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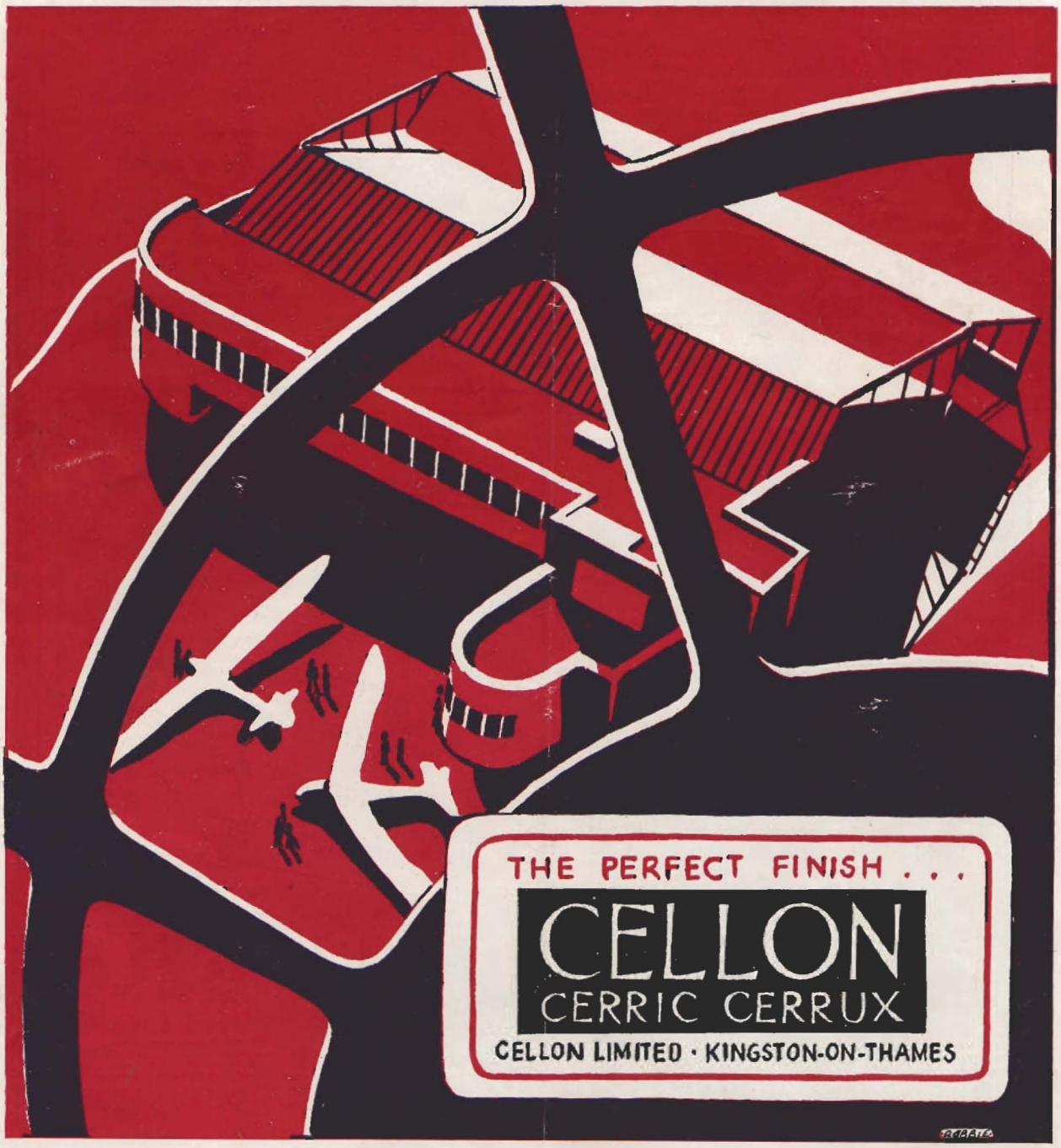
SAILPLANE AND GLIDER

SEPTEMBER 1945
Vol. XIII. No. 8.

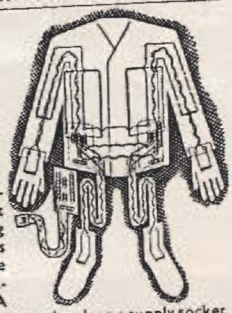
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Sailplane and Glider

THE FIRST JOURNAL DEVOTED TO SOARING AND GLIDING

SEPTEMBER 1945 ★ Vol XIII No 8

EDITOR:
F/L VERNON BLUNT

ASSOCIATE EDITORS:
ALAN. E. SLATER
ANN C. DOUGLAS

ADVERTISEMENTS:
C. K. MARSH

EDITORIAL OFFICES:
139 STRAND, W.C. 2
PHONE: CEN. 2708

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BEFORE the late war, flying was still something of a novelty; a sport for the wealthy (or the sacrificial), sometimes a time saver for the very rushed and rich, and a sojourn in the R.A.F..for a few. Thousands of small boys knew all about aeroplanes in minute detail, of course, but they were at a disadvantage in having no actual air experience. Now, the natural process of growth in the small boy, and the war, have produced an enormously increased number of people who can handle aircraft well, and are thoroughly familiar with most aspects of their operation. Many of these will turn to gliding just to be able to go on flying, or for sport or relaxation. For some time after civil gliding restarts it may be expected that the majority of new members will already have flying experience. What effect is this going to have? For the actual change over from aeroplane flying to glider and sailplane flying, a short conversion course, and not an instruction course will be required (as stated by Arthur Clarke last month). This should be sufficient to turn the aeroplane pilot into an adequate sailplane pilot. But just flying a Sailplane, however well, is only the means to an end. It is by no means the end itself. High performance soaring is an art requiring experience, skill, and endurance of a high order. (But let it be said here that for those who have not the time, opportunity, or inclination to go in for the big stuff, there is plenty of fun to be had from ordinary club flying.)

The first stage in the development of the potential high performance pilot is the acquisition of "feel," and a sensitive approach to the air in which he flies. This is where the aeroplane pilot is generally at a disadvantage. His care has been for his motors as a source of power, and not the air. In fact the power of the air has frequently been a nuisance, when it has forcibly impressed itself on him in the form of headwinds, and turbulence on the approach. He has been accustomed to ride through the air in something that feels solid under his seat. He may even be somewhat disturbed by the cockleshell feel of the sailplane that rides *on* the air. But unless his attitude to the air is one of understanding, even co-operation, he will find that it is thoroughly capricious and unreliable, and he (literally) gets nowhere. In this respect the glider trained pilot is better off. He has had to rely on the power of the air from the start, and has, so to speak, grown up with it: he instinctively knows its habits, so that by the time he has got through his flying training and can handle a sailplane effectively, he is ready (if so inclined) to go straight on to thermal and advanced soaring. The glider-taught pilot, too, in his longer period of training at the gliding club, will have picked up a large amount of knowledge from the experts and had plenty of time to see them fly and watch their technique. But the power pilot should be fully converted to handling a sailplane within a week or a couple of week-ends with any luck. What will happen to him then? He may not have seen anyone circle in a thermal, or even have much more than a hazy idea of what they are. His previous flying will have made him impatient for more than the odd circuit, and yet he will not have the ability to go further. He may realise his trouble and settle down to picking up all the information he can on his own and practising it with great patience, or he may think there's "nothing to this gliding," get fed up and go away.

What is the answer? Films and slides on soaring and the necessary meteorology, talks by "Silver C" pilots on their experiences and difficulties, all given as a part of the clubs' regular activities, will help. But unfortunately, the ideal will be almost impossible to attain at the time when it will be most needed, due to present costs, and lack of sailplanes and equipment, etc., for surely the aim is for the clubs to be able to offer full flying training to "Silver C" Standard as normal procedure.

SOARING BIRDS

by

JOHN H. STORER *

A STUDY of bird flight with a slow motion camera brings up some questions about gliding and soaring which so far as I know have not been satisfactorily answered.

We find among gliding and soaring birds three classes adapted to three different types of environment. Soaring birds of the ocean that can travel on dependable air currents near the ocean surface have, almost without exception, wings of high aspect ratio and narrow or pointed tips. They sometimes soar to great heights but probably seldom need to. As Mr. Alfred Woodcock has shown in his studies of soaring gulls, when conditions are right for soaring over the ocean they are apt to be uniformly good over great areas, and fairly close to the surface.

ALBATROSS

The birds that are built to travel on these currents are built for straight soaring ability, with the modification that their wings must be short enough to be manageable for active flight when necessary, and simple enough so that they can be used when wet. As a rule they are not strong fliers and depend on soaring for most of their travel. The albatross, one of the most highly specialized of this class, has an aspect ratio of about eleven.

An intermediate group of birds lives on or near the water, but also travels long distances overland by soaring, and to do this must often soar to great heights from which it can glide between the widely separated thermal currents. Here we find a sort of hybrid wing. The white pelican, with a nine-foot wing spread, has the high aspect ratio of the ocean soarers, but the slotted tips of the land soaring birds. The wood ibis habitually flies with a series of flaps followed by a glide on its momentum. During this glide, it uses pointed wing tips, but when it starts to soar, it spreads the feathers at the tips to form a series of slots, and so far as I have been able to observe it keeps these slots open habitually when soaring.

SLOTTED WINGS

The third group of soaring birds, buzzards, condors and hawks that travel chiefly over the land must usually get a good elevation for gliding between scattered currents of rising air. These birds, almost without exception, use slotted wing tips for soaring. The condor, one of the most highly specialized, depending almost entirely on soaring and gliding for its travel, has wings slotted for about four feet out of its entire span of ten feet. Most of these soaring birds have a lower aspect ratio than the ocean soarers. They might seem to have altogether a less efficient wing for either gliding or soaring than the ocean birds, and yet nature has developed this wing through a process of evolution based on the survival of the fittest, a wing that is certainly more complicated to use and probably more fragile. Why ?



Turn begins, drops right tip for turn.



Left tip raising, while right wing tip is dropping.



Turn finished, starting to level off. Dropping left wing tip raising right.

MORE EFFICIENT

A number of reasons have been advancing—the need for banking sharply at low speed in a tight spiral to keep within the limits of a narrow thermal, the ability to spill lift by opening the slots when enough elevation has been gained, the greater stability given by slots in violently changing mountain currents, etc. But there are plenty of observations of slots used when none of these reasons seemed to apply. I have watched condors trying to gain elevation when there was barely enough air motion to keep them going. I have watched them travel for long distances on a straight level course, and spiralling upward, always with motionless wings, and they used slotted tips under all these conditions. Having seen albatross pivoting on a pin point among the rollers of the Pacific, I would credit the pointed tips with good stability.

BANKED FEATHERS

These slotted tips are very deceptive to watch, and in studying them one should always keep this point in mind, the feathers are banked somewhat one above the other, highest in front, lowest behind, so that when seen from a certain angle, below and behind or above and in front, they mask

* Presented at the two-day technological Motorless Flight Conference of the Soaring Society of America, Inc., at the Polytechnic Institute of Brooklyn, Aug. 5th and 6th.

each other and appear closed, even when seen at close range through powerful glasses, but from below and in front the condor slots always appeared open in my observations, but they can vary the size of the openings.

FLAPPING FLIGHT

If we compare the shapes and positions of these feathers in soaring and in active flight we find a very interesting similarity. In flapping flight they act as the propellers. The rear vane of each feather is wider than the front one so that on the down stroke the pressure against the air twists the rear vane upward, giving the feather the shape and position of a propeller blade. In this way the wing is driven forward as far, in some cases farther than it moves downward, drawing after it the inner half of the wing which maintains a positive angle of attack throughout the stroke and supplies most of the lift.

In gliding and soaring the wing and tip feathers take very much the same positions and angles. If we take a condor's primary feathers we find that it takes from a quarter to half a pound of upward pressure on a single feather to give it the amount of upward bend shown in many of the movies of condors gliding with motionless wings. In many cases the feather at the leading edge of the wing is twisted to between 30 and 40 degrees minus angle to the line of flight, each succeeding feather have a slightly lower angle of attack until at the rear they have a positive angle.



Buzzard gliding with motionless wings.

LIFT ACCOMMODATION

This graduation in the upward bend of the feathers seems to correspond roughly to the distribution of lift over the upper surface of a wing, highest toward the leading edge, lowest at the rear, except that the reduced bend on the successive feathers gives this slotted wing surface a sloping straight line rather than the curved camber of a wing. The solid part of the condor wing is cut off square across the end at the base of the slots and would seem designed to concentrate the tip vortex from the concave lower surface and direct it upward through the slots.

The author has not been able to learn of any tests with slotted tips that would compare with the tips of a soaring bird. One may well ask whether the soaring bird, developed through a process of the survival of the fittest, may not have something to teach the engineer who says its slotted wing is not the most efficient type for soaring.

With acknowledgments to "Soaring."



More Orders for Chilton OLYMPIAS have already been received than for any other high performance sailplane ever built or sold in Great Britain. Purchasers include some of the best-known personalities in the pre-war British soaring movement.

In view of recent claims we would suggest that much design and experimental work (including exhaustive flight-testing) has yet to be carried out before any other type can justfiably claim equal or improved performance over the proved figures of the OLYMPIA.

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POST-WAR GLIDING

By P. A. WILLS, C.B.E.

AFTER a gap of some years on priority business, I have recently had time to think again on gliding affairs, so that the views of one coming back more or less fresh to the subject (in so far as anyone *can* at the present time be described as "fresh" on any subject) may be of interest.

As in every other subject under the sun, we must avoid the temptation of trying to go back to "the good old days." The world has grown older and in some ways wiser by more than the five or six calendar years that have elapsed. I have been privileged recently to investigate in Germany the progress of gliding during the War, and it is obvious that as far as possible we in England must take advantage of their progress, and start up again where they left off, so filling the gap in our own development which the Germans have forced on us.

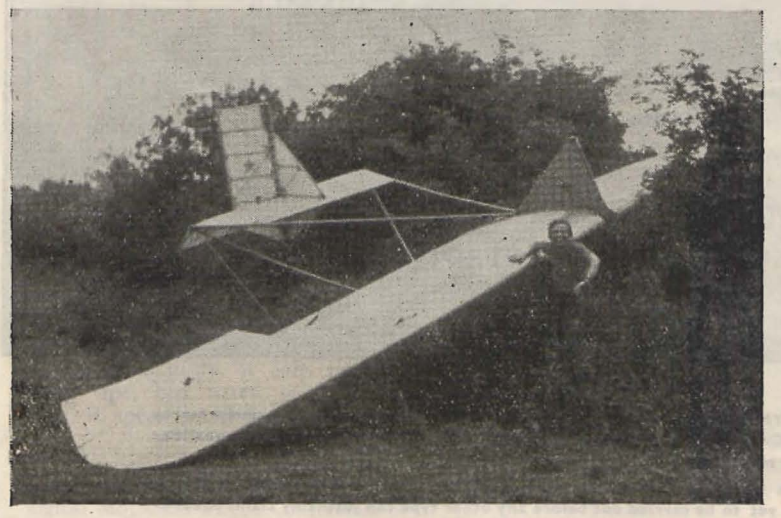
A.T.C. GLIDING

The main development in this country since the War has been the advent of A.T.C. gliding, and whilst this has covered only the first stages of training, it has done so on a much larger scale than was ever contemplated by the pre-war club, and accordingly in my views the lessons they have learnt are of great value and must be used by post-war clubs to the full.

Bearing in mind, however, that these lessons are limited to the first phases of training, I do not think A.T.C. are likely to hold any necessarily conclusive views on the methods of training beyond the "B" Licence stage of plain gliding, as distinct from soaring flight.

There is some reason to believe, however, that the elementary training methods of the pre-war club were, financially speaking, their Achilles heel, and that many clubs made a loss on this side of their activities which was covered by profits on more advanced flying, private owners, social activities and so forth. Any improved methods therefore will be of the greatest value in the hard years to come.

Lesson number one in my view is that A.T.C. have finally seen off the stage that devastating device, the "Primary" trainer. This fearsome apparatus not only struck terror into the hearts of beginner and beholder alike, but also probably gave the general public the impression that the glider pilot must be slightly mad to be prepared to adventure in the air at all.



THE UBIQUITOUS PRIMARY.
What aircraft ever worked harder for its living.

THE DEVELOPMENT OF THE "CADET"

By taking the "Cadet," strengthening it here and there, and particularly by putting a landing wheel on it which greatly reduces landing stresses on machine and pilot, and speeds up all ground handling problems, the A.T.C. have produced a machine which can take an *ab initio* pilot right through from preliminary to "C" Licence stage in the shortest possible time.

The machine is easier to fly, safer in a crash, and easier to handle, than a "Primary." Lastly, for post-war clubs, the possession of a few pairs of Tutor wings will enable them to provide a reasonably good soaring machine for their members on the same basic type.

STANDARDISING MACHINES AND PROCEDURE

The increased cost of aircraft in the first post-war years is going to be a serious problem. It can be materially eased by standardising types to the utmost, so that manufacturers can jig for quantity production.

In this respect A.T.C. and club can materially assist each other by standardising as far as possible on the same types. And since many members of the A.T.C. will doubtless also become members of the club, a standardisation of the types common to both will be mutually beneficial to pilots as well.

Whilst methods of instruction in A.T.C. and the civil club will not be able to be exactly parallel owing to the different context of service and private flying, there will doubtless be many ways to avoid the member of both having to remember two different standards of procedure.

CLUBS NEAR TOWNS

The second lesson, which is one which was before the War being practised by the Midland Club, amongst others, is that all instruction prior to the soaring stage can be conveniently and efficiently carried out on flat sites near the larger centres of population. Only

the extreme enthusiast before the War found it worth while motoring great distances every week-end to indulge in ground slides at his nearest gliding club.

The only reason he had to go so far was that the club existed on the soaring sites and had no facilities for elementary instruction elsewhere.

We must in my view aim in future that the only pilots arriving at a soaring site are those who are ready to learn to soar, or can already do so. It is greatly to be hoped that some liaison between A.T.C. and the post-war club will be made to enable their present elementary instruction facilities near every big town to be shared. In return the clubs could make their sites and facilities available for summer camps, when the most promising A.T.C. pupils could receive instruction beyond their present stage.

TWIN OR SINGLE SEATERS?

An alternative scheme of instruction from the beginning in two-seater sailplanes has been suggested, but in view of the fact that the immediate post-war cost of a two-seater sailplane is likely to be not far short of £600, it seems to me that this idea is not immediately practicable, apart from the operational difficulties involved, which may be considerable.

The post-war types of a gliding club should therefore be confined to " Cadet " and " Tutor," a cheap cantilever sailplane and a two-seater, both of standard design. Here the Germans may be able to help. Whilst during the war they do not appear to have produced any new types to be of club interest in the near future, they have modified various pre-war types for quantity or even mass production. Thus, it is estimated that between 5,000 and 10,000 " Grunau Baby II's " have been built, upward of 1,000 " Meise " (" Olympia "), and 300 " Weihe," and possibly 750 two-seater " Kranichs." The man-hours required to build the " Meise " have been reduced from 4,000 to 1,200. All this has been done without reducing the efficiency or strength factors of these excellent machines.

It is just this reduction of cost which is going to be the core of our problem here, so that an effort is being made to obtain the latest German designs for this reason.

MASS ORDERS

In any case, some co-ordination between the clubs themselves and A.T.C. in their placing of orders would clearly assist manufacturers. Thus if all orders were co-ordinated and pooled say twice yearly so that quantities of a type could be ordered at one time, manufacturers would be able to assess how much they could afford to jig up for production.

Before the War an individual private owner almost always expected some special features on his machine, but seldom expected to have to pay for them. With a better idea of costing, manufacturers should now be able to make the private owner pay a proper price if he insists on variations from standard, instead of as in the past, the loss incurred on these having either to be borne by the manufacturer or covered in the profit made on his standard productions for the clubs.

FINANCE AND EQUIPMENT

Whilst post-war costs must for the time being be very much guesswork, clubs must calculate on the basis that machines will cost about double the pre-war figure. This should involve subscriptions and flying fees being doubled, if a sound financial basis is to be reached.

By pre-war standards many clubs have quite reasonable liquid assets, but it is to be feared that these will evaporate quite rapidly in the new circumstances. So that much will depend on either a direct government subsidy, and/or a fairly liberal policy in providing genuine clubs with ex-German aircraft, balloon winches, and other items of equipment which should be in good supply.

British manufacturers of gliders would, I am sure, benefit by a liberal policy of this kind. They will not be in a position for some time to supply the quantities that will be needed, and if they were, the clubs would not have the necessary finance. There would, therefore, be a gap of several years during which manufacturers and clubs might grow very weak. If quantities of German machines are provided, manufacturers will have to C of A them, and will get work in repairs and maintenance. Meanwhile the movement will flourish, more people will come into it, and the trade will grow.

I see the gliding movement at present rather like a water pump that has been standing idle for some time. You can work away at the handle for a long time with very little result, unless you prime it, after which results arrive with great speed. If the clubs can be adequately primed now, they will never look back.



AIR REVIEW

Air Review. Vol. 7, No. 2. June-July, 1945. The title of this journal, formerly published by the Air League, has been acquired by the organisation which produces the " Aeromodeller," and it appears now in a much enlarged and luxurious form at 3s. A large proportion of the paper is taken up with descriptions of aeroplane types, but the remainder shows commendable variety and even includes a page on the aerodynamics of windmills. Stringfellow's model of 1848 also gets a look-in, with a page of general arrangement drawings.

Tommy Rose writes nostalgically about the early years of the Light Aeroplane Club movement, with its delightful inter-club social functions and the " adventure " of cross-country flying. He doubts if those happy times will ever come again, what with modern instructional methods, the lack of a second Sefton Brancker, and the clubs becoming " commercially minded." This may serve as a warning to us, though the gliding clubs had not reached that distressing stage by the time the war began. How long our respite will last, remains to be seen ! A.E.S.

BALANCING A SAILPLANE

By J. C. REUSSNER.

THE performance of a sailplane is affected to a large extent by balance. As the calculations involved are comparatively simple, there is no reason why a sailplane pilot should not check his own machine for balance

A sailplane is usually trimmed so that it will fly at its most efficient speed without the necessity for tail-load to keep it in this attitude. This means that all the forces acting on the machine must be balanced without any assistance from the tail-unit.

The principle forces operating on a machine are the weight, which acts at the centre of gravity, and the wing lift, and the wing drag, both of which may be assumed to act at the centre of pressure of the wing. Other forces such as fuselage drag and tail unit drag affect the balance, but to a much smaller extent, and in the balance calculations for a sailplane they may be ignored.

The problem of balance has now resolved itself into positioning the centre of gravity directly under the centre of pressure, when the wing is at its most efficient incidence. To do this we must be able to fix the positions of the centre of gravity and the centre of pressure.

It might be as well at this point to define the terms " centre of gravity " and " centre of pressure " for the benefit of the uninitiated.

The centre of gravity, C.G., may be defined as the point at which the sum of the weights of all component parts of the machine acts. To put it more simply, if the machine were suspended at its C.G. it would balance in any position.

The centre of pressure, C.P., may be defined as the point at which the resultant forces on the wing cut the chord line, or, more simply, it is an imaginary line running spanwise along the wing on which the total lift of the wing is operating. The centre of pressure does not stay in one position but changes with the wing incidence. When the wing is near the stalling angle the C.P. will be well forward, generally at about 30 per cent. of the chord, but as the speed of the machine increases, thus decreasing the angle of incidence, the C.P. will move towards the rear. In a fast dive the C.P. may be well behind the trailing edge.

Let us now consider how we can find the position of the centre of gravity. When a new machine is being designed a great deal of time is spent in estimating the position of the C.G. and positioning the various components so that it will fall as near to the ideal position as possible. To find the C.G. of a completed machine, however, the simplest method is by weighing it. *Fig.* 1 shows how this is done. The machine is hung in flying position on two spring balances A and B, and the distance of each balance from the leading edge of the wing is measured.

Let A = Weight on balance A (in lbs.).

B = Weight on balance B (in lbs.).

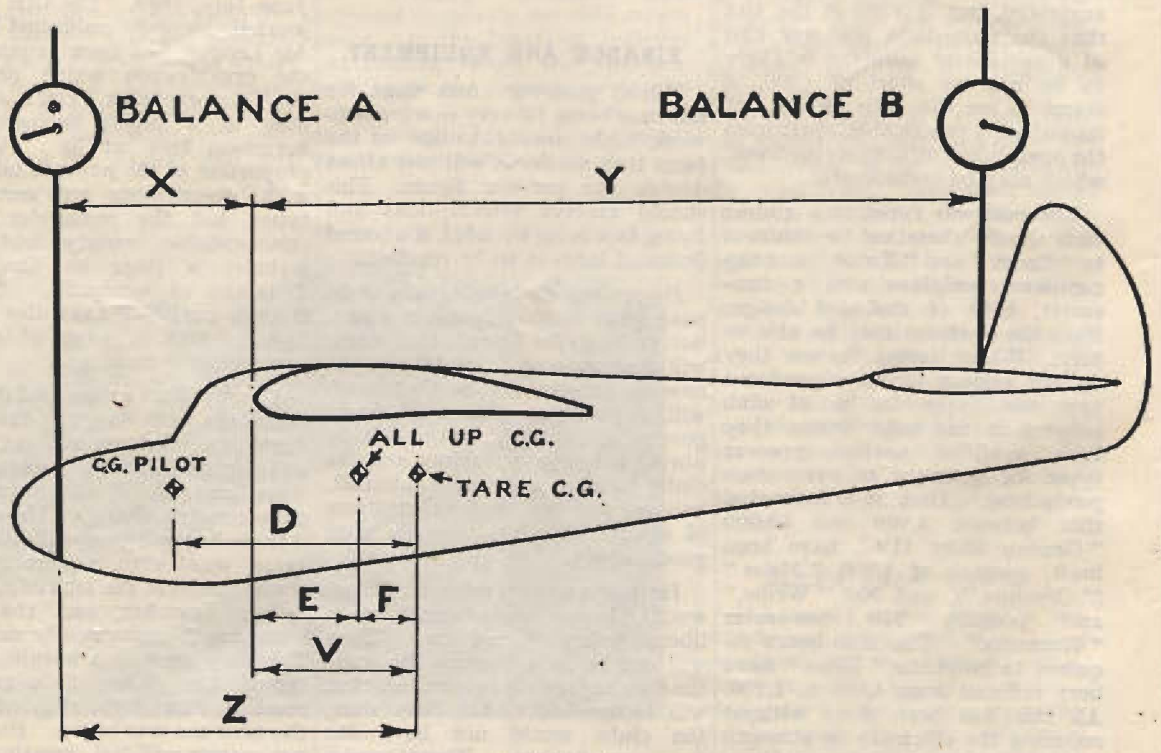


FIG 1

X = Distance of balance A in front of L.E. (in inches)
Y = Distance of balance B behind L.E. (in inches).
Z = Distance of C.G. behind balance A (in inches).

To find Z we multiply the weight on balance B by the distance between the two balances, and divide the answer by the sum of the weights on both balances. Thus :—

$$Z = \frac{B \times (X + Y)}{A + B}$$

If we now take dimension X from Z it will give us dimension V—the distance of the tare, or empty, C.G. behind the leading edge. It is often useful to mark this point on the side of the fuselage, together with the tare, or empty, weight of the machine. This C.G. position must now be corrected to allow for the weight of the pilot. If a machine is generally flown by one particular person it can be balanced to suit his weight, but it is more usual to balance a machine so as to allow for a 180 lb. pilot. The centre of gravity of a man in sitting position is usually taken as 10 inches up from the seat bottom and 10 inches out from the seat back, this position should now be located in the fuselage, and the distance between it and the tare C.G. measured. Let us call this dimension D. To find the all-up C.G. of a machine we multiply the weight of the pilot by dimension D and divide the answer by the sum of the weights of the machine and pilot. Thus :—

$$F = \frac{Wp \times D}{Wp + Wm}$$

Where Wp = weight of pilot in pounds.
Wm = ,, ,, machine in pounds.
F = distance of all-up C.G. in front of tare C.G. in inches.

As we require to find the distance of the C.G. behind the leading edge we now take dimension F from dimension V which gives us dimension E, the one we require.

Let us now consider the problem of positioning the centre of pressure. As stated before it is usual to balance the machine so that it will fly at its most efficient gliding angle. This gliding angle may be assumed to correspond to the highest LIFT—DRAG value of the wing. We must now find the position of the C.P. which corresponds to this value. To do this we must refer to the characteristic curves for the airfoil employed. *Fig.* 2 shows airfoil curves for a typical wing section. It will be seen that L—D, centre of pressure and lift coefficient (Cl) are plotted against angles of incidence. The highest value L—D is the peak of the L—D curve and by dropping a vertical line through this point it will be seen that it occurs at an angle of incidence of one degree. Where this vertical line cuts the C.P. curve indicates the centre of pressure position for this angle of incidence, and by reading the value off the left-hand side of the figure it will be seen that it is about .38 of the chord. Multiplying the chord of the wing by this figure will give us the distance of the C.P. from the leading edge.

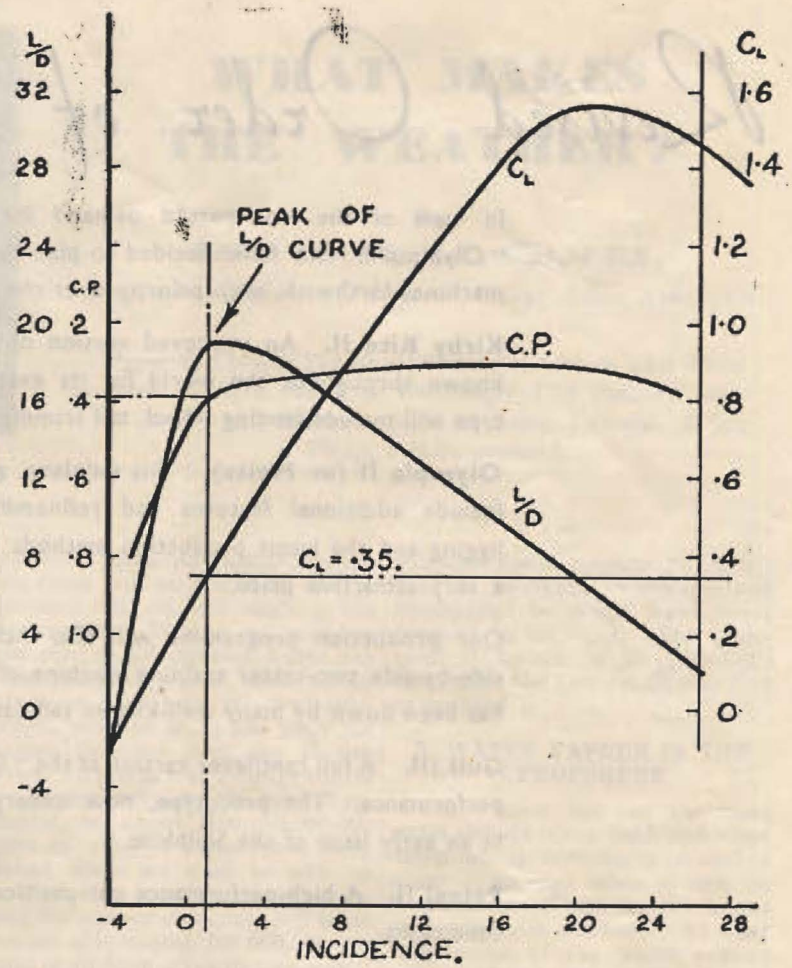


FIG. 2.

It is important to realise that the above is only strictly correct for a machine with parallel chord and constant section, where the centre of pressure is on an almost straight line running spanwise along the wing. As most sailplane wings are tapered and are made up of two or more different airfoil sections we must find the C.P. at various points along the span and then take the mean position. However, if the reader does not wish to go to all this trouble a good approximation may be obtained by finding the C.P. position for the root-end section and taking this as the mean C.P. position of the wing. It should be noted that this method cannot be applied to a swept-back wing.

(*Continued on page* 18)

Revised Order of Production

In view of the unexpected demand for the "Kirby Kite" and the "Olympia II," we have decided to plan the quantity production of these machines forthwith, with priority over the higher performance types.

Kirby Kite II. An improved version of the now famous pre-war type known throughout the world for its excellent qualities. The post-war type will include landing wheel, tail trimmer, and other features.

Olympia II (or Meise). This sailplane, already so well advertised, will include additional features and refinements. By special attention to jigging and the latest production methods we aim to market this type at a very attractive price.

Our production programme will also include the following :— **Type 21** side-by-side two-seater training machine of 54 feet span. The prototype has been flown by many well-known sailplane pilots and voted a winner.

Gull III. A full cantilever version of the "Gull I," a machine of exceptional performance. The prototype, now undergoing tests, will be illustrated in an early issue of the *Sailplane*.

Petrel II. A high-performance competition type most suitable for British conditions.

Every Machine produced will be up to the highest standards of workmanship and tested by our own sailplane pilots with many years of soaring experience. Sailplane pilots will also supervise the detail production.

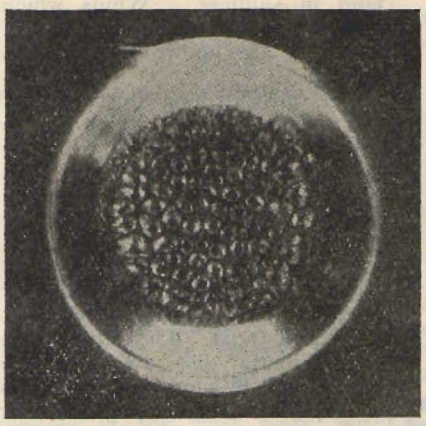
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AUSTRALIA :	Light Aircraft (Pty) Ltd., Sydney.
SOUTH AFRICA :	Thomas Barlow & Sons Ltd., Johannesburg.



By courtesy of the Meteorological Society
Fig. 1. Convective motion in gold paint

WHAT MAKES THE WEATHER?

By
DAVID BRUNT, M.A., Sc.D., F.R.S.,
Professor of Meteorology, Imperial College, South Kensington.

Paper read before The Royal Society of Arts at John Adam Street, Adelphi, W.C.2, on Wednesday, 17th January, 1945, at 1.45 p.m. Professor E. N. da Costa Andrade, D.Sc., Ph.D., F.R.S., presided.

THE answer to the question posed in the title of this lecture can be given in a few words, namely, that weather is produced by the ascent of air, and particularly by the ascent of damp air. If the air always moved horizontally, weather as we know it would not occur. Indeed, the essential differences in the character of weather in different parts of the world are, in the main, differences in the form or scale of the mechanism which produces the ascent of damp air.

Before we can develop our argument in detail, a few general principles must be stated and explained :—

1. AIR PRESSURE

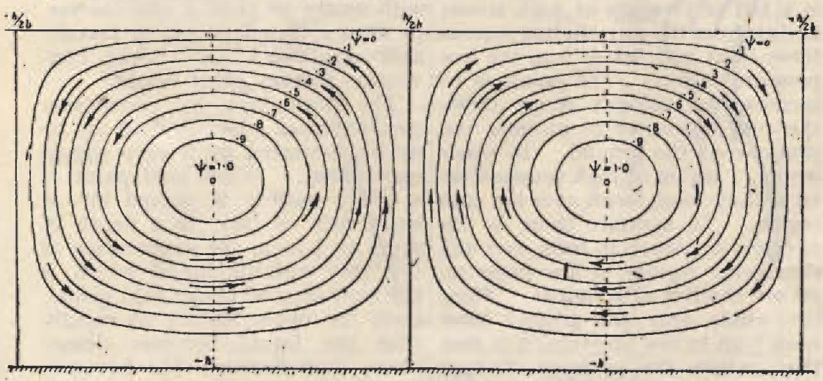
The pressure of the air at any level is a measure of the weight of air above unit area, say one square centimetre, of a horizontal surface placed at that level. The higher we place our horizontal surface, the less air there will be above it, and so pressure falls off with height in the atmosphere. When a region of low pressure, or a depression, forms, say over the British Isles, some of the air must have been removed sideways, so as to leave less than the normal amount over the British Isles. To produce an average winter depression requires the lateral removal of about 100,000,000,000 tons of air. I have often been asked when we shall be able to control the weather out-of-doors, and the answer obviously is " when we are able to stop 100,000,000,000 tons of air from going its own way."

2. WIND. BUYS BALLOT'S LAW

The wind near the ground is directed from high to low pressure, but in such a way that, in the northern hemisphere, an observer standing with his back to the wind will have lower pressure to his left than to his right; in the southern hemisphere he would have lower pressure to his right. This statement is known as Buys Ballot's Law, after the Dutchman who first enunciated it.

3. WATER VAPOUR IN THE ATMOSPHERE

The warmer the air, the more water vapour it can hold, and when damp air is sufficiently cooled a stage is reached when it can no longer hold all the water vapour with which it started. At that stage some of the water vapour will condense into small water drops. This is what happens when, on a clear night, the ground is cooled by radiation to the sky, and the ground cools the air above it, and fog is formed. When damp air rises into levels of lower pressure, it expands and cools. We then have the opposite action to that which occurs in a bicycle pump, which compresses and heats the air, and the air in turn heats the end of the pump through which it is forced. Ascending air thus expands and cools, and, if the ascent is continued sufficiently high, within the rising air there will form, first a cloud of very small water droplets, of diameter comparable with 1/1,000th inch, and later larger drops, of diameter 1/100th inch and upward, which fall to the ground as rain. If the condensation starts at levels where the temperature is below the freezing-point, it will usually be in the form of snow. The smallest crystal of ice is a hexagonal plate. It may grow in



By courtesy of the Royal Meteorological Society.
Fig. 2. Vertical section through a single cell of Fig. 1. The lines are the lines of flow of the liquid, the arrows indicating the direction of flow.

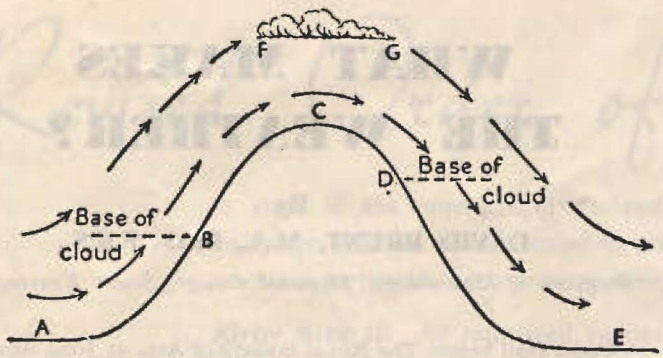


Fig. 3. *Flow of air over a barrier of high ground.*

one of two ways. When the amount of water vapour available for condensation is small, the crystal plate grows in thickness, and eventually becomes needle-shaped. Snow formed at high levels, or at low levels in very low temperatures, is in this form. When the snow is formed at temperatures not far below the freezing point, with plentiful water vapour available for condensation, the crystal grows an arm at each angle. The fully-developed crystal if this type may take a myriad of different forms, and the snow-flake which falls to the ground consists of a large number of crystals tangled together. Much of the rain which falls in the British Isles in winter starts as snow at high levels, and melts in falling through the warmer air at low levels.

When air containing a cloud of water drops sinks, the process of condensation is reversed ; the cloud becomes thinner, and eventually disappears.

4. DIFFERENCES OVER LAND AND SEA

The air is heated and cooled by the ground. The temperature of solid ground, and, consequently, the temperature of the air immediately above it, is rapidly raised by bright sunshine, and is rapidly lowered by radiation to the sky on a cloudless night. But over the oceans the surface temperature changes little from day to night. By day the sun's rays penetrate through a considerable depth of water, and their energy is shared out through so large a mass of water that only a very slight change of the temperature of the surface water, and of the air above it, is produced. At night, as soon as the surface layer of water is cooled by radiating heat to the air, it sinks, and is replaced by warmer water from below. Thus, the night cooling the surface of the ocean is very slight. We have, then, to think of the temperature of the sea, and of the air immediately above it, as remaining nearly steady by day and by night, while the land, and the air above it, is warmed by day and cooled by night.

In summer, the land gains more heat in the long days than it loses in the short nights, and so it becomes, on the average, warmer than the sea. In winter, on the other hand, the land loses more heat in the long nights than it gains in the short days, and so becomes, on the average, colder than the sea. Consequently, breezes from the sea are mild in winter, and cool in summer. In the British Isles in winter the temperature of the air depends far more on the direction of the wind than it does on whether the sun is shining or not.

SUMMER AND WINTER WINDS.

When the air over the central part of a continent cools in winter, it shrinks downward, so that there is a fall of pressure at high levels, and air from the surrounding regions flows in at high levels into the low pressure region. The result is to increase the amount of air above the cold region, or to increase the pressure at the ground. In other words, a region of high pressure, or an anti-cyclone, forms over the cold region. In summer there is the opposite tendency to form over the continents regions of low pressure, rather shallow depressions. Since the winds near the ground blow from high to low pressure, it is seen that, where the pressure changes in the manner I have described, the surface winds will blow from land to sea in winter, and from sea to land in summer. Winds which show these seasonal changes of direction are known as monsoon winds.

The most striking illustration of the seasonal changes which I have described will be found over the large land mass of Europe and Asia. In winter the lowest temperatures and the highest pressures are to be found over north-east Siberia, and out of this region blow the dry cold winds which form the north or north-east monsoons of the China coast and India. The anti-cyclone over Siberia dies away in the spring, and in summer there forms a depression, or centre of low pressure, to the north-west of India. The winds blowing around this depression yield the south-west monsoon of India, the southerly monsoon of the China coast, and, in the extreme west of the zone of influence of the low pressure, the Etesian winds of the Mediterranean.

5. STABILITY OF AIR

Air becomes top-heavy, or unstable, when its temperature falls off with height by more than 5.4° F. per 1,000 feet. Instability of air is produced when the ground beneath it is warmed by the sun, or when a mass of cold air passes over a warm surface. The instability is rectified by the warm surface air rising in a number of separate currents, each surrounded by colder currents descending from above to take the place of the warm air. The rising currents are known as *convection currents*. If the rising air is damp, and the ascent is maintained to a sufficiently high level, each convection current will form a cloud, of the cumulus type, and the cumulus cloud may grow sufficiently to yield a rain-shower, or even a thunderstorm in favourable conditions, *i.e.* violent convection to very great heights.

The formation of convection currents in an unstable fluid can be readily imitated by a very simple experiment. When gold paint of a cheap variety is poured into a small dish or tray, to a depth of say $\frac{1}{8}$ to $\frac{1}{4}$ inch, the evaporation of the very volatile liquid which is the basis of most cheap gold paints, cools the upper surface so rapidly that the liquid becomes denser above than below. The liquid in the dish is seen to break up into a number of small cells, within each of which the liquid ascends in the

middle, spreads outward at the top, and sinks at the outer margin. The same type of motion can be imitated in air contained in a small chamber having a glass top and a metal base which can be heated from below, the motion being rendered visible by cigarette smoke. When the chamber is made so that the glass top can be set in motion across the chamber, giving a shearing motion to the unstable air in the chamber, the threads of convection are sheared into vertical planes, and the motion of the unstable air then consists of long rolls parallel to the direction of motion of the glass plate, with adjacent rolls rotating in opposite directions. (See Figs. 1 and 2.)

When the wind is uniform in speed and direction through the layer of atmosphere in which cumulus clouds form, the clouds will be of the usual woolpack form. Under such a cloud there will be a vertical current, and a sailplane which succeeds in getting into this ascending current can circle around in it for an indefinite period.

When the wind speed increases with height through the layer in which cloud forms, the clouds will be in long rolls, whose length is roughly parallel to the wind-direction. Such clouds are known, to pilots of sailplanes or gliders as *cloud streets*. Underneath such a roll of cloud there is an upward air current, in which a glider can go across country as readily as a tram running on rails.

Convection is likely to become active either in quiet fine weather when the mornings are bright and sunny, or when cold air from high latitudes flows southward over relatively warm ground. The sailplane pilot depends on convection to keep him in the air, and while the present British distance record for sailplanes, from London to Cornwall, was made in anti-cyclone weather on April 30, 1938, by P. A. Wills, an earlier record flight in 1936, also made by P. A. Wills, was set up in the cold air in a depression, on a day when small cloud streets alternated with rather irregular cumulus.

OROGRAPHIC CLOUD AND RAIN

We now return to our original thesis, that weather is mainly produced by the ascent of air. One example of this, the convection current which produces cumulus cloud, and possibly a rainshower or a thunderstorm, has already been mentioned.

An even more obvious condition in which air will ascend is when a ridge of high ground or a range of hills or mountains, lies as a barrier across the direction of the wind, forcing it to flow upward over the sloping ground. The horizontal flow of the air is disturbed to a height of from 2½ to 3 times the height of the high ground, the heights being measured from the level of the low ground upwind of the barrier. Even a large building will produce similar disturbances of horizontal flow, and it is to allow for this that the chimneys of power stations are usually about 2½ times the height of the building. (See Fig. 3.)

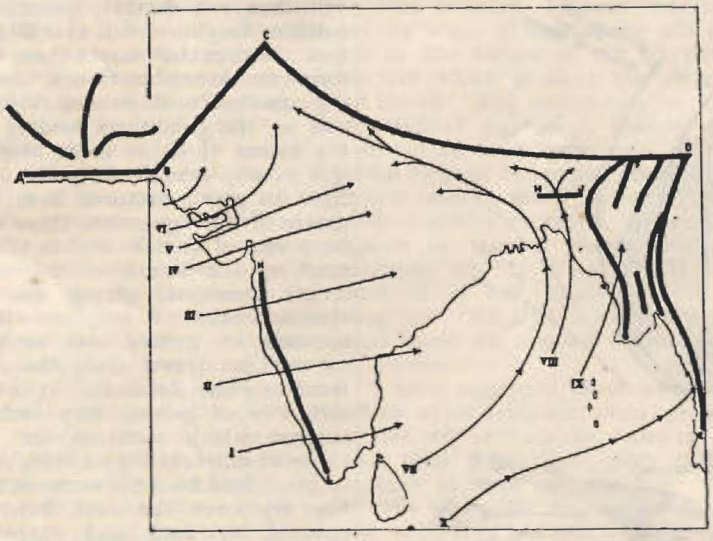
"BANNER CLOUD"

The air which is carried upward over the high ground will expand and cool, and if the barrier is sufficiently high, cloud will form, early or late in the ascent according as the air is initially very damp or not. Such cloud is known as orographic cloud, and any rain which it may yield is known as orographic rain. It sometimes happens that the air near the ground is too dry to yield cloud, while the air some distance above the ground is sufficiently damp to form cloud when at its greatest height above the barrier. Such cloud will not move away downwind, but will remain apparently fixed in position above the barrier. Sometimes a cloud forms at the peak of a mountain, and is then known as a " banner cloud."

If the barrier is high, rain will usually fall on the high ground, most of it on the windward side of the barrier. Rainfall produced in this way will continue so long as the wind retains its direction, and the air it brings is sufficiently damp. When rain falls from a cloud formed over a mountain top, the base of the cloud on the lee side will be higher than on the windward side.

INDIA A GOOD EXAMPLE

The most outstanding example of rainfall produced in this way is the rainfall of the south-west monsoon of India. India is almost completely surrounded by mountains, except along the south-east coast. Fig. 4, due to Sir George Simpson, gives a schematic representation of the main mountain ranges of India. The south-west monsoon, reaching India as a warm and damp current, is forced to rise over these mountain barriers along the south-west coast, and in so doing yields copious rainfall, as also does the current reaching the west coast of Burma. The stream-line marked VIII strikes the Khasi Hills, and is forced to rise almost vertically for 4,000 feet, giving the highest recorded rainfall known. At Cherrapunji the annual rainfall averages 424 inches, of



–Stream Lines during Monsoon.

By courtesy of the Royal Meteorological Society.

Fig. 4.—Schematic representation of the main mountain ranges of India. The long arrows indicate the lines of flow of the S.W. monsoon current

which about 400 inches falls in the months April to September. In the lee of the mountains the rainfall is relatively small. The trajectories marked IV and V pass over low coastal regions, and reach Central India as warm damp currents capable of yielding heavy rainfall among the hills. The northern-most part of the south-west coast of India is flat, and the air carried inland along trajectories VI meets no barrier of high ground, and consequently yields little rain. The inland region reached by this air is Sind, and the desert of Sind testifies to the dearth of rain, the annual total of rainfall averaging less than 10 inches over a very large area, and less than 5 inches over an area of at least 40,000 square miles. It is noteworthy that if the mountains of India were levelled out the climate would be drastically altered, and India would be a hotter and much more unpleasant land to live in.

The long succession of mountain ranges running down the west coast of North and South America also produce plentiful rain, and there are places among the Rocky Mountains in Canada where the rainfall is comparable with all but the wettest parts of India. A map showing the annual rainfall of a country will usually reflect all the salient features of the contours of the gound. Even in the British Isles we find the heaviest rainfall in those regions where damp winds from the Atlantic are forced to rise over steep slopes, as shown by the outstanding raininess of Snowdonia, the Lake District and Western Scotland.

ASCENT OF WARM AIR OVER COLD AIR

There is yet a third way in which air can be made to ascend. Instead of a barrier of high ground, it may meet a barrier of colder, and therefore denser, air, lying in its path in the form of a wedge, over the upper surface of which the warm air climbs. This occurs within the depressions which exert the main control over the weather of temperate latitudes, these depressions being regions of conflict between warm and cold winds. The lowering of pressure which marks the development of a depression as well as most of the features of the weather within the depression, are associated with the ascent of the warmer over the colder air current. Nearly all the rain which a depression brings is formed in this way, and falls from an upper warm current through a colder current lying below it.

In a fully-grown depression the warm air at ground level is limited to a small sector extending outward from the centre in a southerly direction from the centre (Fig. 5). The easterly edge of the warm sector, where cold air is being replaced by warm air, is called the warm front, and the westerly, or rear, edge of the warm sector is called the cold front. This warm sector is attacked by the cold air on both easterly and westerly flanks, and eventually it loses this battle, and is forced to retreat upwards, with the cold air taking its place along the ground. When the warm air has all been pushed up from the ground, the depression begins to die away, and the rainfall becomes lighter, and finally ceases.

The cold air in the rear of a depression is in the form of a wedge with a nose at some distance above the ground, this form being dictated by the variation of wind speed with height, as determined by surface friction. The warm air which climbs up over the elevated nose of the cold wedge will, in some depressions, become saturated and unstable during this ascent, and will then rise further, sometimes reaching heights of well over 20,000 feet. Within this current there will form cumulo-nimbus clouds, towering cumulus clouds with dark tops, and as the conditions leading to the ascent of air to great heights will usually prevail along the cold front to great distances from the centre of the depression, there will be a line of cumulo-nimbus cloud marking the length of the cold front, sometimes giving rise to thunderstorms. A sailplane which succeeds in getting into such a current can travel along the cold front to great distances. It is the difficulty of getting into such a current which accounts for the rarity of sailplane flights along cold fronts. Seen from the warm sector, the sky over the cold front is covered by dark and shapeless clouds, and it is not possible, from the appearance of the sky, to tell the precise moment when the cold nose of the cold front is overhead.

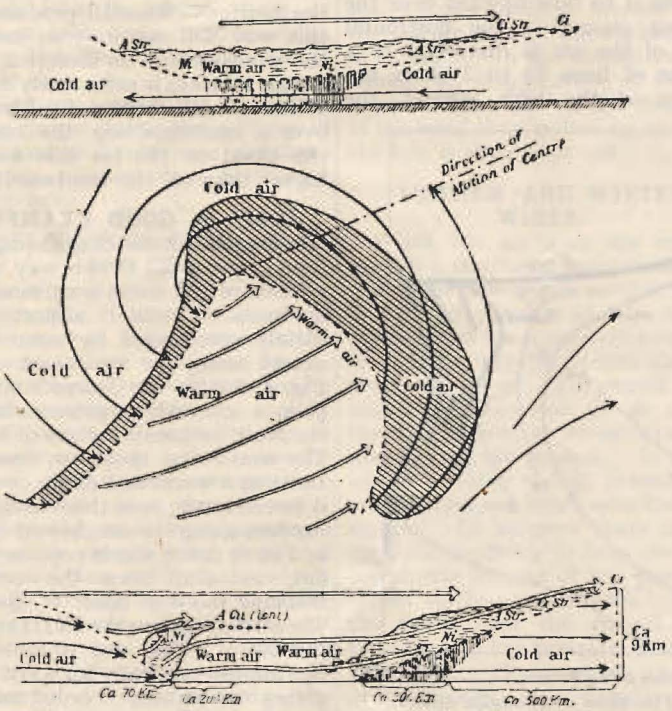


Fig. 5—The air-flow in a fully-developed depression, with veritcal cross-sections to north and south of the centre.

THE FORMATION OF A DEPRESSION

The fact that heavy rain occurs within a depression is in itself evidence of large-scale ascent of air. It is perhaps worth while considering briefly the basic facts of the formation of a depression. The depression can be defined as a centre of low pressure, having a counter-clockwise circulation of winds about that centre. In the northern hemisphere, air moving over the earth is subjected to an acceleration to the right of its direction of motion, on account of the rotation of the earth. This is the fundamental dynamical fact to be considered. Now suppose that a depression is to be formed with its centre at some point O. This requires the lateral removal of air from the region centred at O. The most obvious way of removing this air would appear to be to cause it to diverge outward in all directions from O, as shown in Fig. 6. The air moving outward from O would swing around to its right, as shown in the diagram, and in the end would acquire a clockwise circulation around the centre O, and not the counter-clockwise circulation required for the depression. If a counter-clockwise circulation is to be produced, the air must converge inward towards O, as shown in Fig. 6 (*b*). This is shown in vertical section in Fig. 6 (*a*). This diagram shows the inward convergence of the lower air towards the point O. Now the air which flows in towards the centre must ascend, since there is no other way in which it can be disposed of. But the mechanism which has so far been described only provides for an accumulation of air above O, yielding a rise, and not a fall, of surface pressure. In order to produce a fall of surface pressure we must provide a mechanism for removing the surplus air at high levels, and the formation of a depression must be such as is shown in the completed diagram of Fig. 6 (*a*), with the further proviso that air must be removed at high levels more rapidly than it is brought inward by the currents in the lower atmosphere. Thus, at high levels above a depression, there must be an outflow of air, and a clockwise circulation of winds, and observations of the motion of cirrus clouds above depressions have confirmed this. The formation of an anti-cyclone is shown in Fig. 6 (*c*) and (*d*). Above an anti-cyclone there must be an inflow of air and winds blowing around the centre in a counter-clockwise direction. The diagrams of Fig. 6 must not be regarded as one of a number of possible theories of the origin of depressions and anti-cyclones. Rather is it to be regarded as stating the geometrical conditions to which any theory of the origins of these systems must conform. The only difference which can subsist between different theories of the origin of depressions will be as to the nature of the physical factors which produce the ascent of the air. This ascent may be due to statical instability, leading to convection on a large scale, or to some form of dynamical instability which causes a warm current to rise over a colder current. That the ascent of the air shown in the diagram of Fig. 6 (*a*) should be vertical is not implied in the diagram. All that is necessary is that there an upward component of motion.

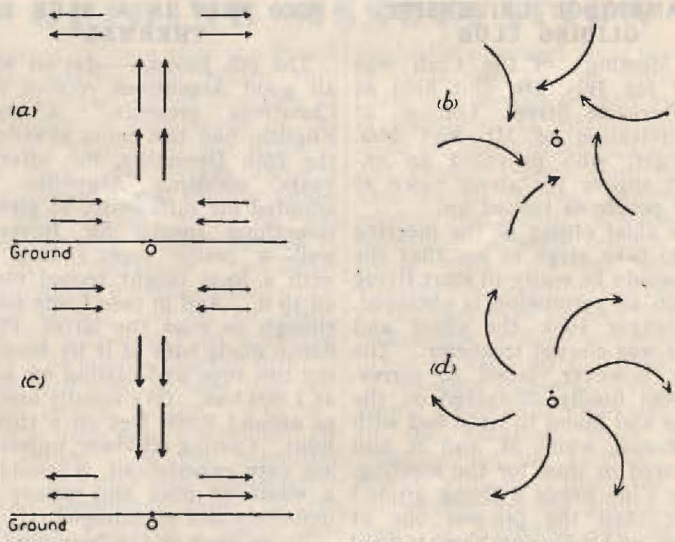


Fig. 6.—*The essential air flow in the stage of growth of a depression* ((*a*) *and* (*b*)) , *and of an anticyclone* ((*c*) *and* (*d*)).

I have suggested three ways in which warm damp air, when caused to rise, will produce cloud and rain, and even depressions with their systems of wind and weather. If I have given the impression that the rainfall of any one place is to be explained entirely in one of these ways, I should like to correct it. It can safely be said that a very large part of the rainfall of the globe, in all latitudes, is directly due to the ascent of damp air over sloping ground, over hills and mountains. But even in India, where the summer monsoon rainfall is of this type, a considerable amount of rainfall comes from thunderstorms. In temperate latitudes, where most of the rainfall is due to depressions, the accentuation of rainfall among the mountains is a striking feature of rainfall maps, and there is an appreciable contribution to the rainfall from thunderstorms, formed over strong heat convection currents, or along the cold fronts of depressions.

SUBSCRIPTIONS

The circulation of *Sailplane and Glider* is limited by its paper quota. This is the reason for the reduction in size, and the thinner and therefore lighter paper. The publishers can dispose of far more copies than can be printed. To be sure of your copy, therefore, it is necessary to take out an Annual Subscription of 13/- post free for twelve numbers. Publication date is the 5th of the month which the issue is dated. Cheques, Money Orders, etc., payable to *Sailplane and Glider*, and crossed.

CAMBRIDGE UNIVERSITY GLIDING CLUB

A Meeting of the Club was called for July 4th and held at 6, Albemarle Street, London, at the invitation of Mr. and Mrs. Slazenger, who provided an excellent supper for about twice as many people as turned up.

The chief object of the meeting was to take steps to see that the Club would be ready to start flying as soon as permission is obtained.

Slazenger took the chair and Angus was elected treasurer. The latter, however, failed to arrive, and was finally contacted on the 'phone and found to be in bed with pneumonia, which M. and B. had not cured in time for the meeting.

The Club needs a flying ground nearer than the pre-war one at Caxton, and it appears there is good prospect of permission to use Marchall's aerodrome just outside Cambridge; its area has been increased greatly during the war.

The Club hangars are still requisitioned by the A.T.C., though they are not very active at present.

As to machines, the " Granta " (a Utility type) is stored, and the " Cambridge I " only needs a new leading edge to make it airworthy. Pending the arrival of new machines which may not at present be built unless they come under the definition of " prototypes," everyone is asked to hunt around for possible additions to the Club's fleet.

A provisional committee was elected from those present.

Will any club members who have not done so kindly get into touch with Mr, R. H. Angus, Sidney Sussex College, Cambridge.

While giving a demonstration of gliding to the A.T.C. Cadets, at Fairoaks Aerodrome on V.J. Day, F./Lt. D. F. Greig, A.F.C., in the " Blue Gull," unfortunately got caught up in a thermal off the winch launch, and unfortunately was too preoccupied to realise the extent to which he was drifting down-wind, so that to his great consternation he found that he would be unable to regain the landing ground. In his concern for keeping out of the London Flying Control Area, he reached 5,500 feet and finally landed at West Malling Aerodrome 41 miles away.

9,000 FEET IN A BLUE SKY THERMAL

The 6th January—day on which all good Argentines receive their Christmas presents. I, being English, had had mine already on the 25th December, but after six years' residence Argentine had adopted me sufficiently to give me something special for Reyes as well—a really super-gliding day with a local height record tack d on to it. And in case I was foolish enough to miss the latter, Providence made sure of it by breaking my tow rope and casting me adrift at 1,000 feet. (We usually aerotow to around 2,000 feet on a thermal hunt. Casting off lower, unless you are very experienced, is considered a waste of time and money and definitely not encouraged.)

To go back to the beginning. It was a really beautiful day, very hot and absolutely cloudless from horizon to horizon. About a couple of miles away an enormous column of smoke rose vertically from an area of burning grass some ten miles in extent, and around the top of the column sailplanes were playing happily most of the morning. My turn came about two o'clock. The temperature was 97° and nobody had reported that it was cold above, so I very foolishly set out in only a leather jacket and woolly scarf over my dungarees. Never again. The " Grunau Baby " had no windscreen and I finally had to give up and come in because of the intense cold. However, I started out quite happily with no idea whatever of anything unusual in the height line. We had arranged to tow towards the smoke, but long before we reached it the aeroplane shot up ahead of me so fast that no amount of stick back could possibly catch her, and the " Baby " was dangling a broken rope from her nose. I slipped the rope and circled fast. What's this—four metres a second rise—thirteen beautiful feet—780 feet a minute, and me well inside it. Oh boy, oh boy ! This is the life ! I banked steeply and held her there, round and round and round and round and round interminably. A thousand metres, two thousand metres, two thousand five hundred ; still a steady four metres rise on the variometer. I could see a bevy of sailplanes below me, one other " Baby " quite near (the German girl, Giselle Hillger) and the "Viking" and "Rhonbussards" well underneath. Most satisfactory. But now the lift was lessening and I finally flew out of the top at 2,740 metres by the barograph (my altimeter was reading low ; although I had set it to zero before I left, when I landed it read no less than a thousand feet below ground).

We straightened out and I looked around. Incredible distances spread below me. On the far horizon rose a narrow vertical shining column which puzzled me considerably till finally I identified it as one of the canals in the Tigre Delta, end on. The burning field lay well behind, and oddly enough I had never once smelt smoke in all that climb. So was my thermal induced by the fire, or quite independent ? And—ha! wait a minute —that means one leg of the Silver Silver " C." Can one combine height with distance or isn't that allowed ? Fifty kilometres would be dead easy to-day, but I dare not try it in case I lose the height leg by landing outside the field. (Moral, read the rules first—but if I had it wouldn't have been a record, so again I was lucky.)

It was chilly but not uncomfortso, and I cruised about happily. At about 1,000 metres (altimeter reading) I found first a zero, then little ups and downs. Suddenly, when I was meditating about getting back to the field to land, there was my variometer reading 2½ metres up. This petered out at 2,000 metres and very cold it was, too. I came down a bit steeply to warm up but a little bump was too tempting to leave. Round and round again, up to 2,200 metres by the altimeter and still a 2½ metre a second thermal. But by now I was shivering with cold. My teeth were chattering and my hands so blue and frozen that I could only just feel the stick. The thought of 97° on the ground seemed like Heaven itself, so I deliberately left my thermal—and have felt like a criminal ever since. Actually I was still shivering when I stepped out of the " Baby " and the barograph case was almost too cold to touch. But it was still ticking over nicely and I found to my astonishment that I had been up nearly two hours and a half (my previous best being 42 minutes) and captured a wholly unexpected altitude record *en route*.

VERONICA PLATT.

AUSTRALIAN GLIDING ASSOCIATION

KEITH HEARN'S VISIT TO CANADA AND U.S.A.

Pilot-Officer Keith Hearn, a member of the Gliding Club of Victoria, returned home on leave on 9/6/45. He left Australia in April 1944 for No. 3 S.F.T.S. R.A.A.F., Calgary, Canada.

By great energy and initiative he was able during leave periods to cover over 4,000 miles, hitch-hiking around Canada and the U.S.A. by aeroplane and motor, etc. On 20th March, 1945, he visited the De Havilland Gliding Club at Toronto and met Les Racey of the Soaring Association of Canada and was shown the Club's "Sparrow" design gliders (pictured in *Gliding* January 1945), and he was shown over the De Havilland plant. In New York he met Walter Schroder, model aeroplane editor of *Airtrails*, and after making contact by phone with Ben Shupack, Secretary of the Soaring Society of America, he was, between 30th March and 1st April, 1945, the guest of Paul, Ernest and William Schweizer, of Schweizer Aircraft Corporation at Elmira. He was interested to note that the famed Elmira Soaring Site (Harris Hill) was developed under direction of the Board of Supervisors of the Chemung County in the State of New York, with Works Projects Administration and County funds. On 30th March, 1945, he was passenger with Paul Schweizer in a "T.G. 3 Schweizer" two-seater for a flight of 9 minutes from a car-towed launch, and on 1st April, 1945, he witnessed Paul Schweizer make a 55 minute thermal flight to 3,200 feet from a very low car-towed launch in the "T.G. 3" (solo) in little wind conditions. He was shown over the Schweizer factory and was very appreciative of the hospitality given by the Schweizer brothers. Keith was in contact with Ward A. Stone, editor of *Gliding* (per letter) and supplied him with Australian news and photographs which were published in the January 1945 and April-May 1945 issues of this journal.

CIRCULATION REPORT

Total number of A.G.A. circulars each issue is now over 300, having gradually increased from about 50 in 1939, as finance permitted. Clubs and persons actively engaged in gliding or in establishment of clubs are asked to forward accurate and prompt reports from time to time of all relevant information relating to gliding activities, in particular, accurate records of all flying done, for the circulars. Excellent co-operation has been had in the past from various clubs and individuals, and all concerned are urged to keep up the good work. *A financial statement* covering the period 3/8/39 to 31/12/44 was issued to the affiliated State gliding organizations on 16/5/45. The report indicates that the work undertaken for the gliding movement in Australia can be considerably expanded if finance is available. It is suggested that those in receipt of circulars should forward annual donations, however small, to augment the funds of the Association. *Remittance* should be made payable to the Gliding Club of Victoria (which keeps a current account for the A.G.A.), and it should be indicated that the amount is a donation to A.G.A. funds.

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Letters to the Editor

1, Newhall Street,
Birmingham.
14th August, 1945.

DEAR SIR,

It would appear that your correspondent, Major Deane Drummond, did not read your editorial headed " To Kadet or not to Kadet " carefully and accordingly completely missed the point. As I understand it, the discussion was that of whether a primary machine or a secondary should be used for primary training—nothing more or nothing less. The question of two-seaters was not even referred to and is, of course, an entirely different proposition. It would appear to me that to any unbiased person the case in your leader of " Dagling " *re* "Kadet " for early primary work is unanswerable. If, however, the question of two-seaters became an active and practical proposition then, of course, another situation would arise. I entirely agree with Major Deane Drummond that the ideal training both for speed and safety is a combination of two-seater and primary or secondary according to the percentage of two-seater experience available for any given pupil: in fact I would go so far as to suggest that this training is the ideal one to aim at; but that does not in any way justify ground slides on an expensive and vulnerable machine such as the " Kadet " when there is a cheaper and more suitable machine to hand in the " Dagling." I think in another leader you asked for clear thinking and reflection. That would appear to be well called for. There are so many red herrings drawn across the straight if somewhat hilly path of soaring flight that this latter suggestion is most necessary to get to our objective without undue blood, sweat and tears.

Yours faithfully,
C. ESPIN HARDWICK.

17, Brentvale Avenue,
Southall, Middlesex.
14th August, 1945.

DEAR SIR,

ORGANISING CLUBS

The letter from W. E. Hick printed in your August issue under the above heading is surely a striking example of unorganised clubs.

It is difficult to conceive how three clubs situated as stated could be so woefully ignorant of the assistance they could have afforded one another.

The whole situation definitely needed a real organiser and apparently such a one did not exist in any of the three clubs.

It is generally agreed that the purist gliding enthusiast has little time for powered flight and, on the other hand, the power pilot is not interested in any other form of air travel. The model boys are simply indulging in a hobby that is the nearest their financial position will allow them to approach the real thing.

But think of the benefits that can be derived from close co-operation of all three classes.

For instance, what greater triumph could a model builder have than to see one of his creations reproduced in man carrying form? Or what greater thrill could a gliding enthusiast have than to act as a meteorologist to a power pilot? As for the power man, it is highly probable that after a short spell with an experienced gliding instructor, he would automatically switch off the motor as soon as he was airborne ! ! !

To endeavour to show that it can be done, a Gliding and Light Aeroplane Club has been formed in this area and is now making great efforts to obtain all the necessary equipment, etc., to make a start as soon as regulations permit. Particulars of this can be found in the August 10th issue of " The Aeroplane " in the form of a letter from the organiser, Mr. G. A. Chamberlain.

Mention has also been made in the local press, with the result that enquiries are being received from R.A.F. personnel who are anticipating an early return to " Civvy Street."

The enthusiasm of all concerned is so great that it is almost impossible to visualise anything but a successful and happy Club. Of course, this is early days, there is much to do and a lot to obtain. In this respect we welcome any assistance, but I, personally, am confident that in due time I shall be able to inform Mr. Hick, through your columns, that there is no reason whatsoever why Models, Gliding and Power cannot be housed in the same hangar.

Yours faithfully,
WM. A. O'HIGGINS.

R.A.F. Station,
Mauripur, Sind,
S.E.A.A.F.
August 14th, 1945.

DEAR SIR,

There are one or two points raised in recent correspondence on which I would like to pass comment.

Firstly, to accept Mr. Rice's invitation in his letter printed in your June issue, with regard to the proposal for an exchange of visits between clubs, I feel very strongly that the first proposal, put forward by Mr. Bernard Thomas, approaches the ideal set-up. I would go so far as to suggest the formation of a National Gliding Club, which would control all the sites throughout the country, such sites being run by local branches of the National Gliding Club. All persons wishing to take part in this sport would pay a subscription to the N.G.C., which would make grants to the branches for local expenses, supply gliders, sailplanes, winches, and in suitable cases, *i.e.* the Leicester branch, aero-towing facilities. The quantities of such equipment would be allotted on a membership population basis, *i.e.* 100 members in a 50-mile radius area round the site would qualify for two primaries, two secondaries, one sailplane, etc.

England is a very small place, and there is only a limited number of good sites. It therefore seems logical that there should be one general organisation to cover the whole country, to co-ordinate the gliding activities throughout the country, to organise national competitions, to pick teams and contribute towards the expenses of the international competitions which we hope will come again one day. I regret I am not *au fait* with the activities of the B.G.A., and it is of course possible that the above may be accomplished by a widening of the authority of this body.

Secondly, I feel I must suggest to Major Deane-Drummond that by the pen-ultimate paragraph in his letter of May 19th he is giving the impression that he is trying " to teach his grandmother to suck eggs " ! I do not profess to put forward an expert opinion on this matter of training, as I could easily be detected in any " line-shooting " if your new Associate Editor has kept any of her records of the Surrey Club !

Personally, I feel that solo *ab initio* training is ideal—a heavy, strong and open glider teaches confidence and full use of controls (none of these delicate half-inch movements), and there is no changeover when the pupil suddenly find himself alone, and wondering how much of his previous flying had been done by his instructor. In a primary he learns to depend on himself right from the start, and he works up gradually to the more sensitive type of machine.

I disagree with the statement about bad advertisement value—if the general public want to learn about gliding then it is an excellent thing for them to see what the pilot is doing from the first ground slide upwards. If they watch through any period at all they will see how each pupil progresses, and they will see that a mistake results at the worst in broken landing wires, which are quickly repaired.

In my opinion two-seater instruction should be given, if desired, after the " C " stage. The pilot's flying characteristics can then be checked

and any minor faults corrected—and they will only be minor faults after something less than two hours' flying time; and the pilot can also be given advanced instruction on steep turns and soaring flight generally.

I hope to be back in England by the end of this year, and I hope that by that time civilian flying, and therefore gliding, will be shaking off the cobwebs and preparing for a good and well-backed start. It will certainly have my fullest support.

Yours faithfully,
ALLAN H. GIBB,
S./Ldr. F.R.Met.S.

SOARING ASSOC. OF CANADA, OTTOWA.

DEAR SIR,

I am glad to be able to announce that at the suggestion of the S.A.C. the Air Cadet League of Canada have decided to embark on a programme of gliding training. Don MacClement, S.A.C. Vice-president, has been transferred to the League by the R.C.A.F., and is in complete charge of their gliding plans. These call for the training of a number of Cadet officers as gliding instructors this summer, and establishment by them of regional schools for training cadets for "B" stage next year. It is hoped that eventually all of Canada's 30,000 Air Cadets will receive gliding training.

The initial step has been to set up a Central Gliding School, and although this is being financed entirely by the Air Cadet League they have very kindly agreed to permit any S.A.C. member to take full advantage of its facilities at the same rates as Cadet officers.

The School will be open during August and September, and two one-month courses leading to qualification as S.A.C. Grade 1 instructors will be held. As it is realised that many S.A.C. members will not be able to attend for a full month it has also been decided to provide gliding on a less formal basis at a daily rate. Thus the A, B, and C gliding certificates could be earned in a shorter period, or club members with previous experience may be able to qualify as instructors without attending the full course.

Primary training will be carried out at Carp Air Station, which has been loaned by the R.C.A.F. for the purpose. The field, which is situated in good thermal country near Ottawa, will provide 3,000 feet long launches in all directions, as well as the usual hangars, barracks, lecture room and offices. Hill soaring will be available at the site of the Gatineau Gliding Club, which is nearby.

The school will be staffed by S.A.C. approved Grade 3 instructors and a fully qualified ground engineer. Equipment will include six single place secondary sailplanes and two two-seaters, two winches at Carp and one at the Club field, and the usual retrieving cars. It is also hoped that several other aircraft of diverse types will be made available by their owners, and every effort is being made to secure a power plane for aero-towing.

As the greatest single obstacle in the way of gliding clubs in this country is the lack of properly qualified instructors, it is hoped that many clubs will be able to send representatives to the school. The Department of Transport have agreed to permit S.A.C. approved instructors to teach gliding unhampered by the old restrictions, and candidates at the school who acquire the necessary experience will be awarded S.A.C. instructor's certificates endorsed by the Department.

Apart from the opportunity provided by the school for members of different gliding clubs to meet each other, there will be a chance to show the Department of Transport what gliding is all about, as they have promised to send an observer.

Charges have been based on bare costs, as nearly as they can be estimated, and the League does not expect to make a profit. If due to a larger attendance or lower depreciation of equipment than expected, a profit is made, this will be turned over to the S.A.C.

As the cost of a complete instructor's course is rather high, it is suggested that clubs might share the cost of sending a member to the school. The representative chosen should be the best potential teacher in the group—not necessarily the most experienced pilot. It might also be possible for some individuals to arrange to attend as representatives of their local Air Cadet Squadrons if they agree to serve later as Air Cadet instructors. Very sincerely yours,

J. A. SIMPSON, *President.*

Blaby, Leicester. 22/7/45.

DEAR SIR,

What is the British Gliding Association doing? This is exactly the time when a virile central body could be putting the gliding community on its feet again. The Air Ministry having plucked the last machine from the Clubs, could be persuaded to make amends by diverting into the right hands some of the precious plywood and spruce being rejected from aircraft factories. I have seen one pile of materials that had stood all last winter in the open in a junk yard because no-one realised its uses for the gliding community. With the cessation of war contracts much material, cut to size and even partly fabricated will be thrown away unless M.A.P. is told of our needs. We want all the material we can get to repair the ravages of Time and the A.T.C.

Nine hundred redundant barrage balloon winches are about to be chopped up. They belong to John Citizen and I see no reason why the gliding clubs should not buy a few at their scrap value. The same applies to beaverette armoured cars and jeeps, so useful for bouncing through the heather with half the club aboard. Let the B.G.A. get busy now and salvage some of this war debris. Let us have representation before the Government to secure early removal of the ban. Almost every other country has continued gliding during the war, but we have sunk even further behind leaders of the art during the past few years. The time has come to speak and act. Gliding clubs all over the country are not merely rousing from wartime inactivity but are straining at the leash for the chance to go. Gliding is a fine healthy outlet for the mental and physical vigour of our youth. The B.G.A. should let the Government know how it can help to get us restarted—now, before the equipment is broken up or wasted. Yours faithfully,

J. CECIL RICE, *Chairmau,*
Leicestershire Gliding Club.

[The B.G.A. is representative of the Clubs, and thus it may be supposed that the activity is similar.—Ed.

The Rowans, Pine Glade,
Farnborough, Kent. 5/8/45.

DEAR SIR,

On spending further thought on the ingenious theory of the effect of wind velocity gradient on up and down wind flight explained by Mr. Hiscox in the SAILPLANE for January 1945, I have come to the disconcerting conclusion that it is based on a fallacy.

Lift, as concerning aerofoils, is a matter of differential pressure—*i.e.* more pressure underneath than on top: differential speed of air flow is only a means to this end. Now differential pressure cannot persist in free air: the difference in pressure which gives lift to an aerofoil exists only between the two air streams separated by the solid structure of the wing.

Normally there is no "velocity gradient" in the air ahead of the wing; the aerofoil starts from scratch and causes the air to flow faster over the top than underneath the wing in order to produce differential pressure. If there is a velocity gradient, since, in free air, it cannot be associated with a pressure gradient, it means that the aerofoil, instead of starting from scratch, has to increase an already existing difference in velocities before any difference in pressure will occur. It is not suggested that this will reduce the lift obtained from the wing, but that the wind velocity gradient will merely be added (or subtracted in the case of down wind flight) to the differential velocity set up by the aerofoil, *without any direct effect on the lift.*

Yours faithfully,
R. E. PEARS, Capt. A.A.C.

ROYAL AERO CLUB
GLIDING CERTIFICATES

"A" Certificates (208)		Gliding School	Date taken
2770	Alan Proud	N.E.31, E.G.S., Usworth	10. 6.45
2771	Eric Charlton	Ditto	10. 6.45
2772	Richard John Owens	N.W.186, E.G.S., Speke	27. 5.45
2773	Dennis Brian Ballinger	S.W.92, E.G.S., Yate	18. 2.45
2774	Kenneth Reginald Hill	Ditto	18. 2.45
2775	Franklyn Geoffrey Robinson	Ditto	18. 2.45
2776	Mayrice Frederick Haines	Ditto	8. 4.45
2777	Horace George Perrett	Ditto	8. 4.45
2778	S. F. Wills	Ditto	18. 2.45
2779	Peter Harold Bain	Ditto	8. 4.45
2780	Jack Percival George Rogers	Ditto	8. 4.45
2781	Alan Rix	N.E.31, E.G.S., Usworth	10. 6.45
2782	Philip George Rouse	S.W.88, E.G.S., Wroughton	27. 5.45
2783	Allan Clemitson	N.E.31, E.G.S., Usworth	10. 6.34
2784	Derek Graham Mather	N.W.184, E.G.S., Woodford	27. 5.45
2785	Gerald Flemming Taylor	M.45, E.G.S., Meir	25. 3.45
2786	Septimus Andrew Rutherford	N.E.31, E.G.S., Usworth	16. 6.45
2786	Septimus Andrew Rutherford	N.E.31, E.G.S., Usworth	16. 6.45
2787	John Mackereth	N.E.25, E.G.S., Hedon	19. 5.45
2788	Raymond Leonard Cook	Ditto	21. 5.45
2789	Claude Ernest Savage	Ditto	18. 5.45
2790	Edward William Duck	Ditto	19. 5.45
2791	John Mahoney	Ditto	20. 5.45
2792	Thomas William Haggitt	Ditto	19. 5.45
2793	Victor Dobson	Ditto	19. 5.45
2794	Theodore Stewart	N.E.31, E.G.S., Usworth	16. 6.45
2795	Malcolm Raymond Shaw	N.W.184, E.G.S., Woodford	27. 5.45
2796	Heury Humphreys	M.42, E.G.S., Walsall	9. 6.45
2797	John Laing	N.E.26, E.G.S., Greatham	10. 6.45
2798	John Brian Renton	Ditto	10. 6.45
2799	Arthur Smith	Ditto	17. 6.45
2800	Maurice Sydney Lovegrove	C.123, E.G.S., Bray	9. 5.45
2801	David Laurie Field	Ditto	9. 6.45
2802	Alan Wilfred Burns	M.43, E.G.S., Walsall	27. 5.45
2803	Charles Henry Griffiths	N.W.186, E.G.S., Speke	27. 5.45
2804	Peter Joseph Grainge-Jackson	S.W.88, E.G.S., Wroughton	18. 6.45
2805	Anthonio Verrico	L.149, E.G.S., Gravesend	17. 6.45
2806	Philip Reed Miller	N.E.31, E.G.S., Usworth	16. 6.45
2807	Robert Culvenor Gibson	203, E.G.S., Newtownards	26. 5.45
2808	Robert Harry Line	S.E.163, E.G.S., Portsmouth	15. 4.45
2809	Maurice Leslie Rance	C.121, E.G.S., Halton	7. 6.45
2810	James Brian Chanter	C.122, E.G.S., Harrow	13. 5.45
2811	Frederick Leonard Sharman	M.44, E.G.S., Rearsby	10. 6.45
2812	Kenneth Reginald Beetlestone	L.147, E.G.S., Fairlop	27. 5.45
2813	Ronald Vincent Holden	M.44, E.G.S., Rearsby	17. 6.45
2814	Derrick Pritchard-Jones	N.W.183, E.G.S., Woodford	27. 5.45
2815	Derek Morley Alsop	N.E.26, E.G.S., Greatham	17. 6.45
2816	John Brian Wild	W.65, E.G.S., Cardiff	19. 6.45
2817	Peter Orchard McCann	N.E.184, E.G.S., Woodford	27. 5.45
2818	Angus Hope Robertson	L.146, E.G.S., Fairlop	27. 5.45
2819	Eric Lloyd	N.W.186, E.G.S., Speke	27. 5.45
2820	Edwin Thomas John Manning	S.W.87, E.G.S., Weston	17. 6.45
2821	Graeme Shannan Forrester	Ditto	9. 6.45
2822	Mervyn Noel Choules	Ditto	9. 6.45
2823	Arthur Robinson	Ditto	16. 6.45
2824	John Geeve	Ditto	16. 6.45
2825	Cyril Robert Smith	L.145, E.G.S., Colchester	24. 6.45
2826	Robert Wilfrid Kidd	N.W.187, E.G.S., Stretton	11. 3.45
2827	Philip Rushton	C.122, E.G.S., Harrow	8. 4.45
2828	Derek Leslie Collingwood	M.44, E.G.S., Rearsby	17. 6.45
2829	William George Munro	203, E.G.S., Newtownards	22. 5.45
2830	Ian McLean	S.4, E.G.S., Abbotsinch	12. 5.45
2831	Hugh McMeekin Smith	Ditto	19. 5.45
2832	William Johnstone	Ditto	19. 5.45
2833	Robert J. Pollard	Ditto	27. 5.45
2834	Eric Barclay Boag	Ditto	12. 5.45
2835	John Richard Hamilton	Ditto	12. 5.45
2836	George Brian Moncrieff-Yeates	S.E.167, E.G.S., Fairoaks	7. 4.45
2837	Douglas Roland James Kay	Ditto	17. 6.45
2838	Stauley Trussler	Ditto	2. 4.45
2839	Robert Keith Drew	Ditto	20. 5.45
2840	Norman Geoffrey Smith	Ditto	27. 5.45
2841	James John George LeBrocq	Ditto	13. 5.45
2842	Bernard Benjiman Jelley	M.48, E.G.S., Bretford	17. 6.45
2843	Kenneth Ernest Shephard	C.122, E.G.S., Harrow	23. 6.45
2844	Leonard Bathrolomew	L.149, E.G.S., Gravesend	24. 5.45
2845	John Arthur Cook	C.122, E.G.S., Harrow	23. 6.45
2846	Derek Leslie Hickling	M.44, E.G.S., Rearsby	17. 6.45
2847	Terrence Edward George Harrison	M.48, E.G.S., Bretford	27. 5.45
2848	Charles William George Neave	L.149, E.G.S., Gravesend	24. 6.45
2849	George Fitzmaurice Atterbury	S.W.83, E.G.S, Moreton Valence	24. 6.45
2850	William Cyril Thornton	M.44, E.G.S., Rearsby	3. 6.45
2851	Laurence Joseph Gardner	M.48, E.G.S., Bretford	27. 5.45
2852	Denis John Neil	C.122, E.G.S., Harrow	23. 6.45
2853	Antony Lionel Dyke	M.41, E.G.S., Knowle	26. 4.45
2854	Gerard Sheridan	S.4, E.G.S., Abbotsinch	19. 5.45
2855	Eric Vincent Perry	M.45, E.G.S., Meir	13. 5.45
2856	Malcolm Keith Burley	M.41, E.G.S., Knowle	25. 3.45
2857	Edward Paul Lash	N.W.189, E.G.S., Carlisle	6. 5.45
2858	John Brown	Ditto	12. 5.45
2859	Cecil Peter James	N.W.284, E.G.S., Woodford	17. 3.45
2860	Kenneth Edward Miles	M.44, E.G.S., Rearsby	22. 4.45
2861	Henry McNeill	201, E.G.S., Long Kesh	6. 5.45
2862	Ian Joseph Middleton Dawson	M.41, E.G.S., Knowle	17. 6.45
2863	Norman Samuel Fursland	S.W.88, E.G.S., Wroughton	17. 6.45

BALANCING A SAILPLANE

(Continued from page 7)

We have now found the loaded C.G. and C.P. positions for the machine. We should now check to see what distance there is between these two points. If this distance is small, say 2 inches, it may be overlooked. If, however, the distance is more than this, ballast should be added to the nose or tail to trim the machine. To find the amount of ballast required we multiply the all-up weight of the machine by the distance between the C.P. and C.G., and divide the result by the distance from the C.G. to the point where the weight is to be added. Thus :—

$$B = \frac{W \times H}{L}$$

Where B = Weight of ballast required (in lbs.).
W = All-up weight of machine and pilot (in lbs.).
H = Distance between C.P. and C.G. (in inches).
L = Distance from C.G. to point where weight is attached (in inches)

If the C.G. is in front of the C.P. the ballast should be fixed to the tail of the aircraft ; if it is behind, ballast should be fixed to the nose.

It now only remains to ensure that there will be no tail load to upset the balance of the machine. Since the tail unit will have a symmetrical airfoil section, it will give " no lift " when it is pointing directly into the airflow.

When the air passes over the wing it is given a slight downward deflection which is known as downwash and the tail unit must be pointed directly into this flow. The formula for the tailplane incidence to meet these requirements is :—

$$a = \frac{36.5 \times Cl}{R}$$

Where a = Angle of incidence of tailplane.
Cl = Lift coefficient of wing at max. L/D.
R = Aspect ratio of wing.

The incidence of the tailplane must be set relative to the same datum line as the wing incidence. The Cl value used in the above formula is read off the airfoil characteristic curves in a similar manner to the C.P. position. Referring to *Fig.* 2 again we find the Cl value for the section illustrated to be .35.

BRISTOL GLIDING CLUB

Would anyone interested in forming a Club in the above area please write to the Editor.

CANADIAN NOTES

The GATINEAU CLUB, Ottawa, had made a start this year. Work has been done on the hangar, which needed painting at the time of publication of the last Bulletin. A Radiophone for communication between the instructor and winch driver is being constructed by the " Communication Committee." Next year it is hoped to have an airborne receiver for instruction. There is to be a Club Movie in which all members of the Club will feature, the showing of which is to be an event of the winter. It is also proposed to make a brief training film.

McGILL GLIDING CLUB, Montreal, have also begun operations again this year, using a Breigleb. Their workshop is open every evening. They have one Primary completed except for splicing of control cables and covering, and the completed components of another on which the metal fittings have to be installed. They were hoping to have one Camp at the end of July, another during the last week of September.

NOTICE!

CHANGE OF ADDRESS

The Editorial Offices of " Sailplane and Glider " have been moved to 139, Strand, W.C.2. In future will you please address all correspondence to the same.

SOUTHDOWN GLIDING CLUB LTD.

We shall commence Gliding and Soaring again at the Devil's Dyke as soon as civil flying is permitted. Old members and prospective members should write for details to:

Hon. Secretary,
FLT/LT. S. G. STEVENS,
R.A.F.V.R.,
" SOUTHERLEA,"
MEADOW CLOSE,
HOVE, 4.

Royal Aero Club Gliding Certificates—*(Cont.)*

" A " Certificates		Gliding School	Date taken
2864	William Gadsby	M.45, E.G.S., Meir	3. 2.45
2865	Peter James Huggins	C.122, E.G.S., Harrow	24. 6.45
2866	John Daniel Moscrop	N.E.21, E.G.S., Usworth	6. 5.45
2867	Michael Egbret William Cope	C.124, E.G.S., Aldenham	30. 6.45
2868	Norman Ross Clarkson	C.122, E.G.S., Harrow	23. 6.45
2869	Ronald Derek Hunt	S.E.166, E.G.S., Ashford	17. 6.45
2870	Ronald Albert Hook	W.65, E.G.S., Cardiff	3. 7.45
2871	Clifford Francis Sparrow	E.103, E.G.S., Bury St. Edmunds	30. 6.45
2872	Gordon Victor De'Ath	S.W.88, E.G.S., Wroughton	17. 6.45
2873	Clive Patrick Francis	M.41, E.G.S., Knowle	26. 4.45
2874	Joseph Holford Mundy	N.W.183, E.G.S., Woodford	27. 5.45
2875	Lewis Frederick Barker	L.145, E.G.S., Colchester	24. 6.45
2876	Ronald James Sullivan	C.124, E.G.S., Aldenham	3. 6.45
2877	Billy North	N.W.181, E.G.S., Blackpool	23. 6.45
2878	Ivor Gardiner Menzies Gordon Dorward	Ditto	21. 6.45
2879	John Keith Hatfield	Ditto	21. 6.45
2880	James Wigley	N.W.190, E.G.S., Cranage	6. 6.45
2881	Reginald Wilmot Roddan	Ditto	28. 5.45
2882	Charles Roland Beaumont	Ditto	28. 5.45
2883	Frederick Neville Hoskins	N.E.26, E.G.S., Greatham	27. 5.45
2884	Herbert William Hunter	Ditto	27. 5.45
2885	Walter Stanley Tate	N.E.26, E.G.S., Greatham	19. 6.45
2886	Allen Coates	Ditto	16. 6.45
2887	Eric Noel Fenwick Blumer	Ditto	12. 6.45
2888	Gerald Gilbert Charles Catliug	C.126, E.G.S., Booker	24. 6.45
2889	Philip Kenneth Cooke	C.122, E.G.S., Harrow	23. 6.45
2890	Gordon Desmond Bailey	S.W.80, E.G.S., Christchurch	24. 6.45
2891	Douglas William Bedford	L.146, E.G.S., Fairlop	10. 6.45
2892	Gerard Vincent Reynolds	C.125, E.G.S., Denham	8. 7.45
2893	Clive Dennis Musk Gurr	Ditto	8. 7.45
2894	Dennis Sydney Bootle	Ditto	7. 7.45
2895	Francis Charles Brady	L.149, E.G.S., Gravesend	7. 7.45
2896	John Henry Reeve	C.125, E.G.S., Denham	8. 7.45
2897	Raymond Henry John Penfold	C.122, E.G.S., Harrow	23. 6.45
2898	Charles Hall	C.125, E.G.S., Denham	7. 7.45
2899	Dennis Reginald Savage	Ditto	8. 7.45
2900	Peter Vincent James	W.65, E.G.S., Cardiff	3. 7.45
2901	Dennis Allen Mouckton	L.149, E.G.S., Gravesend	24. 6.45
2902	Patrick Edward Stanbrook Batey	S.E.163, E.G.S., Portsmouth	25. 3.45
2903	James Richard Brown	C.125, E.G.S., Denham	7. 7.45
2904	Michael Cole Downing	N.E.22, E.G.S., Kirbymoorside	13. 5.45
2905	Marcel Littlefair	Ditto	26. 5.45
2906	John William Gaton	N.W.183, E.G.S., Woodford	16. 6.45
2907	Shaun Glenville Browne	N.E.22, E.G.S., Kirbymoorside	11. 3.45
2908	Geoffrey Bower Ducker	N.E.25, E.G.S., Hedon	24. 6.45
2909	James Clifton Mason	C.125, E.G.S., Denham	7. 7.45
2910	Thomas Harold English	N.E.22, E.G.S. Kirbymoorside,	26. 5.45
2911	Alan James Young	N.E.25, E.G.S., Hedon	24. 6.45
2912	Ian Gunn Wilton	N.E.27, E.G.S., Woolsington	30. 5.45
2913	Abraham George Cohen	M.41, E.G.S., Knowle	8. 7.45
2914	Harry Parsons	M.45, E.G.S., Meir	13. 5.45
2915	Clifford Francis Howard	M.41, E.G.S., Knowle	8. 7.45
2916	Robert Frederick Afford	L.149, E.G.S., Gravesend	24. 6.45
2917	Frederick Robert William Dagg	C.122, E.G.S., Harrow	24. 6.45
2918	Robert Clarkson Pardoe	M.41, E.G.S., Knowle	8. 7.45
2919	David Stanley Back	C.125, E.G.S., Denham	8. 7.45
2920	Terrance Frank Dinan	S.W.87, E.G.S., Weston	9. 6.45
2921	Leonard John Glover	S.W.92, E.G.S., Yate	11. 3.45
2922	John Frederick Appleyard	N.E.22, E.G.S., Kirbymoorside	19.11.44
2923	Harry Richardson	N.W.183, E.G.S., Woodford	17. 3.45
2924	James Knox Sinclair	L.143, E.G.S., Croydon	16.12.44
2925	Bian Trevor Neil Newlaud	L.149, E.G.S., Gravesend	24. 6.45
2926	Dzvid Lansbury	C.125, E.G.S., Denham	8. 7.45
2927	Charles Maitland Allan	A.I., E.G.S., Sutton Bank	1. 7.45
2928	Samuel Alexander French	N.W.189, E.G.S., Carlisle	21. 5.45
2929	Geoffrey Frederick John Manders	C.125, E.G.S., Denham	8. 7.45
2930	Peter George Payne	Ditto	8. 7.45
2931	Ronald Arthur Walker	L.149, E.G.S., Gravesend	24. 6.45
2932	Anthony Frank Masters	C.124, E.G.S., Aldenham	30. 6.45
2933	John England Taylor	L.142, E.G.S., Stapleford Tawney	17. 6.45
2934	William Evan Jones	Ditto	16. 6.45
2935	Maurice Riddihough	M.41, E.G.S., Knowle	5. 7.45
2936	John Hamilton Perrier	C.125, E.G.S., Denham	16. 7.45
2937	Raymond Arthur Fears	S.E.161, E.G.S., Brighton	8. 7.45
2938	Gordon Hesling Merry	W.65, E.G.S., Cardiff	12. 7.45
2939	James George Donald Arnett	S.W.161, E.G.S., Brighton	8. 7.45
2940	Bernard Arthur Hudson	Ditto	15. 7.45
2941	Norman McKinnon Mauclark	S.3, E.G.S., Macmerry	10. 4.44
2942	Peter Lewis	N.W.190, E.G.S., Cranage	17. 6.45
2943	George Albert Bradshaw	L.149, E.G.S., Gravesend	24. 6.45
2944	Albert Gordon	N.I.201, E.G.S., Long Kesh	6. 5.45
2945	George Theodore Fulton Sadler	C.125, E.G.S., Denham	8. 7.45
2946	Albert Maynard Webley	S.W.83, E.G.S., Moreton Valence	9. 7.45
2947	Dudley Telford Richard Williams	W.65, E.G.S., Cardiff	15. 7.45
2948	Leslie Graham Comlay	W.68, E.G.S., Porthcawl	8. 7.45
2949	Graham Williams	Ditto	8. 7.45
2950	Ernest Dolloway	M.41, E.G.S., Knowle	17. 6.45
2951	Donald James Barton	N.W.184, E.G.S., Woodford	27. 5.45
2952	Jean Michael Hahn	S.E.161, E.G.S., Brighton	15. 7.45
2953	Bernard Frederick Broadhead	M.47, E.G.S., Gt. Hucklow	8. 7.45
2954	Clement Ian Porter	L.147, E.G.S., Bulphan	16. 6.45
2955	Harry Foster	A.I., E.G.S., Sutton Bank	1. 7.45
2956	Jack Simler	L.142, E.G.S., Stapleford Tawney	17. 6.45
2957	Ronald Chrisp	N.E.27, E.G.S., Woolsington	15. 7.45
2958	Matthew Henry Gibson	203, E.G.S., Newtownards	23. 6.45
2959	Gilbert Brooke Hill	N.E.30, E.G.S., Sherburn-in-Elmet	18. 3.45

(Continued Overleaf)

CLUB ANNOUNCEMENTS

LEICESTERSHIRE GLIDING CLUB

In view of the sufficient numbers already enrolled the membership lists have been closed until further notice. Don't forget our monthly "get-together" at the Victory Hotel—every third Friday of the month. Come and meet the gang.
Garden Party, Sept. 1st—get details. Monthly "get-together" dance, every third Friday of each month—Sept. 21st and Oct. 19th.

THE MIDLAND GLIDING CLUB LIMITED

The Secretary invites enquiries *re* post-war programme at Long Mynd. Subscription rates, etc., forwarded to those interested on application to:—F. G. Batty, F.C.A., 2, Lombard Street West, West Bromwich, Staffs.

DERBYSHIRE & LANCASHIRE GLIDING CLUB, GREAT HUCKLOW, TIDESWELL, DERBYSHIRE

Still on the active list. Club activities will commence as soon as civil flying is permitted. Full particulars, booklets, etc., from Secretary, 87, Fargate, Sheffield, 1.

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MRS. R. H. HADDOCK,
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HARRIETSHAM,
KENT.

Royal Aero Club Gliding Certificates—(*Cont.*)

		Gliding School	*Date taken*
	"A" Certificates		
2960	Joseph Babb	N.E.30, EG.S., Sherburn-in-Elmet	8. 4.45
2961	Derrick Harrison	Ditto	17. 6.45
2962	Allan Pickard	Ditto	23. 6.45
2963	Herbert Geoffrey Howe	Ditto	24. 6.45
2964	Eric Lawson Johnson	Ditto	23. 6.45
2965	Brian Robinson	Ditto	24. 6.45
2966	Reginald Alfred Moss	M.41, E.G.S., Knowle	5. 7.45
2967	John Philip Barnwell	Ditto	8. 7.45
2968	David Richard George Burnett	S.W.89, E.G.S., Christchurch	7. 7.45
2969	Alfred Edward Hill	W.65, E.G.S., Cardiff	15. 7.45
2970	Gordon Leslie Dollery	S.E.163, E.G.S., Portsmouth	17. 6.45
2971	Derek William Pickering	N.W.181, E.G.S., Blackpool	15. 7.45
2972	Ronald Cecil Reid	4 Gliding Wing, 75 Air School, Lyttleton, S. Africa	5. 8.42
2973	Maurice Ernest Fuce Filmore	C.123, E.G.S., Bray	21. 7.45
2974	Jeffery Clayton	Ditto	14. 7.45
2975	J. Bagnall	M.43, E.G.S., Meir	14. 7.45
2976	Ferek Charles Walkley	S.W.83, E.G.S., Moreton Valence	8. 7.45
2977	Kenneth Bertie Charles	L.146, E.G.S., Fairlop	16. 6.45
	"B" Certificates (30)		
2159	Douglas Leonard Geoffrey Young	E.107, E.G.S., Lincoln	21. 4.45
2110	Alfred Sydney Hufton	Ditto	21. 4.45
2080	Frederick Rawlinson	Ditto	21. 4.45
2796	Henry Humphreys	M.42, E.G.S., Walsall	14. 6.45
2670	Cyril James Barefoot	S.E.161, E.G.S., Brighton	17. 6.45
2677	Harry Thomas Dumbleton	M.41, E.G.S., Knowle	14. 6.45
2376	Henry Walker	N.W.183, E.G.S., Woodford	25. 4.45
2823	Arthur Robinson	S.W.87, E.G.S., Weston	17. 6.45
2824	John Geeve	Ditto	17. 6.45
2836	George Brian Moncrieff-Yeates	S.W.167, E.G.S., Fairoaks	21. 5.45
2857	Edward Paul Lash	N.W.189, E.G.S., Carlisle	13. 5.45
2858	John Brown	Ditto	13. 5.45
2876	Ronald James Sullivan	C.124, E.G.S., Aldenham	3. 6.45
2885	Walter Stanley Tate	N.E.26, E.G.S., Greatham	3. 7.45
2887	Eric Noel Fenwick Blumer	Ditto	3. 7.45
2129	Richard John Knibb	Ditto	3. 7.45
2075	Ronald Frank	N.E.22, E.G.S., Kirbymoorside	8. 4.45
1506	Donald Morison Holman	Ditto	2. 6.45
2912	Ian Gunn Wiltou	N.E.27, E.G.S., Woolsington	3. 6.45
2924	James Knox Sinclair	L.143, E.G.S., Croydon	11. 3.45
2927	Charles Maitland Allan	A.I., E.G.S., Sutton Bank	4. 7.45
2928	Samuel Alexander French	N.W.189, E.G.S., Carlisle	21. 5.45
2933	John England Taylor	L.142, Stapleford Tawney	18. 6.45
2941	Norman McKiunou Manclark	S.3, E.G.S., Macmerry	25. 4.44
2951	Donald James Barton	N.W.184, E.G.S., Woodford	15. 7.45
2731	Francis Mullany	Ditto	13. 7.45
2955	Harry Foster	A.I., E.G.S., Sutton Bank	5. 7.45
2959	Gilbert Brooke Hill	M.E.30, E.G.S., Sherburn	10. 5.45
2960	Joseph Babb	Ditto	1. 5.45
2972	Ronald Cecil Reid	4 Gliding Wing, 74 Air School, Lyttleton, S. Africa	7. 9.42
	"C" Certificates (22)		
1688	Clifford Uphill	M.43, E.G.S., Walsall	15. 6.45
1694	Joseph Harry Victor Wood	Ditto	12. 6.45
1842	Frederick Ralph Buckland	A.I., E.G.S., Sutton Bank	14. 6.45
1695	Sidney Edgar Farman	M.41, E.G.S., Knowle	15. 7.44
1992	Gordon Henry Daniels	A.I., E.G.S., Sutton Bank	14. 6.45
2363	Lawrence Frederick Southorn	Ditto	14. 6.45
2520	Raymond Ernest Wigg	M.43, E.G.S., Walsall	14. 6.45
1908	Joseph Hassall	Ditto	14. 6.45
1884	Nelson Howes Chipperfield	A.I., E.G.S., Sutton Bank	22. 6.45
1860	Arthur Barry Farwell	Ditto	14. 6.45
1691	Charles Edward Atherton Causton	Ditto	29. 6.45
1700	Sydney Richar Webb	Ditto	28. 6.45
1719	William Watson	Ditto	5. 7.45
1769	Arthur Harry Phillips	Ditto	7. 6.34
1993	Percy Robert Solder	Ditto	5. 7.45
1863	John Norman Earl	Ditto	5. 7.45
2726	John Clarke	Ditto	5. 7.45
2924	James Knox Sinclair	Ditto	5. 7.45
2927	Charles Maitland Allan	Ditto	5. 7.45
2941	Norman McKinnon Manclark	Ditto	5. 7.45
2955	Harry Foster	Ditto	5. 7.45
2972	Ronald Cecil Reid	4 Gliding Wing, 75 Air School, Lyttleton, S. Africa	2.11.42

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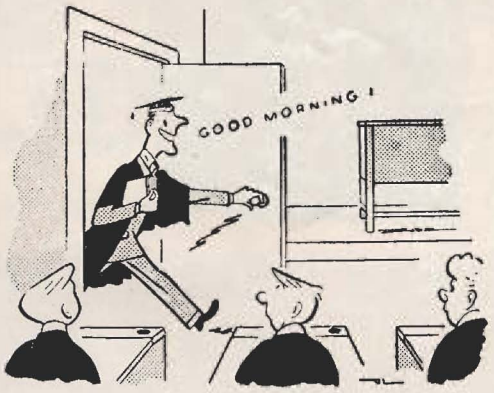
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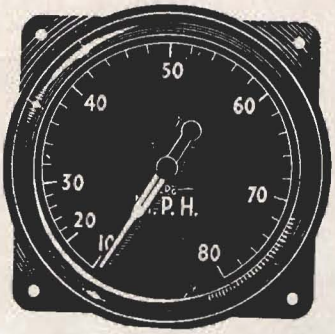
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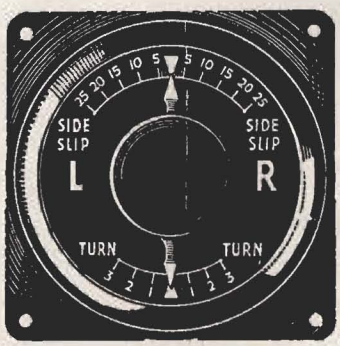
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