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EDITED BY ALAN E. SLATER



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The B.G.A. National Competitions

THE Annual Competitions of the British Gliding Association for 1937 will be held on the site of the Derbyshire and Lancashire Gliding Club at the Camphill, Great Hucklow, Derbyshire, from August 28th to September 5th, both dates inclusive.

Intending competitors are reminded of the following necessities:—

Third party insurance for the sum of at least £2,000.

A sealed barograph must be carried in the machine in all competitive events. A certificate proving recent calibration must also be produced.

All competitors must be in possession of a current competition licence issued by the British Gliding Association.

All competing machines must have a current certificate of airworthiness.

CLASSES.

For competition purposes all sailplanes entered will be divided into two classes:—

CLASS I.—Single-seater machines of unlimited span.

CLASS II.—Machines of span up to 46 feet, and all machines carrying more than one person.

PRIZES AND AWARDS.

Distance.—The Wakefield Trophy will go to the British pilot who holds the British distance record obtained between September 6th, 1936, and September 5th, 1937.

CLASS I.—£5 5s. for the longest distance flight during the competitions. £2 2s. for the second longest.

CLASS II.—£4 4s. for the longest distance flight during the competitions.

Height.—The De Havilland Cup will go to the British pilot who holds the British height record obtained between September 6th, 1936, and September 5th, 1937.

CLASS I.—£5 5s. for the greatest height attained during the competitions. £2 2s. for the second greatest.

CLASS II.—£4 4s. for the greatest height attained during the competitions.

Duration.—The Volk Cup will go to the British pilot who holds the British duration record obtained between September 6th, 1936, and September 5th, 1937.

£4 4s. in addition to the pilot (if any) who beats the existing record by the biggest margin during the meeting.

Out and Return.—The Manio Cup and £2 2s. for the best Out and Return flight by a CLASS I machine. £2 2s. for the best by a CLASS II machine.

Club Team Prize.—The L. du Garde Peach Trophy for competition among teams of three a side with a machine in CLASS I or II nominated by a gliding club.

Special Prize.—To be announced later.

Intending visitors and competitors are requested to apply as early as possible to Mr. B. A. G. Meads, Stonycroft, London Road, Alderley Edge, Cheshire, for any information and entry forms, etc., and so avoid the usual last-minute rush.

Accommodation may be booked at the Marquis of Granby Hotel, Bamford, at special terms to visitors to the competitions. Applications for reservations should be made early.

The International Meeting

IT is probably insufficiently realised how much has been done by various private individuals and firms to make it possible for a British team to be sent to the Wasserkuppe.

First, there is Lord Wakefield's magnificent gift of £500, most of which has been needed to pay for the insurance upon which the authorities insisted.

Then there is the gift of £50 by the *Daily Dispatch* of Manchester, to pay the expenses of taking out the FALCON III two-seater which that journal had already presented to the Derbyshire and Lancashire Gliding Club.

Another generous gift of £50, by Mr. Derry, to the London Gliding Club has enabled the club to pay the expense it has been put to in sending out its KING KITE sailplane. The other two KING KITES are still the property of Mr. Slingsby, whose firm built them, and who has also loaned his own FALCON III to the Derbyshire and Lancashire Club while theirs is away.

The members of the team, both pilots and assistants, have almost without exception gone out at their own expense. Many of them (especially Mr. Hiscox) have, in addition, borne other expenses in connection with the provision of cars and trailers.

These facts should be borne in mind when comparing the achievements of the British team with those of their competitors who have by no means had to rely on private initiative for their participation in the meeting.

From Here and There

Captain Reitsch.—Fräulein Hanna Reitsch, the famous German sailplane pilot, has been appointed Flight Captain by the German Air Ministry. She is the first woman to be given such rank.

* * *

Only a Rumour.—In an interview with the *Sheffield Independent* Mr. B. A. G. Meads, chairman of the Derbyshire and Lancashire Gliding Club, has denied an alleged rumour that the club ground is to be used as a civil and military aerodrome.

* * *

Soaring Hay.—On June 24th, according to the Reading correspondent of the *Daily Herald*:—"Labourers pitching hay in a meadow at Bradfield, near here, paused to wipe their foreheads while they surveyed their nearly completed task. The next moment they jumped with amazement; the load was vanishing before their eyes. It was swept away in a solid mass by a whirlwind and carried hundreds of feet into the air. Part of it came to earth nearly a mile away."

* * *

Longest Ridge-Soaring Flight.—A flight of nearly 160 miles along a continuous ridge by Mr. Lewin B. Barringer, the American "Silver C" pilot, was mentioned in the March issue of THE SAILPLANE, and the route of the flight shown on a map published in the April issue. In this issue we publish a detailed account of the flight, reproduced from *The Sportsman Pilot*, which Mr. Barringer has kindly sent. Although the official distance was 154.54 miles, the actual distance covered, owing to slight curvature of the ridge, was 210 miles.

* * *

German Gliding Organisation.—The original German gliding organisation, the *Rhön-Rossitten Gesellschaft*, was early in 1933 merged into the newly-formed *Deutsche Luftsport Verband* (German Air-sport Association). This body has now been dissolved, and its place has been taken by a new organisation, the *Nationalsocialistische Fliegerkorps* (N.S.F.K.), whose members will wear the Swastika on the left arm. The German Soaring Research Institute (D.F.S.) at Darmstadt will presumably become a sub-section of the new body, as it was of the old. Major-General Christiansen is to be the head of the new organisation.

* * *

Supply Parachutes Soar.—During the recent military operations in Waziristan, British bomber transport aircraft were dropping supplies by parachute to the Bannu Brigade on May 13th when two of the parachutes, after opening, began going up instead of down. According to a paragraph in the Delhi *Statesman*, sent to us by Mr. M. V. Laurie: "It appears they had been caught in an upward current and these parachutes were carried past the air craft from which they had been released to a height of approximately 10,000 feet, when they were carried by a cross current well away from the camp and no doubt have now been found and suitably dealt with by enemy tribesmen."

R.I.B.A. Exhibition.—The Airports and Airways Exhibition, organised by the Royal Institute of British Architects, will be at Liverpool (Walker Art Gallery) from July 4th to August 7th, and at Birmingham (Museum and Art Gallery) from August 23rd to September 18th. The exhibition includes a section dealing with gliding.

* * *

Riedel in America.—Peter Riedel, who at present has a post in South America, is spending his vacation attending the U.S.A. National Soaring Contest at Elmira, where he is flying a RHÖNSPERBER sent over for his use by the Aero Club of Germany. The *Hamburger Fremdenblatt* of June 27th reports that Riedel has already made a flight of 107 miles from Elmira, during which he climbed to 2,100 metres (6,900 ft.), thus exceeding the American height record for soaring flight by about 225 metres. Before going to Elmira, Riedel carried out a soaring flight above the buildings of New York.

* * *

Crossing the Alps.—On May 30th, during the recent international gliding meeting at Salzburg in Austria, five German sailplanes succeeded in crossing the Alps. This is stated to be the first time the southern chain has been crossed in soaring flight; previous flights have been over the main chain. The farthest distance was achieved by the pilot Karsch in the two-seater MILAN, accompanied by Klein; he landed, after a flight of 122 miles, in Farra d'Alpago on the plain of the Po river. In the RHEINLAND, Kraft flew 110 miles and landed near Udine. Fräulein Hanna Reitsch was third with 100 miles, landing in Pieve di Cadore; she flew a SPERBER. Ruthart in the WIPPERSTERZ landed in the same place, and Haase in a MINIMOA flew 81 miles to the Starnberg Lake near Munich. We hear that the only other pilot to go off on a distance flight was Fräulein Emi von Roretz, who is well known in England. Next month we hope to get details of these flights.

Instruction Camps

Derbyshire and Lancashire Gliding Club: Members' training camp from July 17th to 25th. Apply to C. Kaye, 63, Clarkhouse Road, Sheffield.

Midland Gliding Club: July 30th to August 8th, and September 6th to 12th. Apply to D. C. Timings, 32, Bunbury Road, Northfield, Birmingham.

Yorkshire Gliding Club: August 1st to 14th. Apply to H. T. Blakeston, Spellowgate, Driffield, Yorks.

London Gliding Club: Anglo-German Gliding Camp, August 7th to 16th. (As we go to press, we hear there is a possibility of Frl. Hanna Reitsch attending this camp.) Public Schools Camp, September 7th to 16th. Apply to H. E. Hervey, London Gliding Club, Dunstable, Beds.

All of the above except the first are open to non-members.

For instruction courses abroad, see THE SAILPLANE for May, 1937, page 106.

To the Wasserkuppe

WHEN the Wilson liner s.s. Accrington sailed from Hull on Saturday, June 26th, it was a great occasion in the history of British gliding. Roped to the decks were the five trailers containing the British sailplanes entered for the International Gliding Competitions at the Wasserkuppe in Germany: the HJORDIS, three KING KITES, and a FALCON III. There were also five cars to tow them across Germany, also roped down, and a party of ten persons to accompany them (not roped down).

The North Sea was calm and free from bumps, so everything reached Hamburg in good order at 5 a.m. on June 28th. Here practically the entire morning was spent getting the sailplanes, trailers, cars and baggage through the customs, a feat which, by some miracle, was accomplished without loss of temper on either side, and the long procession departed over the bridge from docks to town with the best wishes of the Customs Department ringing in its ears.

After causing several traffic blocks in the streets of Hamburg, we at last managed to escape into open country, skilfully guided by the shipping company's representative, and soon found an open-air restaurant where we could mop our brows, have our first taste of German food, and watch the inquisitive crowds collect round the long "caravan" parked in the road outside. A group of friendly naval officers very kindly put us wise of a route to the Rhön which would include two stretches of the wonderful new auto-roads, upon which some of the party were able later to get up speeds of 60 to 70 m.p.h. without their swaying trailers getting quite out of control.

The first night was spent at the little town of Elze, between Hanover and Göttingen (where the wing-sections come from), and a convenient covered market-place, complete with night watchmen, was found for stowing the trailers and cars.

All along the route the party met with the friendliest reception, though until we neared the Wasserkuppe few people seemed able to guess what was in the trailers. When told, they did at least know what a sailplane was —which cannot be said of the captain of our ship, who had referred to them as "these here aeroplanes."

The heavy two-seater, pulled by Mr. Fenton's 13-year-old Bentley, got rather left behind on the second day, and, after a narrow escape from being smashed to matchwood by a lorry under a narrow railway bridge, fetched up at Gersfeld the second night. The rest of the party, however, were able to reach the Wasserkuppe in time for a look round the place before sampling the extensive new washing facilities, including shower baths, recently installed, and retiring to the dormitories apportioned to the British team. Never having seen the place before, they were completely bowled over by the vastness of everything as compared with even the largest gliding centre in their own country.

As this issue of THE SAILPLANE goes to press just as the competitions are beginning, a detailed report will have to wait till next month. Up to the time of writing, all the expected teams have turned up except the Jugoslavs and Italians; the former are expected half way through the meeting, but the latter are not sending their single entry after all. The Poles were here first, the British next, then the Germans, followed by Austrians, Czecho-Slovaks and Swiss.



The five trailers containing the British entries for the international competitions at the Wasserkuppe, assembled at Kirbymoorside before setting out for Hull on June 26th.

[Photo by F. N. Slingsby.

On the first day of the competitions 10 cross-country flights were made, the pilots being five Germans, two Poles, one Swiss, one Austrian (Emi von Roretz, who flew to Hameln), and one British—P. A. Wills, who went 45 miles in the HJORDIS to Langensalza. Dittmar and Hanna Reitsch reached Hamburg.

LIST OF TEAMS.

Type of Sailplane.	*Identification.*	*Pilot.*	*Competition No.*
Poland.			
ORLIK	SP-861	Baranowski	1
CW 5/bis/35	SP-995	Zalski	2
ORLIK	SP-1002	Brzezina	3
PWS 101	SP-1005	Petérek	4
PWS 101	SP-1006	Mynarski	5
Switzerland.			
S 18 T	Nr. 213	Godinat	6
SPYR III	Nr. 109	Sandmeier	7
MOSWEY II	Nr. 204	Müller, Heiner	8
SPYR III	Nr. 39	Baur, Willi	9
Czecho-Slovakia.			
TULAK 37	OK-gen. Cecek	Pitrman	10
TULAK 37	OK-Cechy	Silhan	11
DUHA II	OK-Mario	Chlup	12
VSB. 35	OK-Olomouc	Steyskal Prachar	14
Great Britain.			
HJORDIS	G-GAAA	Wills, P. A. Neilan	15
KING KITE	G-GAAB	Neilan Watt	16
KING KITE	G-GAAC	Watt Smith	17
KING KITE	G-GAAD	Hiscox	18
FALCON III	G-GAAE	Mrs. Price, J. Murray Fox	19
Germany.			
MG 13	D-14-150	Schmidt, Kurt	20
MINIMOA	D-11-94	Späte	21
MOAZAGOTL	D-4-602	Hofmann	22
FAFNIR	D-11-78	Dittmar	23
REHER	D-11-95	Frl. Reitsch, Hanna	24
Austria.			
RHÖSADLER	OE "Florian-Geyer"	Fiedler	25
CONDOR II	OE "Tirol"	v. Lerch	26
SPERBER	OE "Ziehrer"	Frl. v. Roretz	27

The Longest Ridge-Soaring Flight

By LEWIN B. BARRINGER

FOR several years I had thought of making a soaring flight down the Blue Mountain ridge in Pennsylvania. Many power flights across this long continuous "hog-back" mountain had convinced me that here, right close to home, we had distance soaring possibilities perhaps second to none in the entire country.

Although I had so often thought of soaring along the Blue Mountain ridge, for a long time I could locate no cleared place on top of the ridge where a take-off could be made. Early in March, 1935, while I was flying on a reconnaissance mission with one of the National Guard "Douglas 0-38's," my course took me past the town of Ellenville, N.Y. Above Ellenville is a good sized mountain which forms the end of the ridge. There, at the one place where it could do me the most good, I sighted a small field high on the mountain side, overlooking the valley and the town.

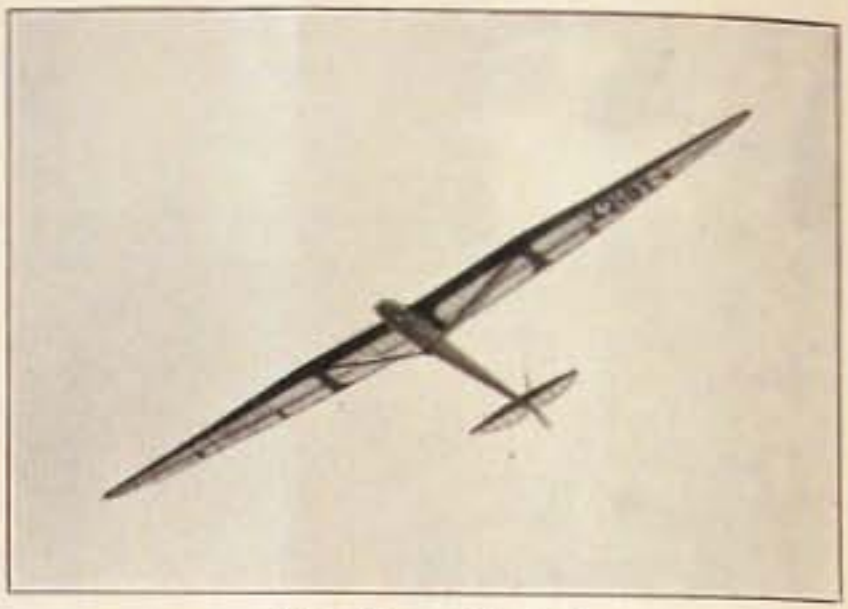
As soon as I was able I drove the 150 miles up there from Philadelphia and found that a good road led to the small field, and that it was in nearly every respect an ideal take-off site. From then on I began to make my plans. I had gathered data about wind directions and velocities which had been recorded for that locality over a period of 22 years. From these I determined that March and April seemed to have the most days of strong N.W. winds. I then dug up the records of those months and found the hourly direction and velocities for March and April of the preceding year.

It was, however, a combination of circumstances other than meteorological that finally decided the date for the soaring expedition to Ellenville. The Joint Persian Expeditions invited me to head their newly formed aviation department. My acceptance of the position necessitated my sailing April 30th for a two-year sojourn in Persia doing aerial survey work. Hence, if the soaring flight was to come off at all, it had to come off more or less immediately.

Arriving in Ellenville Saturday, March 31st, I met Earl Southee, who was to supervise any attempt at setting a record, and the three other members of the crew. We spent the next two days of "dud" weather preparing the shock cord, making trial launches into the valley, and in other ways getting all set for the first flight off Mt. Mongola, 1,400 feet above the valley and 1,720 feet above sea level.

Two of the greatest meteorologists in America, Dr. Karl O. Lange, of M.I.T. in Boston, and Dr. James H. Scarr, of the U.S. Weather Bureau in New York, were to wire me when the most propitious weather conditions were on the way. As we ate lunch on Tuesday, the 2nd, two telegrams from these gentlemen arrived simultaneously, and we made ready to take off next day at dawn. The sailplane was towed up the mountain on its trailer and stored in a barn near the small take-off field.

Up at 3.30 a.m., we had a bite of breakfast and drove up the mountain. The sailplane was hauled to the field, assembled, checked, and all ready to take off by the time it was light enough to fly. It was cold up there, and the fire we built served both to warm us and to show the wind direction and velocity. The direction was perfect, due N.W., but the velocity, not over 5 m.p.h., was too slight for take-off. Gradually, though, it picked up, and by shortly after eight we were all set to take off.



The "Albatross" in flight.
(Photo by Fred T. Loomis.

I strapped on my 'chute, climbed in the narrow little cockpit, and had the hood fastened down over my head. With the tail of the ALBATROSS II. held by a rope one end of which was tied to a car and the other end held by three men, the shock cord was stretched out by my Ford roadster. The four strands of ⅝-inch rubber rope were stretched to nearly double their length; the ship quivered with the strain. As Earl Southee gave the signal "Let's go!" there was a snap and the ship stayed right where it was as the shock cord let go and crashed against the rumble seat of the Ford. The metal ring on the tow hook had snapped in two!

Substituting another ring we made ready to try again. This time Earl Southee's cry of "Let's go!" brought immediate and powerful results. With terrific yet smooth acceleration the big sailplane shot forward. Almost before I could think I was making more than sixty miles an hour and was well out over the edge of the mountain. I immediately felt the lift and began climbing steadily as I made several "figure eights" along the face of the mountain. Here, although unknown to me, a remarkable thing happened. The many spectators saw a small hawk go after me, and, apparently infuriated at having his soaring domain invaded by a strange new bird, he actually attacked my right wing tip!

In no time, it seemed, I caught a thermal and spiralled up 2,000 feet on it before heading down the ridge.

The first thirty miles were slow—taking me nearly two hours, for the wind was quite variable. I kept going on slope-wind most of the way, being helped a bit now and then by weak thermals.

Passing the fire tower beyond Port Jervis, I was only about a hundred feet higher than the lookout,

and when I shouted at him, he almost fell out of his perch. Thermal lift carried me past the bad wooded stretch between there and the Delaware Water Gap. I soon found myself flying along the ridge overlooking the Delaware and the Shawnee Golf Course. The Gap itself looked very wide and formidable, and I wondered how I should get across it.

Just about then I caught a thermal that took me up at ten feet per second as I spiralled steeply to stay within it. From 3,000 feet the Gap looked insignificant, and I sailed over it, in fact miles past it, before I was down slope-soaring again.

The next twenty miles were the best part of the trip. The ridge was unusually even and a strong cross-wind blew all along it. Putting the nose down, I watched the air speed go up to 55 as I kept the rate-of-climb at zero, and sailed along in the steady slope wind about 500 feet above the ridge. It gave me a chance to relax a bit and eat a bite of lunch. Ted Bellak, my crew chief, had wired over my head a thermos full of hot coffee with a rubber tube leading down, and all I had to do when I wanted a drink was to put the tube in my mouth and press a valve.

Along about mid-day, four and a half hours out and 90 miles on the way, things began to look bad. The wind died down. I had to drop well below the ridge. It was all wooded below, and I had a few very anxious moments as I glided across some foothills and well down into the valley. It looked as if I was all through, but I decided to hang on to a slope on a low foothill as long as I could.

Then, thank Heaven, the wind picked up again. Carefully I worked my way up to the top of the ridge once more, soon caught a strong thermal which boosted me first at ten feet per second and then *seventeen feet per second!* I climbed it to the cloud level, over 5,000 feet, and continued on my way. The temperature (a record of which I kept on a pad strapped to my right knee) was 39 degrees along the ridge and 30 degrees at the top of my climb. They call them "thermals," but there was certainly nothing warm about them that day!

So the hours passed rapidly as I continued on slope winds and thermals. Although I was cramped in that tight little cockpit, I was far too interested and excited really to get tired. I know nothing quite so thrilling as a soaring flight such as this. The thought that I was well past the 136-mile mark which stood three years as a world's record was encouragement enough.

Six hours and ten minutes out, at 2.40, I passed Manada Gap. It reminded me of the time during the last summer's National Guard encampment when I flew one ship of a three-plane formation which made a surprise attack at dawn on the infantry at Indiantown. We had flown through this very gap, west down the valley, skimming the tree tops, and then through Indiantown Gap completely to surprise the ground troops who had neither seen nor heard us coming. What a nice surprise attack I could have made this time, sailing down on Indiantown on silent wings!

After a thermal had carried me across this gap, my mind was quickly brought back to present realities when I began steadily to lose out as the wind shifted gradually to the west. I stretched it as far as I could, my heart in my throat, as I skimmed the tree tops. Then came the landing—quite suddenly. I had decided to land in a field half a mile away when a down-draft off a low hill caught me, and I put the nose down and dived at the up-slope. The airspeed showed close to sixty as I put her on the ground, pushed the wheel full forward and jammed on the brake. I came to a dead stop in 40 feet.

I had made an arrangement with Earl Southee and Ted Bellak whereby they started after me as soon as I was out of sight. They were to "check in" at the Western Union offices of five principal towns along the route. I was to telephone the one nearest to my landing place and leave a message directing them where to come. This worked so well that when I called from a farmhouse near Piketown, Pa., seven hours after taking off from Ellenville, now 220 miles distant by road, Earl and Sully arrived within an hour, and Ted, with my car and the trailer, half an hour after them.

Measuring on my map the air line distance from Ellenville I found it to be approximately 160 miles. Allowing for the inevitable error there was a bare chance that I had the necessary 5% over Dick duPont's National Record of 158 miles. Unfortunately the Press immediately announced a new record although I told them I would not know for sure until my barograph had been calibrated by the Bureau of Standards a week or more later. The Bureau finally announced my distance as 154·54 miles.

I look on every carefully recorded soaring flight as a contribution to the science of aeronautics and meteorology. As such the conclusions obtained from



Lewin B. Barringer standing beside the "Albatross II" after making the flight of 154½ miles described in this article.

it are important. The chief conclusions of this flight which, as far as I know, was the longest ever made along a continuous ridge, are as follows:—

1. It established the Ellenville site, which I discovered, as one of the most promising in America.
2. It proved the value of careful study and preparation beforehand.
3. It showed that very strong thermals exist in sub-freezing temperatures. (Some were stronger than any I have ever encountered in the summer-time.)
4. Although thermal soaring played an important part in this flight, it can truly be called a ridge-soaring flight as most of the distance was made in pure slope-wind and the thermals utilised developed because of the ridge.
5. Due to the fact that I was often bucking a cross headwind, I would undoubtedly have made much greater distance in a sailplane of cleaner design and higher cruising speed such as we have to-day.

I am hopeful that someone else will follow me down that route. If not, perhaps I'll have to try it again myself.

The General Design of the "King Kite"

FEW high performance sailplanes had been built in England up to September, 1936, when the work on the design of the KING KITE was begun, but some lessons had been learnt from experience with HJORDIS.

The new design was to be made as small and handy as was consistent with high performance, and robust enough to be suitable for the private owner who wants to fly on different sites. The new requirements were that the machine should be easy to fly in clouds, and that it should not be liable to drop a wing on the ground when being taken off by winch or by aeroplane. And, owing to the increase in the length and duration of flights, the cockpit was to be comfortable and the instruments were to be easy to see.

The chief differences between HJORDIS and the KING KITE were as follows: Considerably reduced taper, less cambered wing section, landing flaps, gulled shoulder-wing, fixed tailplane, larger instrument board, and larger cockpit for the pilot.

As far as performance was concerned, it was desirable to have a greater speed range than HJORDIS, at the same time keeping the sinking speed as low as possible. This consideration involved a smaller twist on the wing, so as not to lose efficiency at high speeds; this in turn required less taper to avoid loss of lateral control near the stall. A twist of 3½ degrees was decided upon and a taper ratio of 2.5 : 1. A span of 51 feet and a root chord of about 4 feet gave an aspect ratio of about 18.5; a slight reduction on the 21 of HJORDIS.

The root wing section was NACA 23021, transforming into NACA 4412 at the tip. The reason for choosing NACA 23021 for the root section was that it combined a good all-round performance with an extremely low moment coefficient; an important consideration since high diving speeds had to be catered for. NACA 4412 gave the desirable qualities for a tip section; high maximum lift and a gentle stall.

The comparatively high stalling speed and flat glide were likely to be troublesome for landing in small fields, so it was decided to fit landing flaps, since these, by increasing the drag of the wing proportionately more than they increase the lift, steepen the glide as well as reduce the stalling speed.

Fortunately tests had been carried out by the "National Advisory Committee for Aeronautics" of America with plain and split flap on NACA 23021. These tests appeared to show that, provided the hinge gap was effectively closed, the results with plain flaps compared quite favourably with those obtained with split flaps of the same size, so the former were chosen, as they presented a simpler proposition from the manufacturing point of view.

Another advantage of plain flaps was the probability of being able to use a small flap depression for quick take-off, a very important consideration with aero-towing, since for small deflections this type of flap gave an increase in lift for a small increase in drag. Other possible uses, which were suggested, were to use a small downward deflection for lowering the sinking speed at low speeds and a small upward deflection for the same purpose at high speeds. At this stage perhaps it is worth mentioning that the flaps are not intended for getting out of muddles in clouds.

New information on wing-fuselage junctions encouraged the use of a shoulder-wing instead of a neck. The resulting low position of the wing rendering a gulled wing a practical necessity rather than a fashionable extravagance.

Stability was clearly a very important factor for cloud flying. In view of this, a fixed tailplane was fitted to the KING KITE instead of the pendulum elevators on HJORDIS.

The conditions for which the KING KITE was intended to be used made it essential for the pilot to be comfortable and to have a good view, and also to have easy exit with a parachute in an emergency. The necessary freedom was obtained by moving the dashboard further forward than was normal practice and enclosing the cockpit in a celluloid "greenhouse." The "greenhouse" conformed to the basic shape of the fuselage; this, though increasing the frontal area over that given by the conventional blister, had the advantage of giving a better streamlined shape and a rather less "made to measure" feeling about the cockpit.

The fuselage closely followed the KIRBY KITE form except for a rather fatter nose, to give room for the large number of instruments required for blind flying.

Wooden construction was used throughout, the bending load on the fuselage being taken by the longerons, and torsional loads by the ply skin. The wing was of the single spar type; the spar, located at 0·3 chord, taking bending, and the torsional load being



The first "King Kite" at Dunstable; pilot, D. G. Hiscox.
[Photo by I. Parold.

taken by the ply covering, which was carried back to the rear spar; the front and rear spar and the ply between them forming the drag bracing of the wing. It was necessary to put the ribs very close together in order to keep the shape of the section and develop the full stress in the thin ply covering. Nearly the whole trailing edge was taken up with either flaps or ailerons. The latter were covered with fabric and stiffened by diagonal ribs in order to avoid any tendency to flutter due to concentration of weight far from the hinge line. Owing to the large torsional loads on the flaps they are covered with ply.

A report on the performance of the machine had already been published in THE SAILPLANE; though spinning trouble has been met since then which has needed a new rudder. Spinning trials with the new rudder have been done and it is satisfactory. Also, experiments are still being made to find the flap deflection which gives the best performance when flying slowly.

Some preliminary performance figures have been obtained, and an actual performance curve is being plotted as the figures come in. It is not possible to give any definite information about the performance until a consistent set of figures has been secured, but it seems likely that the KING KITE will be capable of doing good flights.

Mr. H. C. Smith, who did the check of the stressing for the British Gliding Association, gave a great deal of valuable help and advice, and the success of the machine is largely due to him.

G.M.B. AND P.S.

An International Week-end in Yorkshire

FROM A CORRESPONDENT

THE Yorkshire Aeroplane Club held an International Rally on the week-end of June 5th and 6th and the Yorkshire Gliding Club was asked to co-operate. Most aeroplane rallies are much alike, and it is not too much to say that the gliding part of the programme really distinguished the meeting from its predecessors.

On the 5th a flying display took place at York Aerodrome, and a demonstration of the KING KITE on an aero-tow was meant to be one item. Unfortunately, Wills, trying to take the machine off from Welburn Aerodrome in grass waist-high, found that a mid-wing machine cannot be aero-towed out of long grass. One wing inevitably lifted out of the herbage before the other, and the machine immediately and irrevocably cartwheeled. Damage was fortunately of a minor nature, but put the machine out of action for the week-end, so he was towed over on a KIRBY KITE.

A perfectly straightforward aero-tow, release and landing produced a storm of applause from the public, which had been far less impressed by some very active aerobatics on various preceding aeroplanes.

On the Sunday, the guests were brought by char-a-banc up to Sutton Bank. As usual, the wind was wrong, a very light southerly breeze rendering soaring on the South Slope just possible for a few minutes at a time. However, the foreign guests, French and German mostly, were given circuits on the FALCON III. two-seaters, Slingsby flying his with an accuracy that astounded and even alarmed all; the approach being over the heads of the spectators.

Herr Oskar Ursinus was amongst the visitors. His impressions are not recorded, though there is some doubt whether he went away under the impression that the KIRBY KITE was the KING KITE, shortly to be seen at the Wasserkuppe. Miss Heron-Maxwell was there, back from some months' thermal soaring in Germany. She did a parachute descent on Saturday, much to the approval of the spectators. On Sunday she was winch-launched for a circuit in the KIRBY KITE. We hear she is going to do some soaring in England this year, and hope to see her at the B.G.A. competitions.

The view from Sutton Bank on a fine day must alone have made the day memorable to the visitors, who departed in the evening with requests that the event be made an annual one.



Herr Oskar Ursinus, "Father of Gliding" (with pipe and hat), at Sutton Bank on June 6th, with Herr Schumacher (his son-in-law) and Mr. and Mrs. P. A. Wills.

Wolf Hirth on Thermals

KNOWING that several of his countrymen were visiting the Yorkshire International Rally on June 5th and 6th, Wolf Hirth could not bear to remain on the other side of the Channel, so over he came on the Saturday by aeroplane to Heston, and the following day saw him at the London Gliding Club—his first visit to Dunstable for over four years.

In the days when the international "Silver C" certificate was first invented, and only three people in the world possessed it, Herr Hirth was one of the three. It was he, in fact, who invented the technique of getting up in "pure" thermal currents under a clear sky; this feat he performed for the first time during a visit to America early in 1931. So when, in the evening, he was good enough to give the club members a talk on high-performance soaring, with special reference to the forthcoming Wasserkuppe competitions, what more natural than that he should concentrate mainly on the subject of thermal currents?

Like many experts, Hirth believes in finding thermals by looking at the variometer rather than by theorising about where they are likely to rise from the landscape below. Nevertheless, there are certain local signs of probable thermal activity which experience has shown to be useful. For instance, when gliding out from a hilltop in calm weather to look for thermals over the valley below, as pilots were doing in last year's Wasserkuppe competitions, a useful sign was the onset of a little wind and the appearance of a little fluttering in the trees—a signal that a thermal had started.

The best place to find thermals is over cornfields when the corn is almost ready for cutting but not yet cut. Cornfields are particularly good when the sun is shining on them on a day when there are many cloud shadows about. Ploughed fields, which have a reputation for producing thermals, are often wet, in which case they are not much good. But in that part of Europe in which the Wasserkuppe is situated, there is nearly always a thermal over every village.

Although wooded country, as a rule, is considered bad for thermals, they are found over the pine woods of Northern Germany, the reason being that there is sandy ground under the trees, whereas the parts around the wooded areas may be damp, especially where lakes abound.

Hirth discussed the triangular out-and-return course which has been set for the international contest. One point of the triangle, the Dammersfeld mountain, is no good for thermals, being covered with trees, but one can glide from there to Gersfeld and arrive at a sufficient height to catch a thermal from its buildings.

Coming to theoretical matters, Wolf Hirth discussed his theory, by no means universally accepted, that thermal currents are not continuous but rise in the manner of bubbles, which are usually elongated vertically, e.g., a thermal may be 1,500 feet high and some 400 to 500 feet wide. The distance between one thermal and another varies greatly, but is usually from ½ to 1¼ mile. The frequency of thermals arising from one spot also varies much according to the conditions, but is commonly from 10 to 30 minutes.



Wolf Hirth climbing out of the cockpit of the "Rhönsperber" after flying it at Dunstable during his visit to England in June. Also in the picture: G. B. Baker, J. S. Fox and Mrs. Joan Price.

If air rose in the form of stationary "chimneys," one would be able to soar continuously in one place, but nobody has yet been able to do this on thermal currents alone. When flying at Buenos Ayres, for instance, Hirth was able to keep up for a long time over one spot, but the thermal lift was discontinuous, coming up in a series of "bubbles" from the concrete buildings at El Palomar airport.

Hirth likened thermals to real bubbles in another way, saying that they appear to have a sort of "skin," which, when broken, allows the warm air within to escape upwards. The pilot Ludwig Hofmann believes that he once unintentionally started a thermal going up by diving on to it and breaking its "skin." The dive was from 1,000 feet to about 70 feet, over a village (where thermals would naturally be expected), and as a thermal began to rise immediately afterwards, Hofmann is convinced that it was his dive which started it going up. He now does the same thing often and is sometimes apparently successful.

A usual condition in Japan (which Hirth visited once), and often in other countries, is that the thermals below 600 feet rise too slowly to lift a sailplane; then from 600 feet to 2,000 feet there are good thermals; at about 2,000 feet there is an inversion, then above it the thermals are again good. To get into the upper region one needs to find a specially fast-rising thermal to carry one past the inversion. In fast-rising thermals the air rises quickest in the centre, and a pilot who goes round in tight circles in the right place will climb well above those who are making wider circles round him. But this is not the case with all thermals; under clouds, particularly, there may be several centres of rising current, and it may take quite a time to find them.

To get thermals in windy weather it is better to fly over mountains than over flat land, because the lee side of a mountain—in the so-called "wind shadow"—is the only place where thermals can grow big before the wind breaks them away.

The Way of Two Birds in the Air

By GRANT LINTON

MANY years ago in the course of a walk into the country the writer chanced to pause awhile on a low bridge spanning a slow stream.

It was twilight. It was still. There was no perceptible wind.

Into the quiet, the stillness, presently there came the low swish of wings. Overhead, some thirty feet above the surface of the stream, two gulls travelled side by side in the direction of a nearby lake. There was no movement of their wings: only a soft rush of air as the birds swept surely and swiftly by. For as far as the eye could see the effortless flight went on, following a level course along the stream.

That strange eerie flight is as vivid in the mind to-day as when it occurred those many years ago.

What was the secret of this soaring flight? It is a question which propounded itself many times.

Obvious as the explanation now seems, it is only recently that it has suggested itself.

The soarers were at a height from the stream about the same as its width. They maintained a position above the stream midway between its banks. These clearly were the conditions of the problem.

Except one condition—that of time.

It was twilight.

The land had lost its heat of the day more quickly than the water. The air above the stream was now warmed more than the air above the land. It rose. The cooler air from either bank flowed in to take its place; was warmed; and too ascended.

Here, in miniature, was a veritable "land-breeze"; a double eddy, continuous along the stream. And, above the centre of the stream, where the two currents blended, the canny sea-birds travelled in a strong and upward flow.



Soaring among vultures! a remarkable photograph taken by Herr Wolf Hirth from his "Moazagotl" sailplane while flying in thermal currents over Rio de Janeiro in 1934. The vultures are evidently sharing the same thermal with the sailplane.

The writer has witnessed this special soaring flight only the once. Perhaps the circumstances which conspired to create the highly-developed upward flow above the stream were unusual; the season of the year, the weather conditions of that distant day there is no memory of.

Yet it might be that the necessary conditions are more common than may seem. (Few birds are on the wing after sundown.)

It might even be that on a larger stream, a river, the two-fold twilight flow at times—and beyond twilight into the light of the moon and the stars—might enable a sailplane to soar above and along the course of the water.

Therein is a possibility at least which, surely, should enlist the interest of all of us: who essay from the shores of an own and illimitable ocean, who delight in its ebb and flow, who seek its hidden ways.

Birds in a Rotating Thermal

In THE SAILPLANE for September, 1936, Mr. H. C. Bergel put forward the suggestion that the air in thermal currents has a rotary motion. The idea suggests itself of testing the theory by comparing the performance of birds circling in opposite directions in the same thermal. Mr. I. G. Robertson, formerly of the London Gliding Club, writing from Kuala Lumpur in the Federated Malay States, sends an interesting letter describing just such an observation, and it is of additional interest that the place where he made it is only three degrees north of the Equator, so that the rotation of the earth cannot, in this case, be looked on as a cause of the rotary movement in the thermal.

Mr. Robertson writes:—

"Here on the Selangor Coast, still mainly under forest, we have a large variety of soaring birds which sail round the sky in ordered aimlessness. My present remarks refer to a certain type which seldom flies alone, but generally in company with about ten or twelve others. These birds all circle in the same thermal, but spread fanwise when moving off to find the next.

"I have often watched these birds circling high, and they do not seem to mind which way they go round, and generally about half are going each way. Neither have I been able to detect any appreciable difference in time between the different directions of circling. On one occasion recently, however, a flight of thirteen of these birds passed at about 150 feet over a corner of the forest, and it at once became clear that a thermal had just detached itself. The birds at once started circling—five one way and eight the other. I saw at once that this thermal was whirling, no doubt owing to the breeze blowing along the edge of the forest. The birds spotted it too, for the five birds did about two circles to the other eight's one. The five turned round and went the other way.

"I leave you and/or your readers to draw the conclusions."

Three Cross-Country Flights

By R. S. RATTRAY

1—June 18th: Dunstable to Barnet By-pass Road, 20 miles

THE first of these flights is of possible interest only because it was made at a comparatively low altitude—never more than 1,800 feet—on an overcast and sunless afternoon. I had already spent 3½ hours cruising up and down the hill at Dunstable, never getting much more than 1,200 feet, when about 2.15 p.m., on reaching 1,800, I "went off." I do not think, however, that the trip proves very much. I was over-anxious to push on and never availed myself of maximum thermal assistance.

The sequel to this rather indifferent and quite uneventful effort was that numerous highly imaginary accounts appeared in the Press: how the sailplane had landed among the traffic, how it had crashed and how I had telephoned Dunstable to collect the bits. The last item of news was indeed correct, the "pieces" being the usual components of all sailplanes: fuselage, wings, struts and tail planes.

2—June 22nd: Dunstable to Farley Hill, about 5 miles

This second flight hardly warrants the designation of "a cross-country." I left the hill at Dunstable at about 2,000 feet, about 1 p.m., on what seemed a perfect soaring day, but almost immediately encountered a strong down-current of as much as 12 feet a second, which persisted until I landed near Luton. I was later retrieved by Vigers, who most kindly took pity on my poor flight (plight) after I had been sitting in the field, where I had landed, seven hours—a very salutary and useful lesson to which I draw the attention of over-hearty would-be cross-country aspirants.

3—June 23rd: Dunstable to Royal Corinthian Yacht Club Aerodrome, Burnham-on-Crouch, 64 miles

Walker has informed me that the recognised penalty for the third abortive attempt to fly the 50 km. test for "Silver C" is to be forcibly deprived of one's nether garments, which are then hoisted on the wind-sock mast. I did not realise the danger I was running when, on the day following the landing at Luton, I once again "burned my boats" and set the bow of CAMBRIDGE II. eastward.

Wednesday, June 23rd, was a perfect day for soaring flight: even the Air Ministry foretold it would be so. The wind was west, with higher up a bit of north in it. Bunches of beautiful cumulus cloud hung in clusters in a blue sky. A few minutes after being winch-launched I had picked up a good thermal over the landing ground and was up to 3,000 feet; I continued circling in this and was off. Making use of experience gained on the two previous flights, I never once quitted a thermal voluntarily until my variometer showed I had fallen out of it and lost it. Then I would chase and soon overtake the cloud shadows in a long glide, watching the little red ball* and praying for the green one to pop up. There was very little wind—about 10 to 15 m.p.h.—and, when circling, the sailplane scarcely seemed to move over the ground far below. This impression of immobility, almost inertia, is, I believe, the undoing of most beginners like myself who do not fully realise how very quickly even 4,000 feet of dearly won altitude can be dissipated in a glide on a falling variometer.

Thrice on this trip I was down well below 1,000 feet. Once, after about an hour on the outskirts of a town—goodness knows where; again over a farmstead where I had already selected my field and had come so low that I could see the faces of the farm hands gazing upwards at the circling plane; and for a third time just as I was nearing Chelmsford to the northward of which I was sliding down in a long glide thinking to land in the fields behind the town.

On each of these occasions, just when I had almost abandoned all hope, up popped the little green ball and round I would swing the CAMBRIDGE in wide groping circles as the lift increased and we went sizzling upwards. (The CAMBRIDGE II. always makes a sizzling noise in a thermal.) The luxury, the satisfaction, the relief of being thus snatched upward at the very moment when all seems ended is an incredibly fascinating experience.

Another great joy in sailplaning is that one need never feel lonely; there is always someone to talk aloud to (oneself). "You are indeed in luck's way to-day" said a voice, as I looked down for the third time from about 4,000 feet on the very spot where a few minutes previously I had been ignominiously preparing to land.

But a still greater adventure lay in store. Looking ahead I suddenly saw a white streak where earth and sky met. Like Xenophon's armies of old I called out: "The sea! The sea!" For although I had often visualised this very moment ever since I had done my first ground-hops, it came as a sudden surprise. Now, the plane losing some height, the vision vanished, leaving one wondering if it had been a mirage. I became so engrossed once more in watching the instruments that I had almost forgotten about it, when on rising again to over 4,000 feet I saw quite unmistakably to be almost looking down on a little township on the bank of a tidal estuary in which were two little islands, which appeared to float like water lilies on the surface of a pool. There was a coast line, too, bending away to the northwards, and another running east, and the sea apparently on three sides of me.

The town, I discovered later, was Maldon, and the islands Osea and Northey. Just at this point some impish impulse almost made me decide to land on one of these islands just for the fun of sending a message to Johnny Furlong to say: "I have landed on an island in the sea, please come and fetch me."

I circled over Maldon, climbing steadily. Here I realised I had come to the cross roads of my aerial journey. Should I swing more north and follow the

* Slater-Cobb Variometer.



Captain R. S. Rattray flying the "Cambridge II" sailplane in which he performed the cross-country flights described in this article. The machine is here shown about to land after an aero-tow at Fenny Stratford.

[Photo by F. N. Slingsby.

coast in hopes of reaching the maximum distance possible in this direction from Dunstable, or should I continue eastward until I reached the sea on the same course as that on which I had so far been borne? I decided to carry on, but very soon turned southward from the mud flats over which I was drifting to inspect another river estuary and a town, which I could see on my right, and about ten miles away.

Soon I was over what I was later to be told was Burnham-on-Crouch. I circled over its fleet of toy-like boats, my variometer showing a steady 6 feet a second rise. Then I saw far below in a field what looked like a white star, or, as it was by the sea, perhaps I should write "a starfish." "An aerodrome," I said, again aloud, and sure enough I could just discern a yellow and white sausage hanging lazily in a far corner.

I noticed the spot and flew on towards the sea coast, about five miles. The terrain seemed very flat but much cut up with what looked like ditches, and fearing it might be boggy I reluctantly sacrificed five or six miles to my distance and turned back, reaching the aerodrome with over 1,000 feet to spare. Indeed, I had a job to get down, for there was strong thermal lift down to 500 feet, but at last, passing out over the river, I skimmed the masts of the yachts and over the banks to land a few feet from the white star in the centre of the aerodrome.

A cricket match was in progress near by. Two of the team awaiting their turn to bat came across, and one very kindly escorted me to the Royal Corinthian Yacht Club, where its secretary permitted me to telephone and offered me the hospitality of the club.

I had landed at 3.15 after exactly 3½ hours' flying. The distance is 64 miles. "It's quicker by rail!"

Furlong and his sister most kindly fetched me. Back to Dunstable at 3.30 a.m.

I remember the late Eric Collins once saying to me: "When a man gets the 'Silver C' he is just beginning to learn the technique of sailplaning." So entirely do I agree with this opinion that I hesitate to point out any lessons in these minor flights of mine which might possibly be of use to others. This, after all, is the only possible *raison d'être* for accounts such as this, which are otherwise only of a personal interest.

In flying, I have always found that it is the more simple and obvious points over which one trips up. For example, do not allow yourself to be hustled or hurried or flustered before going off on a cross-country. Make yourself as comfortable as possible: cushions, warm clothes, gloves, warm boots; at 4,000 and 5,000 feet it can be very cold, even on a summer day.

Here are a few points which from my own experience I have found useful:—

When cruising over the hill at Dunstable in search of thermals, but too low as yet to circle, immediately a thermal is encountered zigzag in very short "S" turns. It's a capital way of wriggling oneself into a thermal in which one cannot yet circle.

On a cross-country flight, gain every foot of height on almost every possible chance of doing so; you will need it badly sooner or later. Observe cloud shadows, rather than smoke on the ground, for the wind direction which concerns you. Never say die; my own very limited experience has shown me how one may be almost preparing to land and a few minutes later be looking down on the same spot from 4,000 feet.

And finally: to Hervey, Walker, Quinn and some of Zander's men, and to that partner and good companion of mine, John Furlong, my thanks for much assistance when no one else but one of the world's *workless* could possibly be flying.

The CAMBRIDGE, I would like to add, is a very fine machine; in efficiency it is, in my opinion, between a KIRBY KITE and a RHÖNBUSSARD.

Among the Books

Our next article in this series will deal with books on gliding—English, American and German. Included will be a review of Captain C. H. Latimer-Needham's book, "Sailplanes," which has just appeared in a cheap edition at 6s. The text is the same as the original 15s. edition published by Messrs. Chapman & Hall, and the book is, we believe, still the only technical work on the subject in the English language. Copies may be obtained from Mr. H. O. Davies at 13, Victoria Street, London, S.W.1, at 6s. each, post free.

Wolf Hirth's book, *Die Hohe Schule des Segelfluges*, which has already run to three editions since it was published in 1933, is, we are glad to state, at last being translated into English. The translator, Miss Naomi Heron-Maxwell, has now practically completed the work, so that the English edition may be expected shortly. The book deals with the technique of high-performance sailplane flying, and the latest edition has been brought thoroughly up to date.

Cloud Base in Thermals

By J. S. Fox

THE amount of cloud in the sky, and the height at which it is likely to form, depends on the amount of moisture in the atmosphere on any particular day.

Assuming that on good soaring days clouds are formed from air which has risen from the ground by thermic action, we should be able to learn more about these clouds by studying the condition of the air at ground level before it starts on its upward journey. In this article I have attempted to show how I think it should be possible to calculate the height of cloud base from the Relative Humidity of the air at ground level. But before doing so I will give a brief explanation of the different "Lapse Rates," and also try to show, in as simple a way as possible, how "Relative Humidity" and "Dew Point" are measured.

All temperatures are given on the Fahrenheit scale.

Lapse Rates.

"Lapse Rate" is the meteorologist's term used to express the fall of temperature with height. It varies under different conditions, but can be generally classed into three separate groups.

1. Normal Lapse Rate. 3·3°.

Temperatures at different altitudes are measured daily up to considerable heights both by aeroplane ascents and also by using small captive balloons. Taking all weather conditions year in and year out, the *average* fall of temperature with height is 3·3° per 1,000 feet. This is known as the "Normal Lapse Rate."

2. Dry-Adiabatic Lapse Rate. 5·6°.

Rising air cools rapidly due to expansion. As long as no condensation of moisture takes place it will cool at a uniform rate as it goes up, no matter what the condition or temperature of the air may be through which it rises en route. This *rate of cooling* can be very accurately calculated, and has been shown to be at the rate of 5·6° per 1,000 feet, which is known as the "Dry-Adiabatic Lapse Rate."

3. Wet-Adiabatic Lapse Rate. 3·1°.

In a thermal this dry-adiabatic lapse rate holds good as long as there is no condensation of moisture, but as soon as cloud base is reached, the "Latent Heat of Condensation" of the rapidly forming cloud gives a new supply of warmth to the thermal. Condensation continues to take place as it goes on up, heat being liberated all the while; which means, of course, that the lapse rate is now different, and that cooling is less rapid than it was below cloud base. This new rate is called the "Wet-Adiabatic Lapse Rate," and it *averages* about 3·1° per 1,000 feet.

Actually, however, it can vary very considerably under different conditions; but as the interiors of clouds are outside the scope of the present article it is hoped to include in a later number of The Sailplane a few notes on the different Wet-adiabatic Lapse Rates which are to be found inside clouds, and their bearing on the corresponding cloud-lift connected with them.

For the moment we must confine ourselves to the Dry-adiabatic Lapse Rate, as in section 2, and bear in mind that *dry rising air cools at the rate of 5·6° per 1,000 feet.*

Relative Humidity.

Air always holds a good deal of invisible water vapour, and if we were to consider a sample of air, at a temperature of say 60°, there are two things we might learn about it:—

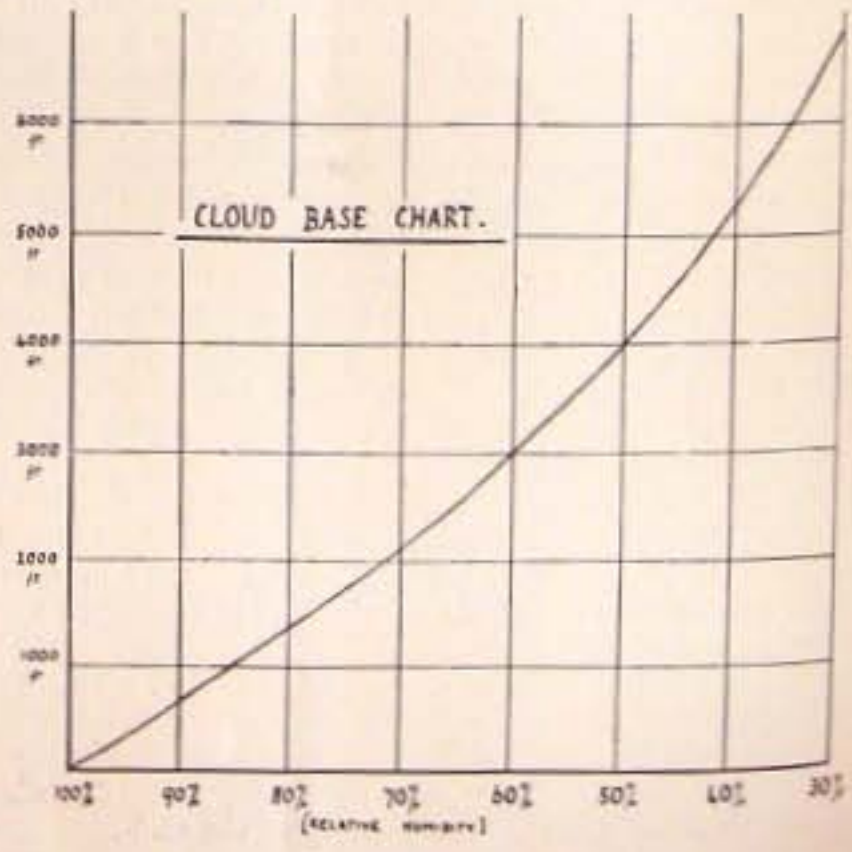
1. How much water vapour does it hold at this 60° temperature?

2. How much could it hold at this 60° temperature?

The *ratio* of 1 to 2 is called the Relative Humidity, and is measured as a percentage—say 65% for example. (100% of course represents saturation.)

Water will evaporate quickly if the air is dry, or slowly if the air is damp; so the obvious way to measure the dampness of the air is to measure the rate at which water evaporates. This can be done very simply by tying some wet muslin round a thermometer bulb; the faster the water evaporates from this the more it cools the thermometer. Coolings of from 0° to 10° are often obtained in this way, and in practice one uses two thermometers mounted side by side; an ordinary "Dry-bulb," and a "Wet-bulb," and these must be placed in a position where there is a strong draught of air, or else be well fanned in some way before readings are taken; any air-speed between 5 m.p.h. and 60 m.p.h. will give correct results.

Now if we find from the dry bulb that the temperature of the air is, say, 60°, and if the wet bulb shows a drop of, say, 5¼° below this, we then look at 5¼° against the 60° curve on the "Relative Humidity Chart," and here we see that the Rel. H. is 70%. This, of course, tells us that the air is holding only 70% of the water vapour that it could hold at this 60° temperature.



I have drawn out this "Relative Humidity Chart" and included it here for the sake of easy reading, but for accuracy the full standard tables giving all relative humidity values should be used. These can be obtained from H.M. Stationery Office, Kingsway, London, price 1s., and they are called "Hygrometric Tables." They also include tables for all dew point values, and vapour pressure values.

It must also be realised that to ascertain correctly the air's Rel. H. by the use of wet and dry bulb thermometers needs much care and is not too easy, and will be incorrect if inadequately ventilated. A more reliable instrument is the Assmann Psychrometer.

Also, of course, remember that both thermometers must be in the shade.

Dew Point.

The colder the air becomes, the smaller will be its capacity for holding water vapour; and supposing we start cooling it down it will eventually reach a temperature at which the water vapour in it is all that it can possibly hold at its new temperature. The critical point is called "DEW POINT," because if we were to cool it any further it would then have to start shedding some of its vapour which would condense into visible water in the form of Dew, Fog, Mist, Cloud or even Snow.

If we wanted to find out the actual temperature at which this begins to happen we could do so by turning to the Dew-point section in our "Hygrometric Tables," and we should see that our 5¼° against 60° gives dew point at 50°, i.e., *by cooling it through 10°.*

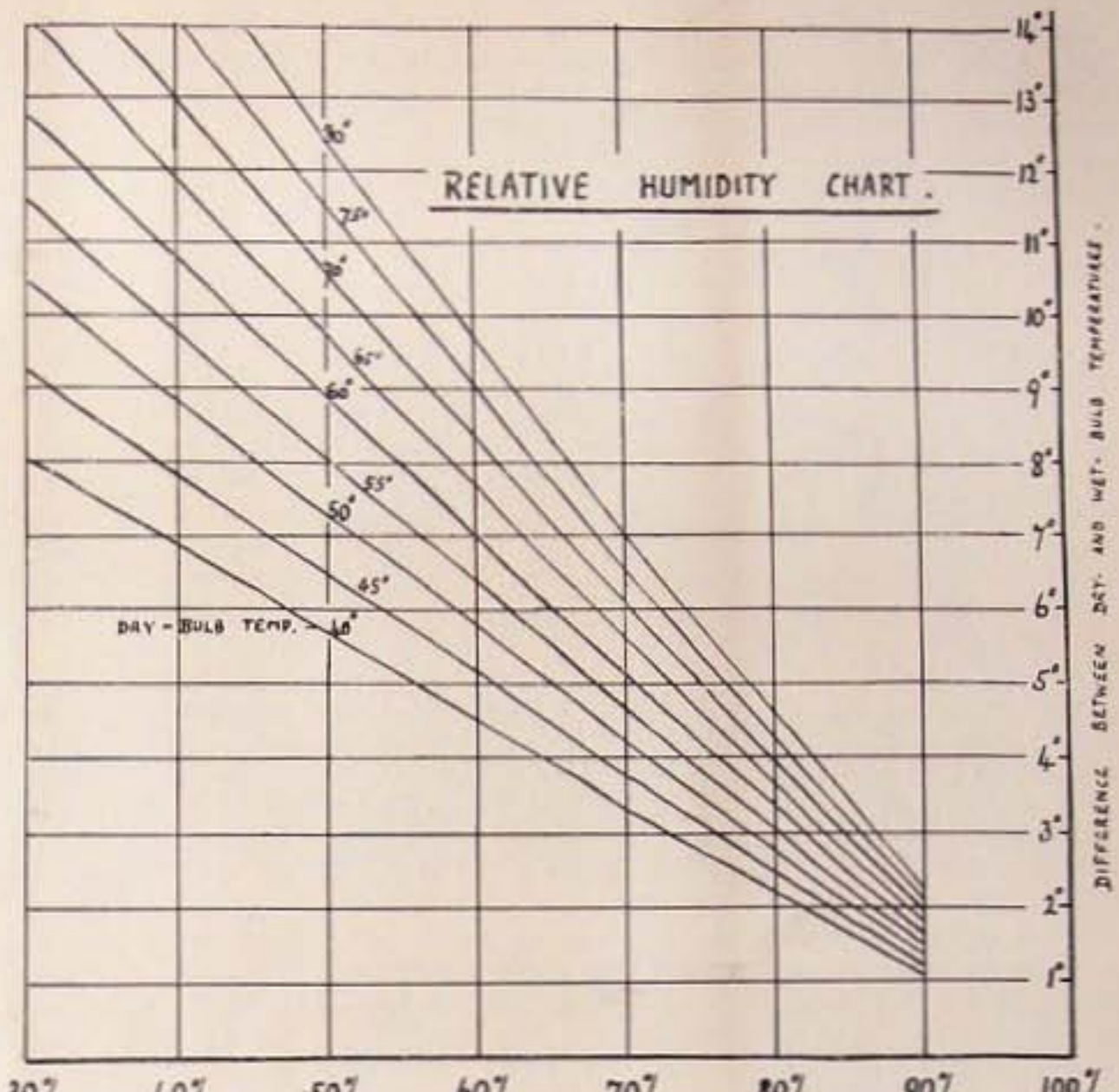
Cloud Base.

Having explained the meaning of "Dry-adiabatic Lapse Rate" (5·6° drop per 1,000 feet); of "Relative Humidity" (as a saturation percentage), and of "Dew Point" (as the temperature at condensation point), we may now perhaps re-state the main question under discussion as being that we want *to calculate the height at which dew point is reached in a thermal, by knowing the relative humidity at its base.*

In the particular example mentioned above we saw that dew point was reached after a cooling of 10°. And as we have also seen that a thermal cools at the rate of 5·6° per 1,000 feet we may therefore expect cloud base to be at a height of

$$10 \times \frac{1{,}000}{5{\cdot}6} = 1{,}786 \text{ feet,}$$

but this result is not quite accurate, and needs an important correction.



Cloud Base in Thermals.

Relative Humidity, per cent...	100	95	90	85	80	75	70	65	60	55	50	45	40	35
Cloud base height	0	300	650	1000	1350	1700	2100	2500	3000	3500	4000	4600	5250	6000

The standard dew point tables are all based on normal conditions at ground level only (i.e., for an average pressure of 1,000 millibars) and any decrease in pressure will cause dew point to be reached at a lower temperature. This means of course that more cooling is required to reach condensation point, and that cloud base will be slightly higher than this 1,786 feet. A calculation* shows that if we multiply the lapse rate value (5·6) by a factor of ·85 this will give us the necessary correction, and we should then get a result within the bounds of reasonable accuracy.

Returning then to our 10° drop in temperature we find that we shall reach cloud base now at a height of

$$10 \times \frac{1{,}000 \text{ ft.}}{5{\cdot}6 \times {\cdot}85} = 10 \times \frac{1{,}000 \text{ ft.}}{4{\cdot}76} = 10 \times 210 \text{ ft.} = 2{,}100 \text{ ft.}$$

Having thought out this method of calculating cloud base, the next step was to study from the tables the number of degrees drop to dew point for *any* relative humidity value between 100% (saturation) and, say, 30% (very dry), taken against *all* summer temperatures between 90° and 40°. These figures took some time to work out, but it was interesting to discover that, taking any one relative humidity value at a time, the drop to dew point seemed to be very much the

* Water-vapour gradient on Air Ministry's Tephigram.

same no matter what dry-bulb temperature one started out from, i.e., for ordinary summer days. It was therefore possible to generalise, and to dispense with any consideration of the day's temperature. The results could conveniently be averaged up into one concise graph, instead of needing to have different graphs for warm and cooler days.

This final result is shown in the "Cloud Base Chart" (see p. 158). From it we can read at a glance what we set out to discover, namely, *the height of cloud base in a thermal from the relative humidity of the air at its base.*

So far I have only had one opportunity of putting this idea to practical test in a sailplane.* On that occasion at Dunstable I circled in a pure cloudless thermal until cloud condensation started all round me at a height of between 4,000 and 4,100 feet. I had taken readings shortly before going up which were: dry-bulb 56°, wet-bulb 48°; i.e., a drop of 8°. These figures, as can be seen from the "Relative Humidity Chart," represent a Rel. H. of 51%. Also from the "Cloud Base Chart" we see that this 51% Rel. H. should give cloud base at almost exactly 4,000 feet. It may, of course, be only beginner's luck in that the only observation I have so far been able to make proved so encouragingly correct, but in any case it made one feel that this idea might enable sailplane pilots to make some new observations which could not possibly be done in any other way.

It is also interesting to note that these figures of 56° and 8° give dew point at 38° at ground level, which equals 34·4° at 4,000 feet (almost freezing point). Unfortunately I only have a very cheap and unreliable thermometer in the cockpit, but it registered below the 35° mark, and I was feeling decidedly cold. The newspapers next morning gave the 6 p.m. reading for Rel. H. at Kingsway on that day (October 18th) as 54%.

Generally speaking it should, of course, be understood that the graph I have worked out is only really applicable to good thermal days, and that it could not be expected to be at all reliable for cold fronts or large storms in which very different masses of air are taking part and moving at different altitudes and in different directions; in such cases it would be impossible to be sure of measuring the right mass of air forming the clouds. It applies only to direct thermic action when the air from the ground actually goes up into cloud. It also can make no allowance for a possibility which might exist of the thermal drawing other different air up into itself on the way up. Neither does it allow for the fact that air can sometimes cool below saturation point before condensation actually begins; and if such a condition of super-saturation did happen to exist, it would mean that cloud base would then be slightly higher than the height shown on the chart.

The fact that temperature (within the limits we are concerned with) makes so little difference to the result is fortunate in that it enables the idea to be of convenient practical use. If it were otherwise it would always be necessary to take our measurements in the exact spot from which the thermal had its origin, and at the exact time of its birth, which would, of course, be impossible. Since it is the humidity alone which controls the question, it does not make any difference if the temperature does happen to be greater at the thermal base than elsewhere, or if it varies generally during the day, provided that the *humidity* remains the same. One point to mention here is that there is often a slight decrease in the Relative Humidity value during the day, which causes cloud base to get higher as the day goes on. An observation taken too early in the morning might perhaps give a result which would be incorrect at mid-day.

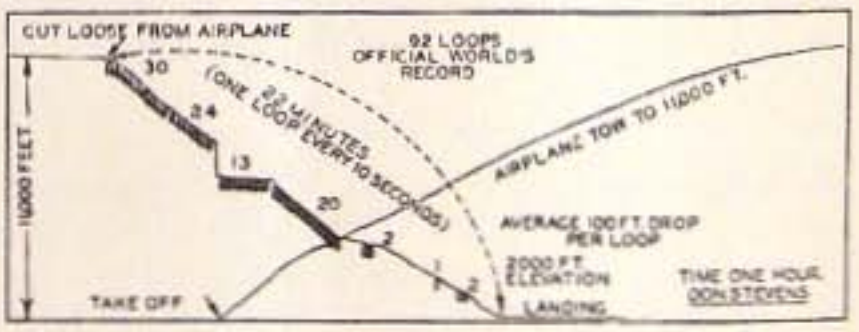
In conclusion we might say that this chart could be used on any summer's day when thermal conditions are good; that it shows the height of cloud base above the place where you are measuring the humidity, no matter what its altitude may be; and that cloud base may sometimes be found above the indicated level, especially on very warm days or on days with unusually strong thermic action, but that it will seldom, if ever, be found below it.

* Since this article was written, further flights reaching cloud base have been done by Mr. Fox and others, viz.:—April 11th, relative humidity (Kew) was 55%, cloud base at 4,000 ft.; April 25th, rel. hum. 49%, cloud base 4,300 ft.; May 5th, rel. hum. 45%, cloud base 4,800 ft.; June 23rd, rel. hum. 45%, cloud base 4,500 ft.

The Looping Record

In the last issue of THE SAILPLANE, Flight-Lieut. E. L. Mole described how he had performed 67 consecutive loops in a WOLF sailplane after being aerotowed to 8,000 feet over the aerodrome at Cairo, and asked if this was a record.

It might have been, a few years ago. But recently Mr. Don Stevens sent us an account of how he did 92 consecutive loops at last year's American soaring meeting at Elmira. He was towed up to 11,000 feet, and, in addition to the advantage this great height gave him, he found a thermal current on the way down,



and managed to do a number of loops in it without losing height. The American magazine, in which the account was published, has evidently re-drawn the barograph record (shown herewith), since Mr. Stevens has been made to do his 92 loops in space as well as in time—a phenomenon which, if true, would no doubt be of great interest to Professor Einstein.

An even greater number, 125 loops, was done by Wolf Hirth two or three years ago at the Böblingen aerodrome near Stuttgart. One day, before breakfast, Hirth was towed up to 2,100 metres (about 6,900 feet), and spent the next half hour looping down to within 15 metres of the ground, while a friend lay on his back in the grass and counted the loops.



The German two-seater sailplane "Kranich" has now been fitted with cockpit covers for blind flying instruction. Left: in its original form with open cockpits; top right: with closed cockpits; bottom right: the same, with the curtain drawn down for blind flying.

[Photos by D.F.S.

Cockpit Cover for "Kranich"

The two-seater sailplane KRANICH, designed by Hans Jacobs and owned by the German Research Institute for Soaring Flight (D.F.S.), was described in THE SAILPLANE last November. By closing in the cockpits with a transparent cover, the performance of the machine has now been improved and other advantages secured—for instance, conversation between pilot and passenger can now take place in ordinary tones of voice without the use of telephones.

For blind flying instruction, in preparation for cloud flying, the forward part of the cabin can be closed off by a movable curtain so that the occupant has no view, while the instructor in the rear can still see around. The curtain can be manipulated during flight.

The cabin top is constructed of welded steel tubing, to which the Cellon or Plexiglas panels are riveted. The top, including hatches, consists of four parts: the fore and aft openings or hatches, a centre portion and an aft fairing. These four parts can be substituted for the four corresponding parts in the open cockpit arrangement in a few minutes, without any structural changes.

Herr Jacobs informs us that the price of the KRANICH in Germany is RM. 4,975 without instruments. It is manufactured by Flugzeugwerke Karl Schweyer, Mannheim-Ludwigshafen, and by Flugzeugbau Alex. Schleicher, Poppenhausen, Rhön.

Correspondence

Don't Jump to Conclusions

SIR,

I feel that you should have the facts of the following story, which has caused some amusement up here, before they get too distorted.

I was waiting in the KITE while McMurdo was preparing to tow me up, and was feeling very hot, so naturally sat upright to keep my head above the windscreen. After casting off at 3,000 feet I settled down in the cockpit to get on with the business of soaring. I noticed a smell of manure and remembered that people had circled in whiffs from hay fields, etc., so proceeded to circle immediately without referring to the variometer. After several circles I looked at the instrument and discovered we were in a down-draught.

The mystery was solved soon after landing, for Major Shaw occasionally grazes sheep at Welburn and I must have been a little careless before entering the cockpit.

This all goes to prove that flying by instruments is the only reliable method, because the senses give such a poor indication of what the machine is doing.

P. M. WATT,

Thornaby on Tees, Yorks.

News from the Clubs

Derbyshire and Lancashire Gliding Club

Owing to the necessity of going to press early our flying figures for the month are not complete and will be reported fully in next month's issue.

Thermals from the Winch.—The remarks contained in the leading article of the June SAILPLANE are particularly interesting to us in view of our own recent experiments in connection with thermal flights from the winch. Our new winch, with a little over 3,000 feet of extra thin but strong cable, was delivered by A. L. Slater on June 15th, and in spite of its complicated mechanism proved an immediate success. With the two winches in operation there should be a considerable speeding-up of our instruction. With a very light breeze from the north-east some very interesting flights have been made. With nearly full length of wire out, heights of between 750 and 800 were obtained and a number of pilots were able to search the locality for thermal activity; some gained a little height after leaving the wire and flights up to 10 minutes were recorded, though most pilots reported only weak thermal lifts in odd places. Whether or not their little success is due to their inexperience does not seem pertinent, but what is important is the value of a means of getting a new "C" pilot up to such a height that he can circle and "search" with safety and confidence and also be independent of hill lift to get him to those heights. With the excellent material at our disposal we hope to report great progress in the near future.

B.G.A. Competitions.—Preparations are already being made for the National Competitions, and it is with pleasure that we accept a very handsome trophy for an inter-club team contest from L. Du Garde Peach, Esq.; those who attended the competitions last year will recollect the success of this event, which was an impromptu effort. We are already assured of three entries. Will clubs please take notice? The date of the competitions is August 28th to September 5th inclusive.

This Month's Funny Story.—A rather ham-fisted bungy pupil is overheard telling a co-bungyite that he expects that the instructor will transfer him to the winch after his next launch. Says his friend: "Don't be daft—he's not building a tunnel."

Congratulations to "Jewwy" Smith on his selection for the British team for the Wasserkuppe. We wish him (and our two-seater) every success in the event.

Furness Gliding Club

Tuesday, June 1st.—Redshaw again flew for 10 minutes in the KADET, his greatest difficulty was to keep her down, for whenever she began to climb down went her nose, and finally she settled gracefuly on top of the hill. Charles took her off and landed her at the starting point. But Allen had a poor launch and busted a rudder pedal instead of a record.

June 5th.—Clouds down on the hill-tops. Whilst we worked in the hangar, R.A.F. machines could be heard but not seen, obviously circling blindly above us; we could appreciate the difficulties of the pilots.

Sunday, June 6th.—Almost windless; high launches were tried but nobody could connect with lift. Between flights a flagstaff was fixed, Redshaw repaired the KADET, and others, including Bruce Kingsmill, worked on the hangar roof.

F. Charles, now completely equipped with parachute, is thoroughly convinced that thermals are more active inland, so he packed his trailer and the following day went south.

June 12th.—Stevens had several launches in his new machine; no details to hand.

Sunday, June 13th.—Wind south-west. Allan came down from Windermere and late in the day had four flights in the KADET; such determination to succeed will soon be rewarded.

June 14th.—Wind north-west, strong. Stevens had a rough ride in his SPECIAL, and experienced difficulty in getting down on the hill-top after an hour of rough going. Redshaw had the KADET on the spot, but wiser counsel prevailed.

Sunday, June 20th.—A grand day, wind north-west. The sky was full of flat-bottomed cumulus clouds, arranged in parallel streets, yet the wind came in spasms. To get away from a bungy launch needed some careful planning. Stevens and Redshaw each had 30 minutes' soaring. An aero-tow would have guaranteed a good start across country.

June 21st.—The longest day of the year; a cloudless sky and a healthy west wind. A real opportunity to soar throughout the night, for the moon was full. Stevens again enjoyed 30 minutes' soaring, landing about 9 p.m.

Cambridge University Gliding Club

The club's KIRBY KITE was delivered in the middle of June, and met with immediate popularity during a second visit by the club to Kimmeridge, Dorset. Piloted by Simpson and Turner, its performances during the camp included: an out-and-return flight of 15 miles (each way) at a height of 5,000 feet; a climb to 2,300 feet from a bungy launch on a windless day; and a soaring flight over the sea during which 4,000 feet was reached three miles out from the coast. A fuller description of these flights will appear in next month's SAILPLANE.

CAMBRIDGE I., after two years' freedom from major damage, has had a hard time this month. At the beginning of June it was undershot into a hedge at Caxton Gibbet by MacClement, but repaired by Dart Aircraft in time for the camp, where, however, one wing was broken when the tip hit a bush in an otherwise well-judged emergency landing. But in the meantime several hours of good flying were done in this machine, during which P. M. Thomas and Gardiner reached heights approaching 2,000 feet.

The TOTTERIDGE was also taken to the camp and damaged, though, fortunately, not severely; a "C" aspirant, misled, perhaps, by the example of a previous pilot, attempted a down-wind downhill landing, jumped one stone wall, and hit the next.

Aero-towing.—Slazenger has kindly fitted up his "Moth" with a towing hook, and on June 23rd he towed Turner in the KITE round and round Heston Airport while Air Ministry officials "observed" from below. Further flights were then made by "Loopy" Lingford (who did one of the usual) and Simpson.

Midland Gliding Club

June 6th.—A south wind but promising-looking sky brought out the winch, which was kept busy heaving all and sundry into the sky. The only thermal encountered during the day was found by Durose when taking his "B" in FALCON I; he had no variometer and barged right through the lift on both legs of his "S" turn while those on the ground gnashed their teeth in anguish. Durose thought that there must have been some lift about as his flight lasted for 3 minutes 15 seconds.

Thwaite struck a corner boundary post of the ground with the wing of KADET II when landing. Actually the post got the worst of the argument and KADET only suffered minor damage to the leading edge.

Late in the evening, K. Edwards, at the Mynd for the first time for many months, was given a winch launch in FALCON I and struck the corner of the hangar during his circuit, and Falke was badly damaged. We feel that less experienced pilots would be wise to take a ride in the two-seater before going solo if they have not flown for some months.

June 14th.—A merry party was organised to visit Long Mynd this Monday evening and several hours' flying were put in. A duel between the TIDDLER Tykes and the GRUNAU Kads was in progress and amusing to watch.

June 20th.—Another day of winch work, but nothing exciting to record.

June 21st and 22nd.—On both these evenings parties turned up at the Mynd, but found that the wind direction in Birmingham bore no relation to that on the edge.

On Tuesday evening, however, Davies was tempted over the edge in the KITE, could not find any lift, so dashed in to land up Asterton Gully and struck a rock in the process—bad luck, Frank!

We must record our appreciation to James for the gift of a very excellent Ford retriever; it is worthy of better treatment than is usually given to retrieving cars, and we will see that it gets it.

Three "B" certificates were taken at Long Mynd during the period by Nyborg, Durose, and Jolly.

Yorkshire Gliding Club

Saturday, May 22nd.—Wind S.E., 15 to 25 m.p.h. Dene Drummond and Halton hopped the HOLS, but conditions were rather rough.

Sunday, May 23rd.—Wind variable, 10 to 25 m.p.h. Barker and Wordsworth tried the South Slope in the G.B., each getting about 500 feet. Barker took out his SCUD III, but came in after 33 minutes. Hastwell was launched in the G.B., but had to land after four minutes. Training followed with Leach and Miss Coope on the DAGLING, and others hopped the HOLS, but conditions were again rough.

Thursday, May 27th.—Wind S.W., 15 m.p.h., decreasing. Barker did an hour in SCUD III, and A. O. Pick 20 minutes in the KADET.

Saturday, May 29th.—Wind S.E., 10 to 15 m.p.h., variable. Hinchcliffe and Leach continued training in the HOLS.

Sunday, May 30th.—Wind W. to S.W., variable. Leach and Hinchcliffe hopped the HOLS, Leach qualifying for his "A" certificate. Barker took up SCUD III, and with plenty of height made for Welburn Aerodrome, landing there after a flight of about 2½ hours. Slingsby was launched in the FALCON III with Hinchcliffe as passenger, and also left for Welburn, arriving with 3,000 feet in hand.

The following shows the rest of the day's flying (the FALCON III and FALCON IIIS each carried a passenger on every flight) :—

FALCON IIIS: Sharpe, 30 min.; KADET: Fisher, 1 hr. 23 min.; FALCON IIIS: Hastwell, 30 min; Stedman, 31 min.; KADET: Alderson, 43 min.; FALCON IIIS: Sharpe, 18 min. and 20 min.; KADET: Verdon Roe, 33 min.; FALCON IIIS: Stedman, 33 min.; Slingsby, 15 min.; KADET: Curry, 30 min.; FALCON IIIS: Slingsby, 15 min.; Sharpe, 15 min.; KADET: Jowett, 20 min.; FALCON III: Slingsby, 30 min.; FALCON IIIS: Heath, 20 min.; KADET: Watson, 45 min.; FALCON III: Slingsby, 20 min.; FALCON IIIS: Hastwell, 10 min.

Total flying time, 12 hours 24 minutes.

Saturday, June 5th.—Wind south, 10 m.p.h. Wordsworth, Heath, and Pick soared the G.B. and later Dene Drummond, Leach, and Halton hopped the HOLS.

At York, where the International Air Meeting was in progress, Wills did an aero-towed flight in the KIRBY KITE lasting about 15 minutes, and in the evening Slingsby was aero-towed back to Welburn. Several members turned up for the dance in the marquee, and as far as can be ascertained enjoyed themselves thoroughly, finishing up on the roundabouts, etc., on the adjoining fair ground.

Sunday, June 6th.—Wind south, light. About 120 guests and foreign pilots from York visited Sutton Bank, arriving in time for lunch at the club house. Unfortunately the wind did not allow us to show them all we could do, but circuits in the FALCON two-seaters provided an interesting afternoon for them. Herr Ursinus was amongst our distinguished visitors, and Miss Heron-Maxwell, also a visitor, circuited the KIRBY KITE. Later in the day training went forward in the HOLS, Drummond and Leach both qualifying for their "B" certificates.

Tuesday, June 8th.—Wind south, light. Slingsby arrived and soared the KITE. Passenger flights were given in the FALCON III by Slingsby and Murray, but rain broke up the party.

Saturday, June 12th, and Sunday, June 13th.—Intermittent rain. Again training was all that could be done.

Channel Gliding Club

Owing to a continuance of inclement weather our activities have been restricted to maintenance work on machines, and drainage work on a considerable scale to our recently erected hangar, which the extraordinary amount of rainfall had actually at one time made awash with flood water. Tremendous activity on the part of our keener members have made a repetition of this impossible by digging substantial trenches all round connected with deep sump-holes filled with rubble. The excavated earth was spread over the hangar floor so as to raise its level considerably, and we were extremely gratified with the immediate effect of dryness in the building.

On **Whit Sunday** weather was at last favourable, and 15 flights of instructional nature in our dual B.A.C. VII. were made. A new member was given his first flight, and this provided spectators with considerable thrills, as on each turn the pupil fought with the instructor, producing results which gave those watching a heart attack, while the instructor, who was the writer, felt a decided quickening of the pulses at the times. This led to a definite rule that pupils should hold the stick with two fingers and thumb only.

On the following Sunday morning, wind being favourable, E. Griffiths and F. Whitnall, soared the solo B.A.C. for three-quarters and half hour respectively, before the wind dropped, and gained a pair of "C" licences. In the evening instructional flights were given with the two-seater, when the above-mentioned *ab initio* pupil showed considerable improvement over his previous efforts.

Cornwall Gliding Club

June 6th.—James, a "C" pilot, was just taking off for what promised to be the first soaring flight in the history of the club, when, a few seconds after the ring had dropped off, the starboard wing folded back, and from 30 feet the KEEBLING spun over and fell on its back. The king post took the crash, and James, though well strapped in, struck his head on the front of the cockpit and suffered concussion, and had to be removed in an ambulance. A careful examination of the wing revealed no other failure than the breaking of the two bolts which pass through the pylon and secure the fittings to which the root end of the front spars are attached. The rear wing root fittings were still intact and fastened, and the front spar of the wing was apparently undamaged. The flying wires were intact and secured. The bolts had broken clean off in the threaded portion, but apparently had jammed in their holes, as they also secure the port wing, which did not fold back.

Luckily the CRAMCRAFT is due to arrive shortly so that flying will not be delayed.

Newcastle Gliding Club

Week ending June 6th.—Summer weather with west and south-west winds gave us plenty of opportunity for training at Cramlington, using the full length of the flying field. Eighty launches were made, McClean and Smith taking "A" certificates and Smith his "B" also.

Week ending June 13th.—Forty-four launches made with easterly winds at Cramlington. Wood, after a low launch in the GRUNAU, proceeded to make "S" turns without releasing the cable, which dragged him down at a steep angle for the last twenty feet. This resulted in a wrecked cockpit and cracked fuselage for the machine, and a broken leg for the pilot. As this is our only sailplane, other than Hick's MERLIN, soaring is held up until delivery of the KIRBY KITE, and until repairs to the GRUNAU are completed. By then a number of our "B" men should be ready for "C" certificates.

Week ending June 20th.—Easterly winds still prevailing. Fifty launches were made on open and nacelled DAGLINGS, Gilbert Cummings taking his "A" certificate. We omitted to report Roberts's "B" certificate last month. This makes the total for mention this month three "A" certificates and two "B" certificates.

Dorset Gliding Club

Maiden Newton, Sunday, May 2nd.—Wind in an awkward quarter, but sufficiently variable to make elementary training rather a problem. Other pilots also had practice hops, in the evening when the wind had dropped enough to be ignored. Manning and Jackson had flights from the top of the Cottage Slope.

Tuesday, May 4th, and Wednesday, May 5th.—On these evenings Clewlow, Manning, Jackson, and Lansdown had flights from the hangar slope in the open machine.

Saturday, May 8th.—Manning, Jackson, Clewlow, and Shelton all flew from the hangar slope and, later, beginners trained down below.

Sunday, May 9th.—A very gusty S.W. wind, a lot of driving rain and low cloud made flying impossible till late in the afternoon, when Laver went up to try the new PRÜFLING. This flight gave Laver ample opportunity to find that the controls and trim of the machine were quite O.K., and soon afterwards the site was obscured by low cloud.

Sunday, June 6th.—Owing to repairs flying was not started till late in the afternoon, when Rolfe, Shelton, and Lansdown flew the nacelle from the hangar slope, and after Manning had had his first trip in the nacelle, training was carried out below till nearly 10 o'clock.

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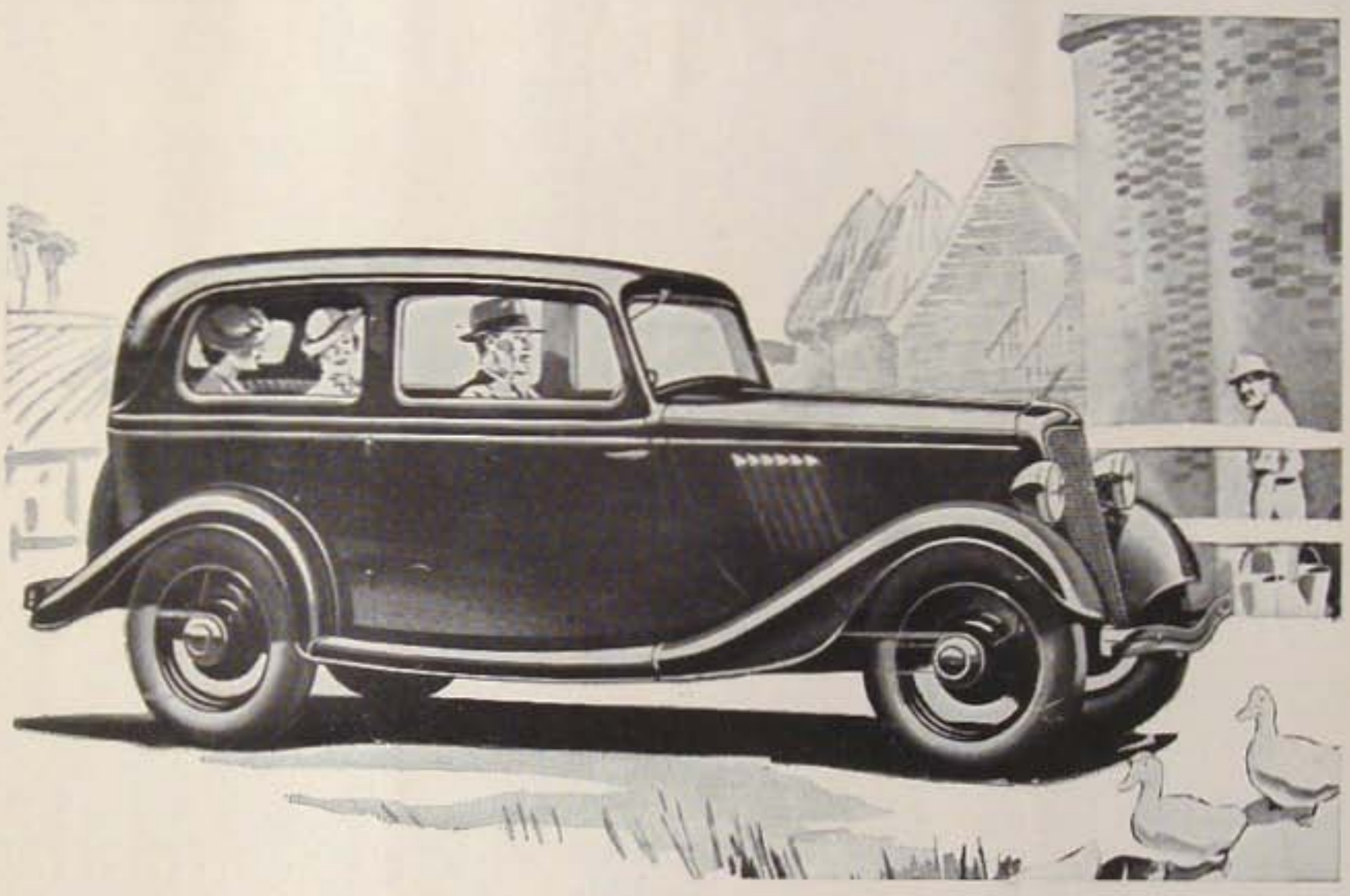
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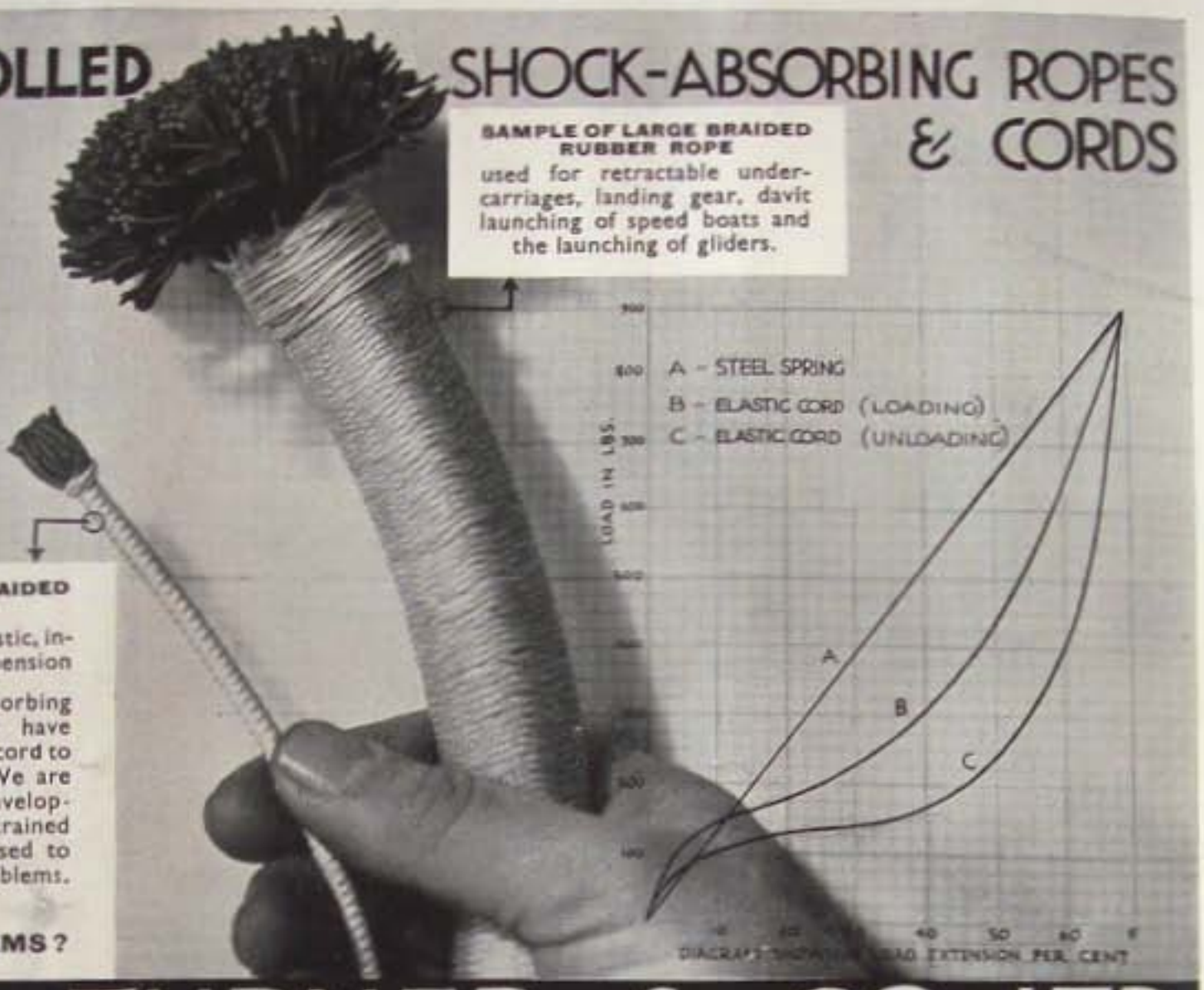
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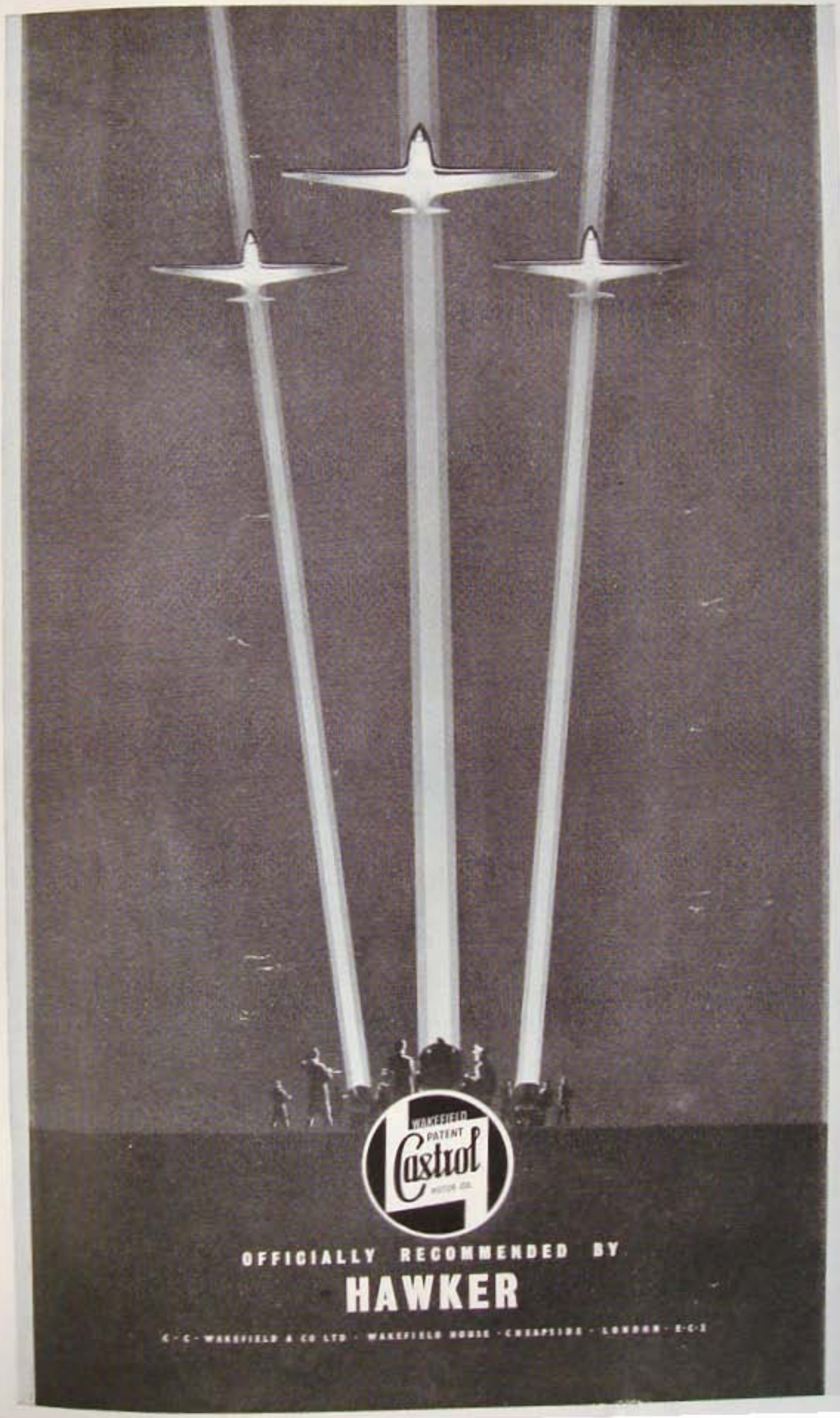
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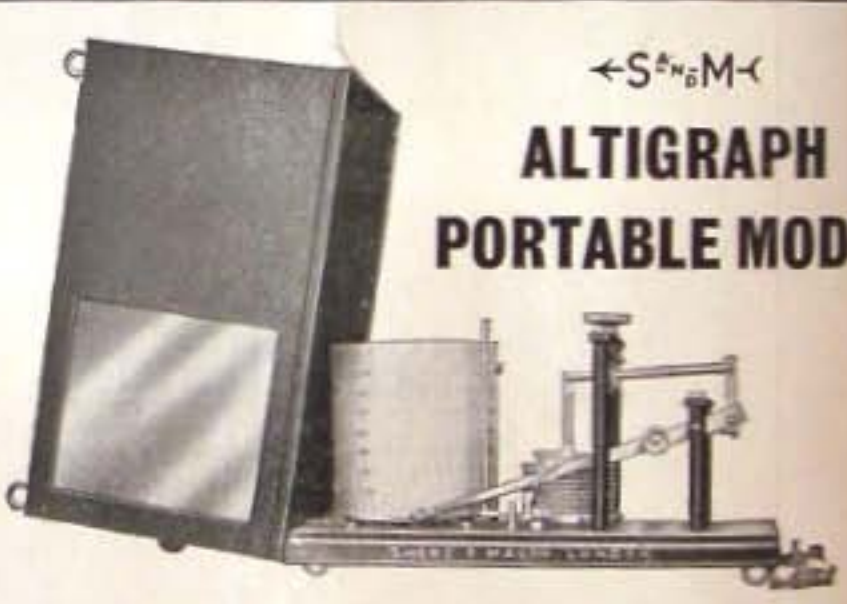
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