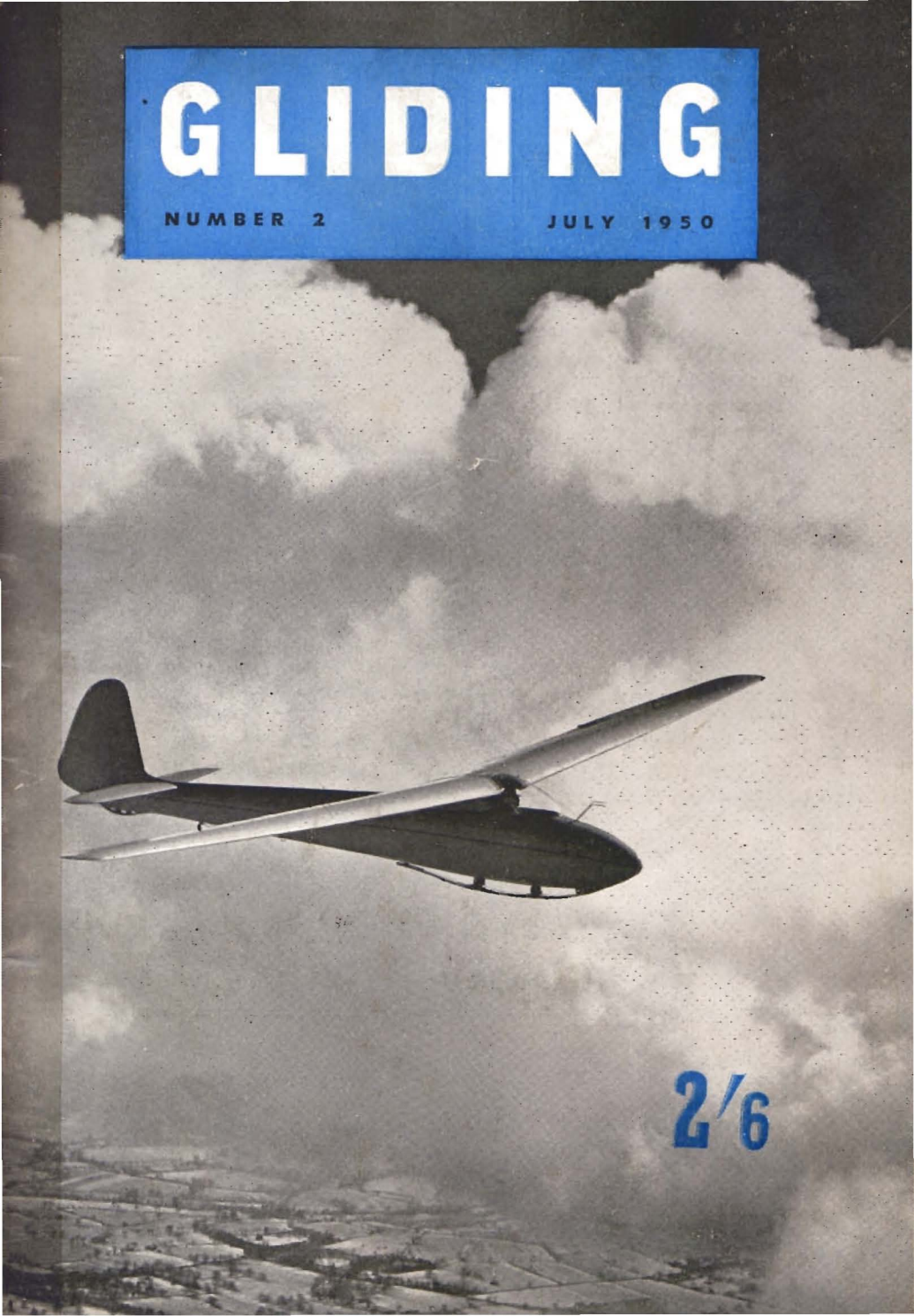
GLIDING

NUMBER 2 JULY 1950



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GLIDING

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THE NEXT STEP

The first issue of GLIDING, which appeared early this year, has met with a reception which justifies its continuation as a quarterly journal.

Such a journal has a special place to fill, by publishing matter of enduring value rather than of ephemeral interest. But while we endeavour to keep readers in touch with the latest scientific and technical advances which concern our subject, it must not be assumed that this is our only purpose. History is also a science, and we look to all sections of the gliding movement to keep us informed of what they are doing.

The present issue appears on the occasion of the 1950 National Gliding Contests, held at the Derbyshire and Lancashire Gliding Club's site. In consequence, it is designed to interest not only the gliding fraternity, but the large number of visitors who habitually attend these contests; in fact, it will serve as a Contest Programme, and a list of competitors will be found on the middle pages.

Fifteen gliding clubs told us their histories in the first number of GLIDING. Two of these were Service clubs, and there was, in addition, an article on the Air Training Corps. But gliding in the Services is increasing every month, a pleasing phenomenon for which two new factors are largely responsible: the formation of the R.A.F. Gliding and Soaring Association, and the decision of the A.T.C. to carry their instruction through to the advanced soaring stage. In the next issue we shall again include a survey of all these activities.

There are two ways in which readers of this journal can help to maintain it in a flourishing state. One is by buying it as well as reading it. The other is by furnishing it with news and articles for publication.

As to news, we would particularly like to hear of cross-country flights, so that we can then publish in each issue a map showing all those made in the past three months. But to be of any value the map must be comprehensive, and this means telling us of *every* cross-country flight made.

And as to articles, they must be written before they can be printed, and a fat envelope containing a suitable article is definitely of more use than a thin one with nothing inside but suggestions about what somebody else should write.

Finally, we are pleased to announce that GLIDING will in future be the Official Organ of the British Gliding Association. Editorial policy will remain independent, and will be devoted to furthering the interests of soaring flight and of those who practise it.

A.E.S.

Competition Flying

The British National Gliding Contests will be decided upon marks earned by flying performances, as in previous years; the first three prizes will go to the entrants of the three sailplanes earning the greatest number of aggregate marks.

When soaring flight first began, it was considered a noteworthy feat to keep a glider up at all, and this outlook persisted in diminishing degree up to the last contests before the war, when marks were still awarded for duration flights, not only for height and distance as now.

The trend nowadays is to lay most emphasis on getting to a definite place, and even getting there in the shortest possible time. This is not due to any idea of turning a sailplane into a regular transport vehicle; the reason is simply that a scientific sport should set itself scientific problems of constantly increasing complexity for solution.

The following notes are written for visitors to the meeting and for the general reader, and not, as will be obvious, for advanced sailplane pilots.

Distance flights

Marks are given for distance at the rate of 1 mark per mile, except that flights of under 15 miles earn no marks.

Distance flights are accomplished almost entirely by the use of upcurrents (thermals) caused by heating of the ground by the sun. In consequence, they rarely start before about 11 a.m. at the earliest, or can be carried on for more than about 6 hours at the most. But in six hours, or even less, a sailplane can go a long way, and efficient organisation is needed for the pilot's team, with retrieving trailer, to reach him as soon as possible after he lands. If he is the only pilot flying the machine, he may have to fly again next day after a tiring night journey by road.

Cross-country flights can be started in two ways. If a good wind is blowing up the hill (in this case Bradwell Edge in a west wind or Eyam Edge in a south wind), a permanent upcurrent is created in which the pilot can wait till a thermal comes along. The outward sign that he has caught a thermal is that he starts flying in circles, because thermals are narrow. If the wind blows in any other direction, or is absent, the pilot must catch a thermal immediately after being launched by winch; in this technique there is large element of luck, as he has not much height to lose while looking for one.

If a thermal goes high enough, a cumulus cloud forms in its top; but the life of a thermal and its associated cloud is limited, so the pilot must constantly proceed from one thermal to the next. Part of the art of competition flying consists of deciding whether to stay in a thermal till it dies, while the wind carries it along, or to leave it and take a chance of finding another one in the direction the pilot wants to go.

The pilot has also to judge the best speed for crossing the dead air between thermals; flying too slowly may waste time unnecessarily, while flying too quickly causes unnecessary loss of height. When high up, thermals are found by watching the clouds; when low down, by examining the landscape for likely "thermal sources."

Attention to all these factors can make a big difference to the marks earned on a distance flight.

Examples of distance flights are described on other pages: one across southern England, one in East Anglia, and two from England across the Channel to Belgium.

Goal flights

If a pilot declares his destination before starting a flight, and then lands within 1,000 yards of it, he gets a 20 per cent. bonus, added to his distance marks, for his goal flight. He may, on reaching the goal, find soaring conditions so good as to make it worth while to go on, and get more marks for the additional distance than the 20 per cent. bonus would have earned.

There is obviously an art in choosing a most suitable goal in accordance with the pilot's judgment of probable weather conditions. He must also be a competent map-reader.

It is not uncommon for a pilot to declare an ambitious goal which he has little hope of reaching, if the reaching of it could set up a new record. Examples described in this issue are: Mr. Phillips and Mr. Carrow,

who declared Le Touquet and reached Canterbury; and Mr. Welch, who declared for Strasbourg and reached Brussels.

Out and return flights

Unless the air is calm, an out-and-return flight must be made either against the wind in one direction and with a following wind in the other, or else across the wind in both directions. Progress against the wind can only be made between thermals, because the sailplane drifts back with the wind while climbing in a thermal. A machine with good "penetration" is needed: that is, a sailplane whose speed can be increased without excessive loss of height. It takes good soaring conditions and a skilled pilot to make any overall progress against a wind of more than 15 m.p.h.

A successful out-and-return flight can earn a lot of marks. The outward journey is marked as for a goal flight, and the return journey earns double marks (2 per mile) and a double bonus.

A description of an out-and-return flight by A. H. Yates will be found on another page.

Altitude flights

High altitudes can be reached in two ways. One is by climbing in large cumulus clouds of shower or thunderstorm type; they may be called glorified thermals. This involves the art of blind-flying on instruments. Recent research has shown that the reputation of such clouds for violent turbulence has been overrated in the past; loss of control, formerly attributed to this cause, is more likely to be of psychological origin.

Both Mr. Welch and F/Lt. Miller climbed in clouds of this type in order to gain height for crossing the Channel on 12th April, as described elsewhere in this issue.

The other condition for high altitude flights is a phenomenon peculiar to high hills, such as those around the Derbyshire and Lancashire Gliding Club. Stationary waves are set up in the air, probably on many occasions by Kinder Scout, in much the same way as a wave in a river is caused by a submerged boulder. These waves are propagated upwards through the atmosphere, and the highest flight yet done in England by their utilisation is described by a club member, Mr. George Thompson, in this issue.

Marks for height are awarded at the rate of one for every 100 feet, reckoning to the highest point reached, starting from the lowest point previously recorded after the launch. Climbs of less than 1,500 feet do not count.

Goal races

This is a new feature in British gliding contests, which would have been introduced last year but for unsuitable weather. The organisers will decide on the goal, and pilots must get there as quickly as possible after executing a manoeuvre which is the equivalent of crossing a starting-line. They can choose their time for crossing it, provided they are already in the air.

For this flight, the usual distance marks and goal bonus are awarded, plus extra marks for speed, but none for height. If the goal is reached, 3 marks for every mile per hour of ground speed are awarded, provided the speed is not less than 10 m.p.h.

The difference in technique between a speed race and a distance flight is that the pilot is more likely to press on, instead of lingering in each thermal to gain more height. This lessens the chance of finding the next thermal, but the extra marks are worth the risk.

Handicap Classes

Sailplanes will be handicapped in three classes, in order to ensure that the Contests will be decided as far as possible on the skill of the pilots alone. The machines are divided into classes according to their aspect ratio, that is, the ratio between the span of the wings and the mean chord, which is the average breadth of the wing from front to back. As a general rule, those with the largest span have the largest aspect ratio, and an increase of span brings the advantages of a better gliding angle and a diminished rate of sink.

Machines in Class 1, with an aspect ratio of 17 and above, are "scratch"; those with aspect ratio between 14 and 17 (Class 2) get a bonus of 10 per cent., and those below 14 (Class 3) get 25 per cent. added to the marks they earn during the Contests.

This handicapping system is being tried out for the first time. In some previous national contests, the sailplanes have been handicapped in two classes according to span alone.

Standing Wave to 15,490 Feet

by George E. Thompson

This flight was made on 11th March in a "Viking" sailplane, starting and finishing at Bradwell Edge, Great Hucklow, Derbyshire. The pilot describes how he climbed to the greatest height yet reached in a standing wave over England.

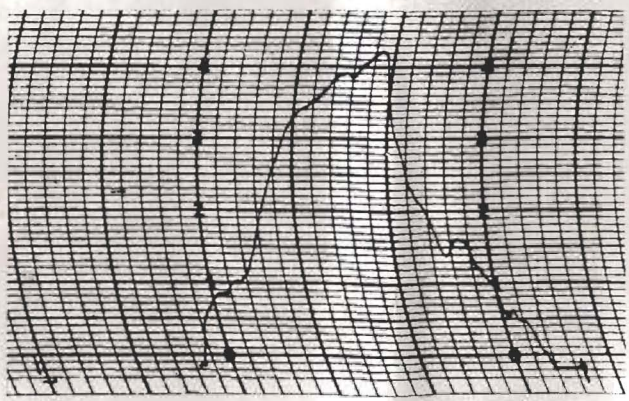
The weather, as observed at Camphill before the start of the flight, was: Surface wind exceedingly strong, westerly. Sky mostly covered by strato-cumulus cloud of the form often associated with standing waves, i.e., in stationary bars and patches, with cloud forming on upwind edges and dissolving on downwind edges. In particular there was a wide opening over Bradwell Valley, on to which fronts the club's west slope of Bradwell Edge. The clouds forming over the Edge were moving at a furious rate into the mass of cloud lying just to the east of Camphill. Occasionally small lenticular clouds could be seen, fairly high, through breaks in the strato-cu. Because of the wind speed, no flying was being attempted at the time of my arrival.

In the following account of the flight, all heights are altimeter readings above the launching point, which is 1,250 ft. above sea level.

The Flight

When we were lined-up behind the soaring slope awaiting take-off, the air speed indicator was registering 40 m.p.h., with gusts to 50 m.p.h. (The Viking normally flies at 40 indicated air speed). After a very turbulent launch at 13.45 hrs. it was necessary to dive at 70 I.A.S. to hold position over the slope, meanwhile climbing with the green ball* above the 20 ft./sec. mark. The climb was made in the clear air just ahead of the forming cloud, the base of which was 1,000 ft. approximately. Above 1,000 ft. the turbulence diminished considerably, and the wind speed slackened a little to perhaps 55-60 m.p.h. The rate of climb dropped off also, and at 3,000 ft., level with the tops of the clouds, was about 3 ft./sec.

* The green ball of the variometer indicates gain of height.



Barograph record of Mr. Thompson's flight on 11th March. The figures represent thousands of metres. 1,000 metres = 3,280 feet.



'Viking' Seaplane of the type used by Mr. George E. Thompson for the flight described in this article.

I had by then edged to the north end of Bradwell Edge, and looked around for evidence of better lift elsewhere. There were a few small, thin lenticular clouds a little distance to the south, but too far away to make use of from that height, and there was also a group of larger lenticulars very high and far away in the N.W. A particularly large bulge of cloud standing up from the strato-cumulus sheet a few miles to the N.N.E. drew my attention, and as I watched it I could see eddies of cloud racing up its windward side and down the lee side. This appeared to promise well, so I endeavoured to reach it; but progress was slow against the wind, which seemed at this height to be N.W. and about 50 m.p.h., and before I had covered half the distance I was sinking towards the cloud sheet between. I therefore returned to the edge of the cloud over Bradwell Edge.

There was some lift at 3 ft./sec. on the way back, and my height was 4,000 feet or so when I met lift at 10ft./sec. directly above the cloud edge. I turned into wind and climbed rapidly in the dead-smooth lift found in standing waves. As height was gained the wind appeared to veer towards north and to diminish in speed; but it was impossible to estimate its velocity with any degree of accuracy, because my position at any time was most difficult to determine, partly on account of the height and largely because so little of the ground was visible. Nevertheless I was able to reduce speed to 40 I.A.S., and found myself pursuing an oval course above the valley between Camphill and Longstone Moor (S. of Camphill), with the sides of the oval heading approximately north to south. It was necessary to hold the northerly headings for longer than the southerly ones, and hence I take it that the wind was from about north and was less than 40 m.p.h. The lift above 11,000 ft. diminished to 3 ft./sec. and a pause occurred at 12,000 ft., but 3 ft./sec. returned on my increasing speed a little, petering out again at 13,000 ft.

Except for the group of lenticular clouds still as far away in the N.W. and apparently just as far above me as when I first saw them, the lenticulars had disappeared. This, of course, meant that I had no guide to the whereabouts of the rising air, and was the cause of my great difficulty in remaining in the lift when I found it. Westwards and southwards of the Pennines and the Peak District the strato-cumulus sheet was unbroken, but over the hills it lay in irregular undulations, many of the hollows showing holes in the cloud, as in the case of Bradwell Valley. In some areas east of the hills the cloud was formed into parallel ridges and hollows, and this configuration showed also in an area due south of me running southwards from a point about 15-20 miles away.

After a few minutes I became aware that a very large area east of the hills had become almost clear of cloud. Meanwhile the hole over Bradwell Valley was much reduced in size and showed signs of closing up.

I increased speed to descend and, of course, ran into more lift, which at 3 ft./sec. took me to 13,900 ft. (by altimeter—actually 15,500 ft. above sea level). It was bitterly cold, and in the best traditions of British soaring I had omitted to provide for such eventualities, having neither gloves nor protective clothing. Also head and eyes were somewhat muzzy with oxygen shortage, heart beating rather heavily, and breathing deeper than usual. I felt that the time had come to return, and forced the

descent with dive and spoilers, noting the thermometer readings at each 1,000 ft. level. I do not recall meeting any rapid sink. At 5,000 ft. I met an Olympia flown by G. O. Smith, and kept company with him for some few minutes, noting meanwhile that three or four thin lenticular clouds had formed above us, at a height that I estimated as roughly 12,000 ft.

The hole over Bradwell Valley was by now very small and sometimes completely closed over, so I decided to go home before things became sticky. As I made my way into the hollow, the increasing wind kept carrying me into the upgoing air on the east side, where once I found myself diving at 70 I.A.S. with spoilers out and climbing at 3 ft./sec. or so. I finally did force my way into the bottom of the hollow, which was just then thinly closed in with cloud, and it was then that I gained a most impressive view of a standing wave. From the crest in front and 700 feet or so above me, the cloud poured downwards like a monstrous torrent of foaming water streaming over a gigantic, miles-long weir, to race turbulently beneath me and then to leap skywards to another crest behind. The phenomenon gave an awe-inspiring impression of enormous power, much as does a cu-nim. cloud when one contemplates entering it. I estimate, from a study of the map, knowing roughly where the two crests lay, that the crest-to-crest distance was 5 or 6 miles.



Environs of Bradwell Edge. The shaded portion shows the position of the hole in the cloud sheet which marks the trough of the wave. Note that its oval outline is modified by cloud formed in the lee of Bradwell Edge caused by the upcurrent there.

I descended through cloud only 600-700 ft. thick at 60-70 I.A.S., heading into wind, having first fixed position through small holes between cloudlets, and during this descent was carried backwards about a quarter of a mile. The approach to the landing field was unpleasant, but a comfortable landing was possible in the somewhat sheltered hollow of the field, at 15.35 hrs.

Points of Note.

WINDS.—This is the first wave in my experience in which the wind speed had diminished with height; usually it increases considerably. At Liverpool the surface wind was measured as 20 knots (23 m.p.h.), very much less than the 60-70 m.p.h. found on Bradwell Edge, and in Sheffield earlier

in the day the wind was only moderate. There is some resemblance here to the conditions on the day of our previous best wave (when B. Thomas reached 11,000 ft.). At Burnaston (Derby) that day, conditions were anticyclonic, hazy, with much strato-cu. and negligible wind, whilst at Camphill strong winds were the order of the day. Can it be that these high winds are produced by a "Venturi effect" between the inversion at about 4,000 ft. and the hills rising to 1,500-2,000 ft.?

CLOUDS.—The noticeable lack of lenticular clouds was no doubt caused by the upper air being very dry. When they did occur in the vicinity of Camphill they were very thin and fibrous, rather like cirrus, indicating ice-crystal composition. In the area south of me, where the strato-cu. was formed into ridges, I was able to observe the cross-section of the configuration quite clearly; it consisted of wide hollows with rather sharp peaks, suggesting a cycloidal, rather than a sine curve, in the airflow.

For a part of the time the stratocumulus directly below showed very clearly the effect of Bradwell Edge on the forming cloud. A rough sketch map indicating the approximate size and shape of the "Bradwell Hole" at the time shows how the Edge created a rectangular patch of cloud within the roughly oval gap produced in the trough of the wave.

At no time did the cloud show any signs of a front in the vicinity.

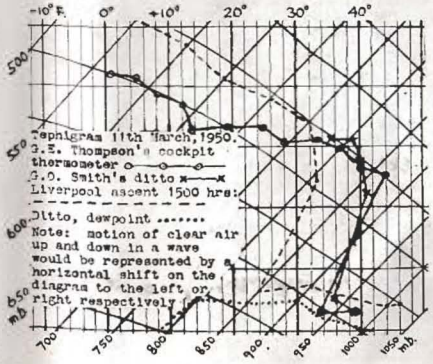
RIPPLES.—I met only one brief patch of ripples when at about 9,000 ft., and must have passed through at an angle to them, since they caused some lateral rocking as well as pitching.

ICING.—None whatsoever, neither on external surfaces nor on cockpit glazing.

TEMPERATURES.—Here we enter debatable territory. As already explained, I noted the thermometer readings during the descent. Mr. Smith, using a similar type of thermometer, took readings during his ascent. We met at about 5,000 ft., hence discrepancies cannot be ascribed to the time interval between our respective sets of readings. A comparison has since shown that my thermometer reads 3° C. (5° F.) lower than his. Applying a +5° F. correction to my figures, I have plotted both sets of readings on the tephigram, using the thickness of the 100 mb. layer at each height to convert altimeter reading to barometric pressure. We agree about the temperatures at ground level and at 5,600 ft.; otherwise not at all, my figures showing a wider range both ways. I think that the sharp drop of the last point in Mr. Smith's plot is significant here, since from surface to 4,000 ft. he was climbing very rapidly, so that lag in the thermometer could produce a "wiredrawing" effect, rounding off the extremes. Only at the final reading was his thermometer given full time to settle to the ambient temperature. My own descent was made at a more leisurely rate, so reducing the effect of lag. It seems to me that the discrepancies can reasonably be assigned to the errors introduced by lag, and that the two significant points can be taken as confirming my own plot.

On the other hand, this plot suggests that 11,000 ft. of my climb was made in air that was potentially very unstable, which is not normally consistent with waves, although W. E. Crease's flight of 3rd December, 1948, shows that this is not impossible. There is the further difficulty that the Liverpool ascent for 15.00 hours shows the upper air to be only slightly unstable, and Liverpool is but 50 miles west of Camphill. There was a low-pressure area to the east of the country, so one would expect the upper air to grow more unstable towards the east, but it seems doubtful to me that this could cause so much difference in 50 miles.

Those then are my observations; now let the rival theorists battle it out amongst themselves. Without question there was a heavy inversion about 3,000 ft. above Camphill, and a wind shear through 70° or 80° above this; but why either or both of these should give us a wave effective to heights greater than we have had before is a question that I leave to the reader. All that I ask is for more of 'em!



Wave Clouds Over Derbyshire

Photographed by G. E. Thompson



These magnificent photographs of wave clouds were taken by Mr. Thompson from his

A view from about 10,000 ft. over Bradwell Edge. The cloud sheet, 5,000 ft. below is thrown into waves, and the 'Gull I,' flown by Derek Roper, is climbing rapidly. Mr. Roper afterwards flew 95 miles to Kettering. A north wind is blowing from top right to bottom left of the picture.

The panoramic view below is taken from the same height, with the wind blowing from left to air has been carried down





'Viking' sailplane on 28th May, under similar conditions to those described in his article.

Above : A photograph from about 5,000 ft. above Bradwell Edge, level with the tops of the wave crests in the cloud layer. The wind is blowing from left to right, and in the left half of the picture is a descending cascade of cloud such as Mr. Thompson described in his article.

right. On either side of the crest of the highest wave is a hollow free from cloud, where the below condensation level.



International Contests

In the history of gliding there have been three international contests, as distinguished from other meetings which were essentially national contests with a few foreign visitors taking part.

In July, 1937, a British team went to the Wasserkuppe, in Central Germany, with five sailplanes and eight pilots. British achievements were one "Daily Prize" for altitude and a new international two-seater duration record. But the principal prizes went elsewhere, to five Germans and one Swiss pilot, while Polish pilots won prizes for greatest height and greatest distance.

The next international contest was held in July, 1948, at the Swiss gliding site at Samedan, in the Upper Engadine, not far from the Italian border. A British team went with six sailplanes. Swedish, Swiss, Spanish and French pilots led in the final placing, but the British position was vitiated by the failure of a recording barograph carried by Philip Wills during a high-altitude climb, which he describes on another page. A triangular speed contest in which Mr. Wills took part is also described in this issue of GLIDING.

This year a British team has been entered for an International contest in Sweden from 3rd to 16th July. The team consists of Philip A. Wills, C.B.E., Lorne Welch, F/Lt. R. C. Forbes and F/Lt. P. G. Mallett. All these pilots took part in the 1948 contest, and Mr. Wills was also in the British team in 1937. The Swedish regulations call for a "Leader," who may either be additional to the pilots or one of them. Mrs. Ann Douglas again occupies this position as she did two years ago, and will help to relieve our pilots of extraneous worries.

It was decided this year not to launch a public appeal for funds, in order to avoid interference with the appeal which will be needed for the International Contest of 1952, to be held in Finland, probably, in connection with the Olympic Games. All members of this year's team, therefore, are paying their own expenses, with the exception of a small amount of money left over from the 1948 contest and a contribution from the R.A.F. Gliding and Soaring Association.

In Switzerland, the British fleet consisted of two Olympias, two Gull IV's and two Weihes; only the last were large-span machines. It was thought that those of smaller span would probably do better in Alpine conditions, which events showed to be improbable; but in any case Swedish meteorological conditions are more likely to favour sailplanes of large span. So three Weihes, the only ones in the country, are to be taken, and F/Lt. Mallett is taking a Gull IV.

Although entries to all these international contests are made through various national Aero Clubs, the national teams are not regarded as separate entities for the purpose of allotting marks and prizes. The tradition has always been to treat the pilots as individuals, independent of nationality, so it is never possible to speak of a particular country having reached a particular place in the final results. This outlook accords with the traditional spirit of gliding.

On the following pages, meteorological conditions for soaring flight in Sweden are described in a most instructive article by K. G. Hakansson, who was in charge of meteorological briefing at the Swedish National Contest last year.

It will be noticed that soaring conditions are not unlike those in England, except that the landscape is even damper. The British pilots will not, therefore, be handicapped, as they were two years ago. by the strange behaviour of air currents among High Alps.

It will also be noticed that Mr. Hakansson assumes that competitors will be turning up on the site before the Contests begin. However, it has since been announced that they will not be allowed to do so.

Points will be awarded to competitors for distance, altitude, speed and for goal flights. They will also be varied in accordance with soaring conditions on each day, as shown by the average of the three best performances.

Soaring Weather in Sweden

by Karl Gosta Hakansson

The following notes are for the information of foreign competitors in the World Championship Competitions at Oerebro in July, 1950. Most of these notes are based on my experience in the years when I have officiated at the Swedish Soaring Championships there.

Contrary to what is the case in some other countries, e.g. Switzerland, distance and altitude flights can only be made in South and Central Sweden with the aid of dry thermals and moist thermals. In order to judge where such thermals may be formed, it is necessary (a) to ascertain the distribution of atmospheric temperatures and humidity in higher altitudes, and (b) to study carefully the weather chart and the physical properties of the terrain. Particulars of the former are obtained by radio soundings taken at Göteborg, Karlsborg, Stockholm, and sometimes also Kalmar. The study of the ground properties and their effect on the thermals is, on the other hand, primarily a matter for the individual pilots, and I will therefore give below our experiences from preceding years. The reader should now get out his map of Sweden, preferably to the scale 1:1,000,000.

You will see in this map that Oerebro is situated at the western point of Lake Hjälmaren. Obviously, this lake will greatly affect especially the dry thermals in its immediate vicinity. Previous competitions have accordingly been characterized by the great difficulty experienced by the competitors in reaching the cloud base. Generally, it has not been worth while to take off earlier than at 11.00 hrs. But the pilots have also learnt that some areas in the immediate vicinity of the aerodrome are better than others. It is well known that the stone and asphalt streets and many brick roofs of a town are more apt to produce dry thermals than, for instance, a grass field or a forest. There is, however, a place where perhaps a pilot has an even better chance of obtaining a good dry thermal, and that is a gravel pit about 5 km. W.S.W. of the airfield, where there is a fairly large area of bare gravel and sand. It is of the utmost importance that the foreign competitors should, during the days of training preceding the competitions, carefully examine and study ground conditions around the aerodrome, e.g. in the above places, to ascertain the nature of the dry thermals. At every competition at Oerebro my advice to the pilots has always been : "If you do manage to reach a cloud, try never to drop below its base, for the dry thermals below clouds will generally be unable to carry you. What you lose in time by occasionally going higher up in a cloud, you will gain in distance."

How should then a distance flight be planned? Well, the first consideration is of course the wind. The prevailing winds in Sweden are southwesterly or westerly. During the 1947 Swedish Championships we had nothing but S.W. or W. winds at Oerebro. No particularly long flights were accordingly possible, the easternmost aerodrome being at Norrtälje. In 1949 the wind was for several days from the N. and N.W. with consequent long distance flights, but such conditions must unfortunately be regarded as exceptional, and it is best to be prepared for preponderantly S.W.-W. winds.

Below, I will discuss distance flights under the headings of different wind directions.

W. and S.W. winds

With westerly and south-westerly winds, the Norrtälje aerodrome is a suitable goal. Moving E. or N.E. from Oerebro, two large lakes are encountered, viz., first Lake Hjälmaren and then Lake Mälaren. Every pilot knows that these two lakes must have an enormous influence on the thermal conditions of the atmosphere. The first point he has to decide in this particular flight is: "shall I go south or north of these two lakes?" Most pilots probably select the northerly route past the first—Lake Hjälmaren—but the same problem arises when they reach the town of Arboga. The choice there is contingent on the thermal state of the atmosphere. If conditions are very good on the day of the flight, that is to say if there are plenty of well developed cumulus clouds, it matters little which route is taken. But on days of fairly bad

thermal conditions the northern route should invariably be chosen, as the terrain conditions for the development of thermals are much more favourable north of Lake Mälaren than S. of it, as will also be seen on the map. Do not fly too near its northern shore, however, but keep well away from it over land so as to avoid any risk of the sea breeze from the lake interfering with the thermals.

S. winds

Southerly winds combined with good soaring conditions are extremely rare. Nor is the topography of the country to the north particularly suitable for long flights. Should the wind blow from the south, it is probably best to select a N.E. route, even though one cannot then extract the full benefit of a following wind. On the other hand, winds between S.E. and S. often occur ahead of eastward-moving fronts. Of these, the cold front may at times be utilized in distance flights.

E. and N.E. winds

Easterly winds with good soaring conditions have not occurred in recent years, and must be regarded as very rare. Should such winds occur, it will probably be best to select a S.E. route, even though one may not then be able to take full advantage of the wind. N.E. winds have occurred once or twice. In that case it would probably be best to fly in the direction of Göteborg. The area which would then be the most difficult to pass is the neck of land—with many small lakes—between Lakes Vänern and Vättern. From the map you will see that the best route ought to be as close to Lake Vänern as possible. Once past the neck you reach the plains of Västergötland, the terrain of which is very favourable to the generation of strong thermals. Alleberg lies in those plains. Little difficulty should be met in continuing the flight towards a goal on the west coast, unless the goal selected is in its south part, e.g. Varberg or Halmstad, in which case you will have to pass one of the most unfavourable areas from a soaring point of view, viz. the district between Ulricehamn and Jönköping. Many sailplanes have been forced down in that area—the name of Mullsjö (a place about 25 km. N.W. of Jönköping) has a bad sound in the ears of many soaring pilots. In passing this district very great altitude is essential, as proved by the experience of all pilots who have reached Halmstad across it.

N.W. winds

North-westerly winds, too, generally bring good soaring conditions. Linköping, or say Nyköping, can as a rule be reached without trouble, but the country between Linköping and Kalmar presents great difficulties. Soaring conditions in north Småland are bad owing to the many lakes and large forests, and the best way to reach Kalmar is, therefore, to fly eastwards from Linköping to the coast, which may then be followed towards Kalmar, if the thermals are not too good. Kalmar is, however, very difficult to reach, and when the wind is in the N.W. it may frequently be preferable to select a goal in the east, e.g. Nörrtalje, despite the beam wind, so as to attain a longer flight distance than to Linköping.

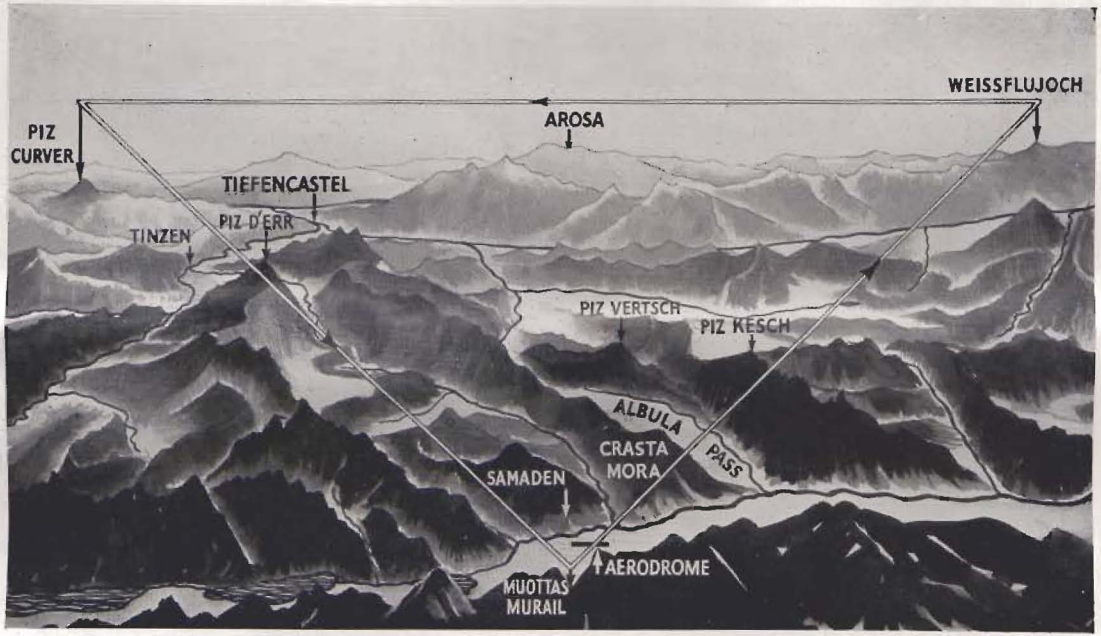
N. winds

When the wind is in the north the soaring pilot will reach the northern extremity of Lake Vättern fairly soon after leaving Oerebro. He will then immediately ask himself: "Should I fly W. or E. of Lake Vättern?" According to the map, there can apparently be little doubt. The terrain E. of Lake Vattern (the plains of Oestergötland) is very favourable for good updraughts, while that of the western side is very unfavourable (many lakes, large forests). Nevertheless, experience has shown that the western side is often preferable. Northerly winds often provide excellent soaring conditions. Cumulus clouds form and develop into cumulo-nimbus, which result in showers. As the terrain on the east side is more favourable for the generation of thermal updraughts, cumuli begin to form earlier on the eastern than on the western side. The cumulus clouds will accordingly change into cumulo-nimbus clouds, and showers may fall, earlier on the eastern side. The thermal updraughts will be destroyed, not only by the actual rainfall, but also by the stratification of the clouds (the spreading-out of the cumulo-nimbus clouds), which leaves no trace of any updraught.

On the western side of Lake Vättern,

however, the formation of cumulus begins much later in the day, and it then frequently has no time to change into cumulonimbus; hence the thermals on this side are not disturbed. If, on the other hand, the soaring conditions are not very good, the route E. of Lake Vättern should always be selected (cf. the reference above to the area between Ulricehamn and Jönköping). Having passed approximately half of Lake Vättern, Småland appears before you with plenty of lakes and wooded country. Very good soaring conditions are required for passing that country to reach aerodromes in Skane. To have the best chances of success, take care never to drop below the cloud base, but to gain altitude instead in good time in some cumulus cloud.





Map showing the route flown by Mr. Wills, as described in his article beginning on the opposite page. Reproduced by courtesy of "Aeronautics."

Alpine Elysium

by P. A. Wills, C.B.E.

In the following article, which is reproduced by courtesy of "Aeronautics," Mr. Wills describes how he set up the present British record for speed over a triangular course of 100 kilometres on 22 July, 1948.

At the morning briefing of competitors at 08.30 in the wooden hut on the airfield, the contest for the day was announced as the 100 kilometre triangular race.

No such stiff test had ever before been set a meeting of sailplane pilots. It was widely believed that no one would succeed in completing the course, which, starting with a dive over the starting line on the Muottas Murail, 1,000 m. (3,000 ft.) above the valley floor, involved a flight across the Engadine valley and over a tumbled mass of mountains to the Davos valley, on a course of about 355 degrees magnetic, turning point the Weissflujoch at the head of the famous funicular, thence on a course of about 220 degrees along the north-west side of the Davos valley to Piz Curver, and a run home once more over massed mountains rising to over 3,000 m. (11,000 ft.) course approximately 110 degrees. Total distance 101 km.

The early day was a perfect cloudless blue, the morning sun shining bright and clear on that unbelievable valley, the green floor of which, flat as a billiard table, is 1,500 m. above sea-level, and which is walled at each side by mountains running from 2,500 to 4,500 m. (8,000-14,000 ft.), capped with snow.

At about 11.00 o'clock, the windsock puffed out from the south—the Maloja wind had started to blow. One after another the bright sailplanes were winched up. They turned on to the neighbouring slopes of Muottas Murail, and traversed them to the top. I was off the ground at 11.24. I climbed to 2,500 m. (8,000 ft.) and beat up and down the Pontresina valley, awaiting the beginning of the cumulus.

The steep slope beneath was scarred with parallel walls of rough stone, to break the winter avalanches. Halfway along was a hut, perched on the top, a Swiss flag fluttering languidly from a pole in the beer-garden. As one passed, often level with it, cheerful drinkers would wave. Twenty or more sailplanes traversing that giant beat seemed quite enough. The lift was narrow and close to the tumbled scree of rock.

At about 12.45 I was sailing near the starting line, in front of the hotel perched at the head of the funicular, when I saw a streak of gunmetal grey dive down from above, across the valley towards the far slope of Crasta Mora. The first machine was away. A few small flat cumulus had started to form, very high, probably around 5,000 metres. There seemed to be little or no upper wind. The south-westerly Maloja wind is a valley wind and does not go very high.

Indeed, Alpine winds are to me completely incalculable. The south-west Maloja wind in the Engadine valley is sometimes accompanied by a precisely opposite wind in the Davos valley only 30 kilometres away to the north, and whilst both are blowing low down, the upper wind may be nil.

I watched the receding dot across the valley, and saw how immediately it reached the far side it started to climb rapidly the razor of Crasta Mora. It was time to go.

So well had I sealed the Gull IV cockpit, and so strong is the machine, that at 160 km/hr (100 ml/hr), she is rock steady and quieter than the average machine at her normal speed. Across the line I eased her back to 110 km/hr (70 ml/hr) and was across the valley and six kilometres on my course in a few minutes. Strong lift on Crasta Mora immediately took me to 3,000 m. (10,000 ft.) and now I was faced with a serious decision.

The general view before take-off had been that the best chance of completing the course was to attempt it in a clockwise direction. But to the west towards Piz Curver the cumulus still seemed very sparse, whereas to the north things looked better. I wasted a fatal 10 minutes making up my



Philip Wills in the "Gull IV" at the Samaden meeting. His wife, standing beside him, was a member of his ground crew.

mind, then saw two or three machines over Piz Kesch to the north and above me, so set off in that direction.

There are two ways of doing an Alpine flight. One is, always to keep a bolt-hole in sight, never cross a mountain without enough height to get either back or on to the next valley, or go round. The other, perhaps only permissible in International Contest Flying: don't wait. Get on and hope. So far we had not experienced a day which tempted one to the second course, and for this first phase I hung on to the safety line. But gradually I began to realise that this day was unlike any other I had ever dreamed of, and that caution was almost unnecessary.

Leaving Crasta Mora I crossed the Albula Pass to a cloud over Piz Vertsch. Underneath it the green ball rose and rose again till it disappeared in the top of the tube. Over 6 m/sec. (20 ft/sec.) climb! At 3,600 m. (12,000 ft.) I turned on the oxygen, the lift continued to the base of the thin flat cloud at 8,000 m. Now it was just a question of holding a compass course at 110 km/hr. until the Davos valley came in sight, on a mountain on the far side was the hotel with a yellow cross marking the turning point. One had to circle it at not over 500 m. or about 3,000 metres above sea level.

I was too high and had to dive up to 160 km/hr again to circle it. Then on to the new course, along the edge of the valley, a bit nerve racking now, because if one got down below the crests of the flanking mountains, and so into the valley wind, there was no knowing in a strange valley where one could find slope lift.

I passed Lorne Welch, in his Olympia, about half a mile on my left, and south of Arosa, almost level with the mountain tops, found my lift. Lorne, though so near, was just that much lower to be out of the pure thermal, and later told me that he had had a bad struggle and lost much time here.

But I was away again, green ball out of sight, into cloud base, but soon found that lift inside was not worth while.

So on to course again, humming through the grey ragged fringes of the cloud at 110 km/hr, not enough sight of the mountains below to locate myself, depending entirely on my compass, and my ability to hold a compass course on the needles of my turn-and-bank indicator.

Gradually I sank below cloud-base and saw ahead the deep valley running down to Tiefencastel, where it is joined by another gigantic valley running down from the Julier Pass. On the far side was the range of which one spike was Piz Curver, the next turning point. But which was it? Alpine maps are not very clear, and Alpine scenery so fantastic and tumbled that one peak looks much like the other thousand. I reached the far side and wasted another precious 10 minutes in finding the yellow cross on the mountainside.

Then on to the home course, once more a nervous few minutes hoping for lift to the upper atmosphere, but under the next cloud up she went.

Soon we were again at 5,000 m. (17,000 ft.) on to our course, but when down to 4,600 m. again near Tinzen, I again found lift the question was, to take it or not?

Had I height to make the homeward run in one or not? I should have worked it out before. I should have marked distances on each leg, but I hadn't. And ahead of me lay the highest and wildest mountain mass of the whole course, the Piz d'Err.

So I took the lift and spent another few minutes rocketing back to cloudbase, then on. For minute after minute I sat, flying at 110 km/hr, a whiff of oxygen, a bar of

chocolate, the bright sun and blue sky and clouds overhead, in every direction below tumbled thousands of white-topped peaks stretching up to the horizon, sliding gently and silently past, in dead smooth silky air.

I never hope again to live through such glory, it was the sailplane pilot's idea of Elysium.

Then the last peak dropped, and ahead I saw again the Engadine valley, and on the far side, the hotel at the top of the mountain wall. I had too much height, I needn't have used that last thermal after all. I pushed up the speed to 145 km/hr (90 ml/hr), flashed across the valley, past the hotel, a 180 degrees turn, the white line rushed below at 170 km/hr, time 14.58 38. Then I was over the edge again looking down on the airfield 1,000 m. below. Air-brakes on we screamed down to a landing.

Two hours, 6 minutes, 48 seconds. Any good? Well, Maurer had done it in 1 hour 40 minutes and was off on a second lap! I tottered out of the cockpit, rushed for a cup of chocolate, felt very old, and took off again. But I didn't get far. The conditions were dying, and I came back again.

Maurer's second lap was done in 1 hr. 36 min., a World Record.

Of the 27 starters on this formidable flight no less than 25 completed the course, and I came in eighth. But *what* a day!

Lessons? Several, but the main one is: Mark off the course, accurate magnetic bearings on each leg, mark each leg off in, say, 10 kilometre sections. Then one can tell whether at any given point one has enough height to make the next turning point without waste of time in further lift. The other lessons are probably only applicable on a perfect day such as this in the High Alps, or in Paradise.



This remarkable photograph, taken by the late Donald F. Greig during the Samaden meeting, shows vigorous cumulus development in the direction of St. Moritz, as seen from his "Olympia" sailplane over Samaden. Reproduced by courtesy of "Aeronautics."

The New Slingsby 18-Metre Sailplane

The Gull IV produced by Slingsby Sailplanes Ltd. two years ago, has won high praise. The following description of a large-span development of the same design has been sent by the makers.

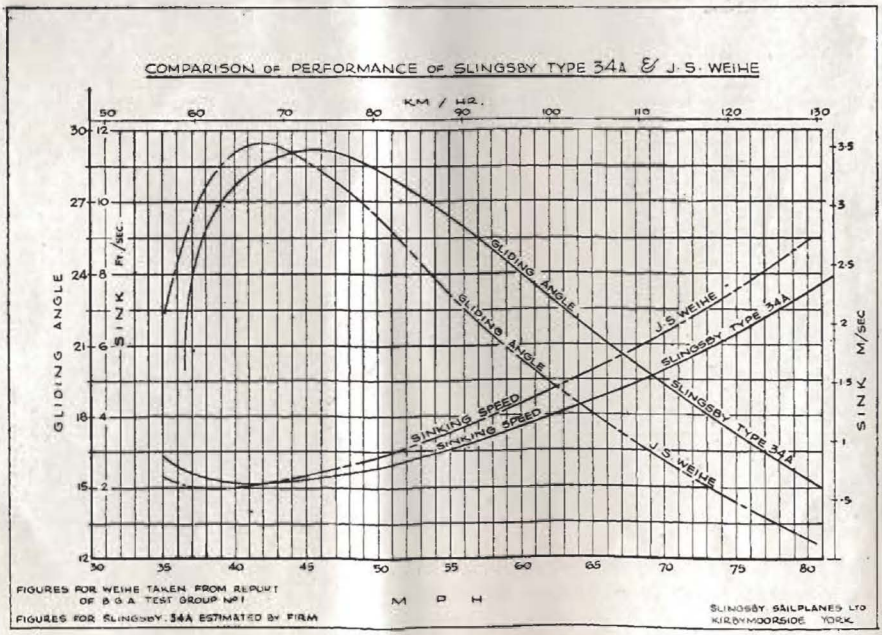
The design of the Slingsby Type 34A is based on that of the highly successful Gull IV. The main features of the Gull IV have been retained, but by overall increases in the size of the aircraft the performance has been brought to such a standard that it will surpass that of any other production type sailplane yet built.

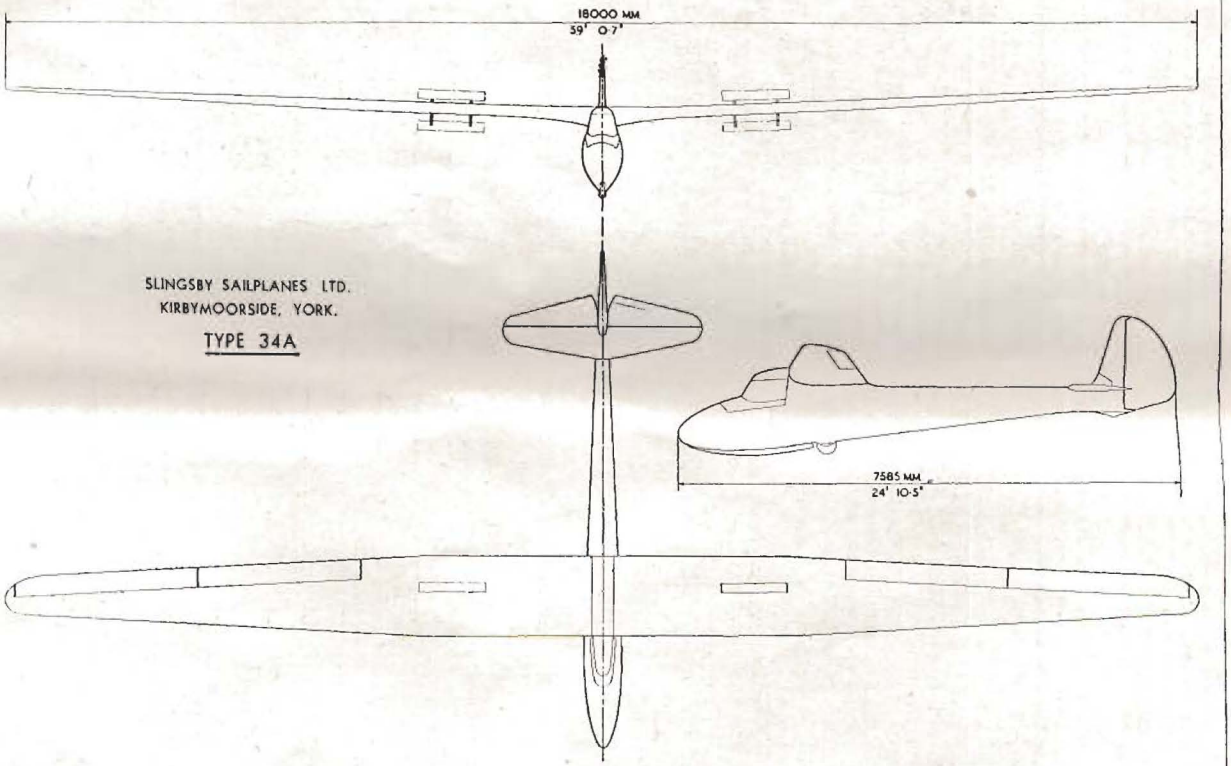
The cockpit arrangement will in all its main features be identical to the Gull IV. Particular attention has been paid to pilot comfort and ventilation, so as to make the machine suitable for the present-day standard of high altitude flying. The instrumentation will be laid out to suit the requirements of individual owners, the large size instrument panel being large enough to accommodate any range of instruments normally required.

Although it will only be fitted to special order, provision is made for carrying the latest oxygen equipment of the economiser type and if required two large bottles can be installed. It will also be possible to recharge the oxygen bottles without removing them from the aircraft.

Sufficient space is available behind the cockpit for such installations as radio and water ballast. Up to 200 lbs. of water ballast can be carried, but this involves a reduction in the factors on the machine.

Elevator trimmer and internal expanding wheel brake will be fitted as standard. The




18000 MM
59' 0·7"
SLINGSBY SAILPLANES LTD.
KIRBYMOORSIDE, YORK.
TYPE 34A
7585 MM
24' 10·5"

front and belly release hooks will be of the automatic pull-off type and will both be operated by one control.

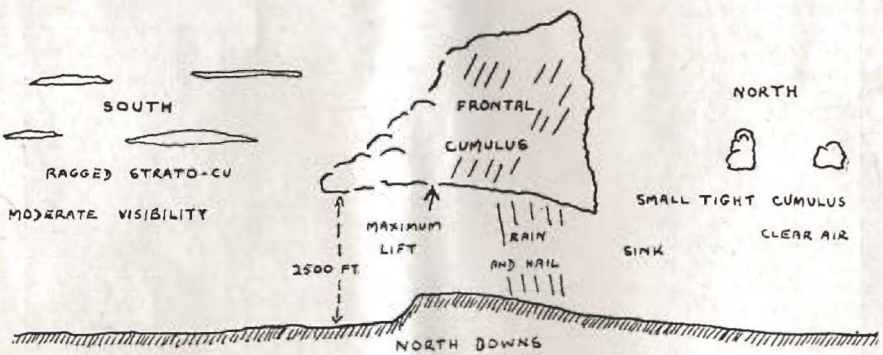
Special attention has been paid to ease of rigging. The main fittings are machined from forged dural billets and the holes for the main attachment pins are sleeved with removable high-tensile steel bushes. When assembling the wings it will be possible to insert the bottom pins with the wing tips resting on the ground; the tips can then be raised and the centre pin inserted. All control connections at rigging points are provided with universal ball ends for ease of assembly.

Care has been taken in the design of the controls to accommodate the wide range of temperatures encountered in modern high-performance soaring; these have been designed to allow for the expansions and contractions encountered over a temperature of from +15°C to —30°C. The controls will, of course, still be operable outside this range.

The dive-brakes in the wing are of sufficient area, when open, to hold the terminal velocity of the machine to within the permissible diving speed, thus ensuring the safety of the aircraft under all conditions. The brakes themselves are of the aerodynamically balanced type, one surface balancing the other in all positions. This arrangement is already fitted as standard on the Slingsby Prefect and has been found to work well, the operating loads being small at all speeds. Refinements in the detail design of the brake mechanism includes ball races in all moving parts.

The need for ease of maintenance has been borne in mind in all stages of the design, and access has been provided to all moving parts in the control systems. Where possible, sealed ball-races and self-lubricating bushes have been used for bearings, so that lubrication will not be required at these points for the full life of the machine.

The performance of the Type 34A will surpass that of any normal sailplane yet built, including the German Weihe and the French Air 100. The best gliding angle will be more than 1 in 29 and the sinking speed 2 feet per second; the performance at high speeds will also exceed that of similar machines.



A section showing the long line of cumulus between which Mr. Karran made the out-and-return flight described on the opposite page. (From a drawing by J. Karran).

Cold Front Out-and-Return

by Jack Karran

On Sunday, 19th March, there was a strong westerly wind at Redhill and broken shaggy small strato-cu. However, some larger clouds appeared to the north after lunch, and it looked to me as though these might be the line of a minor cold front which was becoming active. This was by no means clear, and rather in the spirit of "Oh well, I might as well spend 12s. 6d. in the cause of science," I was towed off at approximately 14.45 hrs. I had arranged for the tug pilot to take me right under the rough line of large but shaggy-looking cumulus clouds, which were some two miles to the north of the aerodrome and appeared to run roughly east and west.

The plot was to explore the lift under it and on both sides. However, as soon as we were a few hundred feet up, it was obvious to me that it was indeed a cold front, which stretched way west of Guildford and east as far as I could see along the face of the North Downs. The cumulus clouds were strung almost continuously along this line in a belt about 2 miles wide, with a base at some 2,500-3,000 ft. Heavy rain was falling from some of the clouds, and I saw a single flash of lightning from one of them. As we approached the actual line of clouds, I could see that their north edges were sharply defined and that the air behind over London had the clear, cold look, with little bunchy "cu," of air of more polar origin.

We passed under the front too low for me to release from the tug in safety, and as we passed into the clear air behind I found that, due to the descending air, we weren't climbing at all. I hastily signalled the tug pilot to turn back by flying out to one side, and after some momentary misunderstanding he did so. As we came back under the cloud I released, and to my delight found the glider going gently up as I flew east under the clouds. I zig-zagged about to find the best lift, which appeared to be one-third back from the south face of the string of clouds marking the line of the front.

It felt uncanny flying at speeds of up to 100 m.p.h. (I.A.S.) without losing height or having to circle. At times I passed through heavy rain and hail, which made no difference to the lift. It all seemed so unnatural that I kept feeling that any moment the lift would suddenly vanish and I would have to do a hectic forced landing in heavy rain. Unfortunately I was flying in the London Control Zone, which meant that I had to keep out of cloud, so reluctantly I had to use the brakes to avoid getting up into it. My only other difficulty was the fact that the canopy kept misting over, due presumably to the mixture of cold and warm airs.

In a very few minutes I was level with West Malling, some 25 miles to the east. The rain here was very heavy, and with the misty canopy it was difficult to see what lay ahead. Somewhat faint-heartedly a turn for home was made, although from ordinary gliding experience it didn't seem very possible to get all the way back against so strong a wind (some 15-20 knots). However, it wasn't an ordinary day, and flying with the ease of a powered aeroplane I flew back, actually doing the last part at over 100 I.A.S. I landed approximately 52 minutes after release, having covered some 50 miles.

When I came back, the front still stretched west of Guildford and had only moved some two miles in a southerly direction. Later on, it appeared to break up and just become so many odd "cu," although the difference in the air to their south and their north was still noticeable.

It had been a fascinating experience, and showed too the great possibilities of flights along such minor fronts. Since March I have seen a number of these, but unfortunately on each occasion I have been otherwise engaged. I hope, however, that others will watch out, because it's so easy to fail to realise what is cooking in the weather, and so miss out on a big opportunity. After all, I think I'm right in saying my particular front didn't appear on any weather map.

The Royal Air Force Gliding and Soaring Association

by The Chairman, R.A.F.G.S.A.

"Airmen" is the generic term applied to all other ranks of the Royal Air Force, and under that title are included such trades as clerk, fitter, medical orderly, dental mechanic, and all the hundred-and-one specialists who are needed to keep an Air Force flying. "Airmen" they may be, but chances to fly, especially as pilot, are often hard to come by. There are also some, accustomed to a passage through the shattered air, propelled by a stream of incandescent gas, who also enjoy a more leisurely kind of flight—in the same way, perhaps, as the Captain of a submarine might find healthy relaxation in sailing a dinghy. For all these varying extremes of specialists, both tradesmen and pilots, it is the belief of the founders of our Association that gliding and soaring provide a healthy pastime and common interest, particularly appropriate to a Service whose justification to exist depends upon its ability to attain mastery of the air.

These are the ideas, differently expressed by different people, which led to the foundation of the Royal Air Force Gliding and Soaring Association early in 1950, with membership open to all soaring officers and men of the R.A.F., and which are expressed in its rules and regulations thus:—

> "The aim of the Association shall be to bring gliding and soaring within reach of all members of the Royal Air Force, with special regard to those normally employed on the ground."

The Association recognises that it has set itself an ambitious task, unlikely to be capable of fulfilment without many years of endeavour. It entails the eventual foundation and growth of gliding clubs on many stations and units; finding money and resources for the purchase of equipment; and, perhaps most important of all, enlistment of the services of many people prepared to give their spare time to benefit, not themselves, but future airmen, who may be only now about to enter the Air Training Corps.

Accordingly, the Association has mapped out for itself a programme: first, to develop the necessary "core" of determined organisers and capable instructors; for it has been shown many times that, without good organisation and good instruction, a gliding club must almost inevitably fail. Second, when organisers and instructors of proved ability and equipment have been found, the Association plans to begin its build-up of a chain of gliding clubs on individual units, so that eventually gliding and soaring may be brought within the reach of every officer and man, and ab initio training undertaken in every club.

In accordance with this plan, the first task of the Association has been to set up a club at the R.A.F. Station, Detling. Here the Association has a Weihe, a Slingsby T-21.b, and a Slingsby Prefect, as well as a building destined to become a clubhouse, with messing facilities and dormitory accommodation for weekends. Courses, both for potential instructors and ab initio trainees, have already begun under the supervision of Flight Lieutenant R. C. Forbes and Flying Officer P. G. Mallett, both of whom hold the "Gold C" and have represented England in international soaring contests. Detling is likely to remain, for some time at any rate, the principal training unit within the Association, and it will have the task, not only of providing facilities for advanced soaring for all qualified members, but also of training instructors, and giving all possible help to other clubs as they form within the Association.

The second step, the formation of these other Associate Clubs, is now beginning. Pride of place must go to the old 12 Group Gliding Club, which was founded as long ago as 1946, and therefore ante-dates the R.A.F.G.S.A. itself. It is now reconstituted as the Linton-on-Ouse Gliding Club, and H.Q. 12 Group is turning its attention to the formation of a gliding club at Newton (Notts.). Bomber Command have formed an Associate Club at Mildenhall. Its President is F/Lt. J. F. P. Archbold, who is

a Navigator, and who, together with F/Lt. Forbes, made a goal flight of 310 kilometres during the B.A.F.O. competitions of 1948. Some twenty other clubs exist in embryo, and will be able to form and begin flying as soon as equipment can be obtained for them.

So far, the R.A.F.G.S.A. has confined its endeavours exclusively to the United Kingdom, where there is more than enough to keep it fully occupied; the B.A.F.O. Clubs are a separate entity, banded together as the Association of B.A.F.O. Gliding Clubs. It is clear, however, that other overseas Commands of the Royal Air Force offer a fruitful field for future developments, and there is nothing impossible in the thought that a boy who first learned his gliding in the A.T.C. may one day break altitude records whilst serving, say, in Aden or Rhodesia.

There is nothing new in the interest of members of the Royal Air Force in gliding. It will be remembered that F/Lt. (now Group Captain) G. M. Buxton once held the British altitude record, and that he was also designer of the Hjordis high performance sailplane, which once held the British distance record. That design was subsequently developed into the King Kite, three of which were flown by the British team at an International contest in 1937—one by F/Lt. P. McG. Watt, who lost his life in a Hampden during the war.

After the war, interest in soaring was stimulated by the capture in Germany of much equipment, which has been put to good use in the B.A.F.O. Clubs. Experience obtained in B.A.F.O. by all ranks is now spread wide throughout the Service; it has created many ardent enthusiasts for gliding and soaring as a pastime of special value to the Royal Air Force. The Royal Air Force Gliding and Soaring Association is the result.

NOTE:—For those members of the R.A.F. who are interested and have not yet joined, full details of subscription fees, flying charges, Command representatives, etc., and how to join, will be found in the following Air Ministry orders: N. 1237/49, N. 317/50, N. 404/50 and N. 512/50.



Flying Officer P. G. Mallett (left) and Flight Lieutenant R. C. Forbes at the International Contest in Switzerland two years ago, when they flew in the British team. They are again taking part in this year's International Gliding Contest in Sweden.

On V.I. Blind Flying

by Philip Wills, C.B.E.

The first query about V.I. Blind Flying is that of the Russian about the elephant—"Does it exist?"

The main evidence that there is some new blind-flying technique which has been stumbled on by a few sailplane pilots lies in the results of recent national and international competitions. At Samaden in 1948 and at Elmira in 1949 there were one or two pilots who, whenever high-altitude blind-flying was involved, would regularly achieve heights not merely a few hundred, but several thousand feet greater than the others, who would come out within a few hundred feet of each other.

On the first competition day at Samaden in 1948, a large cumulo-nimbus formed almost over the airfield, into which at least 13 sailplanes climbed almost at once. (I must have been the 13th, because my barograph packed up on this flight and I lost my height marks).

When I came out, at 20,000 ft. on my altimeter, I saw to my surprise that the cloud was the shape of an enormous dumb-bell on end: a lower mass, a narrow connecting column, topped by an upper mass. Two pilots emerged from the upper mass; the other eleven or so failed to centre themselves accurately enough in the centre of the upcurrent to rise through the narrow column into the top cloud. This centering had been done unconsciously and automatically.

Solutions of the "magic hands" order are very much suspect, and the more likely answer seems to be a new technique. When service and professional civil pilots fail to achieve results as good as amateurs who have had no standard course in blind flying, it would seem that the standard blind-flying training methods are not suited to the requirements of sailplane blind-flying, for which they were never designed anyway.

What is this new technique? I must say at once that I am not certain that I know, and the answer will only come when a qualified blind-flying instructor can be taken into a cumulo-nimbus by one of the few, to see for himself and report on what goes on. But I suspect that the root of the matter lies in the different psychological approach.

Blind-flying is at root a state of mind. So long as a pilot is at ease, he is all right: immediately he gets worried or fatigued, he is in trouble. In power flying, the Turn and Bank indicator is the primary instrument;—it is also a difficult one, so that power pilots are given other, simpler instruments to interpret, only falling back on the Turn and Bank when things go wrong.

In sailplanes, the Turn and Bank is a secondary instrument—secondary to the variometer. The sailplane pilot uses—or should use—his Turn and Bank to chase the indications of the variometer, and carries out all sorts of manoeuvres to a degree unheard of in power flying, in doing so.

It is for this reason that I suggest the name of V.I. (Variometer Interpretation) Blind Flying for this technique.

As to the results, I can only speak personally. But whilst my power-flying friends who have received standard blind-flying training, find that in a sailplane they get much assistance from the use of an artificial horizon (a most expensive, heavy and space-using device), I, who have not, find I can manoeuvre indefinitely in rough cloud on a simple Turn and Bank without experiencing fatigue. Since fatigue must arise from repressed nervous tension, and since I am by no means a placid type, this must mean that the nervous conflict, of physical sensations at war with instrument interpretation, is greatly reduced when using V.I. technique.

If this is eventually confirmed, the possible value to professional power pilots of some blind-flying training in sailplanes is clearly a very important question. The eventual arrival of a two-seater high-performance sailplane in this country should bring the answer. If it isn't confirmed, then people like me have got "magic hands"—or rather, magic Eustachian tubes. I doubt it very much.

Gliding Records

International gliding records, as recognised by the Federation Aeronautique Internationale on 1st January, 1950, are as follows :—

Single seaters

Duration: 40 hrs. 51 mins. by Guy Marchand (France) on 16th-18th March, 1949. (A flight of 53 hrs. 52 mins. by E. Jachtmann (Germany) in 1943 is not officially recognised).

Distance in straight line: 749.2 km. (465.5 miles) by Olga Klepikova (U.S.S.R.) on 6th July, 1939.

Goal and return: 368.8 km. (229.2 miles) by Paul B. MacCready (U.S.A.) on 16th July, 1947.

Goal flight: 602.4 km. (374.3 miles) by P. Savtzov (U.S.S.R.) on 31st July, 1939.

Altitude above take-off: 8,050 metres (26,411 ft.) by Per Axel Persson (Sweden) on 12th July, 1947.

Absolute altitude: 10,211 metres (33,500 ft.) by John Robinson (U.S.A.) on 1st July, 1949. (Harland Ross, in U.S.A. reached 36,100 ft. on 27th January this year).

Speed over 100km. triangular course: 69.6 km/hr. (43.2 m.p.h.) by S. Maurer (Switzerland) on 22nd July, 1948.

Multi-seaters

Duration: 50 hr. 26 mins. by A. Bödecker and K. H. Zander (Germany) on 9th-11th December, 1938.

Distance in straight line: 619.7 km. (385.1 miles) by I. Kartachev and P. Savtzov (U.S.S.R.) on 17th July, 1938.

Out and return: 416.1 km. (257.9 miles) by I. Kartachev and V. Petrotchenkova (U.S.S.R.) on 12th June, 1940.

Goal flight: 495.0 km. (307.6 miles) by I. Kartachev and V. Petrotchenkova (U.S.S.R) on 19th June, 1940.

Altitude gain: 6,780 metres (22,244 ft.) by Guy Rousselet and Léon Faivre (France) on 21st September, 1948.

British Records

Single seaters

Duration: 15 hrs. 47 mins. by A. N. Young at Long Mynd, Church Stretton, 18th August, 1938.

Distance: 232.6 miles by P. A. Wills, Hatfield to Gerrans, Cornwall, 1st May, 1949.

Out and return: 147.2 miles by C. J. Wingfield in U.S.A., 16th July, 1947.

Goal flight: 192.6 miles by R. C. Forbes, Fassberg to Cologne, Germany, and by J. F. P. Archbold over same course, 19th May, 1948.

Altitude gain: 15,247 ft. by P. A. Wills, at Long Mynd, 23rd June, 1946.

Speed over 100 km. triangular course: 29.2 m.p.h. by P. A. Wills in Switzerland, 22nd July, 1948.

Multi-seaters

Duration: 22 hrs. 14 mins. by W. B. Murray and J. S. Sproule at Dunstable, 9th-10th July, 1938.

Distance: 138.9 miles by K. L. Hirst and K. Simpson, Gutersloh to Hamburg (Germany), 28th May, 1949.

Out and return: 77.2 miles by J. W. S. Pringle and J. Grantham, Cambridge to Dunstable and back, 12th August, 1949.

Goal flight: 118.2 miles by C. Nicholson and G. P. Blake, Yeovil to Bramcote, Warwickshire, 17th June, 1947.

Altitude gain: 10,080 ft. by J. A. Grantham and B. E. Bell, Cambridge, 24th July, 1949.

U.K. Local Records

A British record can be set up by a British pilot anywhere. A U.K. local record can be set up by any pilot who starts his flight in the United Kingdom. The following differ from the official British records:—

Single seaters

Goal flight: 192.9 miles by D. H. G. Ince, Long Mynd to Yarmouth, 9th August, 1949.

Out and return: 126 miles by G. H. Stephenson, Redhill to Thruxton and back, 16th April, 1950.

Duration: 33 hrs. 5 mins. by L. Marmol (Czechoslovakian) at Dunstable, 12th-13th April, 1949.

Multi-seaters

Distance: 126 miles by K. Haberstich and K. Fahrländer (Swiss), Bramcote to Hampstead, Norfolk, 25th June, 1947.

No.	Entrant	Type of Gl
1.	T. Rex Young (Bristol)	EoN Olympia
2.	P. A. Wills (Maidenhead, Berks.)	Weihe...
3.	Air Training Corps: 188 Gliding School (Barrow-in-Furness) ..	EoN Olympia
4.	Frank Foster (Farnham Common, Bucks.) ..	Rhönbussard
5.	Imperial College Gliding Club (S. Kensington, London)	EoN Olympia
6.	H. G. Cartwright (Little Gaddesden, Bucks.) ..	EoN Olympia
7.	Newcastle Gliding Club (Newcastle-on-Tyne) ..	Olympia
8.	Surrey Gliding Club (Redhill, Surrey) ..	Weihe ..
9.	H. C. G. Buckingham (Newbury, Berks.) ..	EoN Olympia
10.	Surrey Gliding Club (Redhill)	EoN Olympia
~~11.~~	~~Air Training Corps: 146 Gliding School (Hornchurch, Essex)~~ ..	Rhönbussard
12.	Derbyshire & Lancashire Gliding Club (Great Hucklow, Derbyshire) ..	Gull I ..
13.	Surrey Gliding Club (Redhill)	EoN Olympia
14.	Bristol Gliding Club	EoN Olympia
~~15.~~	~~The Army Flying Club (Combe, Berks.)~~	~~EoN Olympia~~
16.	W. T. Fisher (Cheltenham, Glos.)	EoN Olympia
17.	A. de Redder (Newcastle-on-Tyne)	Petrel ..
18.	Air Training Corps: 89 Gliding School (Christchurch, Hants.) ..	Sedbergh T21.
19.	Air Training Corps: Reserve Command Gliding Instructors' School (Detling, Kent)	Sedbergh T21.
20.	London Gliding Club (Dunstable, Beds.) ..	Gull IV
21.	London Gliding Club (Dunstable, Beds.) ..	EoN Olympia
22.	Air Training Corps: 65 Group, R.A.F. (Langley, Bucks.) ..	Prefect..
23.	H. C. G. Buckingham (Newbury, Berks.) ..	EoN Olympia
24.	Cambridge University Gliding Club	Kranich
25.	Cambridge University Gliding Club	EoN Olympia
26.	Air Training Corps: 64 (Northern Reserve) Group (Yorks.)	Grunau Baby
27.	Royal Naval Gliding & Soaring Association (Portsmouth, Hants.) ..	Mü 13a
28.	Royal Naval Gliding & Soaring Association (Portsmouth, Hants.) ..	Kranich
29.	Air Training Corps: 203 Gliding School (Sydenham, Northern Ireland) ..	Gull I ..
30.	D. H. G. Ince (Glasgow)	EoN Olympia

The aircraft can be distinguished by the competition numbers p

		Pilots (*Name of Team Captain in Italics*)
ider		
..	..	*T. Rex Young*, J. M. Heron, E. A. Thompson, A. F. Gotch
..	..	*P. A. Wills*
..	..	*L. Redshaw*
..	..	*Frank Foster*, P. A. Lang
Ik. II	..	*F. G. Irving*, Miss M. Gilbert, P. Murden
	..	*H. K. Cartwright*, G. Lee
..	..	A. Coulson, S. C. O'Grady
..	..	W. A. H. Kahn, D. Brown
..	..	Bomber Command R.A.F. Team (High Wycombe, Bucks) : F/Lt. Archbold, F/O. Latham, F/Lt. Robins, *F/O. Page*
..	..	P. Blanchard, A. Deane Drummond, W. Jordan, *G. Gregory*
..	..	*F/Lt. Anderson*, H. B. Sadler
..	..	*R. C. Roper*
..	..	*T. E. H. Beck*, L. J. W. Hall, R. S. Hooper
..	..	K. W. Turner, *C. Staffurth*
..	..	*R. Swinn*, Lt/Col. Dickson
..	..	*W. T. Fisher*, S. Feeves, D. Fletcher, L. Zeyfort
..	..	*A. de Redder*, S. C. O'Grady
B	..	*F. R. E. Hayter*, P. J. Squelch, J. C. Allan, G. F. Ball
B	..	*G. W. Charman Thomas*
..	..	C. A. P. Ellis, John Hurry, A. E. Rowley
..	..	G. H. Stephenson
..	..	E. Erdman, *H. R. Watson*, B. Gould, W. Watson
..	..	Maintenance Command R.A.F. (Andover, Hants.) S/Ldr. A. A. J. Saunders, F/Lt. Meidzybrodski
..	..	J. H. Edwards, J. Grantham, T. G. Phillips, F. R. Ward
..	..	*B. E. Bell*, A. L. L. Alexander, D. R. Clayton, D. L. Martlew
T.B	..	*H. Neubroch*, G. Furniss, G. A. Hinchcliffe, W. D. Campion
..	..	*L/Cmdr. G. A. J. Goodhart*, L/Cmdr. H. C. N. Goodhart
..	..	L/Cmdr. H. C. N. Goodhart
..	..	*R. J. Browne*, D. B. Hamilton
..	..	*D. H. G. Ince*

ainted on them. The Sedbergh and Kranich types are two-seaters

National Gliding Contest 1950

AWARDS and PRIZES

1. Prizes

The winner of the Contests will be the glider which amasses the greatest number of marks during the Contests. Prizes will be awarded to the entrants of the gliders placed first, second and third, in accordance with a separate prize list.

The Organisers will announce additional trophies, awards and Daily Prizes to be competed for during the Contests.

2. Contest Awards

The following Cups and Trophies are awarded annually for performances during the National Contests:—

Londonderry Cup	To the Gliding Club nominating as a member of a Club Team the pilot earning the greatest number of marks.
L. Du Garde Peach Trophy	To the Gliding Club whose team earns the greatest number of marks.
Firth Vickers Trophy ..	For the best performance by a British pilot in a British-designed and built sailplane.
EoN Cup	For competition among entrants of whichever type of British-built glider is numerically the strongest in the Contests. Awarded to the entrant of the glider of that type which earns the greatest number of marks.

3. Annual Awards

The following Cups and Trophies are also Open to Competition by British nationals for the year ending 31st December:—

De Havilland Cup	Greatest height during the year.
Manio Cup	Best goal flight during the year.
Wakefield Trophy	Longest distance during the year.
Volk Cup	Best out-and-return flight during the year.
Seager Cup	Best two-seater performance during the year

The method of awarding marks for performance is described on another page in the article "Competition Flying"

Soaring the Channel

The first public announcement of an intention to soar across the English Channel was made in September, 1922, by Captain E. D. C. Herne. This was a month after the Germans had first shown it possible to keep a glider up for more than an hour. Captain Herne, who flew air liners to Paris for Daimler Airways, told the *Manchester Guardian* that he had often felt the lift from a vertical air stream when crossing the Kent coast, and his intention was to soar "several thousand feet" in this current and then glide across to France. His glider was at that time under construction at Stag Lane, and had a designed gliding angle of 1 in 17. It was actually being built for the Itford soaring contest of October, 1922, during which it made a glide of 2½ minutes. A day or two later, when being launched into a high wind, the wing tips developed flutter and broke off. It is just as well that this happened at 20 feet above Itford Hill, rather than "several thousand feet" above the Kent coast.

Since it would need a wind from the sea to produce lift over the cliffs, Captain Herne would have had to set off for France against the wind. To avoid this disadvantage, P. Michelson, who kept his Cloudcraft Phantom sailplane on a hill near Dover for several weeks in 1932, hoped to gain height over a hill in the neighbourhood which faced north-west, so as to make the crossing in a following wind—preferably a very strong one. But he kept his machine picketed down in the open, and it was damaged by marauders before the right wind came along.

Neither of these pilots really had a hope of climbing high enough for the crossing; even at the Southdown Gliding Club, with modern sailplanes, 2,000 ft. is the most attainable over Beachy Head.

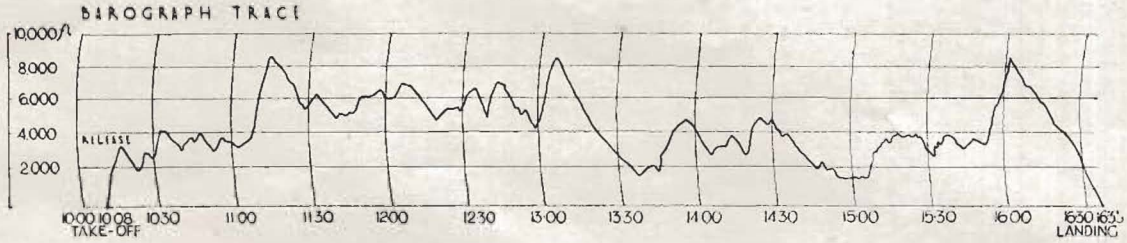
Meanwhile, the *Daily Mail* had decided, in April, 1930, to hold a gliding competition in the summer of 1931. But when details were announced, it was found that £1,000 could be won for a double crossing of the Channel made from an aeroplane-tow to an unlimited height. One entry, which failed to turn up, was to have been launched from a balloon!

On the opening day of the contest, 20th June, 1931, Robert Kronfeld was towed up to 10,000 feet from St. Inglevert in his Wien sailplane and glided across to Dover, after which he was towed again to 9,000 feet and glided back to France, thus winning the prize. Another competitor, Herr Krause, made two attempts in a Falke. The first time, he cast off at 7,000 feet because he had got below the aeroplane, and the second time he released at 3,000 feet because he had forgotten to take his barograph. Other entries were C. M. C. Turner, founder of the Channel Gliding Club, and P. Michelson.

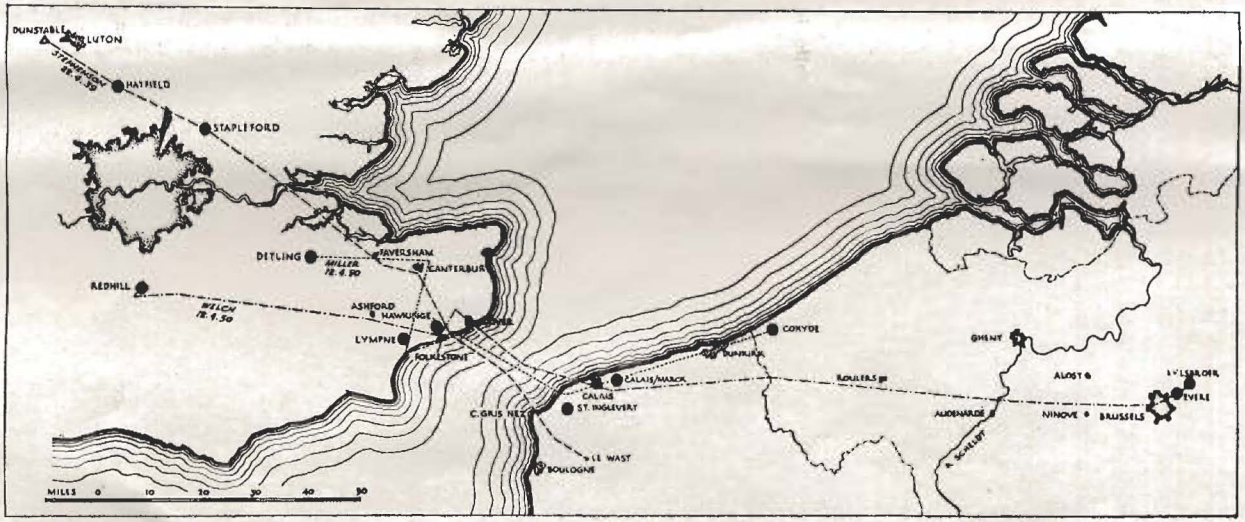
The day before these events, Lissant Beardmore, sponsored by the *Daily Express*, crossed the Channel in his Professor sailplane after a tow to about 12,000 ft., but it was never established whether he released over England or over the Channel. It should be emphasized that none of these crossings was a soaring flight; they were just plain downward glides after gain of height by mechanical means.

Not until 22nd April, 1939, was the first crossing made by means of soaring flight, which is the purpose for which sailplanes are designed. On that day, G. H. Stephenson was launched in his Gull I from the London Gliding Club at Dunstable at 2.55 p.m. (13.55 G.M.T.), climbed to 4,000 feet, and set off with a 40 m.p.h. north-west wind behind him. He was down to 1,000 feet over Hawkinge, near Folkestone, got a thermal there, climbed up into a cloud and emerged from it at 6,000 feet just off the coast. He then glided across the Channel, reaching the French coast at 2,600 feet, and landed 10 miles east of Boulogne without having encountered any more thermals. He had flown 127 miles.

Two more crossings were made on 12th April this year, both in soaring flight. Lorne Welch flew from the Surrey Gliding Club at Redhill to Melsbroek Aerodrome, Brussels, 210 miles; and Flt. Lt. L. A. Miller from Detling to Coxyde, in Belgium, 93 miles. Accounts of these flights are given in the following pages; also some details of two attempts at Channel crossings, starting from Cambridge, in which the pilots were unable to reach the Channel coast, but from which some useful lessons may be learnt. Finally, the meteorological factors involved in making a Channel crossing are discussed.



Above: The barograph trace of Mr. Welch's flight. Reproduced by courtesy of "The Aeroplane."



Redhill to Brussels by Sailplane

by Lorne Welch

(Reproduced by courtesy of "The Aeroplane")

A glider pilot's approach to flying is essentially different from that of the aeroplane pilot. Unless the weather is bad, the light aeroplane pilot is usually able to fly direct to his destination. On the other hand, the glider pilot who wishes to fly across country must choose his route and time his flight so as to make the best possible use of the weather conditions; if conditions are bad or he makes a single wrong decision he will come straight down.

Since most upcurrents are quite small in area it is necessary, when going across country in a glider, to gain height by circling and then glide straight in the required direction until it is time to look for more lift. Gliders are usually flown at an airspeed of about 40 m.p.h., but since so much time has to be spent circling, cross-country speeds are slow. In still air it is difficult to average more than 25 m.p.h., so that it is an advantage to have a following wind.

From Redhill it is impossible to use the unstable westerly and north-westerly winds without crossing the Channel. As this direction holds the only possibilities of a really long trip, I had for some time wanted to get across to see what could be made of conditions on the other side.

When I got up on April 12 I had no intention of going across country. I thought that it would be another day for instruction in the two-seater and doing an aerotow or two. However, by 09.00 hrs. the sky was covered with wonderful-looking cumulus, and this, together with a west-north-westerly wind made me think that it might be a possible "Channel day."

Owing to the lack of AIRMET the only weather information that I was able to get quickly was from *The Times*, and, of course, the ordinary aerodrome weather report. These, however, looked very good and, as the other members of the club said that they would cope without me, I decided at about 09.40 hrs. to have a shot at it.

The next half-hour was frantic, as it was obvious that unless I could get airborne soon a wonderful day would be wasted. We collected the glider, tug, tow rope, barograph and all the rest of the junk on the far side of the aerodrome, and I took off at 10.08 hrs. behind our Auster, piloted by Bob Garnett. The sky looked excellent with good cumulus in all directions.

I had asked to be towed a couple of miles upwind of the aerodrome. Four minutes after take-off, I released at 1,500 ft. in a good thermal (all heights, incidentally, are above sea level, all times are G.M.T.). Six minutes later I reached 3,000 ft. and turned down wind, soaring without any difficulty, following the railway line towards Ashford. Cloud base was about 4,000 ft. Shortly after passing the town I entered cloud for the first time, reaching 8,500 ft., and the glide from there brought me at 11.30 hrs. near Lympne at 7,000 ft.

The next hour and a half was maddening. I decided that, in view of the fact that the wind was very westerly, I would not attempt to cross the Channel unless I was at least 8,000 ft. over the coast. There were great masses of cumulus drifting out to sea. I tried one cloud after another and, although I could get into them without any difficulty, I never got more than 6,700 ft. before the lift faded.

Each time I came out of the clouds on a north-westerly heading I found myself a mile or two out to sea. The clouds were in very large masses, and when among them it was almost impossible to see their structure and to find out which were the good bits. After wasting this hour and a half fumbling around to no good purpose over Folkestone and Dover, I realized that it was a waste of time, and that if I wanted to get any height I should have to go inland and catch a good cloud before it died out.

Finally, just after 13,00 hrs., I entered a decent-looking cloud about three miles north-west of Dover.

The base was 5,200 ft., and this time it really had some lift in it; at 13.12 I reached 8,500 ft. According to my reckoning, I was then over Dover, so I decided that the time had at last come to set course.

Turning on to a compass course of about

150 degrees I carried on through the cloud. I had expected to sink, but it was much worse than I had feared and height was lost surprisingly rapidly.

During the cloud-flying around Dover I had been above freezing level all the time, and had accumulated ice on the cockpit cover as well as a strip along the leading edge of the wing. This was only about two inches high and an inch thick, but it obviously affected the performance considerably. Ice had blocked the pitot about three-quarters of an hour previously, and although a glider is quite easy to fly on sound and feel, it is difficult to keep the speed exactly right without an airspeed indicator.

The rapid loss of height from 8,500 ft. down to 5,600 ft. in some six minutes was due mainly to flying in sinking air. The ice and inaccurate flying, however, must have contributed to this to some extent.

At 5,600 ft. I emerged through the southern edge of the bank of cloud, to find myself about a third of the way across the Channel. Looking back, the coast of England seemed surprisingly far away, but the coast ahead seemed infinitely farther. There was an awful moment when I felt that it would be impossible to reach France and that it would be better to attempt to return. However, a little thought showed that this also would be quite impossible and, therefore, there was nothing for it but to go on, and hope that my calculations were right.

The view was wonderful. Ahead and on the right was Cap Gris Nez under a completely blue sky. There were some small cumulus a few miles inland from the French coast, and to the east of Calais these clouds were much larger and appeared to lie along the coast. There were some ships below in mid-Channel.

After cloud flying, everything appeared extremely bright, and the strips of white ice glistened on the red leading edges of the wings. From my drift the wind appeared to have a westerly component and so I kept aiming for the nearest land.

It seemed almost impossible that we should ever reach land, so I concentrated on flying as steadily as possible, although the airspeed indicator was still not working. However, when down to about 3,000 ft., I realized with relief that there really would be quite a lot of height in hand, so I turned a little to the left towards Calais, as that seemed to be the nearest place where lift might be expected.

The coast was crossed at 2,000 ft., 22 minutes after setting course and, shortly afterwards, when down to 1,400 ft., I found my first French thermal. This was not much good, and a few minutes later, when the cloud shadow covering Calais drifted away, I moved over to the town and caught quite a reasonable thermal which took me up to cloud base at 4,000 ft.

While circling up I had time to consider the position. The surface wind appeared to be west-south-west, while that at cloud base, as shown by the movements of the cloud shadows, was almost due westerly. Inland there were small cumulus not more than 1,000 ft. thick, but along the coast the clouds were larger and looked much better. It was then that I decided to drop the idea of flying south-east into France, and instead to see if I could work my way along parallel to the coast into Belgium.

Keeping on the southern side of the almost continuous belt of cloud that stretched along the coast, I found good lift, and one hour after setting course from Dover I was a few miles south of Dunkirk. The cloud base rose gradually and was soon at 4,800 ft. The amount of cloud to the north increased and I edged gradually towards the south in order to keep over country which was still in sunshine.

Everything seemed to be going very well, but near Roulers I got down to 1,300 ft. before I found any lift at all; and then spent an agonizing quarter of an hour circling over some wretched little market town without gaining any height at all. Up to this time I had not been really worried about finding a good landing place, but now the



Lorne Welch.

fields were divided into tiny strips and there seemed so many power wires, that I could not see anywhere suitable for a landing. During the interminable circling in this patchy lift I kept altering my position slightly to try and find better conditions, and eventually, by shifting continually down-wind, I found stronger lift and was soon up to 3,000 ft.

Ahead, the line of cloud which I had been following was much more definite, with dark black underside and a fairly clearcut southern edge. The main base looked about 5,000 ft., but underneath it, at various places, were curious small wisps of cloud, some as low as 3,000 ft. I flew through one at this height, and although the air quite close to it was still, inside the wisp the lift was more than 1,000 ft./min., and a few circles soon took me up to cloud base, the wisp moving up with me.

As I approached cloud base the wisps grew until in effect they formed an extension of the main cloud at a slightly lower level. I did not go into the main cloud, but carried on flying in the bigger wisps. As a result of being able to fly straight, instead of circling endlessly, I was able to make good time, and the 25 miles from Roulers to the Scheldt, which I crossed near Audenarde, were covered at an average speed of 50 m.p.h.

At 15.57 hrs., when near Ninove, the conditions altered slightly, as the great bank of cloud which I had been following became less well defined, with more broken cumulus on its southern side, so I decided that it would pay to get as high as possible while lift was available, instead of continuing underneath. I managed to work my way up to cloud base, and reached 8,200 ft. before the lift faded out.

Coming out on a south-easterly course, I found great tangled masses of cumulus, most of which looked fairly dead, but ahead and on the left the outline of this amazing bank of cloud could still be seen, so I flew along parallel to it. After a little puzzled map-reading I decided that I was about 12 miles west of Brussels.

The bank of cloud stretched on to the east-north-east and appeared to go about five miles north of Brussels. Its outline was well defined and, judging by the shape of the top, which I estimated to be between 10,000 ft. to 12,000 ft., it was still fairly active. However, its lower edges were much more ragged than they had been previously,



A "Weihe" sailplane of the type in which Mr. Welch crossed the Channel.

and I felt that it would be pretty dead underneath.

The time had come to make a decision, and there seemed three possible courses: (1) To glide straight ahead over Brussels and land at one of the aerodromes marked on my map—Evere or Melsbroek—which I should obviously reach with plenty of height in hand. (2) To fly north and see if I could make any more of this bank of cloud, knowing that if I failed there would probably not be enough height to get back. (3) To glide on straight ahead and land in a field.

The decision was influenced by the fact that there was no very great object in attempting to go farther unless I stood a reasonable chance of going an additional 40 miles, and thus beating Philip Wills's British distance record. Also a retrieve from a Customs aerodrome by aero-tow would be much simpler than a sea and road retrieve from some field.

In view of all this I decided to land at one of the aerodromes near Brussels. The middle of the town was crossed at about 4,000 ft. and after having a look at Evere, which appeared to be a military aerodrome, I decided to land at Melsbroek, which, from the size of the control buildings, was obviously civil. I reached there at 16.30 hrs. at 2,700 ft., and after doing a vast circuit at about 100 m.p.h. with the dive brakes open, I landed on the grass in front of Control at 16.35 hrs.

The aerodrome authorities were extremely helpful, after the initial consternation caused by the fact that I had neither engine nor radio, and I was looked after very well for the next two days. The tow back was made by an Auster brought out from England by Ann Douglas.

By Sailplane to the Continent

by F/L. L. A. Miller

(Reproduced by courtesy of "Flight")

The location of the Reserve Command Gliding Instructors' School at Detling, some 30 miles west of the Straits of Dover, makes long-distance flights to the Continent a frequent possibility in unstable westerly to north-westerly winds. Tentative arrangements were therefore made some weeks ago for aero-tow retrieving facilities from the Continent to be available should a successful Channel crossing be made.

On Wednesday, 12th April, the personnel of R.A.F. Station Detling were on delayed "Easter" leave, and at 10 a.m. on that day I saw that conditions seemed favourable for a high, long-distance flight towards the east. Arriving at Detling at 11 a.m., I prepared for a winch launch in an old Gull I—a sailplane of pre-war vintage by Slingby's, and of similar design to the one flown across the Channel in 1939 by Mr. Stephenson. As most of R.A.F. Detling was on leave, it was not until 12.15 that I was able to get away, being winched off to 1,000 feet by the Kent A.T.C. Wing Adjutant, F/L. Emberley.

After releasing, I circled to cloud-base at 4,000 feet and then found that the wind was carrying me too far northwards of my desired track to Folkestone. From a position three miles north of Canterbury, therefore, I started to work my way south. This proved a difficult operation in the Gull I, which has limited powers of penetration (it was designed in 1937, I believe), and at one time I thought I would be forced to land.

However, soon after 1.15 p.m., I found a narrow but strong thermal which took me to cloud-base at 5,000 feet, by which time I was seven or eight miles south-west of Folkestone. I eventually reached the coast at North Folkestone at 2 p.m. and flew two or three miles out over the Straits of Dover.

I was experiencing very slight icing just beneath the cloud, and recalled that the meteorological forecast had given severe icing in cloud above a freezing level of 3,000 feet. However, conditions were such that I could utilize the cloud lift to gain height, and this I decided to do. Entering cloud, I climbed in smooth lift of about 6 ft/sec. to 9,000 ft., at which height the turbulence became quite severe. As the machine was then heavily iced, with clear ice an inch or more thick on the leading edges and struts, I straightened up on a course of 120 deg. magnetic. The cockpit cover was, of course, also coated with ice, and the air-speed indicator had stopped working. Instruments remaining in use were the electric turn-and-slip indicator, altimeter, inclinometer, variometer and compass.

Under these conditions I descended to 7,000 ft., and saw that I had left a line of cumulus clouds which extended up the Straits of Dover. I checked the surface wind from the white-caps and found that in order to reach the French coast—which I could see beneath a clear blue sky some eight miles to the south—it was necessary to make good a track almost at right-angles to the wind. My position at that time was approximately north-west of Calais, from where the coast recedes eastwards.

The coast looked very far distant in view of the ice which the machine was carrying, the strong cross-wind, and the



"Gull" sailplane of the type in which both G. H. Stephenson and L. A. Miller crossed the Channel.

probable performance of the Gull I under such conditions. Still without A.S.I., I flew to get a rate of sink of two metres "down" on the variometer (about 4 ft/sec.). Keeping Calais in view, I finally crossed the coast west of Calais at an indicated height of 900 ft. above sea level. After flying over the wide stretch of sands I found a thermal and climbed to cloud-base at 3,800 ft., whence I made off down a wind which was blowing straight up the coast towards Belgium. The actual Channel crossing had taken slightly over one hour.

The late start which I had made from Detling now prevented further flight for, at 900 ft. with nothing but "dead" sky ahead, I was forced to look for a landing place. I saw an airfield below (Coxyde) and landed at 3.50 p.m. at a dispersal point near to the runway in use.

I found that Coxyde was a Belgian Air Force base, commanded by Colonel Arends, and I became the guest of No. 1 Fighter Squadron (Commandant Roger de Weser) during my enforced stay there. I was later retrieved by an Auster from England.

In the past I have been employed for some years as a long-range heavy transport pilot on trans-ocean flights. The weather experience which I gained during that time in the Bay of Bengal during the monsoons, coupled with two years' transatlantic flying, has helped considerably in my gliding activities. To others who will undoubtedly wish to attempt long-distance flights to Europe, I would stress that instrument-flying experience is essential. Given a sound knowledge of meteorology, good instrument flying and good planning, even low-performance sailplanes are possible record-breakers in the higher wind speeds and unstable conditions of winter weather.

We regret to record that F./Lt. L. A. Miller lost his life on 11th May while practising aerobatics near Detling, where he was on the staff of the R.A.F. Instructors' Gliding School. He was aged 46.—ED.

Cambridge to Canterbury

Le Touquet was optimistically declared as their goal when T. Gil Phillips and David Carrow prepared to start from Cambridge in the University Gliding Club's Kranich. On the way to Marshall's aerodrome they tossed for position; Phillips won the front seat and Carrow took the back.

The following account of their flight has been supplied by Mr. Phillips. It was made on 23rd April, this year.

At 12 o'clock (11.00 G.M.T.) they were towed off into a north-westerly wind of 10-15 m.p.h. by a Tiger Moth, which took them 13 miles upwind to St. Ives. They released at 3,000 ft. just north of the River Ouse, right under a substantial cumulus, then turned and entered the cloud, and immediately got 5 to 10 ft./sec. lift, which took them up to about 5,800 ft. Lift was fairly turbulent and they had some difficulty in getting on to a compass course of about 170°.

Carrow, in the back seat, got the Kranich on track out of the cloud, and they then carried on course till they saw Cambridge below them from about 3,000 ft. The only likely-looking clouds to be seen from there were almost due east in the direction of Newmarket, so they pressed on across Marshall's towards a cloud over Bottisham which looked promising. At this stage, when they were down to 2,000 ft., Carrow suggested that if they were going to land at Marshall's they had better turn back at once.

Being torn between the alternatives of turning back and of burning their boats by continuing towards the cloud, they remained in a state of indecision for so long that they did nothing, and eventually hit lift at about 1,600 ft. where they were. This gave them a climb to 3,000 ft. and enabled them to reach a fairly good cumulus over Newmarket, which took them up to 6,000 ft. The cloud base, in all the climbs during this day, was between 4,000 and 4,500 ft., and the lift seemed to die out gradually to nothing at just on 6,000 ft. They carried on flying southwards on a

course of 170°, making one climb of about 2,000 ft. on the way, and eventually pinpointed themselves at Maldon at about 2,000 ft., having probably passed over Halstead while in cloud. They found weak lift at Maldon between the town and an island in the Blackwater, and climbed to 3,000 ft. From this height they pressed on due south to Burnham-on-Crouch, and at 1,600 ft. over a small island in the river hey got weak lift to 3,000 ft. again.

After these struggles, they had now decided to land at Southend Airport in the hope of getting an aero-tow home. To reach Southend they had to fly almost due west, as the wind had taken them too far east during their struggles over the Crouch. They circled the airfield at about 1,000 ft. and got a weak thermal, which took them up to 2,000 ft. and drifted them out over the pier. Phillips was keen to explore the coast-line off Southend, to see if there was any undercutting of the prevailing north-west wind by a sea breeze, so he flew along parallel to the coast, a little over a mile off-shore (beyond the end of the pier), and had smooth lift varying from 0 to 3 ft/sec. up to 2,500 ft. Then, after starting a turn towards the town, they had a strong thermal of 10 ft/sec. while still over the sea, and this took them right up to 6,000 ft., back into cloud.

As a result, they now decided to carry on over the river, and flew towards Whitstable on the Kent coast, leaving the north shore of the Isle of Sheppey about a mile to their right. In fact, they crossed 17 miles of water on their way to Whitstable, flying at an indicated air speed of 65, trimming hands-off in perfectly smooth air with the variometer reading between 2 and 3 ft/sec. down.

After crossing the coast they ran into downdraughts of up to 7 to 10 ft/sec., but pressed on towards Canterbury where some promising cumuli were going up. However, on approaching Canterbury at 1,500 ft. they noticed a high mass of stratified cumulus drifting down upon them from the direction of London. This gradually cut off all the sun over the Canterbury area, and they ended up at about 900 ft. over some rising ground a few miles south-east of Canterbury, where they had one bump of 5 ft/sec. up, which disappeared as soon as they attempted to turn in it.

Phillips had picked a large field near a village about a mile downwind; and decided that they'd had it, so he made a normal landing close to a large farm almost in the middle of the village, making the approach between a barn and the church steeple. The village turned out to be Wickham-breux, about 12 miles short of Dover. They landed at exactly 4 p.m. (15.00 G.M.T.). Twenty minutes after their landing, the sky cleared again and good cumulus aggravatingly reappeared and started going up all around them!



G. H. Stephenson in the "Blue Gull" sailplane in which he made the first soaring flight across the English Channel in 1939. Note the flags.

Cross-Channel Meteorology

by A. E. Slater

For most people, a soaring flight across the English Channel presents three problems, not one. In addition to that of crossing the sea, there is the problem of first reaching the neighbourhood of Dover, and afterwards of finding lift on the other side so as to continue the journey into Europe. We can take the three in chronological order.

Reaching the Coast

The Channel coast has been reached many times by sailplane pilots from the interior of the country, in spring, summer and autumn. Ordinary cross-country technique need not be discussed here, but there is a question whether thermals are likely to get feebler near the coast, even in a wind blowing from the land, owing to previous damping of the ground by sea mists and particles of spray. Actually, there seems no evidence of this causing a lowering of surface temperatures on the few days I have looked up in connection with this article; in fact, on April 12th of this year, the maximum afternoon temperature at Lympne, 54°F., was greater than at any other British station listed in the Daily Weather Report. True, *average* afternoon temperatures are highest inland, but sailplane pilots do not attempt Channel crossings on average days; they do it in a Polar Air Mass which continues to warm up all the way to Dover.

A strong sea breeze can ruin the thermals, but this phenomenon seems feeble and infrequent in the narrowest part of the Channel. This accords with recent meteorological findings, that a sea breeze has to draw its air supply from further and further out to sea as the day wears on; consequently the Straits of Dover must be too narrow to keep the supply going for long.

Height at Dover

Undoubtedly the safest way to cross the Channel by sailplane is to get sufficient height over the coast to make a plain downward glide to the other side. Calculation of the necessary height is a matter of aerodynamics, rather than meteorology, if the wind speed and direction are known and vertical currents are ignored. The calculation is simple for a dead calm or a following wind, but in a contrary or cross wind the sailplane will have to fly at a greater speed than that which gives its best gliding angle, and the calculation becomes more complicated. The essential thing is to work it out beforehand, and not over mid-Channel.

As for vertical currents, experience shows that you may get a downcurrent just after leaving a cloud, but that it will not last for long. Stephenson found 10 ft./sec. sink on leaving his cloud, but he put up the Gull's speed to 50 m.p.h. and was soon clear of it. Flying at 35 m.p.h. air speed with a following wind of about 40 m.p.h., he lost height from 6,000 to 2,600 ft. while crossing the water.

Welch emerged from his cloud at 5,600 ft., one-third of the way across, and reached France at 3,000 ft.; he had, however, climbed to 8,500 ft. over Dover, but lost much height after entering the cloud. In the same westerly cross-wind of about 20 m.p.h., Miller sank from 7,000 ft. to 900 ft. during the last third of the crossing. This great loss of height was due to his having to make a southerly track across wind by putting up his speed, as well as to his machine being iced up, so it is not necessary to postulate a down current.

A safe height at Dover for a crossing in clear air may be anything from 5,000 ft. upwards, and this means, almost of necessity, flying in Polar Air in the rear of a cold front in order to get instability up to that height. There will probably be cumulo-nimbus clouds, and large areas of dead air between them. So, until we know more about cumulo-nimbus, there will be a large element of luck in reaching the coast at the right time.

Two flights of Philip Wills from Dunstable to the Channel coast, before the war, show how moody this sort of weather can be. On 15th August, 1937, he arrived at Lympne in his Hjordis to see the "meatiest" cloud of the day over Dover, but there was nothing but down-current below

it and he was forced to land. On 4th September, 1938, after reaching 8,000 ft. twice and 9,000 ft. once on the way, he landed his Minimoa at Lympne in stable air and afterwards watched huge cumulus clouds, rising to 10,000 ft., passing overhead.

Even small cumulus clouds are apt at times to show a periodicity, all boiling up together and then dying down again at intervals of the order of half an hour. Phillips and Carrow were caught out by this phenomenon at Canterbury on 23rd April. With cumulo-nimbus the time interval is larger and apparently more irregular. The problem of getting height at Dover on a suitable day will probably have to be solved by sailplane pilots from their own experience, rather than from any meteorological principles. The only helpful rule appears to be that one should look for cloud lift a few miles inland rather than at the coast.

Lift over the Sea

Several types of upcurrent could exist over the Channel. Cumulo-nimbus has been the only one so far used. Miller entered his cloud three miles out from Folkestone and left it eight miles north of Calais, so his climb from 5,000 ft. to 9,000 ft. was done entirely over the sea. But the rising air must have started from the land. It is, however, possible for upcurrents to grow aloft in a strong polar air stream without their having started from ground level, if the air mass is much colder in its northerly portion. This colder air then arrives more quickly higher up, owing to stronger winds, than it does at lower levels, so the higher cold air comes tumbling down and cumulus clouds grow up to replace it, without their needing to be started off by ground thermals.

It is by this process that secondary cold fronts are created, of the type which sailplane pilots have sometimes used over England. But there is some doubt whether the lift along a cold front could sustain a sailplane over the sea. The doubt resides in the explanation of the lift.

The mechanical lifting of warm air by cold at the cold front is known to be insufficient to sustain a sailplane. The enhanced upper instability already described has been held responsible for the extra lift; but R. C. Rainey, after investigating a cold front flight by H. Winter in South Africa, concludes that the cause of the extra lift is a continuous line of thermals which are all released at the same time by the impact of the front. This presupposes a layer of highly unstable air close to the surface, which is only to be found over land, not over water.

Thermals over the sea have been investigated by A. H. Woodcock, who observed the soaring of gulls over the Western Atlantic, near Cape Cod. He found that gulls would circle in winds of 1 to 15 m.p.h., provided that the air is 2°C. (3.6°F.) colder than the sea. The thermals are drawn out into "streets" of lift by winds of 16-24 m.p.h. if the temperature difference is more than 4°C. (7.2°F.), and the gulls then soar in straight lines. But until gulls have been seen doing this over the English Channel, sailplane pilots will prefer not to risk it.

There are risks even in using cumulo-nimbus clouds, as Miller himself found on 2nd April. Owing to an iced-up cockpit-cover obstructing his view, he got blown out to sea inside a cloud, came out below it, and only just succeeded in gliding back to Folkestone beach. Grantham had a similar experience on 25th April, while trying to reach the Channel from Cambridge. He came out below a cumulo-nimbus when 5 miles out over the North Sea, failed to reach land by one mile, and was rescued by lifeboat. Cumulo-nimbus flying is not such a straightforward business that a pilot can be absolutely sure of maintaining height within the cloud. Furthermore, if he gets into a high-speed dive and puts out his dive-brakes, they may get iced up and refuse to go in again; this will not do his gliding angle much good if he emerges halfway over the Channel.

Thunderstorms could lift a sailplane so high that the influence of the sea could be ignored. But it should be remembered that typical summer thunderstorms are caused by a hot south-easterly wind being overlaid by a cold south-westerly. Pilots should remember this south-easterly wind aloft, and should not stay too long inside a cloud.

Lift over France

The problem of finding thermals on reaching the French coast is fortunately much more clear than the problems already discussed. It hinges chiefly on the temperature of the sea. Average temperature in the English Channel varies from 43°F. in February to 62°F. in August; it is about 47°F. in April. These average figures vary somewhat according to the weather; for example, in February, 1947, the North Sea went right down to freezing point. But to judge by temperatures at coastal stations in on-shore winds, it was about 47°F. during the Channel crossings so far made.

When Stephenson reached the Channel coast, the surface air at Lympne was at 55°F., and this would have warmed adiabatically to 57°F. as it sank to sea level. But with a sea temperature of only 47°F., a layer of cold air must have been built up at the surface, and become fairly thick by the time it reached France, so that the strong wind carried it quite a way inland before it got warmed up again and enabled thermals to rise through it. Stephenson said he could see cumulus clouds about 20 miles beyond his landing point.

On the occasion of Welch's and Miller's flight, however, the air reached France over a much longer sea track in a weaker wind. Tangmere, near which it probably left England, had a temperature of 38°F. at 06.00 hrs. and 49°F. at 12.00 hrs. As the air would have left England about mid-morning, it is unlikely to have got warmer than the sea, so no cold surface-layer was built up during its Channel crossing. But to have produced thermals at the French coast, it must have been already on the verge of instability.

For a cross-Channel pilot to find thermals on the French coast, therefore, he must enter air which left England before it became warmer than the sea, but it must already have reached a temperature sufficient to make it unstable with any further surface heating. To discover whether it will satisfy this condition, one must have information of upper air temperatures, and this is where the cessation of Airmet puts us at a disadvantage. The tephigram shows that air over Larkhill needed to be warmed to only 45°F. at the surface to start up good convection on 12th April this year.

On the day Stephenson crossed in 1939, the upper air was slightly warmer; but 47°F. on the ground would have started convection in it, and if he could only have crossed earlier in the day, before Lympne became any hotter than this, he might have got thermals in France. I have also drawn tephigrams for 23rd and 25th April this year. On the day Grantham flew, maximum temperature at Lympne was only 48°F., and the upper air was very cold, needing only about 40° for good convection; he should, therefore, have found thermals over France if he had got as far.

Phillips and Carrow, on the other hand, would have needed enough height over the English coast to glide all the way to their goal at Le Touquet, as they would have got no thermals over France. Good convection could only start on that day when the temperature reached 50°, which it did at Lympne at noon. Air which left England for France before noon would have been too cold at the surface to produce thermals on arrival over France. And if it left England after noon, the Channel would cool it down so that it would still arrive over France too cold at the surface.

To sum up: let A be the surface temperature needed to start good convection (this can be obtained by 'phone from the nearest met. station); and let B be the surface temperature of the water in the English Channel. To get thermals over the French coast in a wind from England (1) temperature A must not be greater than temperature B; and (2) the surface temperature of the air must not exceed B before leaving England, but must reach A before arriving at the French coast, which it could do either over England or while crossing the Channel.

Finally, I will risk a prophecy. For prolonging a cross-Channel flight across Europe in a north-west wind, the best time of the year is the end of September. From March to mid-September the surface air is liable to become hotter than the Channel during the afternoon, so it will be cooled during the crossing. And from October to February, although the Channel is warmer than the land, thermals are too weak for long-distance flights.

Before mid-September, a west wind offers the best chances. A north-west wind would have to be abnormally cold aloft, as on the day Grantham flew, when the 800-mb. temperature was only 12 deg. F.

Escarpment Soaring Sites in Northern Ireland

by S/Ldr. A. A. J. Sanders

In the early part of this year S/L. A. A. J. Sanders and F/O. P. G. Mallett carried out an extensive survey of Northern Ireland with the object of finding the best situation for a gliding centre. Their well-illustrated report has been issued by the R.A.F. Gliding and Soaring Association, by whose permission a substantial portion of it is reproduced here. It will serve as a model for similar surveys which might well be made in many other parts of the United Kingdom.

The object of this trial was to discover in Northern Ireland an escarpment site, for hill soaring training and practice, which is capable of safe, cheap and easy exploitation throughout the year. Northern Ireland consists of a wide shallow watershed draining into Lough Neagh and the Bann Valley. To the south-east the watershed slopes rise to the intricate and rugged knife-edge Mountains of Mourne: to the south-west and west the watershed merges into a region of jumbled rolling mountains with no clear escarpments. To the north-east the watershed slopes drop in sharp easterly escarpments to the sea: to the north-west the slopes drop in sharp westerly escarpments to the marshes of Lough Foyle.

The area is relatively near the mean track of North Atlantic depressions which produce strong winds from generally westerly directions, associated with heavy rainfall. Cumulus cloud base usually is relatively low, of the order of 2,000 feet.

The lowland fields are of moderate size—10 or 20 acres: the upland fields are small —2 or 4 acres. The hill pastures are unfenced but are frequently cut about by peat diggings. The mountain tops are invariably peat bog with massive hags and stone outcrops.

There are five airfields in County Down, east of the Lough Neagh watershed escarpments; three are derelict. Inside the shallow watershed are six airfields, four being derelict. On the Lough Foyle shores are four airfields, two being derelict. Service interest (R.A.F., R.N.A.S., R.A.F.V.R., A.T.C.) is concentrated in Sydenham, Aldergrove, Ballykelly, Eglinton, and Londonderry: there is a total Service strength of about 2,000, all ranks.

The Tutor and Gull sailplanes of the Ulster Gliding Club were used, with recce by R.A.F. Anson and Tigermoth while engaged on transit flights. The area was flown over by Anson, and oblique photographs were taken showing the most promising areas. These were then reconnoitred by private car, by A.T.C. motor transport, and on foot.

The prevailing wind for the period of reconnoitre was between N.W. and S., velocity 5-20 knots at the Foyle airfields and 10-30 knots at 2,000 feet. Soaring winds from other directions occurred only two or three times in the period. Over the Foyle airfields these winds produce three main weather types, excluding frontal weather. First: cool air, blowing from the W.S.W., produces cumulus, base 2,000-3,000 ft., tops 5,000-7,000 ft. Second: warm air, from the south-west, produces high stratus, often with orographic cloud over the hills. Third: cold air, from the W.N.W., produces heavy cumulo-nimbus,



The west scarp of Benevenagh, looking south.

base 1,000-2,000 ft., tops 10,000-20,000 ft., with rain or hail. Generally, unstable air from W.S.W. or W.N.W., is triggered orographically by the Donegal mountains and arrives as well-formed cumulus over Lough Foyle. The stable air, from west to south, produces wave activity which at times, in strong winds, is extremely pronounced. No altitude soaring flights have yet been made above 5,000 feet.

Three faces o Benevenagh escarpment can be soared in northerly, westerly and south-westerly winds respectively. The greatest chance of success for soaring organisations in Northern Ireland is afforded by the westerly and south-westerly escarpments of Benevenagh, whereas the one now used is the low northerly escarpment.

Westerly Escarpment.—The hill-top slopes down towards the soaring face, and on the level part is heavily obstructed by peat diggings and rocky outcrops. Only two places afford possible alighting areas, and these are not fit for unskilled pilots. They do, however, afford suitable alighting and bunjy-launching points for soaring pilots of ten hours experience, and they adjoin a road.

At the foot of the 750-foot escarpment the ground is marshy, with heavy black soil. Beyond the new highway the ground is sandy and would allow winching along a 300° three-field strip at Aughil, a mile forward of the escarpment. No such strip yet exists, but at low tide auto-launching along Magilligan Strand at Benone is practicable.

The existing system of Ulster Gliding Club is to auto-tow along this Strand at Downhill, using a short wire cable. This launches to 300 feet altitude, the height of the Northerly Escarpment. Longer cable would launch higher, but, bowed under its own weight, it slides along the sand, causing such friction as to decelerate the tow-car, and so prevents the glider climbing. Rope should be used instead, since this would not sink into the sand as the wire does: 600 yards of rope should launch to heights of over 1,000 feet. The long beach necessary for this high launch exists at Benone.

From a 1,000-foot launch the glider, flying south, would drift to the northerly limit of the westerly escarpment lift zone at 750 feet, the height of the hill near by. This lift zone is 3,000 yards long, 1,000

yards wide and 1,000 feet deep: the scarp consists of a cliff rising from a tumbled scree glacis, with the ground behind the cliff edge rising further from the 750-foot cliff to a 900-foot hilltop, and then sinking as rolling peat-bog and stone-walled farmlands towards the Bann river. The lift zone is large enough to bear twelve training sailplanes in 250°-310° winds of 15-25 knots. It is soarable for contest sailplanes in 250°-310° winds between 10 and 35 knots.

Beyond the 3,000-yard lift zone the slope gradient decreases to 15°, until the major cliff of Benevenagh proper suddenly rises from the foothills glacis. This 1,200-foot cliff, above Bellarena railway station, affords a second lift zone for contest sailplanes; in 250°-310° winds this lift zone is 1,000 yards long, 2,000 yards wide and 2,000 feet deep. It is, however, a rather frightening cliff, being quite vertical for the upper 500 feet.

Winching along a 280° five-field strip at Bellarena, a mile forward of the hill, should launch sailplanes into the forward limit of the second lift zone. This offers theoretical advantages which in fact are offset by the frightening appearance of the cliff.

South-westerly Escarpment.—The escarpment in this case has a uniform height of 1,200 feet. The hilltop is horizontal but consists principally of deeply hagged peat-bog, cut in places by peat diggings and elsewhere by rocky outcrops. Only one place affords a possible alighting area, and this, which is also a suitable spot for bunjy-launching, is fit only for the more skilled of glider pilots (of at least fifty hours experience). A difficult lane, at present turf-grown and with a derelict bridge, would, after repair, afford access to this hilltop plateau. Sailplanes could be rigged below the rocky outcrops, and towed by horse or by man to the slope, for launching by hand-bunjy.

At the foot of the 1,200-foot escarpment the ground is alluvial, rolling down to the River Roe, and the fields are smaller and more irregular than the marshes and the sandy strips below the westerly face. At the south end of the escarpment, however, these small fields disappear under the tarmac runways of Limavady derelict aerodrome.

Of the three runways, one lying along 255° T. extends 1,200 yards between the highway and the Roe River. Another 300 yards exist beyond the highway, but may not be used. A grass alighting area links this runway to the control tower to the S.E., and is 3,000 yards upwind of the South-westerly Escarpment. A large hangar, in good condition, with sliding doors, adjoins this alighting area. The former control tower, now derelict, is ideally suitable for conversion to a club-house. The former fire-tender shelter is suitable for storing a prime mover balloon winch, complete with protecting cage. The former control-tower garages are suitable for conversion as a dormitory.

Two miles 255° from the alighting area is Ballykelly R.A.F. Aerodrome, a base for Coastal Command Lancasters, and, on request, available to civil aircraft. Aero-towing could be carried out at this active aerodrome, but not at Limavady, where the runway is fenced off from the adjoining grass areas, and where there are no fire-enders or ambulance facilities. Either aerodrome is in gliding range from the other, from winch launches in calm conditions, so that it would not often be necessary to de-rig sailplanes at Limavady for road transport to Ballykelly, when the wind is calm or not blowing on the south-west escarpment.

From a 1,500-foot winch launch at Limavady, the glider, flying north, would drift to a little above the hill near by. The South-westerly Escarpment lift zone is 3,000 yards long, 1,000 yards wide, and 1,000 feet deep: the scarp consists of a very steep 500-foot slope above glacis foothills which rise 700 feet from the River Roe in a succession of minor scarps. At the north end of the main scarp the steep slopes develop into the vertical cliff mentioned above.

Behind the south part of this S.W. scarp lift zone is the Lynn gully with a secondary S.W. scarp which extends the overall lift zone another 1,000 yards further to the south-east, but this is practicable only for contest sailplanes. Beyond this the slope dies away to a shallow 10° gradient and then rises to Keady Mountain, an isolated 1,100-foot knoll. This cannot be counted as part of the soaring face although it may be soarable.

The main 3,000-yard lift zone is large enough to bear twelve training sailplanes in 260°-210° winds of 15-25 knots. It is soarable for contest sailplanes in 260°-210° winds between 10 and 30 knots.



The south-west scarp, looking north-east.

The overriding attractions of this South-westerly Escarpment are, first, that in stable air-mass conditions, with winds between 180° and 260°, a standing wave forms with its lift zone between Limavady and Ballykelly aerodromes. The lift of this wave extends sometimes to 14,000 feet. The second attraction is that, since the Lough Foyle shore extends upwind of the scarp on bearing 260°, there is good thermal contrast. Thermal lift extends upwind over the four aerodromes of Limavady, Ballykelly, Eglinton, and Maydown to Londonderry; 25-kilometre out-and-return flights may conveniently be made along this airfield chain.

The principal disadvantage of the two sites now recommended, on the westerly and south-westerly escarpments of Benevenagh, is their considerable distance from the centre of population at Belfast. On the other hand, the secondary centre of population at Londonderry is comparatively close, within an hour by rail or road, and another centre of population is developing in the Coleraine-Portstewart-Portrush triangle. Air bases at R.A.F. Ballykelly, and R.N.A.S. Eglinton will increase the local support.

The westerly scarp could be soared, at low tide, after an auto-tow launch from the seashore at Benone. It is unfortunate that this seashore operation is limited in summer by the state of the tide: in winter the sand is never firm enough to permit of any launching at all. It is plain that, for regular operation throughout the year, the westerly scarp must be served by a winching strip around Aughil. Hangarage and a club-house will also be required here, and without these three expensive items the soaring organisation cannot expect to expand.

The southwesterly scarp can be soared after a 1,500-ft. winch launch from the 1,200-yard runway 255 at Limavady aerodrome. Cable wear will, however, be increased beyond normal, consequent on friction with the tarmac runway surface.

A hangar exists already and derelict buildings suitable for preparation as clubhouse, dormitory and garages are available right beside the alighting area.

It will be necessary to obtain permission from the Admiralty to use the runway and the derelict buildings, and for space in one of the three large hangars; also to hire from them the grass alighting area immediately south of the 255 runway.

The weather must be carefully studied. It militates against the use of a hilltop base, since in the winter the crest of the hill is often enclouded: the humidity within the cloud zone is deleterious to gliders and sailplanes. Furthermore, the heavy rainfall on the hilltop plateau in the winter will make conditions there unpleasant for handling gliders and for driving motor vehicles.

The phenomenon of orographic cloud covering the hilltop can be forecast by R.A.F. Ballykelly, and when it is expected all hill soaring must be prohibited. The phenomenon of the standing wave also can be forecast by R.A.F. Ballykelly. When it is expected, there is usually very little warning—six hours, or twelve at most. Usually the lenticular cloud is sighted at dawn, and continues for three hours or so before the rising temperatures and increasing instability beneath the inversion break down the patent flow of the lower layers of atmosphere and so destroy the high wave.

The phenomenon of heavy rain showers can be forecast well ahead. Associated with these, there is often a general lowering of cloud base to heights of 800-1,000 ft., i.e., below the hilltop. In these circumstances the only thing to do is to land before the shower arrives. It is not safe to remain airborne with cloud covering the hill top.

Patches of low cloud at 1,500-2,000 feet often occur, sometimes in association with the high standing wave. Since hill lift normally will soar even training sailplanes at 2,000 feet above sea level, it is essential that every glider and sailplane has a compass, with which to steer out over the low ground. A landing on the plateau behind the escarpment is always hazardous and, even at best, requires a very difficult retrieve, usually by hand for the first mile: a compass will enable one to avoid drifting downwind of the lift zone.

Finally there is the question of the prevailing wind. This has been left till last since there is virtually nothing to choose between the two sites in this respect. The prevailing wind ranges from 220° to 290°, and is of soaring strength from this arc for 40% of the time. South winds and north winds occur for 20% of the time: for the other 40% of time the wind and weather are not fit for soaring.

Winch-cable maintenance will require more attention at Limavady than at Aughil, but this will be offset by maintenance of the winch itself, since at Limavady it will be stored in a garage. Sailplane maintenance can be carried out more efficiently at Limavady than at Aughil, since better hangarage is available. Maintenance of the landing ground should be negligible at Limavady, since all the heavy wear will fall on the tarmac runway. At Benone the summer tides repair the ravages of the tow-car twice daily, but only in the summer is the sand firm enough for towing.

Maintenance of buildings will be more expensive at Limavady, since at Benone and Aughil there are no buildings.

The Limavady grass area between the tower and 255 runway is large enough for primary training and "low hops" in training sailplanes, but it is too short for the "high hops" popular with the A.T.C.

Soaring training must be done in the Sedbergh, with solo soaring on the Kadet and Tutor. Advanced soaring training should be flown on dual contest sailplanes of Kranich type, with solo advanced soaring on contest sailplanes such as Olympia. Soaring in hill-lift should be achieved by high winch launch in soaring winds, followed by a straight glide to the hill lift. Such soaring must be abandoned as soon as the training sailplane sinks to hilltop level in failing lift, to ensure that it regains the base airfield. By soaring upwind, the cross-country sailplane maintains a position always within gliding range of at least one aerodrome, as far as Londonderry (25 kilometres upwind.)

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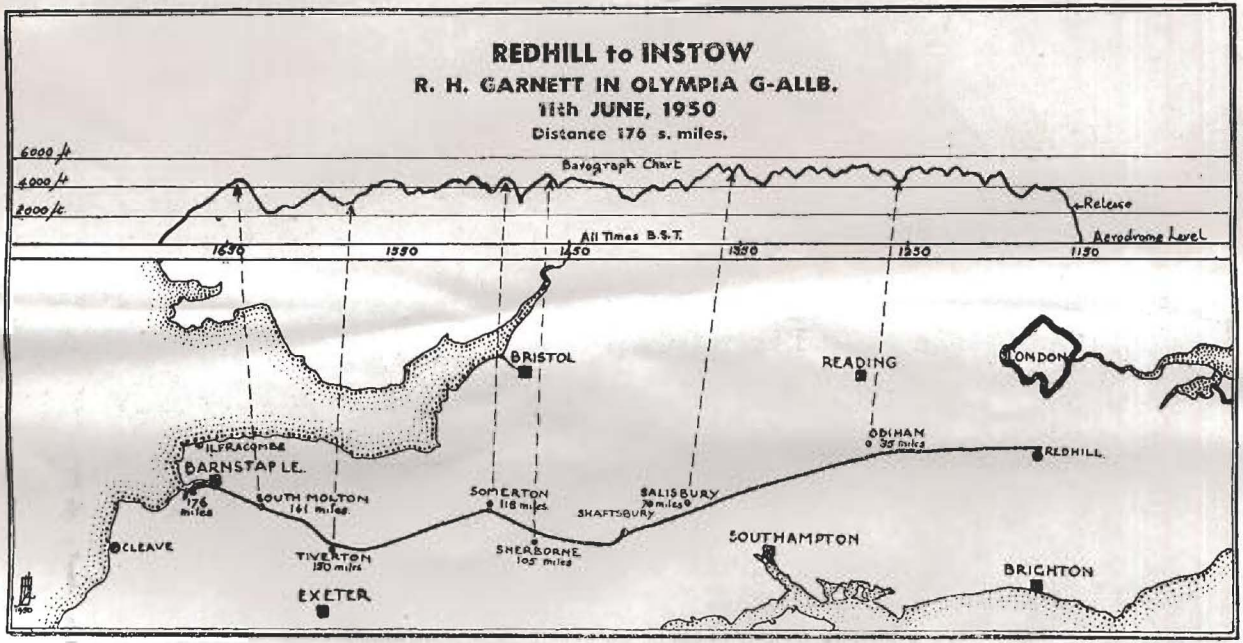
Copies of the first issue of "Gliding", which dealt with the histories of the British Gliding Clubs since the war, and was called "Gliding in Britain", are still available, and may be ordered direct.

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FROM THE SECRETARY, BRITISH GLIDING ASSOCIATION, LONDONDERRY HOUSE, PARK LANE, LONDON, W.1



Lenticular clouds showing the south-westerly standing wave over the Sperrin Mountains, as seen from Ballykelly aerodrome. The wave motion is very apparent in this panoramic photograph. Lift in a standing wave to the lee of the Sperrins was first used for soaring by members of the Royal Naval Gliding and Soaring Association in 1946.



The route of Mr. Garnett's flight from Surrey to North Devon, which he describes in the following pages. Note that the barograph chart reads from right to left.

Surrey to Devon

by Robert H. Garnett

This is essentially the story of a pleasant afternoon's gliding. There were no pre-arranged plans and practically no lessons learnt.

The weather was fairly typical anticyclonic and looked much like the previous few days, which had provided pleasant but not spectacular soaring to 4,000-5,000 ft. The only visible difference was a 5-10 knot easterly wind in place of previous light and variables. Very thin cumulus started forming at about 11.00 hrs. (B.S.T.).

The only plan, if it can be so called, was to do a couple of hours' local soaring and perhaps a cross-country of some kind if conditions proved good enough to inspire the right mood. Take-off was at 11.50, and even on tow the air felt better than the day before. The first thermal confirmed this, the rose-tinted spectacles went on, and off we went at 4,000 ft.

The next two hours were quite remarkably easy and soon the local quarter-inch map was replaced by the half-million. I always carry an old gas-mask bag packed with all the essentials for any unexpected flight including (supreme optimism) maps to quite inconceivable distances in all directions, all clearly marked with a ring at 186 miles*. Also other panaceas to taste.

Salisbury was reached at 5,000 ft. in two hours (70 miles). The barograph shows that excellent lift (a genuine 6-8 ft./sec.) could be had for the asking. A few circles in all the best bits obviated any need for thought. Cloud was used occasionally for a few hundred feet if the lift justified it. This system may appear rather fiddling, but I have the power-pilot's dislike of ground anywhere close, and *always* use good lift when I find it. This has the practical advantages of giving the maximum range of choice at any given moment, the best chance of surviving sudden bad patches, and the minimum physical and nervous exhaustion from struggling in weak lift near the ground. The overall average speed is usually quite satisfactory.

The general direction had so far been dictated by the wind, with the added idea of keeping a bit south to avoid reputedly anti-thermal areas. But at Shaftsbury all clouds to the south suddenly petered out, while further north they merely became weaker and more widely spaced. The next 40 minutes were spent in just staying up. Then things improved a bit and we went north hurriedly. A really good thermal was at last met over Somerton. This was a stroke of luck, as I was fiddling with the map and only realised there was a thermal about just in time.

Hereabouts the clouds became mere vestiges and lift was only half previous strength, but with the wind increasing and sink very reasonably slight, the 186-mile line suddenly looked more feasible. Unfortunately we were forced steadily further north by the encroaching clamp from the south (I still don't know what caused this) and even the revised track to Cleave aerodrome became difficult to hold.

A few miles from Tiverton, there was a half-hour's anxious fiddling in slight lift and sink over an area where the fields were smallish and obviously sloping unpleasantly steeply. As I like to select my fields from a respectable height, progress was slow. When I was down to about 800 ft. above ground, one more good thermal came to the rescue, but it did not carry quite far enough. The only sign of lift was again northwards towards Ilfracombe, but there the magic circle was well out to sea. I never expected to run out of land going west from Redhill.

The landing in a field was fairly orthodox, and the locals were unusually kind and efficient, but I must remember to include a cheque amongst the panaceas. My long-suffering partner, arriving at 07.00 next morning, not only had to dig me out of bed but pay for it as well.

Statistics for those interested:—176 miles in 5 hrs. 35 mins., giving an average of about 32 m.p.h. Maximum height 5,400 ft. No detailed analysis is available, as I find keeping a log is much too difficult when superimposed on thermal hunting and navigation.

All very unprofessional, but great fun.

* Equals 300 kilometres, minimum distance qualification for "Gold C" badge.

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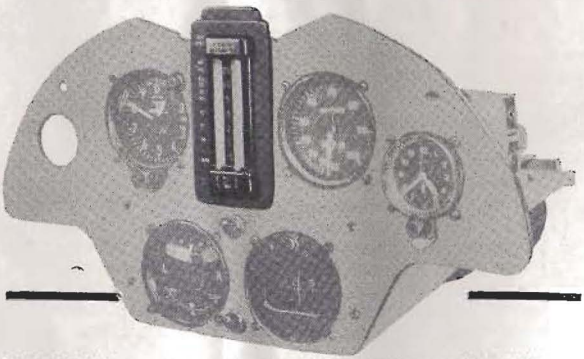
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Out and Nearly Home Again—117 miles

by A. H. Yates

This flight, it should be noted, was made on the same day as that described by Mr. Garnett on the previous page. Soaring conditions were best over south-east England. Elsewhere, Mr. Yates was handicapped by an anti-cyclonic centre over the North Sea, and Mr. Garnett finally by the influence of a stationary front over Brittany; the cause in each case being warming of the air aloft.

On Sunday, 11th June, there was in the morning a light easterly wind and a clear sky. While the College of Aeronautics Gliding Club was beginning the flying programme with Primary circuits, I plotted the tephigram which had just come over the teleprinter from Downham Market. The upper air data for 09.00 hours B.S.T. showed that 3/8 cloud cover could be expected in the afternoon with bases at about 3,500 ft., but that the clouds would be unable to penetrate an isothermal layer above 5,000 ft.

I have had a "Gold C" distance course to Plymouth marked on my map for some time. It starts off almost south to Halton, thence south-west over Newbury to Blandford and Bridport on the famous Wills route. I decided to declare Plymouth as goal and to prospect the route.

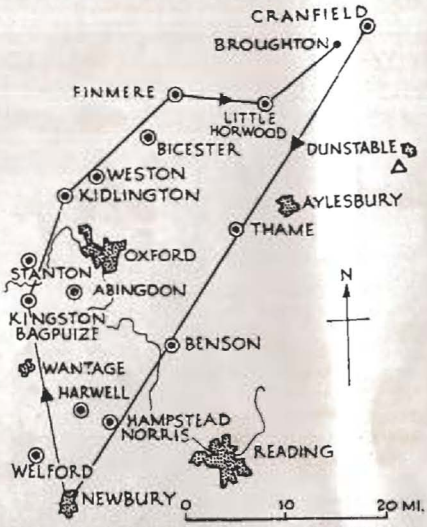
The first puffs of cloud were forming as we left the Met. Office at 11.00 hours, and I obtained a winch launch in our Olympia to 1,200 ft. at 11.45 hours. (All heights are above Cranfield, 350 ft. above sea level). The clouds were already quite shapely, but I had to struggle for 25 minutes near the airfield before I was able to get above 2,000 ft. At 12.45 I reached the base of the clouds at about 3,800 ft. and climbed in the first to 4,700 ft. near Leighton Buzzard. The rate of climb on my Cobb-Slater variometer was usually 3 ft./sec. reaching 5 ft./sec. at the best. I usually fly, however, on the Horn variometer, which reads a comfortable +10 with needle pointing vertically upwards when the Cobb-Slater green ball is only reading 3 to 5 ft./sec.

My cloud flying (using a miniature German turn-and-bank indicator) was, as usual, abominable. I can keep the rate of turn steady and even keep the ball in the middle of its tube, but the air-speed I cannot keep at 45 m.p.h.! Karran recently advised me to use the dive-brakes when the speed reached 60 m.p.h. to "steady the turn." I emerged from the side of my first cloud with dive-brakes full open at 70 m.p.h. but still in a beautifully steady turn. (Note: I must practice on the Link). After this poor show it seemed hardly worth struggling inside a cloud, so I made it a rule to climb to cloud base whenever possible and, after perhaps a turn or two inside, to fly out and on to the next.

During the first hour I had circled in every bit of lift I could find to keep the maximum possible height. After that thermals were fairly plentiful and the barograph chart shows a series of glides to the next cloud on course followed by a climb towards the base, and so on.

At 13.15 I was just north of Aylesbury with the chalky downs on my left. The clouds did not look any better over the hills, so I kept to the north of them and reached Wallingford on the Thames at 14.05. Here I got the best thermal of the day from 2,200 ft. to just over 5,000 ft. I flew on towards Newbury. The clouds now seemed to cover more of the sky and the visibility deteriorated considerably. (A Constellation, which suddenly passed just beneath the glider, brought this home to me). I had been watching the drifting cloud shadows to judge the speed and direction of the wind and I realised that it had not got the northerly touch I needed and was due east. This meant that I was now running into the drifting smoke from London. The next 20 miles might see a worsening, or even the disappearance of thermals. The lift round Newbury, however, was just as good as it had been further north.

I had taken almost three hours, including the slow start, to cover the 56 miles to Newbury, and with only about three hours of thermals left and little wind it was hopeless to think of "Gold C" distance. In



CRANFIELD-NEWBURY-BROUGHTON-117 MILES-A.H.YATES in OLYMPIA-11.6.50

addition, family responsibilities and work to be done next day made me decide to return as far as I could. With a look at Elliott's factory, where the glider was made, I got off northwards towards Oxford. Every time I circled now I was drifting westwards, and I spent a long time circling over Welford and Wantage (15.15) and then a long glide followed from nearly 5,000 ft. to 1,500 ft. across the old G.W.R. main lines to the disused airfield of Kingston Bagpuize. Here, at last, I found another good thermal, and with Abingdon now in range and Oxford in sight I circled over the youthful Thames, making steady headway from cloud to cloud toward the north.

I decided to make for Kidlington, just north of Oxford, and then to fly northeastwards via Buckingham on the main road home, along which my retrieve would come. I stepped along it from airfield to airfield. Over Kidlington at 16.20 hours I had a good climb from 2,000 to 4,500 ft. The glide that followed (at 55 m.p.h., since I now had a headwind component of about 10 m.p.h.) took me by 16.40 to Weston on the Green, which has been marked on my map by my partner, Sqn. Ldr. Sanders, as a large barrage balloon. This indicates that balloon-parachute jumping sometimes occurs, but there were no signs of balloons on this occasion.

From now on the clouds began to disperse. The visibility was now excellent but the clouds far apart and rather flat. A climb at Weston (2,200-4,400 ft.) brought Bicester R.A.F. Station within range and, still following my road home, I reached the disused airfield at Finmere at 17.00 hours, and to my surprise was able to climb back to 4,000 ft. under a cloud which was so thin as to be almost transparent. At this height I could see a definite "haze top" marking the height of the inversion. It now seemed possible to glide directly into wind to Little Horwood, from which I thought I might be able to get an aero-tow to Cranfield. I reached the airfield at 2,000 ft. in an almost cloudless sky and found it disused and obstructed, but found yet another thermal to 3,500 ft. I was now only 13 miles from home, but the wind was against me and, although thermals had twice appeared surprisingly, I knew that only good luck could get me home. I flew on over Bletchley at about 1,000 ft. in calm air and was able to hold height for two or three circles only.

So with Cranfield in sight I was forced to land at 18.00 hours, after 6¼ hours flying, at Broughton, only two miles short of the airfield. The retrieve was, a much simpler proposition than an excursion to Devon.

My average ground speeds (after initial climb over Cranfield) were:

Cranfield to Newbury, 56 miles at 25 m.p.h.

Newbury to landing, 61 miles at 19 m.p.h.

The wind speed at ground level was about 10 m.p.h. all day, although it freshened a little in the late afternoon. This is encouraging, because it suggests that the ground speed of about 35 m.p.h. needed for the 300 km. distance can be obtained with the aid of a fresh breeze even if my inability to circle properly in cloud continues.

There was no sign of any cloud street all day, but almost every cloud showed lift when I arrived underneath it. I have never been able to find any significant difference in the thermal strength over different types of soil (except once when I flew over the Norfolk Broads—but that's water). On this occasion the clouds sucked just as well over the lush Thames valley as over the chalk downs.

For Fun or For Glory

An Old Stager sighs for the Past

The observant discern a curious drift in Competition affairs towards deadly serious aviating and horrid calculations in marks, miles and metres. Juju men juggle with met, pocket thermometers are consulted furtively behind trailers, there is much to-do about when this and that body shall take the air and whether Snooks's Yuno Special has worked a flanker on Eno's Purple Peril. Gents who have not filled in the appropriate forms cannot compete and there is debate whether you should have a Non-ferrous "C" before you may enter. All of which tends to make things hot and testy and the resultant atmosphere a cross between a Heavyweight Boxing Championship and the Senior T.T.

Does this have to be? There was a time when people entered Comps for fun, to meet old friends, to jee-jaw about gliding, to find how other folks were doing and to give a hand with what had to be done. Before Organisation and Efficiency set in, bright new C's entered ancient aircraft to have a crack at their Silver C's, queer approaches and stranger landings were seen, newspapers shewed gliders in trees, the best people were not killed, and lots of fun was had. All rather like a Boy Scouts' Jamboree (the lower ranks slept in tents) and no one was abashed because elsewhere in Europe professional aeronauts put up a 100 per cent. better show than we could. We didn't give a damn—they were better than we were because they were better equipped, better supported, better trained —so what the hell—we were there for fun, whatever flying we could get, and good fellowship.

There are lots of pros in Europe to-day—and a few in this country—way out in front of everyone else and likely to stay there until some British Government supports gliding or helps to provide modern machines. But does it matter? "Le mieux est l'ennemi du Bien" and we can't do anything about it—there won't ever be any more Weihes and the 18 metre Gull is a long way off yet—but we can cook the Comps Regs so that a good amateur in a G.B. can get his number on the board. We can give everyone a chance to sniff the rabbit. We can make welcome everyone who flies for fun, even in a Nacelled Dagling. So what about it?

There's one way. Get at the B.G.A. Bind about the Closed Shop. Agitate and pester. Tell 'em that the Club amateur doesn't want a Nat. Comps. to find the best, second-best, third or fourth best pilot in this country—he knows that pretty well anyhow—but he does want a Week of Soaring, a Jamboree into which he can pack as many airborne hours as he can take, and a Week he can enjoy as if he were in his own Club. If there is the odd pot to be given away on the last day that will be fine and if not we can always drink beer and have a party.

When the B.G.A. says "How?" tell 'em to rehash their Regulations, handicap their regular prize-winners, and fix it so that a Club G.B. or a Club Prefect can top the bill.

Then we shall all have fun and there won't be no glory, which will be A Good Thing.

It may not be European and it may not be American but it will be very good Anglo-Saxon.

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Soaring in India and Pakistan

In 1912 Dr. E. H. Hankin published a book, "Animal Flight," which was long regarded as a classic by students of the soaring flight of birds (there is a copy in the Research Library of the British Gliding Association). For many years Dr. Hankin made the most meticulous observations of the soaring of vultures and other birds in India. But he had no use for most experts' attempts at explaining the soaring—least of all for those who attributed it to the use of up-currents.

Since human soaring flight began, and especially in the last twenty years, there have been frequent suggestions that somebody ought to explore the powerful thermals over the Indian sub-continent in a sailplane. But not until this year does anyone appear to have done so.

On 27th February, Mr. F. H. Irani, Chief Pilot Instructor to the Indian Gliding Association, made a climb in a sailplane to 6,500 ft. near Poona. Mr. Irani has made several soaring flights since then, and writes that he has encountered thermals of more than 20 ft./sec., as registered by his Cosim variometer, on some occasions. Such strong lift, however, covers a very small area as a rule, so that he found himself unable to turn a complete circle in it; there was always less lift on one side of the circle than on the other.

The first soaring flight in Pakistan was made on 15th March, by F/O. J. Z. Mikulski, who stayed up for 1 hr. 5 mins. after an aero-towed launch. He lost height slowly at first, but then the thermals picked up to 3-5 ft./sec. and lifted him to a ceiling of 3,200 ft. It was very bumpy, with thermal gusts of more than 15 ft./sec. at times. The flight was made at the Central Gliding Training School, near Karachi.

On 20th April, one of the pupils, S./Ldr. Hall, after an aero-tow to 2,000 ft. in an Eon Baby, worked his way into the thermals over Karachi, where he was later joined by F/O. Mikulski in an Olympia. The latter's ceiling was 6,200 ft. After a time, cirro-stratus came over and spoiled the thermals, and then a sea breeze of 20 knots removed them altogether. Thermal strength had been up to 15 ft./sec.

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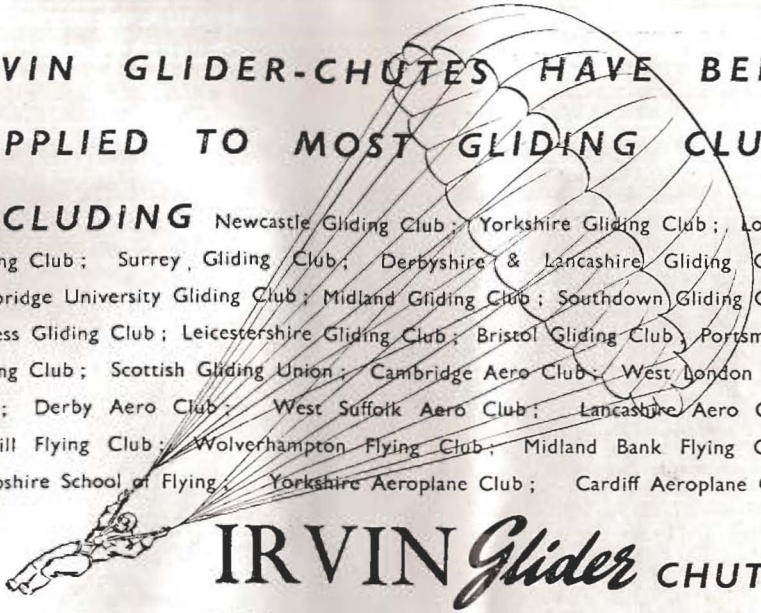
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