THE SAILPLANE & GLIDER

(*Founded in September, 1930, by* THURSTAN JAMES).

The only Journal in the World devoted solely to Motorless Flight.

OFFICIAL ORGAN OF THE BRITISH GLIDING ASSOCIATION.

Editor: ALAN E. SLATER

Editorial Offices: 43, CHANCERY LANE, W.C. 2. *Telephone:* HOLBORN 0309.

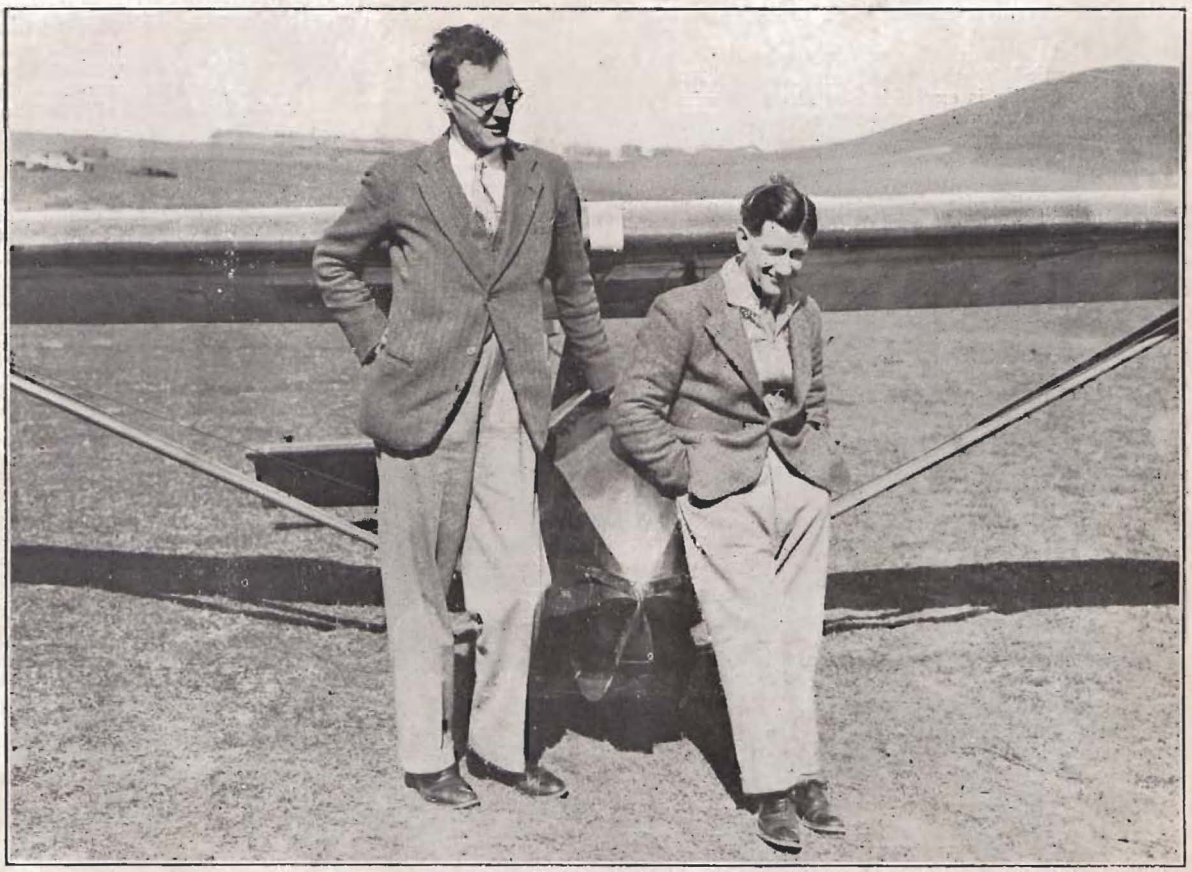
Subscription Rates [Post Free]: Annual 10s. 0d.; Half-Yearly, 5s. 6d., Single Copies 1s.

Vol. 5. No. 4. April 1934. **Published on the 2nd Tuesday of Each Month**

PRINCIPAL CONTENTS

	PAGE		PAGE
Editorial Comments	50	The Clouds on March 18th: *A. E. S.*	54
Three British Cross-country Flights	51	The Soaring Flight of Birds; Dynamic Soaring: *C. H. Latimer-Needham*	56
. . . And Points East: *Die-Hard Redivivus* ...	52	News from the Clubs	61
Forty-five Miles with a Passenger	53	Correspondence	64
From Dunstable to the Blackwater: *P. A. Wills* ...	53		

BACK TO EARTH.



P. A. Wills (left) and G. E. Collins at the London Gliding Club's grounds at Dunstable. Mr. Wills flew without an engine from there to the Essex coast, creating new British records for height and distance, while Mr. Collins soared 45 miles with a passenger from Dunstable to Chelmsford.

THE SAILPLANE AND GLIDER

43, CHANCERY LANE, W.C.2. APRIL, 1934

A Crop of Records.

The principle news which we give in this issue of THE SAILPLANE can be left to speak for itself; in any case, it has swallowed up most of the space usually available for editorial comment. It only remains to congratulate all those concerned: Mr. Wills, who got about as far as the geography of this Tight Little Island would allow; Mr. Collins, who came within a mile or two of putting up a world's record for two-seaters; and Mr. Humphries, who, though somewhat overshadowed by the others, at least nearly equalled the previous British distance record, and set the example to the others by being first away. The nationality of the passenger is also a reminder of how, four years ago, the German leaders of motorless flying did all they could to help to get going a British gliding movement. The same spirit is still alive in those of them who still visit us from time to time; but, though a common interest in the progress of soaring flight is a powerful stimulus to international co-operation, it must not be forgotten that national boundaries have their uses, in that they enable new national records to be set up from time to time.

Gust Soaring.

Flying men often deride the muddle-headed public for their inability to distinguish between air-speed and ground-speed. Captain Latimer-Needham's article in this issue should warn them to be less hasty in throwing stones. How many experts, in discussing the utilisation of gusts, have assumed that a gust can overtake a sailplane from behind? Of course it can't, unless perhaps in such hurricane-like conditions as no sailplane would venture into. The article is of the greatest interest, but for the present we must confine ourselves to pointing out two ways in which gusts and thermal currents can give rise to similar effects, and thus lead to phenomena being attributed to thermal currents which could as well be explained as due to gusts.

Firstly, the sight of a number of birds wheeling upwards is often accompanied by the sound and feel of a sudden increase of wind. This is explained by the rush of air into the space left by the breaking away of a thermal "bubble" from the ground. But a gust usually arrives at ground level shortly *after* it has already passed by overhead, as every kite-flyer knows.

Secondly, G. E. Collins has developed a method of utilising thermal currents by turning towards the side on which a wing is suddenly tilted up. Since a gust from the side is apt to tip a machine over the other way, it is obvious that a similar manœuvre would result in the sailplane being headed into the gust, with a resulting increase of airspeed and consequent gain in height.

GLIDING CERTIFICATES.

The following gliding certificates have been granted by the Royal Aero Club:—

"A" Certificates: No. 352, M. Elliott, Bradford and County Gliding Club, Sept. 10th, 1933; No. 353, R. H. Somerset, London Gliding Club, Feb. 18th, 1934.

"B" Certificate: J. M. Noble, London Gliding Club, Feb. 11th, 1934.

A NEW LOOPING RECORD.

Towards the end of March, according to a report from Buenos Aires, Wolf Hirth looped the loop 74 times in a glider, following an aeroplane tow up to 5,500 feet. This constitutes a new record outside of Russia, the last such record being 68 loops, performed by Willis Sperry (U.S.A.) last autumn, after a tow to 10,000 feet. The Russian record, when last heard of, stood at 184 loops, but they do their looping while soaring over the hills at their Crimean site.

FORTHCOMING MEETINGS ABROAD.

The date of the Rhön meeting is given as July 22nd to August 5th. We would remind readers who are now fixing their holidays that occasionally, in the past, there have been slight alterations in the previously announced dates of starting or of ending the meeting.

The Soaring Society of America announces that the Annual National Soaring Contest will be staged at Elmira, N.Y., between June 23rd and July 8th, inclusive. In addition, a gliding and soaring contest, which will be national in interest and representation among pilots, will be held at Big Meadows in the Shenandoah National Park from September 15th to 30th, inclusive.

The French "Scouts de l'Air" are holding their first national rally in the second fortnight of August at the Banne d'Ordanche, the chief French gliding centre, which is near Clermont-Ferrand in Auvergne.

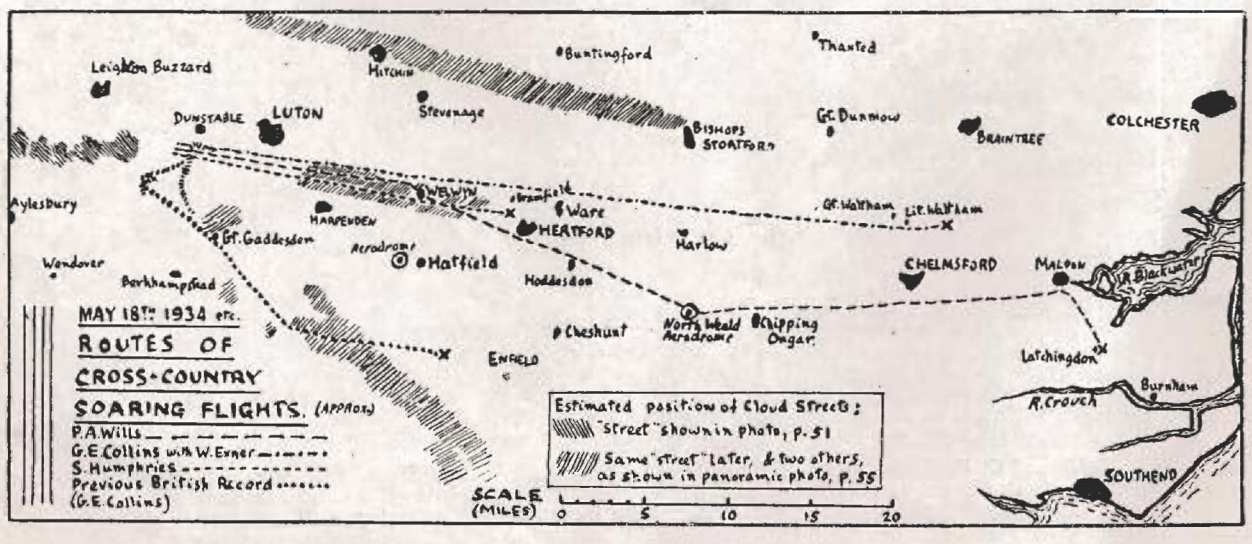
KRONFELD'S PLANS FOR THIS YEAR

The *Neue Freie Presse*, of Vienna, states that Robert Kronfeld has again been invited to France. He has been asked by the French Society for the Promotion of Aeronautics to take part in motorless flying propaganda in France. Public demonstrations have been planned in the more important cities of the French Republic. Kronfeld will also take part in competitions; the most important of these events will be held at the State Gliding School, Avia, near Clermont-Ferrand, where Kronfeld will also act as instructor. An impressive public demonstration will be held at Whitsun, near Paris.

The Italian Air Ministry has taken official steps to prepare for another instruction tour by Kronfeld in Italy. Kronfeld was informed also that the film produced by the Ministry in Italy showing Kronfeld's flight over Rome and Vesuvius will be available for showing in Austria. The first performance is to take place at the end of March in Vienna.

Kronfeld will also visit Czechoslovakia, Germany and England during this summer. The plans concerning the big gliding school in Austria have been abandoned, however.

Kronfeld's newest machine is to be called AUSTRIA III.



THREE BRITISH CROSS-COUNTRY FLIGHTS



A great occasion: left to right, the "Kassel," "Crested Wren" and "Prüfling" soaring at Dunstable on March 18th, and, on the right, the approaching "street" of clouds with whose help the first two got away across country.

On March 18th three sailplanes set off from the London Gliding Club's site at Dunstable Downs, Beds., and achieved considerable distances across country. New British records were set up officially for height and distance in sailplanes, and, in addition, new records for two-seater sailplanes in height and distance.

The exact figures for distance have not yet been officially determined, but, measuring from the landing positions marked by the pilots on a quarter-inch scale map, the distances covered were :

S. Humphries in the CRESTED WREN, 19.3 miles.
G. E. Collins in the KASSEL two-seater, with W. Exner as passenger, 45.9 miles.
P. A. Wills in the PROFESSOR, 55.8 miles.
All three pilots, as well as the passenger, are members of the London Gliding Club.

Wills flew via Welwyn, North Weald Aerodrome, and Maldon, and landed at Latchingdon and Snoreham, about 9 miles due north of Southend. He thus exceeded by a handsome margin the previous distance record by a British pilot, which was set up by G. E. Collins in August last year when he flew in a PROFESSOR sailplane from Dunstable Downs to South Mimms, a distance officially determined as between 19½ and 20 miles. (Actually, an hour or two before Wills landed, Collins had beaten his own record by flying 45 miles.)

It has been stated in the press that R. Kronfeld flew a distance of 70 miles in England in 1931. Actually the distance was considerably less, and, if Kronfeld's starting and landing points are properly identified on a map, their distance apart will be found to be only 50 miles. The flight was from Firle Beacon, Lewes, along the South Downs towards, but short of, Portsmouth (70 miles would have taken him beyond Southampton). Wills's effort is therefore the longest distance soaring flight yet made over British territory.

Collins flew the KASSEL to a point about 4 miles N.N.E. of Chelmsford and 2 miles E. by S. of Little Waltham, in Essex. He was within about 2 miles of beating the world's distance record for two-seaters, set up on July 9th, 1933, by the pilot Burzlauer, who soared with a passenger from Duisburg in Germany to Eindhoven in Holland. According to an Exchange telegram, published in the press at the time, Burzlauer's distance was 47.88 miles. The two decimal places look very circumstantial, but may be the result of an attempt to translate into English 70 kilometres (actually 47.84 miles). We hope to get this point cleared up.

Humphries landed about a mile N.N.W. of Hertford. He probably came within a few hundred yards of equalling the previous British record.

The CRESTED WREN, in which he flew, was designed and built about three years ago by Corporal W. L. Manuel. Rather more than a year ago, it was bought by a group consisting of J. P. Dewsbery, S. Humphries and Major H. Petre. Though built "by eye," rather than designed on paper, it has proved a very successful design, much liked by its pilots, and it has by now done well over 100 hours of soaring flight.

Wills carried a barograph, and his flight therefore counts as an official record. He has also fulfilled two of the three requirements for the "Silver C" badge. His greatest height, according to our own measurement of the barograph record, was about 3,800 feet above the starting point, or some 4,450 feet above sea-level. The previous official British record of 1,750 feet above the start was made by G. E. Collins last August, while J. P. Dewsbery's unofficial record of 3,000 feet has likewise been exceeded. Collins's flight would also have counted towards a "Silver C" if he had had a barograph and no passenger, instead of the other way round. During the flight he reached a height of 3,700 feet above the start, according to his altimeter.

The aftermath of all this excitement has provided much entertainment for the gliding fraternity. Mr. Wills's "fan mail" included, we understand, an offer from a Scottish(!) health resort to house him and his sailplane at the best hotel, free, if he would but practise his soaring over the surrounding hills, which, they assured him (having probably not the faintest notion how a glider keeps up) were ideal for the purpose. He was asked by the B.B.C. to broadcast a description of his flight (it was later published in *The Listener*), and a London evening paper, for whom he wrote an article, rated its readers' intelligence so highly that it actually did not suppress his explanation of the difference between hill-soaring and cloud-soaring, thus giving its readers a rarely-allowed chance of learning how gliders fly, instead of being left to imagine that they are merely tossed about "at the mercy of" gusts and squalls. Our old friend the *West Lancashire Evening Gazette* trotted out again its picture of a CHANUTE glider in flight, thus giving its readers to understand that Mr. Wills covered all that distance dangling underneath the machine, holding on only by his arms while he looked down at 4,000 feet of empty space below.

We give, below, descriptions of their flights by two of the pilots (incidentally disclosing "Die-Hard's" identity to such as haven't guessed it already), and an account of Mr. Collins's flight compiled from particulars he and Herr Exner have given.

Some notes on the clouds, etc., have been added.

. . . . AND POINTS EAST

By DIE-HARD REDIVIVUS.

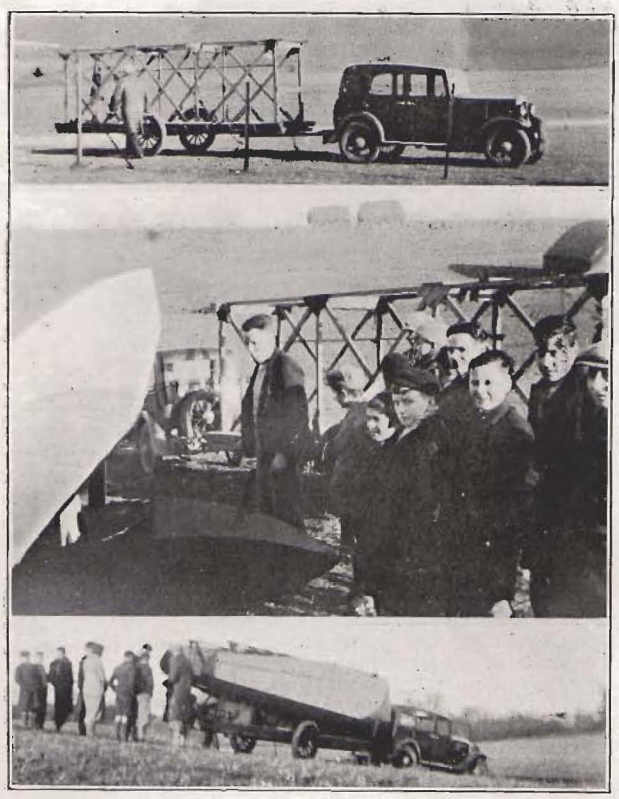
In the tremendous conditions of March 18th the length of a cross-country flight was governed only slightly by the merit of the machine. The heavier the machine, the less hectic the motion; and the better the gliding angle, the better the chance of passing from one terrific volcano to another. But the real secret of the successes of Collins and Wills undoubtedly rested in their exceptional experience, which enabled them to eliminate clogging emotion from their mental activities. Both of these pilots have repeatedly flown clean away from their launching-point, on many different sites, with no hope of return, and both have previously achieved some outstanding distance-flights. Either of these men would have done well in any reasonable machine on March 18th, and very few other people could have imitated them in any machine on any site

Unfortunately for the just deserts of the CRESTED WREN her only pilot present on this day of aerial wrath was the writer, whose normal hobby is to potter up and down the Dunstable ridge. For further details of his shortcomings, apply to Mr. Baynes, to whom Allah be merciful!

The air was at times atrociously rough, so that, after nearly an hour of exploring from the Rifle Volunteer to the Whipsnade Lion, the WREN pilot was just about in tears and was more than ready to land for his lunch.

The vertical movement was at times so savage that one spread one's knees out to press against the sides of the fuselage, while one's ears "went" on the upward movements as well as on the downward. All the same, the machine never once got the bit in her teeth.

Meanwhile Collins in the two-seater was touring repeatedly round and about, tranquilly carrying passengers and undoubtedly getting benefit from this machine's big all-up weight, about three times that of the loaded WREN. At times he was soaring high above the WREN, but when the two machines flew for some minutes in close formation it became clear from their identical performance that height was governed far more by the course taken than by the relative merits of the machines; that is to say, pilotage in its broadest sense was all-important.



S. Humphries standing by his "Crested Wren" in the field where he landed after flying 19 miles from Dunstable. Above: the retrieving trailer ready to start; below: the "Wren" packed on it for the journey home.



Still forming in "streets," though diminishing in size: two rows of clouds seen from the "Crested Wren's" landing place at 5 p.m.

Soon after one o'clock the WREN ran into a real snorter; tremendous jolting, ears "gone," air-speed all over the place—in fact, just about as much as a weary middle-aged gent could stick. But with celestial assistance one kept the air-speed, and a strong leaning toward panic, in hand, and, riding out this rough-stuff head-on, battled out from the ridge until over Totternhoe windmill, 1¼ miles out. Hasty glimpses of the aneroid, the only instrument in the machine, then showed 1,200 feet and rising fast. Overhead was a long and definite street of dark cloud.

It will be gathered that the pilot at this juncture could hardly be said to be in complete possession of his reasoning power, but the situation was saved by a mental oath sworn, and docketed for future use, last summer: that, if one ever again found oneself at a height of over 1,000 feet, with a visible means of cloud-support, one would bolt downwind and chance it. This oath now leapt out of the subconscious mind and dashed in to the rescue, literally compelling the machine to turn downwind. The rudder was not appreciably used again until the machine was thirty feet from the ground outside Hertford—shockingly crude tactics, but at any rate decisive and consistent, with a good chance of success provided that the cloud-streets obligingly butted into each other from Dunstable to Eastern Siberia.

The last ugly moment was the crossing of the Dunstable ridge, where the aneroid leapt upward 200 feet. To turn or not to turn? Down below, peace and quiet; ahead, God only knew! The oath did its stuff, and, although the irrevocable departure was hideously reminiscent of cold-blooded leaps into space, many years ago, with old-fashioned parachutes, once it was an accomplished fact one's heart began to return to its normal rate of beat.

One has treated the opening movements at some length, simply because they were more than half the battle. What followed is obvious. Having tacked on to the tail of the cloud-street, the machine rose steadily for about 12 miles, the greatest height noticed being about 1,900 feet. The actual maximum may have been more, but the aneroid was in rather an awkward position on one's arm, and one had many distractions. Obviously one should have circled in this area. But with a cut-and-dried plan of bowling away with a ground speed of a mile a minute, the idea of picking daisies by the wayside was quite repulsive. One was filled with a horror of *circling in the wrong place*, with the consequent disastrous loss of height and distance.

Thereafter was a period of mental jumble, comparative darkness with a spatter of soft hail, then clear air, and then a wall of white rods immediately ahead. Pulling one's fur cap down to one's eyes, one blazed away into the wretched stuff, unsuccessfully trying to catch pieces of it. But it bounced too much. It would seem that this loose hail was the product of an aerial fountain further back, curled forward in the stronger winds above. For the machine galloped through steadily.

After this the lift gradually quietened down and the weather cleared until one could see for a great distance all round. But where was the next cloud-street? Nothing but blazing sunshine ahead, with the ragged shadow of the nose of the grand old cloud-street gradually coming under the machine. Horrible to relate there was *nothing* ahead. Go back? And find nothing, having fallen too low? Not blinking likely! Excelsior, and chance it!

Hence a marvellous care-free run of about five miles, with one rough spot in it which may or may not have been a beneficial spot for circling. This last lap was the nicest thing one has ever struck in aeronautics, always excepting free-ballooning. With the violent wind behind, the gliding angle was something like one-in-thirty, and one was almost convinced that one could go on for ever. After an inconsiderable change of direction the country ahead became smothered in grass-fields amply big enough for the helicopter-like landing made possible by the wind. So the loafers

on the village green at Tewin had a considerable shock—and still the old WREN galloped on, for all the world like a knowing cow-pony.

The end came midway between Hertford and Bramfield. The machine was now a bare thirty feet from the ground, still doing her mile a minute. A steep about-turn, just short of a road and an oak tree, and she was down, up-hill, up-wind, with a row of haystacks for shelter. And afterwards one could not find a single mark of her landing.

The only potential helper, a small boy, bolted for his life. The passing bus had to go on its way. So the pilot hauled her single-handed to the stacks, pegged her down, and left her. The rest of the business is only concerned with good friends and lots of beer, and people who made nice remarks, bless 'em!

There are a host of morals to be drawn, but, broadly, only one that matters: EXPERIENTIA DOCET STULTOS.

More specifically:—

(1) Circle diligently in all good places.

(2) Relative to the clouds, tend to work backwards rather than forwards. You were probably picked up by an advance-guard.

(3) Tour up and down a cloud-street, and let your ground-speed be that of the clouds.

(4) If you see a wall of snow/hail/sleet, ahead of you, circle on the up-wind side of it.

(5) Don't be afraid of a little semi-blind flying. Give the machine her head, don't fidget, and keep a steady wind-noise.

(6) If one wing is suddenly lifted, force it down and simultaneously turn quietly towards it. That was an extra bit of lift.

(7) In the initial stages, don't be alarmed by the upheaval. A real one is thoroughly frightening, but keep the nose up (also your tail) and head quietly up-wind. This will give you time and space to test the likelihood of a successful bolt behind the ridge

(8) Don't go away at less than 1,000 feet. Better, imitate Wills and leave at 4,000 feet. You will then tend to be in the tail-end of the lift and can go ahead comfortably.

(9) When a landing is irrevocable, pick out a landing-place at 500 feet, or else pick out a good run of country. Don't dither! Tell a good lie and stick to it.

(10) In a high wind your landing-field need only be small; but come in really fast.

(11) Never mind about adjacent roads and public-houses. Get the machine down whole.

(12) In your final turn, don't be caught napping by tremendous drift. Be prepared to make a Schneider-Cup turn, even if you graze the ground with your wing. It won't matter; your ground-speed is practically zero.

(13) Never take off half-clad. Never be unprepared for a surprise, as the Irishman said.

(14) *Keep your wool on!*

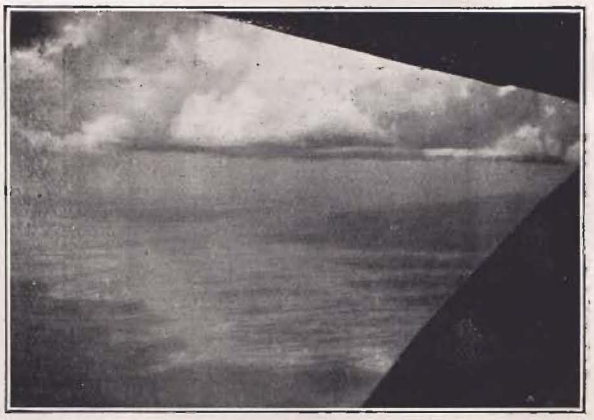
45 MILES WITH A PASSENGER

At Dunstable on Sunday, March 18th, G. E. Collins was giving passenger flights in the KASSEL two-seater, and had already reached 1,700 feet during one of them; his third passenger was Herr W. Exner, who stepped into the rear cockpit quite unaware that anything unusual was about to happen, though he luckily had his camera with him.

The machine was flying at about 700 feet (above starting-point) when it got into a powerful rising current just to windward of the "Bowl," which forms the northern end of the ridge of Dunstable Downs. Collins immediately circled in this and rose towards a cloud street that was passing overhead; this was, in fact, part of the same cloud street as that under which Humphries had gone off a few minutes before. The KASSEL climbed rapidly to 3,600 feet, but that seemed to be about its ceiling, except for a bit of extra lift near Luton which took it 200 feet higher.

When the end of the first "street" had been reached, somewhere near Luton, another one was seen ahead in the same line, so the KASSEL flew straight on and lost only 400 feet in crossing the gap between the two streets. From some of the clouds soft hail was falling, and some of it stuck to the struts. It was noticed, under one of these streets, that the smoke from a tall chimney below was not trailing away in the general wind direction, but was distinctly deviating towards the clouds, or rather towards the region directly under them.

From the end of the second street of clouds no further similar formations could be seen, at least within reach. The next choice lay between two separate clouds, one of which had hail falling from it. Collins therefore chose this cloud, which was somewhat off to the right, as likely to provide the better lift of the two. On arriving underneath it, the two occupants of the KASSEL found themselves in thick hail, which was none too pleasant, so they flew straight on through it, without any circling. 800 feet of height were lost in getting to this cloud, and the KASSEL arrived under it at only 2,600 feet; the former height was regained, however, during the immersion in the hail.



A unique photograph taken by W. Exner during his soaring flight of 45 miles as a passenger in the "Kassel" two-seater. Showing the nearness of the cloud base and, below on the left, the shadow of the actual cloud "street" under which the sailplane was flying.

Both pilot and passenger were by this time feeling thoroughly frozen. As far as bumpiness was concerned, they seemed pretty comfortable, for Collins reports that conditions under the two "streets" were not bumpy; in fact, under the second street the altimeter remained stationary at 3,700 feet.

Having left the hail behind, the KASSEL completed its flight with a long straight glide down wind, which included a down-current at one place. The landing was made in a field near Little Waltham. There were not many fields to choose from, owing to the numerous orchards in the district.

Herr Exner went back to London by train, while the two-seater, with Collins, did not arrive back at Dunstable till the early hours of next morning.

(Note: heights given are above starting point, which was about 750 feet above sea-level, and are altimeter readings.)

FROM DUNSTABLE TO THE BLACKWATER

By P. A. WILLS.

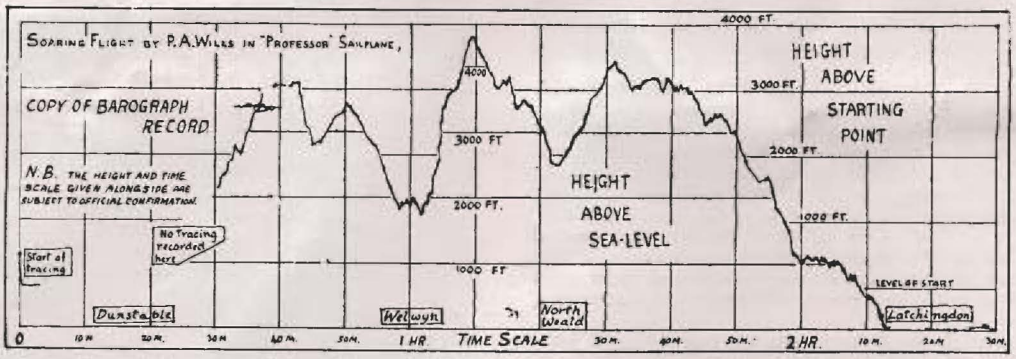
[*The heights given have been inserted after examination of the barograph record.*—ED.]

On Sunday, March 18th, I arrived at Dunstable rather late, about 12.30, but found the London Club PROFESSOR in the hangar, although the Red WREN and two-seater were in the air. Conditions looked pretty good, so we hastily rigged the machine, and at the last moment I thought I would give my new barograph a virgin run, so took that along too.

By the time we got to the top of the hill the two-seater and WREN were specks in the distance under a beautiful street



P. A. Wills flying the "Professor" in which he set up new British records for height and distance on March 18th.



of clouds which had gone over about five minutes before, so fizzing with impatience I got into the cockpit and hastily stowed the barograph on the floor, where it was just out of the way of my left foot. At 1.15 I was in the air, and at about 1.40 the up-current of an advancing line of clouds took me violently in its grip and at about 1,600 feet I left the hill and circled away with it.

About a mile behind me was a heavy storm of hail, and I used this as a signpost and endeavoured to keep my position a constant distance in front of it. It will always be a source of disappointment that the rate-of-climb indicator was not on that day fitted to the PROFESSOR. As a result I am unable to say where or how violent were the up-currents and down-currents. The barograph record shows that they were of considerable violence, and as a general rule I looked for them under the front edges of the cloud street, but I am nearly sure that there was actual lift inside the hailstorm, although to me this seems somewhat remarkable. The first up-current carried me to 3,800 ft. (above sea level) and at about this height I circled along for some 15 or 20 miles, when the hailstorm caught me up, and I found myself flying blind inside it, even more blind because it rapidly dimmed my spectacles; so I stopped circling and made a line out of it. I emerged on the south side, over a town which I have since identified as Welwyn, although being without a map at the time I was pretty well lost. Having lost the lift, I looked for a good field and circled round it, gradually descending to 1,800 ft

Here I must confess to a stupid muddle which might have spoilt the flight if conditions had not been so good. At the launch I had followed the usual practice of setting my pocket barograph to zero. Of course my recording barograph was out of sight, and throughout the flight I was relying on my pocket barograph. My launching point was not at the top of the hill, but it must have been about 650 ft. above sea level, because although the height of the hill at Dunstable is only about 200 ft., the field at the bottom is 450 ft. above sea level. Consequently throughout the flight I was considerably out in my idea of my height: when my pocket barograph told me I was 1,500 feet up I was considerably over 2,000 feet: the country over which I flew being of course pretty well at sea level. This is, probably, partly the reason why the Press reports have varied so much in their height recorded, and as a matter of fact it was not until I could obtain a fairly good view of the barograph record on the next day that I started wondering why it looked so remarkably better than the ideas of height I had got during the flight from my hand barograph.

It appears therefore as if the approximate height of 4,900 feet mentioned, was *above sea level*, and the height above the starting point attained would in that case have been between 4,200 and 4,300 feet. [The barograph was reading 450 ft. at the landing place, which was nearly at sea level, so that amount must be subtracted from these figures.—ED.] As a matter of fact this height was attained in the second up-current struck when leaving Welwyn, so that I must have been pretty nearly that height above the ground at that point.

This second up-current I found under the advancing edge of a second cloud street, and I would give a good deal to know my rate of climb for those five minutes or so. I should estimate that I climbed over 2,000 feet in that time: perhaps the barograph record (which I have not had an opportunity yet of examining) will give a fair idea.

Even at nearly 5,000 ft. the cloud base was well above me—I should estimate its height as a further 1,500 ft.; and I circled off again until shortly afterwards I saw south of me the large sheets of water north of Enfield, which told me where I was. Then I spotted North Weald aerodrome, and as by this time I was pretty cold, and anyway had had a pretty good time altogether, I thought I would land there. However, when after about 20 minutes' circling, in which to my disappointment I raised no sign of surprise or even of life on the aerodrome, a third patch of lift took me up to 3,200 ft., and I went off again.

After North Weald the country from the air is pretty featureless, and without a map I was quite incapable of making a course, so simply went where I was taken. A couple of MOTHS came up behind me, 2,000 feet below, and went slap underneath without seeing me. One was G-EBVK—I read its markings on its top wings—joyous moment—the other a vivid orange machine. Both seemed to have their eyes pretty well glued inside the office: the PROFESSOR after all was more than twice their span and must pretty well have filled the meagre arc of vision which a biplane offers above the pilot. Anyway they weren't enjoying themselves as I was. What seemed a surprisingly short time afterwards, I began to see water coming at me on all sides. I had not realised the coast was so near, and in fact, had I had a map, I could have gone a few miles north and then carried on east for a good way further. But I was not feeling competitive at all anyway, so at what appeared to be the last sizable town before the coast (since identified as Malden) I started circling down, from about 2,000 ft. When I got lower I saw a village a little further east that gave promise of connection with the outside world, so went on to that. I put my barograph away when it read 200 ft. Extraordinary how the mind takes such an authoritative statement for granted. I must have been over 800 ft., and would not have believed that I should be so easily deceived.

Then I circled down and landed in a field full of low blackberry bushes which fortunately proved quite harmless, at 3.45: 2½ hours after my launch, and just over 55 miles away.

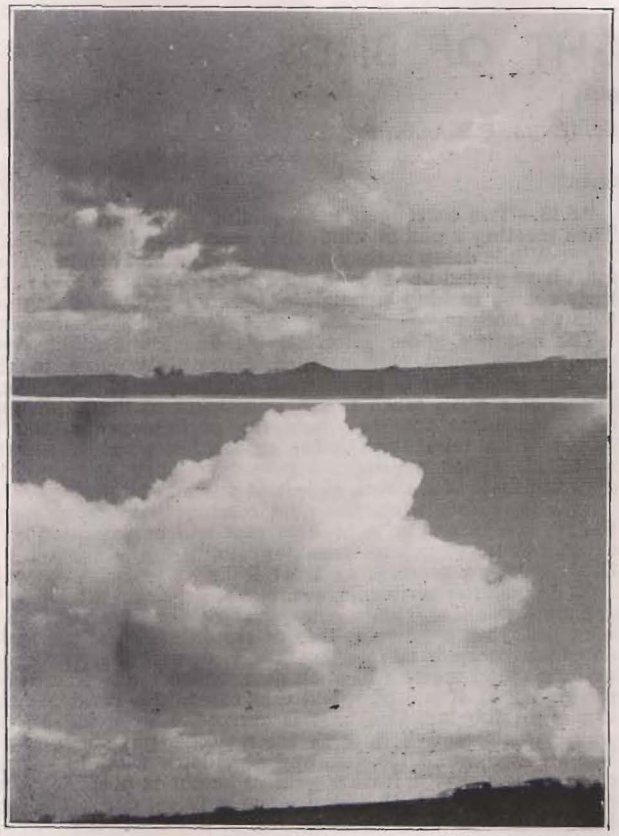
I proved extraordinarily fortunate in my choice of a landing place. A quarter of a mile away, in the village of Latchingdon, the Waggon and Horses produced everything necessary for both pilot and machine—including a miraculous shed which exactly took the dismantled PROFESSOR. The entire village assisted in the process, and everyone, from extremely small boys and girls upward, seized the parts of the dismembered machine and bore them triumphantly from the field.

Of the subsequent turmoil it is unnecessary to speak. Suffice it to say that the Press is much more difficult to manage than the PROFESSOR. I was particularly startled by an article published in an evening paper, purporting to be by me, entitled "Shouting Peer Who Won Me a Cup." The Shouting Peer being the worthy President of the British Gliding Association. The article had started by being mine (by request, and having my eye on a parachute for future use) but had been remorselessly vulgarised to suit the imagined tastes of that paper's readers. If there *are* people of that calibre I shouldn't have thought they could read.

THE CLOUDS ON MARCH 18th

Anyone who remains on the ground while others tour in their sailplanes across country can nevertheless have a lot of quiet fun trying to discover, from the pilot's own accounts, the Air Ministry's weather maps, and observations and photographs of the clouds, what was really going on the air in which they flew.

The flights on March 18th were made in "Polar air" which came from the north-west in the rear of a depression. Polar air tends to be unstable (i.e., lapse rate, or fall of temperature with increasing height, is greater than the average and favours the development of vertical currents); but on this day unfortunately no lapse rate observations were taken in England. The next best thing is to follow the progress of the same air across Europe to somewhere where at last a meteorological ascent was made into it. Adopting this plan, we find that the air in question would have arrived in North Germany by next morning early, when ascents were made at Hamburg and Berlin. Hamburg then showed a lapse rate of about 4½ deg. per 1,000 feet from a height of 2,300 feet upwards; and Berlin one of 4 deg. per 1,000 feet, from 1,600 feet a long way upwards. Below these respective levels the air was



The same cloud street as that shown on page 51, but looking in the opposite direction as it was retreating eastwards. Above: the tail-end of the street is directly overhead; the "Crested Wren" is at the centre of the picture, but too far off to show. Below: the "street" going away into the distance, showing well-developed cumulus at its tail-end, and, far off on the right, a hazy patch of "false cirrus" belonging to a hailstorm.

more stable, there being an inversion layer at both places. But the ground temperature was there only 36 deg., whereas it had been about 45 deg. when the same air was over England at 1 p.m. the day before.

It is noteworthy that both Wills and Collins were able to get up to about 4,500 feet (above sea level) but no higher; in fact, the two-seater found a definite ceiling at that level, up to which it would always rise when under a cloud. Humphries did not get so high, but his CRESTED WREN seems to have been rising steadily all the time it was under clouds; he did not, however, gain his initial height by circling, as the others did.

Assuming that the air above this level was in much the same condition as it was next morning, it would only have been unstable inside the clouds (saturated adiabatic rate is about 3 deg. per 1,000 feet.). It is to be noted that there was a strong tendency to the formation of cloud streets in parallel lines (see panoramic photograph, in which, in accordance with the laws of perspective, they all appear directed to the same point on the horizon). This suggests the establishment of a "cellular" distribution of vertical currents, which, in fact, was seen to develop gradually during the day and still persisted when the clouds were dying down towards evening (see the photograph which was taken about 5 p.m. from the WREN'S landing place).

Nevertheless, the clouds must have had an intimate connection with vertical movements in the more unstable air below 4,500 feet, since it was only when clouds were overhead that any of the pilots could gain height. Collins's observation of chimney-smoke appears to confirm this.

Have cloud streets a definite life-history? Do different portions of a street differ in character according to a definite plan? All the pilots found hail somewhere near the front end of each street, and it is suggested by Humphries and confirmed by Wills that these hailstorms travelled forward along the line, probably owing to the greater wind speed at the cloud tops. It would also seem that the cloud street used by Humphries broke in half shortly after he left it leaving a gap which Collins lost 400 feet in crossing. This must have been the same street; Collins did not use a later-arrived street and then jump to the one in front, because there wasn't a later one. Would Humphries and Collins have done better to continue touring to and fro from end to end of the street? That they did not do so was due to the risk of finding the lift gone, with resulting curtailment of mileage. Often a mass of cold air will descend from a well-developed hailstorm (incidentally producing a "cold front" in advance of the cloud), but on this day none of the hailstorm clouds were particularly large, as hailstorms go, and all the pilots seem to have found lift wherever there was hail. As to the probable life of the cloud streets, there was an interval of quite 40 minutes between the first and last of the photographs of the particular street here reproduced, and it will be seen that in all the pictures the individual clouds have good flat bases, while the last two of the series show well-developed cumulus at the street's tail-end, about one-and-a-half times as thick as the height of its base.

With regard to possible "cold front" effects it must be admitted that Wills believes these to have played a part in providing his chief up-currents both at Dunstable and at North Weald. At the former place, he says (*The Listener*, March 28th), "I saw coming at me on the horizon a perfect line of clouds, led by a storm of rain and hail. About a mile in front of this I hit the tremendous up-rush of air, caused by the rebound of the air carried down by the hail." (He was probably mis-reported; strictly the lift is in the air heaved up over the advancing cold air which has descended from inside the storm.) He has since stated that his "line of clouds" was transverse to the wind, and not a longitudinal "street"; this is certainly very suggestive of a cold front.

It is often not realised how much information can be got from measuring cloud photographs, particularly if such clouds are being actually used at the time for soaring. If the height of the cloud base is known, and the position of the true horizon seen or guessed, it is possible to mark the position of the clouds on a map. This has been done on the map shown, for the first and last of the series of photographs of the "street" used by Humphries and Collins, on the assumption that the cloud base was about a mile above the level of the camera, or 6,000 feet above sea-level, as Wills guessed it to be. Particularly interesting is the positioning of the three streets seen in the panoramic photograph. One of these, of almost uniform thickness, trails across the left half of the picture; the next, in the centre, is the one actually used by the two sailplanes, while a third is seen half way from the middle to the right-hand end; this last is more distant, consists of twin rows of clouds, and is not quite parallel to the other two. The distance apart of the streets works out at 8 miles, and they are arrange *en échelon*—that is, each street is slightly in advance of the one on its left, or behind the one on its right. But in 8 miles a sailplane would lose some 2,000 to 3,000 feet of height, which is not very hopeful. (It may be remarked that, if the height of the cloud base has been over-estimated by, say, 25 per cent., all the clouds mapped would be that much nearer the camera and nearer to each other.

A.E.S.



At a still later stage: a panoramic view showing, in the centre, the cloud street under which two sailplanes have gone off across country. On the left is another "street" seen from the side, while a third can be made out towards the right, very far off.

BIRD FLIGHT XIII.

THE SOARING FLIGHT OF BIRDS

(Continued.)

By C. H. LATIMER-NEEDHAM, M.Sc. (Eng.), F.R.Ae.S., F.Z.S.

Dynamic Soaring.

Elementary Dynamic Soaring.

The possibilties of dynamic soaring flight, as has already been pointed out, were first realised by Lord Rayleigh over fifty years ago, when he foresaw the possibility of making use of winds of fluctuating velocity for sustained flight. In its simplest form, it is carried out almost daily by birds and, perhaps unknowingly, by glider pilots, the explanation being as follows: If a bird or glider is gliding at a uniform speed in still air, it cannot avoid losing height. A climb of limited amount may be executed, but only at the expense of speed, which reduces and may eliminate the margin of speed above stalling point. The climb is brought about by increasing, by means of the tail, the wing angle of attack which increases both the lift and drag coefficients, and thus the lift and drag. The extra lift causes an upward acceleration, but the larger drag causes the forward speed to fall off and so the lift commences to decrease. (Lift being proprtional to the lift coefficient and the velocity squared, or L is proportional to $K_L V^2$.)

Suppose now that a wind blows up with increasing velocity, in the direction opposite to that of the bird's travel, so that its loss of speed is made good, then it becomes possible for the climb to be continued for as long as the wind's acceleration continues to make this convenient adjustment.

Gust Soaring.

Actually, of course, the wind velocity is seldom constant, and is often very gusty, although the gusts may be only of perhaps a few seconds' duration, so that elementary dynamic soaring is possible. It should be noted here that a bird, or aircraft, flying *into* a wind of *increasing* velocity, or *down* wind of *decreasing* velocity, may climb without any control being exercised, owing to the increase of its air speed, and, in fact, could only continue along its original path by deliberately increasing its speed. This fact is of importance, since the involuntary upward movement indicates the approach of a gust and enables its energy to be utilised to the full if desired.

On a gusty day crows may be seen to shoot suddenly up through a distance of several feet, and it would appear from their tail movements that they know how to reap the full advantage from each gust. Sometimes the climbing attitude is retained for too long with the result that a stall follows, but it is not known whether this is intentional or not. There are many references throughout the pages of "Animal Flight," which bear on this point. It will suffice to quote two instances here.

"27.4.12, 4.48 p.m.—A cheel travelling up-wind. . . . Then in a puff it . . . rapidly gained height."

"5.13.—Two scavengers near, gliding up-wind horizontally. Then meeting a puff of wind, they made very large tail-jolts. . . . While doing so they made a rapid gain of height. They must have glided upwards to a height of 200 metres [650 ft.!], their course making an angle of between 30 and 40 degrees with the horizon."

The budding glider pilot, on his first short flights into wind, often pulls the machine dangerously close to the stalling point, but is saved from catastrophe by the timely arrival of a gust, much to the amazement of the pupil, and often instructor too, to whom the performance seems to savour of the miraculous! The sudden lull which leaves the wretched aerial aspirant hopelessly stalled through no apparent fault of his own, is just as disconcerting!

At a later date when the pilot reaches the soaring stage, the lift obtained from a head-on gust will be exploited with exhilaration. (I nearly write "gusto.")

Gust Dynamic Soaring, or Gust Riding.

So far as the writer is aware, all previous attempts to explain the theory underlying gust dynamic soaring have been based on a grave fallacy of reasoning. The generally accepted theory is as follows: The bird, or glider, flying at uniform speed meets a head-on gust, which tends to increase the air speed of the bird, and thus causes increased lift and a gain in height. The gust is succeeded by a fall in the wind velocity and if, just as the negative gust begins, the bird turns through 180 deg. and flies down wind in the decreasing velocity, a further gain of height is possible, since *relative* to the bird, the wind is again increasing. The bird turns again into wind on the arrival of the next gust.

Where is the weakness in this theory? It must be remembered that the bird is supported in the air and is moving with the wind, so that immediately it turns, having reached the point of maximum wind velocity, it must inevitably travel forward through the van of the gust in which it has already passed up-wind, and *it cannot therefore fly down-wind through the hinder part of the gust, referred to as the negative gust.*

The true solution, however, is now obvious. The bird, having climbed into wind in the increasing part of the gust, turns and flies forward with the gust, still in the fore part, the wind velocity now increasing again relative to the bird, and so the climb can be continued. Arriving at the point (relative to the gust) where the gust was originally met, the bird can turn up-wind once more and repeat the performance.

Two features of importance emerge from this: firstly, *the same gust is utilised continuously* (which is probably beneficial since a vigorous gust may be selected), and, secondly,

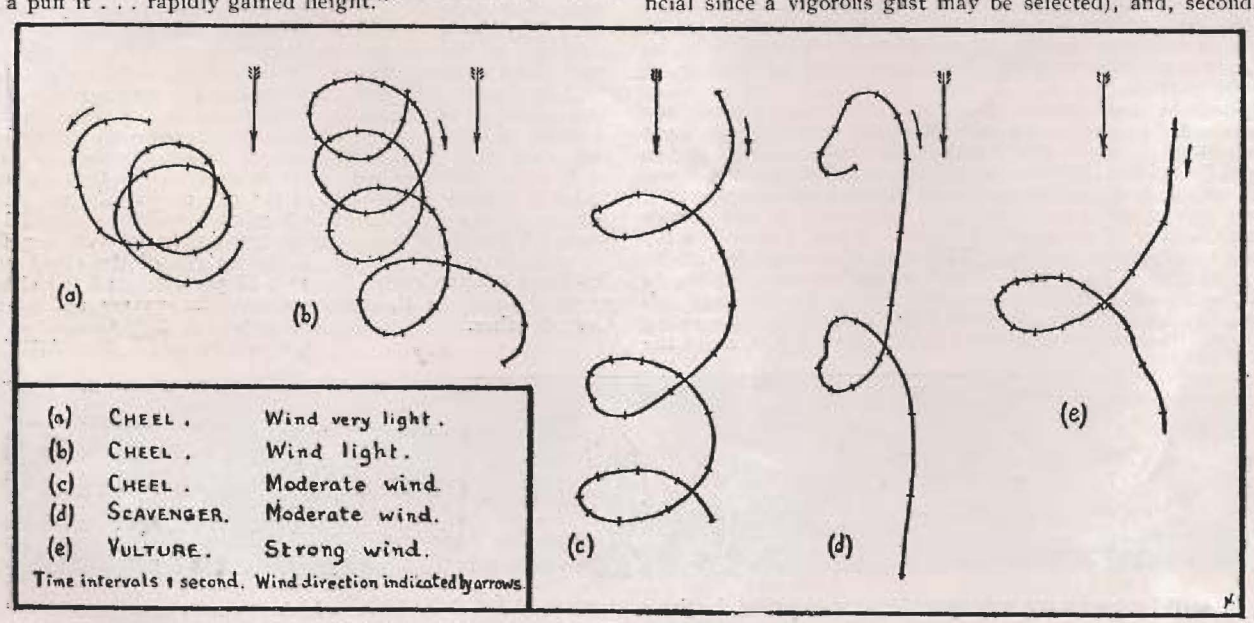


Fig. 1. Paths traced by Birds in Circling Soaring Flight.

the *speed of progress of the bird must be equal to the velocity of the gust across the earth*, but may be increased to some extent by following a mean course set obliquely to the wind direction. Further evidence on this last factor will be adduced later in this chapter.

It is now seen that gust dynamic soaring can be likened with fair parallelism to, say, a fish that travels forward with a wave by sliding down the face, which is in reality continually changing water that is being forced up, and thus the loss of height is made good, and forward velocity, equal to that of the wave motion, is achieved. The circling flight of the bird is necessary for aerodynamic support. Such flight might well be termed " gust riding."

It has always been stated, in the past, that this method of soaring by man is difficult, if not impossible, of achievement on account of the invisibility of the changes in the wind velocity, but it is hoped to show later that this apparent difficulty largely disappears when the theory is properly understood.

Gust Dynamic Soaring of Birds.

What evidence is there of gust dynamic soaring flight being practised by birds? Sir Gilbert Walker has recently* stated that " in India an exhibition of dynamic soaring by the birds could certainly be seen," although he does not appear to have mentioned whether this refers to the complete circling flight or not.

Observations in different parts of Hankin's book disclose almost with certainty that continuous dynamic soaring is made use of by the tropical birds, both as an aid to thermal soaring and independently, although Hankin does not appear to have realised the significance of such observations. He characterises a certain type of flight as " lee-looping," which is defined (p. 401) as a form of circling flight in which, after describing each circle, the bird makes a long glide to leeward. No particular use is ascribed to lee-looping, but it is recorded (p. 34) that " the *diminution* [apparent!] of speed indicating gain of height may occur chiefly . . . at the point where the bird has turned round to face the wind [gust]. In some cases of lee-looping, when observed at some distance from the side, there appears at this point to be a vertical gain of height of as much as 1 or 2 metres. In some cases in lee-looping, *the bird appears to gain height during the whole of the loop*, that is to say, *it gains height not only while facing the wind, but also when going with the wind;* in short, during the whole time that it is on a curved course." Fig 1 (e) is reproduced from the original and is stated to have been such a case.

And again (p. 372), " The gain of height occurs regularly at each loop of the lee-looping." Further, an examination of all entries in which " lee-looping " is referred to, discloses the fact that the stronger the wind the greater the use made of " lee-looping " flight. As examples :

P. 280.—" Cheel lee-looping in *gust of wind.*"

P. 279.—" *During a gust of wind* a cheel was seen lee-looping for a short time."

P. 283.—" *Strong puffy wind, shade,* vultures at height . lee-looping."

At first the theory that this was real dynamic soaring was not altogether convincing; a tentative and alternative explanation being that the flight was thermal soaring in all cases, and that the height gain on the up-wind side could be accounted for by the slower ground speed causing the rate of climb (in ascending air) to appear more pronounced on the up-wind path. This explanation was, however, by no means conclusive, and was upset by the fact that soaring flight was achieved at times when sun-soarability was not present, whilst on almost all occasions the wind velocity was recorded as being high.

Perhaps the main difficulty lies in the fact that thermal and dynamic soaring are so similar to the unitiated observer and may, on occasion, be employed simultaneously. Thus (p. 35), " Two cheels seen *circling* together. One changed its movement from circling to *lee-looping*. Shortly afterwards the other made a similar change. A minute later both birds glided down and settled." Notice here how, the thermal currents having weakened, or died down, the birds change over to dynamic soaring in an attempt to continue their flight, but without success. Undoubtedly it was difficult for Hankin to distinguish clearly between the two methods, but, nevertheless, he was aware that there was some differentiation.

Bewildered by this and similar flights, Hankin records : " It might be thought that the difference between circling and lee-looping depends merely on the presence or absence of wind. I doubt whether this is the case." Thus Hankin came very near to the truth, but was troubled by apparent exceptions to his rule, and therefore doubted his own earlier theories, and continued by stating " there can be no doubt that the amount of leeward drift in circling differs at different times, *owing to factors not yet understood.*"

* See SAILPLANE AND GLIDER, Vol. 5, No. 2, Feb., 1934.

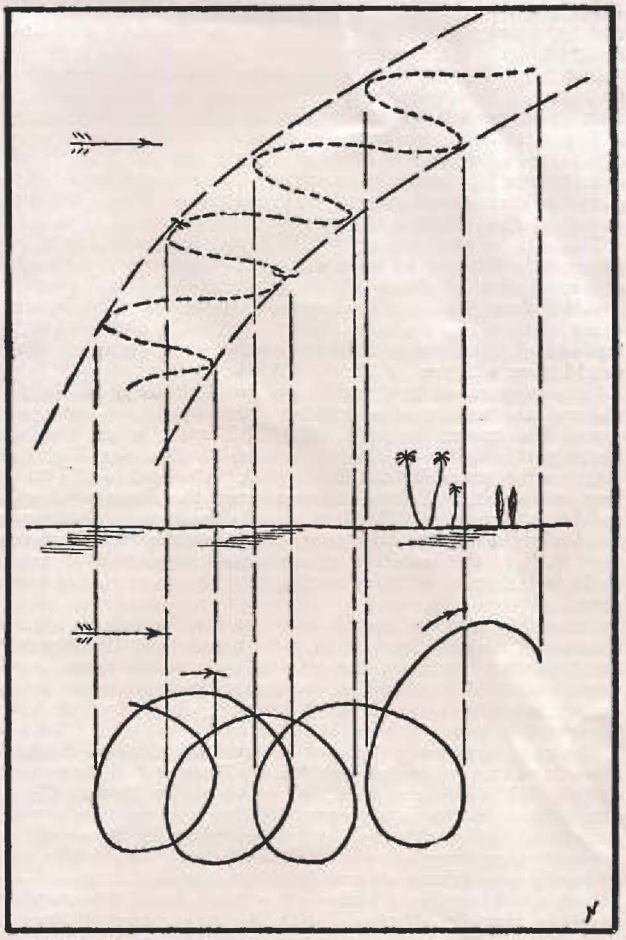


Fig. 2. Reconstruction of Thermal Soaring Flight.

Two further entries may be quoted in confirmation, which leave little doubt of the theory being true :

(P. 312).—" 26-6-12—A cluster of cheels circling. They often glided upwards unusually steeply. On the windward side of the circle a cheel was seen gliding upwards at an angle of at least 30 deg. with the horizon. While so doing it gained 2 or 3 metres height . . . and on the *leeward* side of the track it made another similar *glide upwards. This was seen several times.* . . . Wind between me and the cheels was moving leaves in a *gust.*"

(P. 316).—" 1-10-10—*Stormy wind.* . . . *Heavy cloud.* No glare. Cheels lee-looping."

Analysis of Flight Path Tracings.

Hankin devised an ingenious method of tracing the flight paths of birds, in plan, by placing a looking-glass flat on the ground, following the bird's reflection with a stylograph, and marking its position at equal time intervals by the aid of a metronome. The results, published in " Animal Flight," have been collected together and reproduced here in one diagram, Fig. I. An analysis of these should help to prove and illustrate the theories stated above, although it may be confessed that the tracings contained one peculiar feature which proved to be a stumbling block at first.

The various tracings have been re-arranged so that the wind direction, in all cases, is from the top of the page towards the bottom, and also so that the wind speed is graded to be least at the left-hand and greatest at the right of the figure. It is at once noticed that the loops, in plan, tend to open out with increase of wind speed, which is only as would be expected. The first two diagrams (a) and (b) are obviously cases of ordinary thermal soaring flight. Figure 2 shows the course (b) in plan, and from it the probable upward path has been reconstructed.

The next three curves (c), (d) and (c) are referred to by Hankin as " lee-looping," the wind speed being moderate to strong, whilst in two cases at least the sky is stated to have been clouded over, all of which seems fairly conclusive that the flights were gust dynamic.

The apparent increase of speed on the down-wind side of the tracks is easily explained by the addition of the wind speed to that of the birds, whilst it has to be subtracted, to obtain the " ground speed," on the up-wind side. The apparently longer duration of the down-wind half loop

(A—C=6 secs., C—E=3½ secs., Fig. 3) was at first a disturbing feature and presented some difficulty, but it can now be explained as follows :

One loop of path (c) has been reproduced to a larger scale in Fig. 3. Now the circle diameter of the cheel has been seen to be roughly 110 feet, and the time taken to complete it 10 seconds. In this case the duration of the complete loop can be found from the marked second intervals, B—D, and is seen to be just under 10 seconds. The circumference of the circle is then approximately 345 feet, which gives an *air* speed of about 35 ft. per sec.

The amount of drift during this same time period of nearly 10 seconds is seen to be roughly 120 feet, which gives an *average* value of about 12½ ft. per sec. A rough check is possible here; the total distance covered in the leeward glide is seen to be about 150 feet. Hankin states that the leeward glide may extend to 100 metres, or even more, which would give a figure of about 150 feet for a moderate wind. It is now possible to draw in the wind vectors, on the provisional assumption of a constant wind speed, at each point round the curve; see A'A, B'B, C'C, etc.; when the true flight path *relative to the air* is found. (See also Fig. 4.)

It now becomes obvious that at " A " the bird is still travelling *into* wind, and does not commence the down-wind glide until " B," whilst at " C " it is already flying into wind again. Similarly the change over takes place again at " D " instead of " E." If the duration of each half loop, B to C and C to D, is reckoned up, they are found to be about, if not quite, equal.

From this it would appear that the bird maintains a fairly constant air speed, and it may be noted that the apparent rapid gain of height on the up-wind side of the track, sometimes observed by Hankin, is almost certainly due to the greater steepness of the path brought about by the lower " ground " speed.

The next step was to set out the total drift due to the wind at each of the points beyond " A." Thus at " B " the wind drift is BB'=12½ feet to scale, followed by 25 ft., 37½ ft., etc., at the succeeding points. If the relation between the speeds of bird and wind have been correctly assumed, the curve for one complete circuit should close, and this is seen to be the case (curve shown dotted in Fig. 3).

Instead, however, of obtaining a true circle, the resulting curve is roughly elliptical, with its major axis inclined at some angle to the wind direction. It is possible to take some account of the variation of drift due to the varying wind speed in the different regions of the gust; thus the drift at " B," where the wind velocity is greatest, would be more than at " C," where the gust is commencing; but the maximum and minimum values and also the rates of acceleration must be guessed. The shape of the flight path, relative to the air, becomes somewhat modified under these conditions, but is not materially altered.

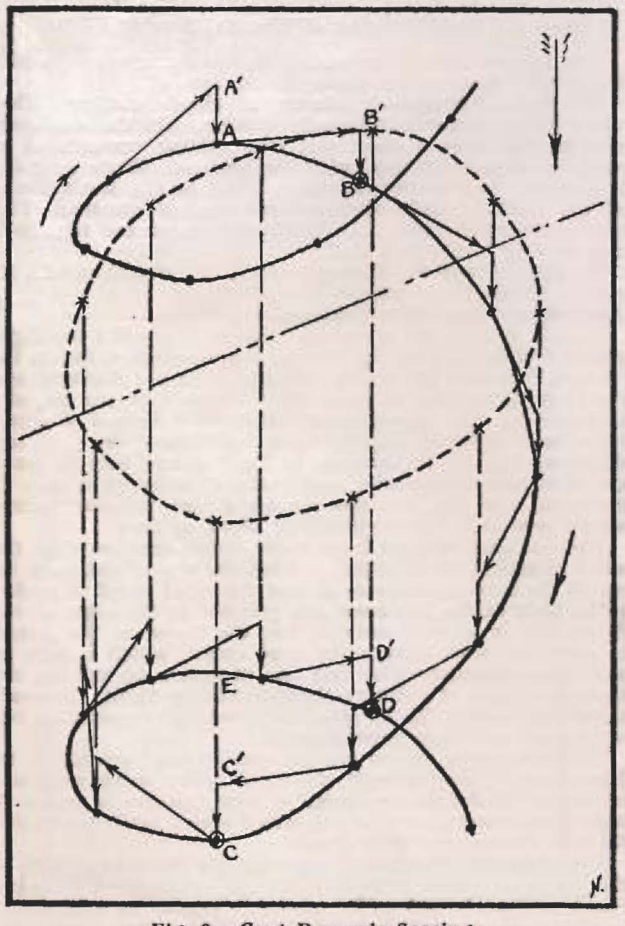


Fig. 3. Gust Dynamic Soaring.

The track of the scavenger, shown at (d) in Fig. 1, was similarly analysed, which showed an average wind speed of about 25 ft. per second, and a true flight path with similar characteristics to the previous example.

If the bird's path relative to the air is elliptical, as seems apparent, then the angle of bank, and flight speed also, would tend to increase after the points " B " and " C," and this is borne out to some extent by Hankin's statement to the effect that the angle of bank varies round the track. (See SAILPLANE, Vol. 5, No. 1, p. 7.) However, this aspect is not considered of much importance, though it may bear some relation to the duration of the gust's development.

Gust Dynamic Soaring with Gliders.

The possibility of gust dynamic flight being carried out with soaring aircraft becomes at once a question of importance and it is hoped that experiments will be made along the lines indicated, so as to establish whether, or not, the method is practicable. Experience alone can supply the answer, but it may well be that yet another method of human soaring flight is added to those with which we are already familiar.

In order that gust dynamic soaring may be properly achieved, it would appear from the foregoing that two factors must be satisfied. In the first place, a gusty wind is essential, and the time taken by the wind to increase from the minimum to maximum value should be such that the sailplane may conveniently turn through 180 degs., i.e., can describe half a circle, and, secondly, the rate of acceleration of the wind forming the gust should be sufficiently high to compensate for the sinking speed of the aircraft. Manœuvrable machines, preferably of relatively small span, such as the SCUD II or DARMSTADT WINDSPIEL, will probably be found most suited for this purpose, whilst the latter factor, although calculable, may best be determined by experiment.

If the time taken for gusts to develop could be measured on the ground before the flight commences, the pilot would know the time necessary for one complete circle, and also, from experience, the correct angle of bank for the sailplane.

The procedure, then, would be to fly directly into wind, or slightly obliquely so as to be able to turn down wind without delay, and as soon as a gust of sufficient intensity is encountered (which would be indicated by a sudden rise of the machine) to start the turn, and continue turning at the predetermined angle of bank, and so drift with the wind in circling flight. The length of such a flight would depend, apart from the pilot's skill, on the life of the gust in which the flight is being made, but should the initial gust be lost it would be possible to fly again into wind until the next gust is met and so continue with it. The present-day information on the life of gusts is insufficient to enable a definite pronouncement to be made, but the fact that the wind structure does remain fairly constant is shown by Fig. 7. Further research on this point should not be difficult and is certainly desirable.

Warning of the approach of a suitable gust could be conveyed to the pilot when already in flight by someone on the ground some distance to windward of the sailplane, who would observe the behaviour of the air by means of an anemometer, and thus the pilot could be prevented from setting off with a gust of insufficient intensity.

The Structure of Wind Gusts.

It is well to gain an understanding of the nature of wind gusts, if dynamic soaring is to be achieved. The available information is by no means complete, but considerable research has been carried out in this connection, the results having been published by the Meteorological Office.*

Wind gusts are due to either or both of two causes : (i) thermal instability, or difference in vertical temperatures, and (ii) the presence of obstacles in the path of the wind.

The eddies due to the second cause are small in comparison with the former and may therefore be neglected in this work. As, however, they are likely to act as a hindrance to dynamic soaring flight, the pilot should become familiar with their characteristics and not allow himself to be unduly influenced by their disturbing effects. Their presence tends to mask the true boundaries of the main gusts.

* M.O. 331d., " The Structure of Wind over Level Country," M. A. Gibblett, M.Sc., H.M.S.O., 1932.

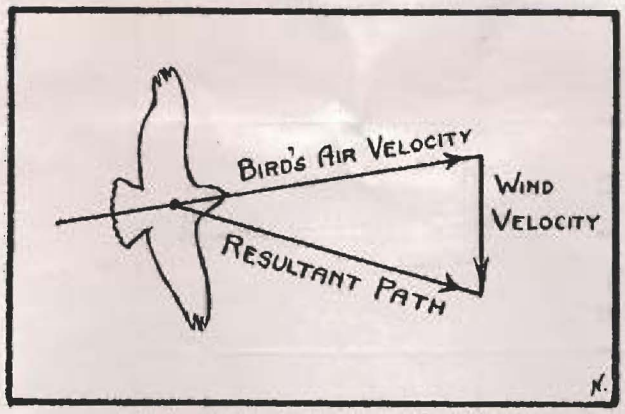


Fig. 4. Effect of Wind on Flight Path.

Durst† has attempted to picture the structure of gusts from series of simultaneous observations of wind speeds and directions at various heights and horizontal distances. According to this theory each gust consists of a large mass of air, with a more or less circular internal motion, which rolls across the earth's surface. See Fig 5 (a). The descending air is cold, whilst the ascending air is warm due to contact with the earth, and is slowed down on account of friction. It must not be thought that the air at the base of each " roll " actually moves backwards, for this circulatory motion is merely superimposed on the greater mean horizontal wind so that the actual gust speed at all points is found by combining the two separate components.

This process has been done diagrammatically at (b) Fig. 5, which thus shows the nature of the winds during the passing of these thermal gusts. If the theory holds good, then it is noticed that *in the high velocity part of each gust there is an upward component of the air's movement* which should prove beneficial to soaring flight, and there is a certain amount of evidence to show that this upwind component does actually exist.

The size of each gust cell must necessarily have an important bearing on the present problem, and this is given as of from 3,000 to 8,000 feet in length, by about 1,500 feet, or considerably more, in height. The width of the gusts is said to be somewhat less than the length.

The gust cells may be capped with clouds, see Fig. 5 (a), and since it has been observed that such cloud formations are often present during gusty weather it may be that soaring pilots are able to use these as a guide, and by their aid learn where to expect the most favourable section of the gust.

The next figure (Fig. 6) has been reproduced from " The Structure of Wind over Level Country," and shows the variation of wind velocity during the passage of a typical gust. The increase, from 20 m.p.h. to 33 m.p.h., is fairly abrupt, and is followed by a gradual falling off of velocity. The probable variation of speed due to the main gust alone has been added as a dotted line, the oscillations above and below this curve being the secondary effects due to friction eddies which were stated to be highly developed on this occasion. The part of the gust of use for dynamic soaring is seen to take about 15 seconds to pass, which allows twice this period, or 30 seconds, for a complete circle of the soaring aircraft. (Note that the cheel's period was about 10 seconds and would therefore be well within the time allowance.) Wolf Hirth measured the time taken for one complete circle by his sailplane MUSTERLE and found it to be 20 seconds*, from which it would appear to be within the range of time permissible. The new Darmstadt WINDSPIEL, specially designed for circling flight, is said to take only 10 seconds for a complete circle.

† " A Theory of Eddies," C. S. Durst, B.A., Part III of M.O 331d.

* " Wolf Hirth on Thermal and Cross Country Soaring," THE SAILPLANE AND GLIDER, Vol. 4, No. 1, 20/1/33.

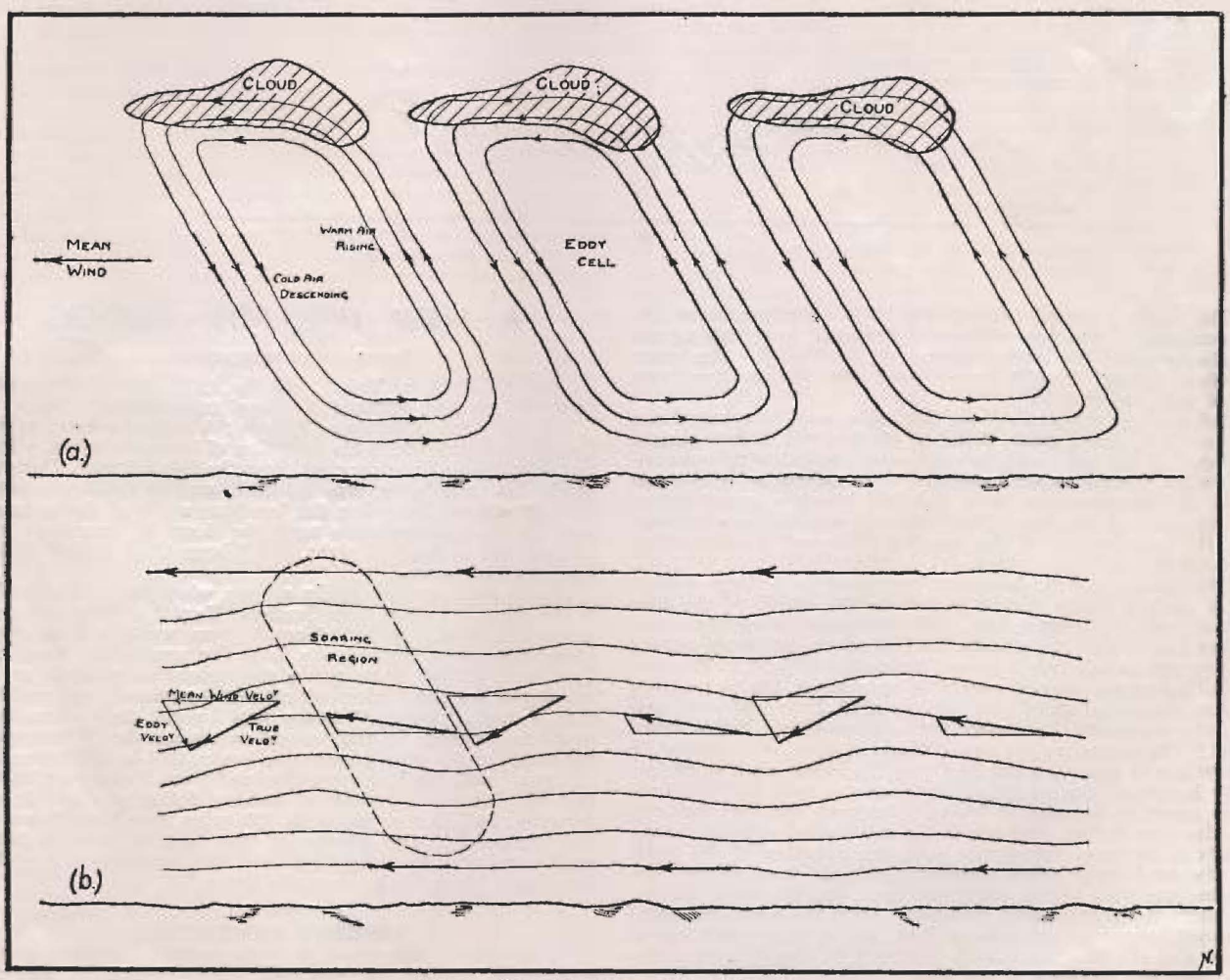


Fig. 5. The Structure of Wind Gusts.

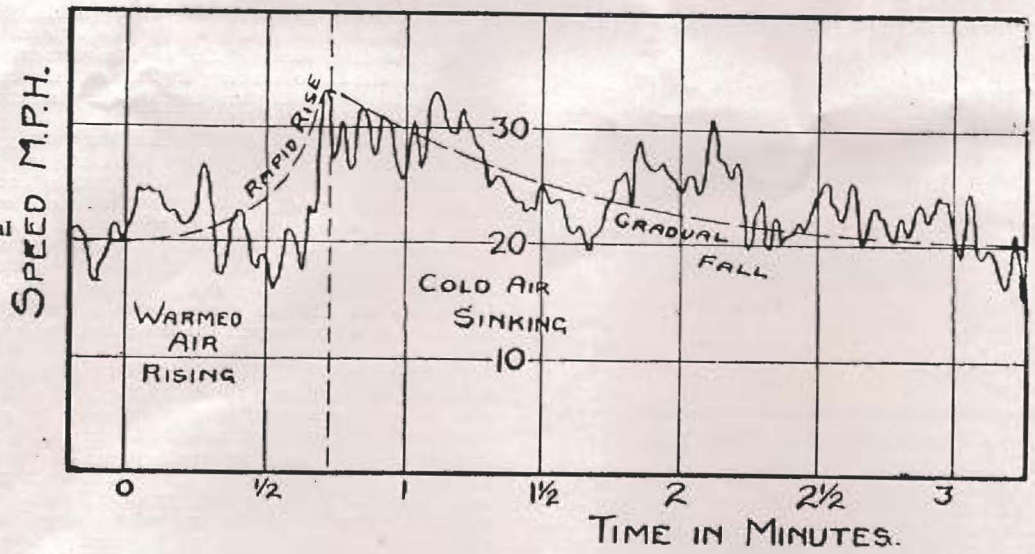


Fig. 6. Typical Wind Gust.

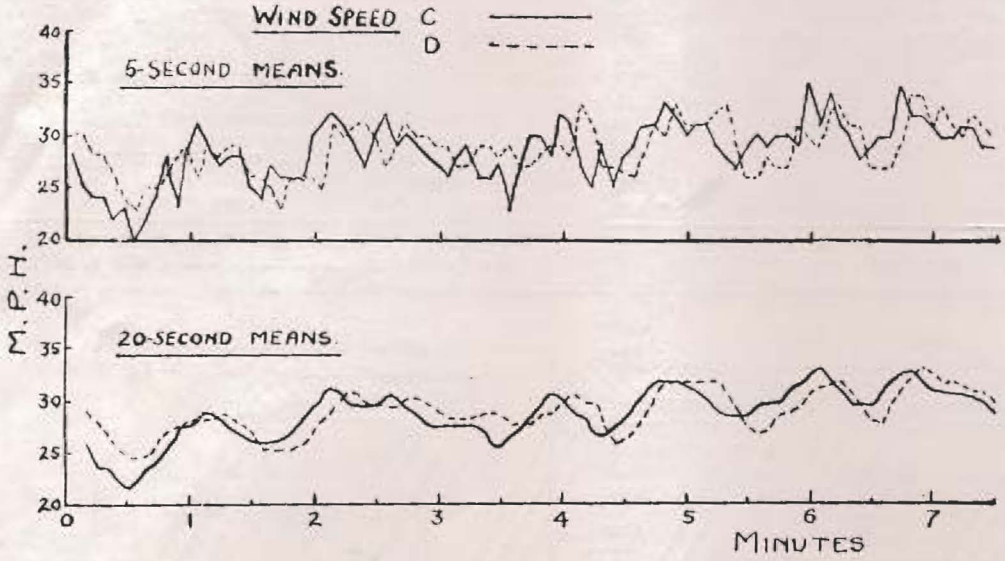


Fig. 7. Persistence of Gusts

The vertical dotted line on Fig. 6 is stated to show the appearance of the new air in the next cell, and this agrees perfectly with the gust diagram (b) of Fig. 5. The more gradual falling off of the gust speed after the peak velocity is of little interest here.

Information concerning the life of a gust is scanty, and in fact it is stated (M.O. 331d., p. 43) that " it is exceedingly difficult, if not impossible in most cases, to follow pronounced gusts on successive anemometers." It should be mentioned that the anemometers were mounted along a straight line at intervals of 350 feet. The difficulty recorded is explained by the interference of the smaller frictional eddies, which are not regularly persistent.

This obstacle was, however, overcome to a large extent by a method which tended to remove the effects of the frictional velocity fluctuations. Simultaneous readings were taken at two stations, distant 350 feet apart, and were plotted as average values over 5 second intervals. (Fig. 7.) The two resulting curves showed very little agreement, but by plotting the average wind speed over periods of 10, 20 and 40 secs., and thereby removing the shorter period fluctuations, it was found that " the curves for the two stations became very similar, if allowance is made for the fact that the mean wind at 50 feet (the height of the recording instruments) took on this occasion about 8½ seconds to travel " between the two stations. As the time period, over which the mean wind value is taken, tends to become comparable with the duration of the gust, so the total curve tends towards a straight line, so that the longer the time period used, the more are the main characteristics of the main gust modified. Only the 5 and 20-second meaned curves are reproduced here, but they are sufficient to show that the identity of each gust may be clearly traced over the observed distance of 350 feet.

(*All rights reserved.*)

A NEW USE FOR GLIDERS

FROM A CORRESPONDENT.

" Don't Listen to This " was the title of a play recently broadcast on the Midland Regional transmitter.

The story was roughly as follows: A retired colonel of the Guards had announced his intention of buying a house, which had been empty for some time, near the South Coast. Unfortunately his own house was haunted, and he could not move from it without becoming the laughing stock of the countryside. The manifestations took the form of moanings and whisperings at dead of night, and " large black birds " hovering over the house.

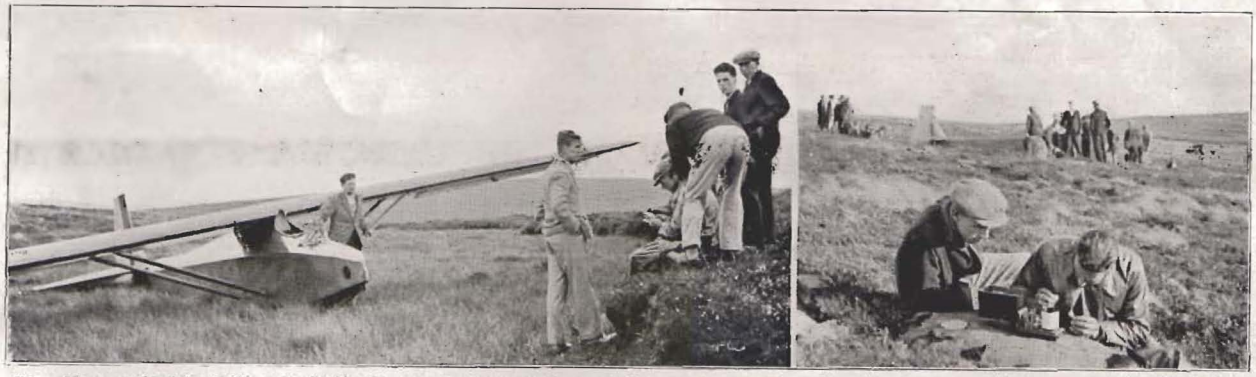
Things were getting really serious when the colonel called in the usual " Friend from Scotland Yard " who immediately discovered that a gang of crooks was using the colonel's prospetcive new house as a base for smuggling from the Continent. They were using the extensive grounds as an aerodrome for the gliders which were employed, and realised that if their " empty " house was bought their operations would be finished. So using sound reasoning, they " haunted " the house of the only prospective buyer, that is, the colonel.

" Yes," said the Man from Scotland Yard, " everyone knows that sailplanes are capable of making flights of many hours' duration, and that as many as 150 miles have been flown on the Continent. The silence of this type of aircraft lends itself admirably to smuggling, and this incidentally explains the ' large black birds ' over the house."

WITHOUT COMMENT.

" I should be surprised if there are more than a dozen serviceable gliders in England."—The Editor of *Popular Flying*

NEWS FROM THE CLUBS.



The Ulster Club's "Kassel 20" after a lucky landing at Benbradagh, Co. Londonderry. Right: an interlude for setting the barograph.

FURNESS GLIDING CLUB.

Saturday, March 3rd.—A real soaring wind, dead west. Speed 20 m.p.h. Telephones ringing and all set. Six willing workers arrived at Askam.

About 3 p.m. Stevens was launched by car on the 1932 competition site and for 30 minutes he pranced around, at times fighting for height; yet he finally made a beautiful landing near the coils of the launching rope and thus made further Club history, being the first Club member to do this trick.

A few words of advice were whispered to Redshaw, who for several months has been awaiting his chance for a "C" ticket. Off he went on his great adventure, but as we watched we were agreeably surprised to see the masterly technique brought into play. In five minutes he was soaring serenely in that stratum 300 feet above the hill, in which he seemed able to tour about in any direction and still gain height. His best was probably 600 feet above the launching point. After 35 minutes he prepared to land, and, although his first attempt was unsuccessful, it filled us with confidence; his next effort brought him sweetly to the appointed spot. Thus ended a real text-book "C" flight; no finer "C" has ever been won!

We begged our Ground Engineer to take his chance, but he was unwell and under the doctor. Stevens had another opportunity to make further history, this time by a distant flight to the bill where Magersuppe once gave us our first taste for soaring. On the return journey he got behind a promontory and lost a lot of height. He reached our site well below the breast; by skilful manœuvring he gained sufficient height to make a spectacular downwind landing, again within 20 yards of the launching point.

All this is most remarkable, seeing that these two men had not had a flight since last September.

Let this serve as encouragement to those who may begin to despair. Once you learn to soar it will never leave you. Landing at the launching point is the finest of all propaganda.

LEICESTERSHIRE AIR SPORTS CLUB.

The winter months were spent in raising funds to buy a training machine, and in searching for a suitable training ground. By the end of January we had secured a temporary ground on Mr. Scottorn's farm at Six Hills, and bought our first machine—a B.A.C.II primary glider.

On **January 28th** we had our first reward for the winter's work when our genial instructor, Mr. Headley, initiated us into the realms of gliding. Since then we have had lessons every week-end, and Mr. Headley has expressed himself as being very satisfied with the progress we are making.

Our best day to date was **Sunday, March 4th.** We had the B.A.C.II and a REYNARD glider owned by Mr. St. Jervis on the field. Conditions were ideal, and both Mr. Headley and Mr. Jervis were catapulted to a height of 70 ft. All the others made good flights and satisfactory landings. Four of our members, the brothers Adcock, Messrs. Moore and Wood, spent several evenings weekly in repairing a PRÜFLING which they secured from Lincoln. They hope to have it completed shortly after Easter.

On **Saturday, March 10th**, some of our members visited Dunstable, and, although there was little activity, we thoroughly enjoyed our visit. We had a very interesting discussion about the winch method of launching. Some of our members are of the opinion that if used carefully it is the best method for training purposes.

[The local press reports that on March 17th "a new method of launching was used," and the B.A.C.II several times reached heights of 150 to 200 feet. The longest flight was about 400 yards and lasted 65 seconds, and there were five other flights of between 50 and 60 seconds.]

A CLUB FOR PEWSEY DISTRICT.

A "Light Aeroplane and Glider Club" is in process of formation in this district. In order that all interested persons of either sex may receive a notice of the preliminary meeting which is shortly to be held, they are requested to communicate with Mr. F. C. Smith, Smith's Radio Service, High Street, W. Lavington, or North Street, Pewsey.

It was in this district that the British Gliding Association held its meeting last summer, at Huish.

SOUTHDOWN GLIDING CLUB.

The fact that no news has been sent to THE SAILPLANE recently is due to the fact that the Club felt it lacked a member with the ready pen to translate a minor bump into "oceans of lift" and to make a humble ground slide into an item of front page news value. However, a member has been deputed to do his worst and notes should appear regularly.

Conditions during **January** were disappointing, but the R.F.D. was kept busy with slides, hops and flights off the top. Much deep thought and still more talk was expended in stowing the five machines in the barn, so that they can now be disentangled before the wind finally drops and are reputed to be complete even with that last bolt, which causes so much frenzied searching.

February started well, and one pilot was heard to say that he would eat his hat if he couldn't soar—we fear that his indigestion was acute! The PRÜFLING was kept hard at it all day, Armstrong qualifying for his "C" with a nice flight of 10 minutes, which ended in fast approaching darkness, and Miss Hackworth very succesfully negotiated her first flights in this machine.

The rest of the month failed to provide a soaring wind, but the "hoppers" had more than their money's worth, and Rubick took his "A" with a good steady flight. The PRÜFLING and R.F.D. sailplane—hereinafter called "Blue Peril"—descended gracefully or otherwise from the hill.

March opened with the dance held in Brighton, and on the following day the S.W. slope was tried for the first time by Reffell in the "Blue Peril," who soared for 25 mins. This slope, although not ideal, offers distinct possibilities, and, being only a hundred yards from our N.E. slope, gives us S.W. and N.E. right on the spot.

Saturday, March 10th, saw the first public appearance of Dunning's home-designed and constructed sailplane. It speaks well for this single-handed effort that it was loaded, brought from Worthing, rigged and flown several times, all in a short afternoon. It was further tested on Sunday with promising results, and, when some slight adjustments have been made, it is hoped to send full details and a photo. It is as yet unnamed, but it is said that its mother was a DICKSON and its father was a HOLS! Another interesting item is that a pair of tapered wings for the "Blue Peril" are now becoming more than a rumour.

Please note that all enquiries for membership, etc., should be sent to A. York Bramble, 3a, First Avenue, Hove, and that information as to actual flying prospects each Sunday may be obtained by ringing up J. A. Lawford, Tel. Horsham Road 70, before 9.30 a.m.

DIFFICULTIES IN JERSEY.

A proposed Gliding Club in Jersey has, according to the local press, had difficulty in finding a suitable site. Permission to use the sands at St. Ouen's Bay has been refused.

BRADFORD AT DUNSTABLE.

Members of the Bradford Club are, with two of the Club machines, spending their Easter holidays camping on the London Club's site at Dunstable. Other Yorkshire pilots are also expected with machines.

LONDON GLIDING CLUB.

Saturday, March 3rd.—A fine soaring wind, blowing straight up the hill, with extra patches of thermal lift here and there. Seven machines were active, off and on, throughout the afternoon; usually several were in the air together. Total flying time, about 7 hours.

The CRESTED WREN was taken to 950 feet (above start) by Collins during a half-hour's flight. Later, Dewsbery flew it for 40 minutes.

Collins and Dewsbery also took turns with the passenger-carrying KASSEL, the former circling up to 950 feet on one occasion. The machine's many flights (all with two up) totalled two hours. Wills flew the SCUD II. for three-quarters of an hour and Briscoe followed with half-an-hour.

KASSEL 20 was soared by J. C. Dent for two hours all but five minutes, and several times reached 900 feet in his hands. Dr. Slater then soared it for 35 minutes.

Hiscox had two flights and Bolton one, in the HOL'S DER TEUFEL. Bolton found an extra patch of lift which enabled him to fly up-wind over the club-house, gaining height all the time.

The PRÜFLING was taken up for 25 minutes; it probably made other flights too, but we forget.

Noble and Ivanoff made three descents each in the open DAGLING, every flight commencing with a short bout of soaring.

Towards evening rapid cooling of the ground reduced the wind to almost a calm down below, in spite of a still hearty breeze up at the hill-top. Stable conditions then gradually spread up the hill, so that only those could keep up who were up already.

Sunday, March 4th.—Another grand day, with the two KASSELS, two WRENS, PROFESSOR and SCUD II. soaring freely at heights up to 600 feet, and the HOL'S puffing along with her nose hard down, and the R.F.D. plunging hectically under incomplete control. Wind S.W., oblique to the hill, about 25 m.p.h., some pretty turbulence, occasional light rain. Flying-time for the day: 14 hours.

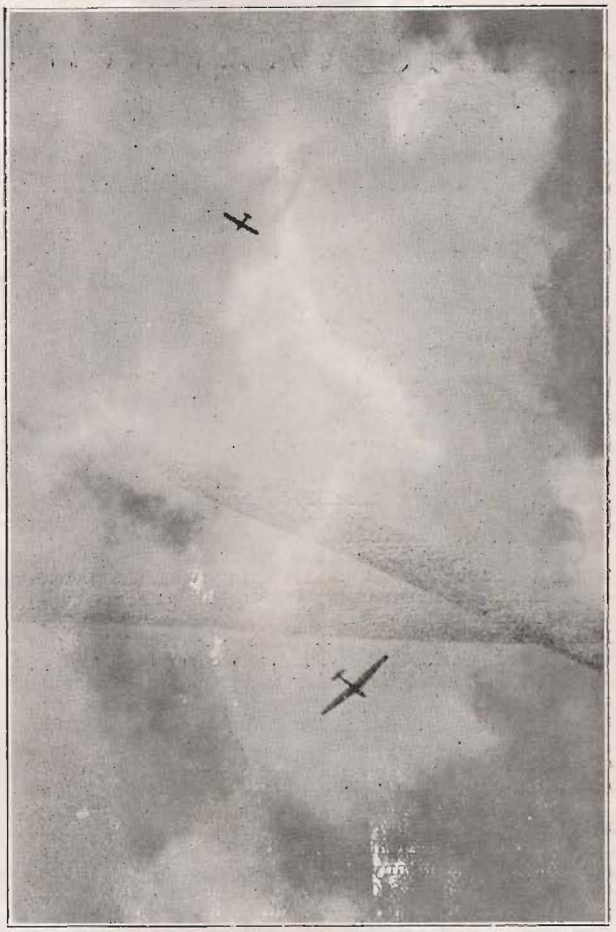
The KASSEL 2-seater carried twenty-four passengers, only once failing to land on the hill-top. Her heights were extraordinarily good, frequently up to those of the single-seaters. The irregularity of the conditions certainly put an extra premium on accurate pilotage.

The Beardmore PROFESSOR flew delightfully, as true as a hair and entirely without vice. The SCUD II. got up to all kinds of tricks in the hands of her semi-owner, watched by a family group consisting of a mellow Mr. Baynes with Die-Hard on, not across, his knee. The machine's six shots at landing on the hill-top were due entirely to the hilarity of the pilot, a temperamental fellow.

The CRESTED WREN put in three hours' soaring in four flights, trotting round and about with inimitable amiability. The WILLOW WREN made a flight of an hour after her second resurrection.

Poor old HOL'S was rather out of her depth, her speed being too low for the speed of the wind. Being forced to stand on her head in order to make headway, she was limited to the boisterous layer immediately above the hill. The open R.F.D. wisely kept out from the hill until her last flight, when an inexperienced pilot dived her on to the Bastion, whence she failed to bounce.

The KASSEL 20, though flown by an experienced power-plane pilot, fell into the booby-trap at the Bowl, smashing her nose and one wing without damaging the pilot. The Bowl is distinctly hot-stuff at the best of times, and in a S.W. wind is to be avoided until the machine is at a handsome height.



"Kassel" two-seater (above) and "Crested Wren" searching for lift under the cumulus clouds.

At least six machines have come unstuck here. Yet so many people find it difficult to learn from the experience of others.

The attendance of members was tremendous. If we had known beforehand that Marcus D. Manton was coming we would have welcomed him more fervently with, say, a red carpet, a butt of Malmsey wine, and a peal of bells. It was great to see him again. He is just the same as ever, which is plenty good enough.

Two of our pilots, one an "ab initio," have now completed flying times which add up to 150 hours. And they are still young, strong and willing, God bless 'em.

Saturday, March 10th.—Wind S. to S.E. Several members of the Leicestershire Gliding Club turned up on a visit. Having read such exciting accounts in THE SAILPLANE, they were evidently surprised at finding nothing in the air. (The best time for visits is when it is a Sunday, or a west wind, or both.) However, they gathered much information on how to use a winch, and (what is far more important) how not to

YOUR INTEREST and HELP ARE NEEDED

To secure the fullest possible development of gliding and soaring in this country.

JOIN THE BRITISH GLIDING ASSOCIATION and JOIN A GLIDING CLUB

Particulars of your nearest or most convenient gliding club can be obtained from the Hon. Secretary of the Association (please enclose addressed envelope).

The following is a representative list of Clubs possessing soaring sites:

BRADFORD AND COUNTY GLIDING CLUB. Sec: A. COX, Overdale, Boston Avenue, Kirkstall, Leeds. Sites: Hawksworth & Sutton Bank.

DORSET GLIDING CLUB. Sec: J. LAVER, 9, Commercial Road, Weymouth. Sites: Maiden Newton, etc.

FURNESS GLIDING CLUB. Sec: H. S. GROSS, 106, Greengate Street, Barrow-in-Furness. Sites: Ireleth, etc.

LONDON GLIDING CLUB. Sec: H. C. DAVIES, 13, Victoria Street, S.W.1. Site: Dunstable Downs, Beds.

SOUTHDOWN GLIDING CLUB. Sec: A. YORK BRAMBLE, 3a, First Avenue, Hove. Sites: Steep Down, Lancing, etc.

ULSTER GLIDING AND AVIATION CLUB. Sec: N. P. METCALFE. The Ulster Spinning Co., Ltd., Belfast. Sites: Magilligan Strand, Co. Londonderry, etc.

THE BRITISH GLIDING ASSOCIATION LTD.

19, BERKELEY STREET, LONDON, W.1

use it.

Sunday, March 11th.—We were not there, but learned that, thanks to the energy of Dessoutter and Hiscox, who took turns at leading the members in to meals (instead of the common practice of all going in together), 53 passenger-carrying flights were made in the POPPENHAUSEN, launched by winch. Thus was much dual instruction given, and much money earned for the Club.

Saturday, March 17th.—A tricky wind from S.W. or S.S.W., blowing almost along the hill, so that, with every launch, it was a gamble whether the pilot could reach the soaring area at the Bowl without losing all his height getting to it. Wills in the SCUD, for instance, arrived there only half-way up the hill, but then rose at once to twice the height of the hill-top. After a good long soar, he lent his machine to another, who after visiting the Bowl made a stalled landing below. Thus it came about that the PROFESSOR, and not the SCUD, set up the new British distance record on the morrow.

The PRÜFLING was soared by Richardson, who performed the difficult feat of reaching the soaring area at the Bowl in it. Ivanoff and Somerset tried to do likewise, but just failed to keep height.

The PROFESSOR had a good time in the hands of Collins, Wills and Dewsbery.

Sunday, March 18th.—This was the day of great deeds; one of those rare days on which Dunstable Downs is reduced in importance from being a first-class soaring site to performing the function of a mere stepping stone, upon which, as Blake said, "Men may rise . . . to higher things." (This isn't the usual Club news-writer: the latter was one of those who stepped off the stepping-stone.)

Upon arriving at mid-day, we had to scrutinize the skyscape with much care in order to discover who was in the air. The CRESTED WREN and the KASSEL two-seater could be made out, touring the troposphere at great heights, but with the greatest variation in altitude from minute to minute, suggesting that conditions were equally hectic in all three dimensions. Even on the ground, one dimension was more than enough. The two machines rose well to each big cumulus that swept past overhead, sometimes doing a spot of circling to help things on a bit

Collins landed with his wife after having reached 1,700 feet, and took off again with our new Indian member, who has come to us after getting his "A" and "B" at the Wasserkuppe. He was given a near view of our English clouds, and was brought down again to make way for Herr Exner (complete with camera) in the passenger's seat

About this time we discovered a well-developed cloud-street approaching from the west. It seemed a long time coming, and we waited impatiently to see what the two machines were going to do about it. As it arrived, the pilots seemed at first to take no notice, then, sure enough, Humphries took the CRESTED WREN away up-wind under the line of clouds, turned round, and came sailing back at an incredible height over our heads. There were a few moments of uncertainty whether he would turn round again or push on into the unknown, but the unknown had it, and, in the effort to keep the WREN in sight while it dwindled to a speck in the distance, we never noticed that the KASSEL had also gone off under the same cloud street.

When it, too, had become invisible, there was nothing left to watch but the PRÜFLING, which continued to function with regularity, if not with smoothness. Richardson soared it twice for 25 minutes a time; Hedges made three flights of which two were soaring; Armstrong had two good long soars on it, finding conditions hectic but instructive; Somerset took his "C" on it, and Ivanoff tried to but didn't quite succeed.

While all this was going on, Wills arrived, heard of his comrades vanished over far counties, found the PROFESSOR straining at the leash (fig.) to be off in pursuit, and took it up the hill. He was soon well away into the air and trying out one cloud after another, but when we looked round after taking our eyes off him for a few minutes, he, too, had gone.

It was not long before news of the departed came trickling in over Mrs. Turvey's telephone at the Farm. The first message was from Humphries at Hertford. He assured Mrs. Collins that he was still half-a-mile short of her husband's record of last year. His final message was "Hurry, hurry! They're tearing the poor WREN to shreds." So Mrs. Collins hurried, delivered the message at the clubhouse, and hurried back to the 'phone, to find that Collins had already announced his arrival, complete with passenger, somewhere near Chelmsford. So off went one party to fetch Humphries, while another patched up the two-seater trailer (which has been blown over more times than is good for it) before taking it off east. The former arrived back in time for a late tea; the latter not till after midnight. By a coincidence the two parties met at a cross-roads in Hertford.

To crown all, the telephone rang once more and conveyed the news that Wills had come down somewhere near Southend,



FOR COLD FRONTS

There's nothing like this grand, hard-wearing Jaeger sweater for the cold fronts (and backs) of glider pilots. In tough blue wool, comfortably ribbed, with draught proof neck and sleeves, it costs but 22/6 from any Jaeger agent. Jaeger also have an almost world-wide selection of pull-overs, sweaters and flannel trousers with special wool taffeta linings.

JAEGER

THE JAEGER MAN'S SHOP 352 OXFORD ST., LONDON, W.1

THERE ARE JAEGER AGENTS IN EVERY TOWN

evidently being stopped only by the sea from going further. To the general relief, he didn't ask for an immediate rescue party, having found a convenient barn in which the PROFESSOR reposed safely until Noble fetched it back later in the week.

Mileages: Humphries, between 19 and 20; Collins and Exner between 45 and 46; Wills, between 55 and 56. Total (counting the two-seater as double), some 167 miles.

Meanwhile, flying continued till dark with such sailplanes as still remained in Bedfordshire; the PRÜFLING and the WILLOW WREN (in which MacClement made two longish flights) both coming down finally when it was just light enough to see to land.

Week-end March 24th and 25th.—On Saturday no-one would come out with a machine to the hill but Hiscox and Bolton, who each had a glide off the top in the HOLS. Others rigged the Club's newest acquisition, the BRITISH FALCON, which the club, aided by private subscriptions, has just bought from Slingsby, who built it for his own use some three years ago.

On Sunday the wind was N.N.E. Bungy launching was indulged in, the DICKSON, PRÜFLING and FALCON being kept busy, the DICKSON was later put out of action. Of course everybody wanted to try the new FALCON; those who had once tasted its joys, even on a short hop, insisted on doing so again and again. Finally it, and the PRÜFLING, were glided down several times from the hill-top.

An extraordinary number of sightseers swarmed about, evidently attracted by last week's publicity and expected to see great things. A party of boy scouts arrived from Stevenage, having come to learn how to start a gliding group in their school. We believe they were advised to join the club and learn something about it first.

CORRESPONDENCE.

Sir,

Here is a copy of my "constructive suggestions" for the reorganisation of the British Gliding Association, sent to the Hon. Secretary in response to the new Chairman's invitation through your columns.

If you care to publish them, not as a monument of wisdom, but as a stimulant to others to make better suggestions, pray do so

DUDLEY HISCOX.

Mr. Hiscox's Suggestions.

Affiliated clubs should be controlled by being required to obey the following simple rules:

1. Use for instruction only machines of approved design.
2. Obtain the services, voluntary or paid, of a registered ground engineer to watch over and advise on condition of machines.
3. Enlist the help of a pilot of six to ten years' experience to be appoved by the Association to watch over and control instruction.

After that leave them alone to work out their own salvations, but set up an information bureau to give advice when required. Also investigate any serious accidents.

Notes on Above.—The Association's concern with airworthiness would be limited to prototypes of which it would hold working drawings.

Funds formerly handed to the Association for Certificate of Airworthiness renewals would be available for payment to the registered ground engineers. They would realise their professional reputations were involved. Self-interest being more powerful than any regulations, the result should be satisfactory.

A list of ground engineers so acting, or willing to act, would be maintained by the Association.

A similar list would be maintained of approved instructors. Men of mature years and/or considerable flying experience are most likely to insist on caution with progress.

Flying certificates "A," "B" and "C" to be issued by the Royal Aero Club; each application, however, to include a certificate from a registered ground engineer that the machine was passed as airworthy before the flight. Ditto all official record flights. This would constitute an automatic system to further ensure inspection.

SLINGSBY SAILPLANES CARBOROUGH. Tel. 660

All Types of MACHINES, MATERIALS, SPARES, TRAILERS.

PRIMARY TRAINERS of APPROVED DESIGN, COMPLETE with C. of A. £45

Workmanship backed with 20 years of Aircraft Experience

HANGARS For SAILPLANES and GLIDERS
(As supplied to the London Gliding Club).
In Complete sections for easy erection or removal. Size 50 x 30 x 8ft. : £107 10s. Any size to order.
G. ELLIS & Co., GAINSBORO ROAD, HACKNEY WICK, LONDON, E.9
Telephone: Amherst 1091 (4 lines).

"MALLITE" or "APPCO" WATERPROOF SPECIAL GLIDER- **PLYWOOD**
Manufactured by the
AERONAUTICAL & PANEL PLYWOOD, Co., Ltd.
218-226, Kingsland Road, London, E.2.
Telephone: BISHOPSGATE 5641.

SCUD
SAILPLANES



Tel. 682
E. D. ABBOTT, Ltd.
FARNHAM — — SURREY

CELLON DOPE
FOR
SAILPLANES and GLIDERS
Cellon Ltd., Upper Ham Road, Kingston-on-Thames.
'Phone No.: KINGSTON 6061. Telegrams: "AJAWB, PHONE, KINGSTON-ON-THAMES."