Thermal Soaring.

SAILPLANE and GLIDER

The First Journal devoted to Soaring and Gliding

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AUSTRALIA NEXT STOP

INSTEAD of the usual bulletin from the Gliding Association of Australia, we have had a letter from Mr. Duckworth, the Honorary Secretary. He has been spending his annual leave, accompanied by Norman Hyde, President of the Gliding Club of Victoria, in making an organising tour of South Australia and New South Wales. The trip took sixteen days, but we must await details for a later issue.

" The main drag on the Australian Gliding Movement is the lack of suitable permanent gliding grounds. Whenever a Club gets a decent ground it is not long before the Air Force or somebody else wants it. As a result it is very hard to settle down anywhere and make efforts to improve facilities and make the game worth while. Some of the places used are very rough and this increases wear and tear and the crashery rate."

EMPIRE FUTURE IS IN THE AIR

We sympathise with Mr. Duckworth and our Australian gliding friends. The same difficulty was was experienced here, until, as is described in this month's " Pioneer " item, Mr. C. E. Hardwick stepped in and bought the site for the Clubs concerned. Let us hope that this catches the eye of some wealthy and influential Australian who will do the same for Australia. We are absolutely sure there are many people who would if they understood fully how vital it is for the Empire to " get into the air " in hundreds of thousands, boys and girls, young and old, rich and poor alike. The future is in the Air, and if we do not realise that fact soon, and very soon, we shall be sunk. It is the Editor's profound belief, and the reason for his having undertaken the task of reviving SAILPLANE in war-time, that nothing is so important to our Empire at this time as this simple truth. As is well known among military thinkers throughout the world, and in official circles in London, it is because he has a different idea from the official view as to what constitutes Air Power, that the Editor retired from the Royal Air Force to put forward his views. The story of that battle is not for the pages of SAILPLANE yet. But he can claim that the ideas he put forward three years ago have been adopted throughout the world wherever Air Power has been used in connection with ground or land operations, and he can say that the Arnhem operation justified his doctrine up to the hilt. The artillery view of Air Power is too limited, and it is the man-carrying properties of the aeroplane which is its greatest significance, and this holds true in peace as well as war.

As an Empire we must get so air-minded that not only is it natural to go everywhere by air, perhaps in machines the like of which has not yet been thought of much less produced, but it must be *easy* to do so because air transport will be so universal, as universal as the motor bus or motor car is to-day.

AIR BENEFITS

The possible benefits from such a translation of peoples about the world are so great as to stagger the imagination. Think about the educational side alone. What will be the effect on our British people when holidays by air in Australia are as common as holidays at Brighton; what will happen to the British working man who is able to pursue adult education by visiting by air those other peoples within and outside the Empire of which he has only heard? There may well come such an awakening of the spirit of the Common Man as has never been seen before, which will sweep away once and for all much of the injustice and tyranny that abounds in the world and all its hypocrisy and false standards And that is why we must be strong in the air—so that British ideas and British justice and love of fair play shall prevail—not because they are British, but because they are right.

The economic consequences of the new dynamic which will follow the education which will come through man's use of the air will be profound, and will indeed be revolutionary.

The Air Age, paradoxically enough, will not be the Age of Empire, for the whole trend of flying is to break down barriers of distance and the earthbound lines of property. An aeroplane has always been the challenge to the sovereignty of nations. It will never be possible to stop aircraft from ranging over the sky of other countries than their own if they choose to do so, and now that rockets have come, we all stand within the orbit of every country in the world, of even the smallest. The world has shrunk and even the most distant lands have become near neighbours in Time. A Good Neighbour Policy is therefore incumbent on us all on even the most thoughtless, most thrusting and most youthful nation.

British Soaring Contests—5

THE 1935 B.G.A. CONTESTS, SUTTON BANK

THE 1935 Contests were held at Sutton Bank, in Yorkshire—the site of the 1934 Contests, and the home of the thriving Yorkshire Gliding Club.

This year there was a marked improvement in performance over 1934, in two particular directions. Firstly, in the increase in the amount and standard of Cross-Country Flying; and secondly, in the new types of British design and construction, including one sailplane in the high performance class.

Twenty machines were entered and flown, and these put in a total flying time of 134 hours 19½ minutes during the eight days of the meeting. The extensive, and successful use of a winch for launching, instead of the more usual hilltop bungy launch, was another advance over the previous years' contests.

ALAS, THE ULSTER SCUD

The first week-end produced weather useless for competition soaring, but pilots were able to get used to the site and its habits at their leisure. The Stedman 2-seater, flown by its designer-constructor, R. F. Stedman, took up as many passengers as it could fit in launches, and the Ulster Scud II, which had journeyed so far, unfortunately got bent, as also did its pilot, after spinning in on an approach.

Monday brought weather suitable both for washing day and the contests. A fresh wind blew and everyone went out to fly, 8 hours 43 minutes being the day's total.

A depression which was approaching arrived in the night, and by Tuesday the polar air sector had arrived. Flying time for the day jumped up to 41 hours, and as many as 12 machines were seen soaring together.

NEILAN'S "SILVER C"

John Neilan in a Kirby Kite was the first pilot to leave on a cross-country attempt, and he made the greatest distance of the day by flying 54¾ miles to Garton, near Withernsea. He obtained most of his lift from rather patchy thermals, and also by circling up to the top of a cumulus cloud near Malton.

After a launch at 10.45, Nicholson, in the Rhonbussard, hill soared for 1¾ hours before managing to get enough height for a good start. He obtained very good lift until almost within crossing distance of the Humber River, whereupon it flattened out before he could take the plunge; so he wisely changed his plans and turned back to land on the spaciousness of Catfoss R.A.F. Aerdrome, 45 miles from Sutton Bank.

Meanwhile, Wills, in the new British Hjordis, had ruled a straight line on his map from the Competition Site to Dunstable, home of the London Gliding Club. This meant a great deal of cross wind flying, which added appreciably to the difficulties of such a trip; he often had to discard good lift which would have taken him too far off his course. The dead area around the Humber proved his undoing, as it also had Nicholson's.

L. H. Barker in Scud II set out for his first cross-country attempt and managed 15 miles, but was somewhat disconcerted during his approach to land by hearty laughter floating up from the ground, where some farm labourers had suddenly realised that he had no engine!

IN TURBULENT DARKNESS

On Wednesday, August 28th, the daily prize was offered for an out-and-return flight to Arncliffe Hall, 12 miles to the north. Both John Neilan and P. A. Wills made gallant attempts, and both pilots did a considerable amount of blind flying in the turbulent, and very wet darkness, of the frequent storms which had developed. Wills reached 5,600 feet, blind, the greatest height of the meeting. Both pilots were, however, forced down before completing the return trip.

NICHOLSON'S "SILVER C"

The following day, Thursday, August 29th, brought weather suitable for duration flying, and a total of 45¾ hours was put in for the day. Three pilots managed to complete their Silver "C" Duration Flights of five hours. These were: G. L. Bell in the Blue Wren, G. O. Smith in the Golden Wren, and C. Nicholson in the Rhonbussard. All three had planned to start at dawn, but due to a temporary lull in the wind which forced machines to land, no one commenced the actual duration flight until lunch time. With this 5 hour flight Nicholson completed his Silver "C" tests and became British holder number Six. John Neilan (No. 5) completed the tests with his flight to Garton the previous Tuesday.

While the duration flying was in progress Wills nipped over to Arncliffe Hall and back, to win the daily prize which had been held over from the day before. He was able to get plenty of lift; at one time his height exceeded 5,000 feet.

Two other cross-country flights were completed on this day: one 10 miles to the east, and one 7¾ miles to the south, which at least made for variety in direction.

DORSLING IN THE AIR

The weather shut down on Friday, and the competitors took the opportunity of visiting Slingsby's warm dry workshops at Kirbymoorside to stroke his latest creations. Shortly before dusk the rain left off, and intrepid Laver took the air in Dorsling, but rain started again and he landed after 28 minutes.

Saturday, August 31st, was a day of struggling to keep in the air at all, with feeble lift over the West Slope. The crack pilots tried all their wiles and tricks, and this in itself was entertainment.

YORKSHIRE CLUB SUPPER

The Daily Prize was to be given for an Out-and-Return Flight to Oswaldkirk Church, 7 miles to the East. No-one succeeded, but A. L. Slater made an attempt on the improbable. This day ended with the Yorkshire Club Supper, now becoming a tradition, and everyone retired to bed full and happy.

Sunday, September 1st, being the day when most people had to start for home, was fortunately not a good soaring day, otherwise many would have been late for work on the Monday morning. As it happened, a fickle wind deposited most of the Last Flighters at the bottom of the hill at least a mile

(*Continued on page* 17)

THE SILVER "C." (No. 3 Altitude)

By J. W. S. PRINGLE.

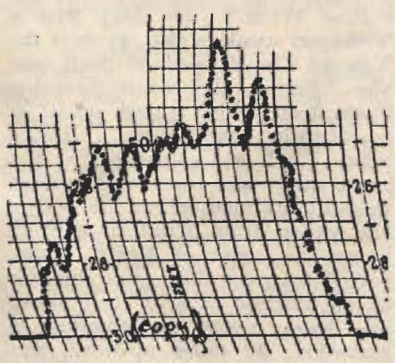
AT the Cambridge University Club we used to have an arrangement with Marshall's to use the Cambridge Airport for towing during the lunch hour, when the circulation of Moths temporarily abated. This was very useful for those members who could make use of it, since it gave us the opportunity of spending a few hours flying round Cambridge on any likely-looking afternoon when we could get away.

This was how I got into the air one day in August 1938. As it was out of Term, there were few members up, and I could only raise Paul Dykes to do the towing and a non-gliding friend to help rig; but this was enough, since we kept the Kite in its trailer at Marshalls ready for such an eventuality.

It was a day of towering clouds with a 15 m.p.h. north-west wind. Although I meant to go for altitude, I could not afford to release very low down, as there would be no time for another tow if the first attempt failed. There was no need to worry: after a little while I was at cloudbase and looking round to get my bearings.

THERMALS NOT ALWAYS CIRCULAR

The wind was strong enough to be disturbing, and the aerodrome looked a long way away. However, I discovered on this flight—a fact which was to be most useful in several subsequent tours round Cambridge—that very few thermals are really circular and that, usually, even when no obvious cloud streets are forming in the sky, it is possible by choosing the right "lane" to fly a long way up-wind without much net loss of height. The Kite gets along very well at about 45 m.p.h. when encouraged, and we reached Cambridge easily and pushed on to the west to get into position.



28.8.38

Out and return to Duxford. Wind 15 m.p.h. W.S.W. Max. height 7,700 ft., 15 minutes blind flying, Silver "C" altitude.

FIRST CLOUD FLYING

When you have never before done any blind flying, the first attempt to go into cloud is as much of a



"I THOUGHT THESE CU-NIMB CLOUDS WERE SUPPOSED TO BE DANGEROUS."

thrill as the first hill soaring. Conditions were perfect. The air in the cloud was so smooth that the Kite's natural stability was almost enough to keep it circling without help. We went round clockwise at rate 1. Everything became very damp. The cloud was quite even in appearance; just a solid and structureless mass of grey vapour. The noise of the wind is different in some unexplainable way inside a cloud. It may be that the rapid climb affects one's ears in spite of repeated swallowing or, more likely, the heavy condensation of water on the wings and cockpit disturbs the airflow. The noise seemed to get louder and louder and to have almost a mesmerising effect. After 10 minutes I could stand it no longer and decided to straighten out on a westerly course. This produced a powerful sensation of doing a climbing turn to the left; the impression was so strong, in spite of the instruments all showing straight and level, that I let the Kite do two more circles to the right, gradually wider and wider, before we came on to course.

SOAKING WET

It took another 10 minutes of straight flying to get out of that cloud—that is 6 miles. When we did come out it was into a rough patch of air with broken cloud at all heights, and directly over Duxford. Everything was soaking wet, as the Kite had no proper cockpit cover. Another large cloud to the west cut off the sun, so I did not on this occasion get the marvellous sight of a vertical wall of cloud. Later I learned always to come out on the west of a cloud, in order to get that sudden dazzling spectacle—murky greyness turning in a flash to a white precipice against the purple sky.

SILVER "C"

We played around a bit on the way back, but it was getting too cold to stay up long. The barograph showed a maximum altitude of 7,700 ft., which gave plenty for the Silver "C" after subtracting the height of the tow. So far as I remember there was still plenty of time, after putting the machine away, to do the best part of an afternoon's work.

Let us hope that after the war gliding clubs, or even light aeroplane clubs, will provide facilities for this sort of flying. For the cost of a 10 minutes' tow, the sailplane pilot can have his fill of the best sport in the world. And all with very little organisation. Learning to glide must and should be a co-operative business with each man putting in a lot of work helping the others.

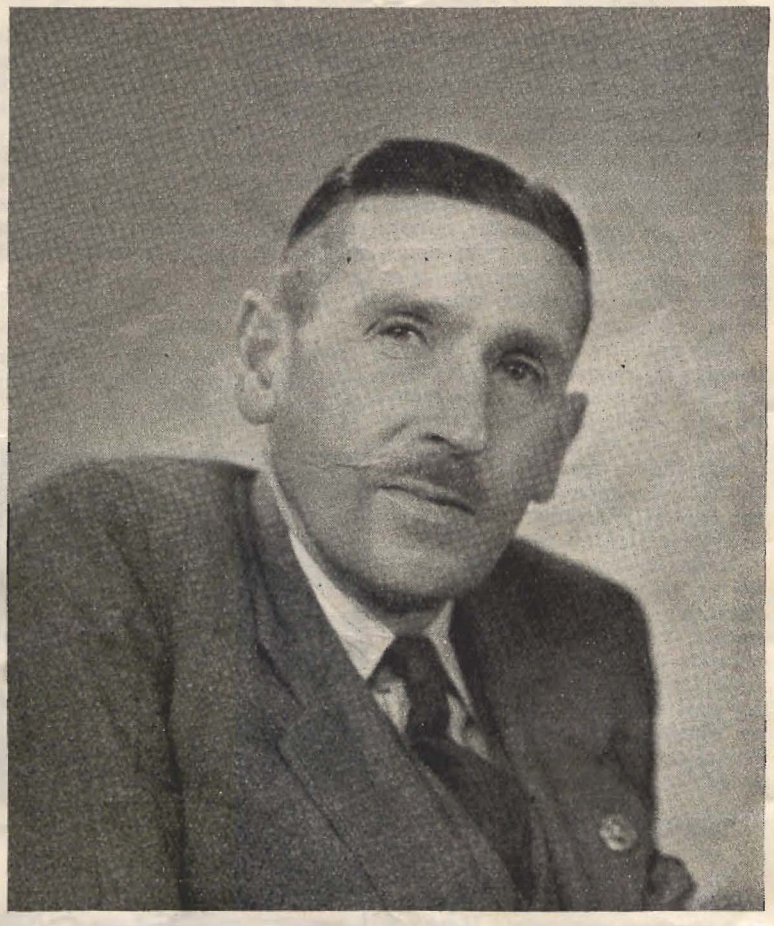
But there will inevitably be people who, having learned to fly in the hard way, cannot go on spending so much time at their sport. They also should be considered in the post-war plan.

Pioneers of British Gliding—8.

C. ESPIN HARDWICK

FOR many years before 1933 Mr. C. Espin Hardwick had been looked on by the highly respected business community of Birmingham as one of themselves ; but then the rumour got around that some of his spare-time recreations were by no means those of the conventional business man. It was only too true, for he had become addicted to week-end visits to the London Gliding Club, ninety miles away from his home at Streetly, and by Easter Saturday had performed a perfect " A " certificate flight from Dunstable Downs. His only previous air experience had been an auto-towed flight with Lowe-Wylde two or three years before.

Thoroughly bitten by this time, he felt an urgent desire to own a sailplane, so ordered a " Falcon " from F. N. Slingsby, this being the most suitable type for a comparative beginner. It was a real luxury model, with padded seat, back and elbow rests, and three instruments on the dashboard—a lot for those days. Its wing-tips being extended and rounded, it received a special type name—the " Falcon II."



Mr. C. ESPIN HARDWICK.

ALAS, THE " FALCON "

As soon as this machine was completed, Mr. Hardwick took it straight to Dunstable and was launched into half a gale in the hope of getting a " C," but on turning at the north end he sank into dead air behind the sharp lip of the Bowl, and his sudden catastrophic loss of air speed led to the inevitable result. However, the " C " was eventually secured at Sutton Bank, during the National Contests on October 8th, 1933, with a flight of 42 minutes.

Soon afterwards, hearing that the London Club was having continual difficulties with its landlord, Mr. Hardwick most generously bought the Club's ground of 117 acres outright, giving the Club 15 years to oay him back without interest. Actually, with help from Lord Wakefield and the Gliding Subsidy, the debt was wiped out within about two years.

B.G.A. CHAIRMAN

The next trouble to come to a head was between the British Gliding Association and the leading Gliding Clubs, who objected that the B.G.A. of that day was run on too extravagant a scale and did not represent the active British gliding movement. So Mr. Hardwick, after being elected B.G.A. Chairman for 1934, tackled the problem of revising the constitution of the Association, but the majority in favour of his proposals did not amount to the necessary two-thirds. He therefore felt obliged to resign his position before the end of the year, but his disappointment was wiped out a year later when the Air Ministry forced the adoption of these reforms as a condition of granting the subsidy.

ECSTATIC SLINGSBY

In spite of these administrative distractions, flying was not neglected, and Whitsun week-end, 1934, saw the " Falcon II " exploring the up-currents over the hills near Prestatyn, in company with the " Blue Wren." On May 21st a V-shaped speck in the sky over the Vale of Clwyd resolved itself into the " Falcon II," while Slingsby, 3,000 feet below, gazed up at it ecstatically, exclaiming, " That's what I *call* a Chairman ! " The owner-pilot was enjoying the most magnificent view of his life, all up the valley from Rhyl to Ruthin, along the coast of North Wales, and down over the mountains, for at an altitude of 3,700 feet above sea level, even the summit of Snowdon, 30 miles up-wind, was below his height. Mr. Hardwick's recipe for attaining this tremendous height over a 900 foot hill was simple : " Whenever I felt any-

thing happening," he said, " I just eased the stick back."

BIRTH OF " THE MYND "

But it was obviously unsatisfactory for Midlanders to have to travel to Yorkshire, Dunstable, or North Wales to get their soaring. This state of affairs was remedied when, at the autumnal equinox, three sailplanes assembled for an informal meeting on the Long Mynd, a dream of a soaring site south of Shrewsbury, 6 miles long, facing West, and with a continuous steep slope 700 feet high.

On October 17th, 1934, the Midland Gliding Club was formed, and Mr. Hardwick, who had taken the major part in promoting the Club and finding the site, was elected its Chairman. But on the very next day he had to go up to London to answer an " interlocutory appeal for an injunction " by someone who claimed that his shooting rights were being infringed and the grouse driven off the moor. Mr. Hardwick at once decided to fight the case, mainly at his own expense, on behalf of his Club and British gliding generally, and the hearing came on in the following March.

" SERVES 'EM RIGHT "

Mr. Justice Crossman, however, granted the injunction restraining the landowner from letting the land for " gliding exhibitions " (his Lordship's fancy name for soaring flight) ; so that was that. But not for long, for in July another part of the Mynd was secured, 25 acres being obtained for a launching site, and by November the Club's hangar was growing up on the site, while the grousing ones looked on in impotent fury.

SATELLITES

Actually the Midland Gliding Club had started flying on December 26th, 1934, at a primary training ground near Handsworth, a few miles from the centre of Birmingham. In July, 1935, the Austin Motor Works joined the Club with a training ground of their own at Northfields, and in October another primary ground was opened at Hereford. All three training groups used the Long Mynd for soaring.

A further modification of the " Falcon " type comes in at this stage of the story—the " Falcon III " two-seater, so familiar nowadays at some A.T.C. schools. This machine, probably the world's first sailplane with side-by-side seating was designed by Mr. Slingsby, but only Mr. Hardwick's encouragement and support made it possible to build the prototype. After that all went well and the type became popular. A " Falcon III " has twice held the international duration record for two-seaters, in 1937 and 1938.

FAMILIAR FAMILY

The Hardwick family have been familiar figures at many soaring sites. His wife usually accompanied him to the Long Mynd. His daughter has just been married. But we are sorry to say that he has suffered a severe blow in the loss of his son " Bill " in a submarine nearly two years ago. Bill was one of the most active members at the Long Mynd, and in addition to flying there, he was compiling a " thermal map " of the site showing where thermal currents were most often to be found in different wind directions. He will be sadly missed by his Club as well as by many others who knew him.

During the war Mr. Hardwick has had to reduce his annual soaring time, which was not inconsiderable,



" BILL."

but he still manages to fit in some flying in addition to looking after no less than seven Midland A.T.C. gliding schools.

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THERMAL FLYING: A Note for Newcomers

By R. H. WARRING

THE article, "Man Made Thermals," in the September issue of the SAILPLANE AND GLIDER, was extremely interesting in that it dealt with that comparatively little known subject, *i.e.* the art of thermal flying. It did not go far enough, however, in explaining the phenomenon of thermal formation and the extent to which thermals can be used.

On almost any day between about five to six hours after sunrise until about an hour after sunset thermals are present in the air. The fact that they cannot be seen, and their secondary effects are not always appreciated has meant that sailplane pilots have, in general, not made possibly the best use of them except when, more often than not by accident, actually finding themselves in one. On almost any fine day a model aeroplane will soar away on *at least* one flight in three. The sinking speed of such models is in the order of 2 to 4 feet per second, so that risers of greater strength than this are nearly always present between the hours of, say, eight and G.M.T. in summer, and for a correspondingly shorter period in winter.

MODEL FLIERS' DISCOVERIES

Equally surprising, perhaps, is the fact recently discovered by model fliers that during the evening hours there is often a belt of weak rising air with an upwind strength of about 3 feet per second between a height of 150 to 250 feet. This belt is quite weak and is fairly extensive.

A thermal is purely a convection current and is formed by the fact that different surfaces reflect and is already well known ploughed fields, fields of ripening corn, towns, villages, buildings, roads, etc., etc., are all good thermal producers when the sun is shining on them. During the day these surfaces heat up more rapidly than their surroundings and give rise to convection currents which often extend to great heights.

EVENING THERMALS

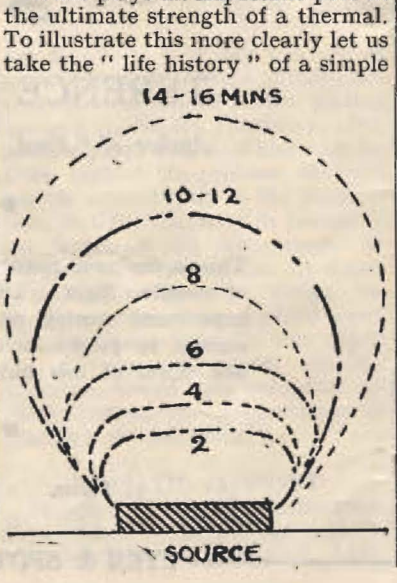
However, such surfaces also cool more rapidly. Thus during the evening such features as ponds and lakes, marshlands, belts of trees, etc., which do not give up the heat they have absorbed so readily, now have a greater temperature than that of *their* surroundings. Under such conditions they now give off thermals, although these will be weaker than "day" thermals.

Put as a general rule: during the hottest part of the day any surface which heats up quickly is a potential thermal source. After the sun's heat has disappeared "cool" surfaces, such as those described above, may now be expected to generate moderate thermals until a state of temperature equilibrium has been achieved over the earth's surface. Evening thermals are always much weaker than day thermals and tend to spread out over a wider area.

THUNDERY CONDITIONS

During the day the average rate of thermal ascent is between 3 and 20 feet per second. It may be much greater than this under exceptional conditions—*e.g.* a thunderstorm or in thundery weather. To balance thus upward motion of air there is a corresponding general descent of air between thermals, the average velocity of which is considerably less than that of the thermals themselves. This downcurrent also extends over a larger area.

Wind plays an important part in the ultimate strength of a thermal. To illustrate this more clearly let us take the "life history" of a simple thermal. Over a suitable thermal source a "bubble" of air is formed, the temperature of which is higher than that of the air immediately surrounding it—*Fig.* 1. Under ideal conditions this bubble continues to grow in size for about 13 to 16 minutes, the temperature difference increasing all the while. (The time figures will vary according to the climate. Those given are average for this country; in hotter climates they would be decreased slightly.)



UNSTABLE AIR

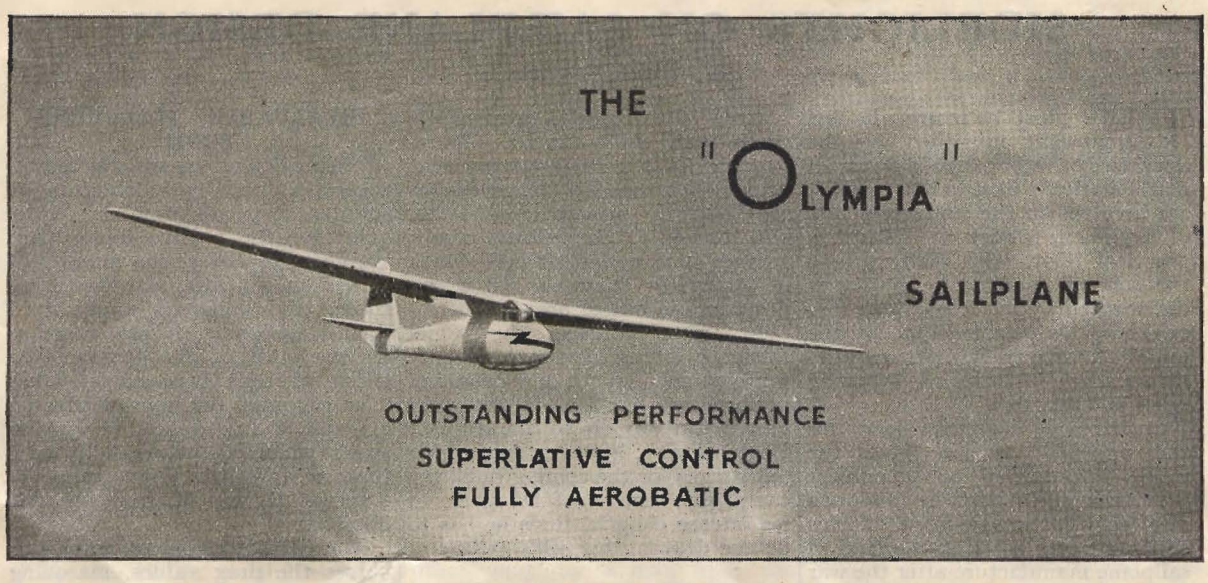
At the end of this time the temperature of air within the thermal bubble is about 10 degrees higher than that of its surroundings (*i.e.* "ideal" or undisturbed air) and the bubble is unstable. This instability finally resolves itself in the bubble breaking away and accelerating upwards to a velocity of about 20 feet per second.

As it rises it tends to spread out slightly and cools down until at about 6,000 feet it reaches an equilibrium position where its temperature is the same as that of its surroundings. The thermal bubble will also contain water vapour, and so if this height is above the condensation level on that particular day this water vapour will condense and the end of the thermal will be marked by the formation of a cumulus cloud. If the height reached by the thermal is below the condensation level no cloud will form.

EFFECT OF WIND

The above represents ideal conditions. The effect is considerably modified by wind. A very light wind will not affect matters greatly and, if conditions allow, the cumulus will form downwind of the source at the peak of each thermal. A moderate or strong wind, however, will have two major effects. In the first place it will tend to delay the heating up of the thermal bubble by cooling the source. This means that on a windy day the strongest thermals may be expected from sources in *sheltered areas.*

If sufficiently disturbed a thermal bubble which has only reached a one to two degree F temperature



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CHILTON AIRCRAFT, HUNGERFORD, BERKSHIRE, ENGLAND.

difference will break away. Its upward velocity will then be about 3 feet per second and it will reach equilibrium at about 500 feet. Generally this is well below condensation level and no cloud will form. Thus the more windy the day the more the likelihood of plentiful " premature " thermals, unmarked by any cloud formation. Only the more powerful thermals—probaly from sheltered sources—will form cumuli. The *time* of development stays about the same, this due to the cooling of the source.

SIGNIFICANT GUSTS

Although many thermals are completely invisible, in the sense that they do not end in forming a cloud, their secondary effects are often quite marked. After the departure of a fairly powerful thermal bubble there is a rush of air—" a gust of wind "—to fill the space left, and the nearer the observer to the source, and the more powerful the thermal, the more pronounced is this effect.

Once a thermal bubble has begun to build up a relatively small disturbance will often break it away. For example, a car passing along a hot road will often release premature thermals from that road, and the very act of flying a sailplane *through* a thermal bubble should be sufficient to release it. If not, then the thermal is probably so weak that it would not be of use for soaring in any case.

THERMAL HUNTING TACTICS

Since these bubbles are attached to the source during their formation this means that the sailplane must approach the ground closely to generate " man-made thermals "—and this may not always be wise. There is the other alternative that by waiting over a source within fifteen minutes at the outside a thermal should rise. In the case of it being " thermal or nothing," it is generally worth coming right down over a promising source.

Once in a thermal the pilot has the task of keeping in the middle of an invisible stream. By watching the rate of climb indicator all the time and exploring the extent of the thermal it is generally possible to find the centre, or the region where the upward velocity is greatest.

CIRCLING TECHNIQUE

To take the fullest advantage of a thermal a tight, flat circle is required. A sailplane held to fly a straight course would automatically tend to circle on entering a large thermal, but would probably fly right through a small one. However this " automatic " circle is too flat and would in any case have to be tightened up.

The main thing to avoid is tip stalling, which may even spin the sailplane out of the thermal completely. Some sailplanes are more prone to tip stalling than others. In some cases this can be cured by increasing the wash-out on the wing tips, but more probably it is due to bad fin and rudder shape in that the centre of lateral area is too high. A sailplane designed for thermal flying should be able to make tight, flat circles with no tendency to tip stall or spin.

The whole subject of thermal flying is still in its infancy, and probably has even more possibilities than are as yet realised.

SIDELIGHTS ON SAILPLANE DESIGN

By ICARUS

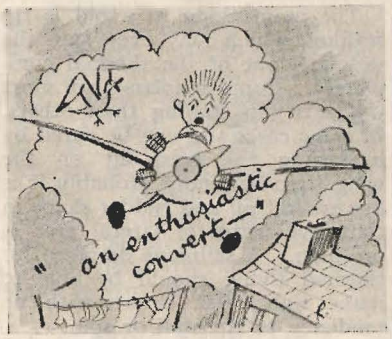
THERE must be many who feel somewhat mystified by the apparently fathomless depths of mathematical abstraction which are involved in the simplest points of sailplane design. Many a practical pilot, who really knows the sort of machine he wants, is discouraged from embarking on designing his own machine by the mumbo jumbo of strength requirements, Air Publications, stressing cases and the like.

Such people may take heart, for the appended review gives the inside information on a subject previously surrounded by too much of a technical smokescreen. Firms contemplating entering the field of sailplane manufacture after the war may benefit from a study of this article which is largely based on pre-war procedure in any country.

As nearly as possible the sequence of events is taken in chronological order.

MARKET RIPE

One day the Sales Department, while conducting a market survey, notes that another Silver "C" certificate has been issued (the second in twelve months), and in an abstract of some twenty closely typewritten pages deduce that gliding and soaring is the coming thing and that the market is ripe for further development. The Sales Manager enlists the willing support of the chief test pilot who, after a series of forced landings immediately after take-off with an experimental engine, is an enthusiastic convert to motorless flight.

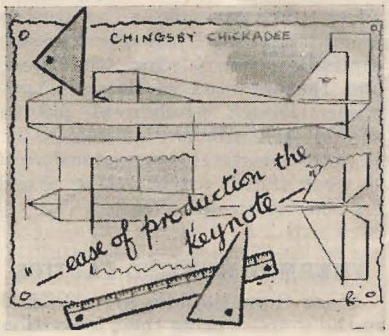


The managing director having narrowly missed decapitation by a revolving airscrew the previous day regards the Sales Department's plans with some favour. Moreover, he finds to his great joy that he can sketch on his blotter shapes that vaguely resemble sailplanes, not having to concentrate about engines and undercarriages which he invariably draws in the wrong position and out of proportion.

At a conference the Chief Designer is instructed to prepare a preliminary layout and details of performance. He immediately passes the job on to the Project Engineer who, however, is working out roughs for the coming publicity campaign; the Chief Designer, to his intense chagrin, finds he has to do the drawing himself.

ELIMINATE FANCY SHAPES

Having broken his only French curve in levering off the lid of a tobacco tin he makes extensive use of 30° and 45° set-squares, circulating all departments that ease of production should be the keynote of design and fancy shapes rigorously eliminated.



The Performance Office are confronted with a thorny problem, as the aspect ratio of the new design is 12, and they are uncertain as to the method of making appropriate corrections. All previous designs have had aspect ratios of 6 or 5 so that the aerofoil characteristics could be read straight off the wind tunnel graphs. Having read somewhere that high aspect ratio reduces induced drag they look up data on a 1927 four-engined flying boat with an aspect ratio of 10, and by a combination of proportion and guesstimation figure out the drag of the wing at 100 feet per second.

INVALUABLE TELEPHONE BOOK

Their calculations are affected by a certain difficulty in obtaining a suitable Reynolds number; in a quest for this elusive figure they are given the telephone number of a well-known firm manufacturing tubing and diligently apply it in their equations. A new member on the staff of the Performance Office misreads the speed and takes it as 100 miles per hour, producing a graph of L/D values at varying speeds which coincides exactly with those of a Vickers Vimy quoted in a recent R. and M. from the Air Ministry.

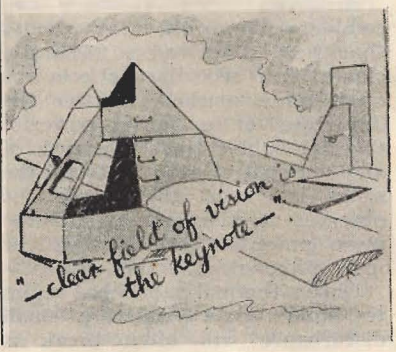
The Chief Designer forthwith halves the drag values, reasoning that the Vimy was a biplane and the new type will be (he hopes) a monoplane.

All is set for further development, but at this point the Managing Director reads, in a dentist's waiting room a well-known aircraft periodical the existence of which he'd never suspected.

He carefully reads an article giving conclusive proof that in the previous year sales of two-seater aircraft exceeded single-seaters by by 10% and all departments are circularised that two-seaters are the coming fashion.

TWO-DECKER SAILPLANE

The new seating arrangement is a compromise; at a mock-up conference the parties are equally divided on the merits of tandem and side-by-side seating, so the Chief Designer decides to mount the pilot over the passenger. This necessitates building a superstructure over the original cockpit

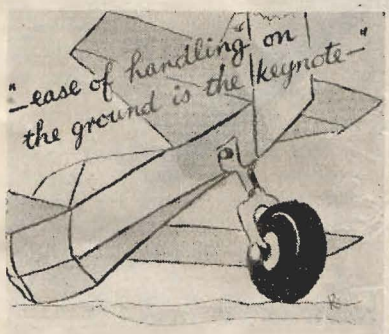


and all departments are circularised to note that a clear field of vision is of paramount importance and must be the keynote of design.

By this time the centre of gravity position is a long way from where it was originally fixed. By balancing pennies on a rule pivoted like a see-saw over an empty beer bottle it is decided to put 22 lb. of ballast in the tail. Heated telephone conversations with the Stores and the flight shed reveal that there is only one 17 lb. ballast weight on the premises. Apparently the last machine sold had been more than usually tailheavy and nearly all the available ballast had been secured to the bottom of the crankcase and labelled " special take-off booster. Do not remove."

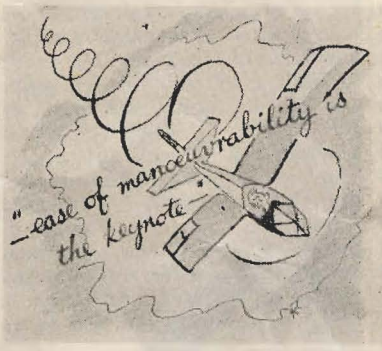
CASTORED TAILWHEEL

As the 17 lb. weight alone is insufficient to keep the centre of gravity within prescribed limits a special tailwheel of adequate weight is designed to restore balance, and all departments are circularised that ease of handling on the ground must be the keynote of design.



In writing the initial specification the Chief Designer wrote " improved spruce may be required when building the prototype." This is transcribed by his typist as " improved space may be necessary when building the prototype," and the Managing Director is peeved to find that the experimental shop floor-space has been increased by 500%, enabling the Employment Superintendent to add two men and a boy to the pay roll.

It is found that one wing has been built 7¾" shorter than the other, due to a draughtsman running short of tracing paper. The Chief Designer is an astute student of birds (all types), and remembers that seagulls circle in one direction only when soaring. He informs all departments that ease of manoeuvrability is the keynote of design, with particular reference to turning.



Unfortunately 7¾" is sawn off the other wing by a man from the G.P.O. who is installing a telephone. The latest memo is amended, calling everyone's attention to the advantages of less wing area in reducing drag and the importance of directional stability when flying on a straight course.

FISH SECTION

The wing section chosen, it transpires, was taken from a report which only referred to its characteristics in inverted flight under icing conditions, and a new pair of wings is designed. At a conference held in the " Slide-Rule and Compasses " the Managing Director traces in the saw-dust his vague recollection of the section used by Bleriot on his cross-channel flight of 1909 ; the photographic department (despatched to secure evidence of this super-section before it is erased by the precious fluid which uncertain hands have allowed to drop on the floor) wander into the wrong bar and, in error, photograph a fish laid down by a successful angler. The picture when developed proves to be underexposed, but is a duplicate of a section much used on successful sailplanes.

COMPREHENSIVE INSTRUMENTS

When the machine is erected and weighed it is found that the tail is too heavy, even when the ballast and tailwheel are removed. The seating arrangement is again altered to bring the pilot in front of the passenger and numerous instruments added to bring the centre of gravity into position. The Chief Designer circularises all departments that a comprehensive instrument installation is the future trend.

THE PILOT'S POINT OF VIEW

For reasons of streamlining and saving in material the fuselage has been made so small that nearly all the control cables have to be spliced on the job ; this results in the quick release being inadvertently connected to the elevator cable. The foreman of the experimental shop has a long chat with the chief test pilot on the merits of simplified controls. The chief test pilot recollects with gloom some previous examples of the experimental shop's too zealous enthusiasm for unconventional devices and has the quick release altered. All departments are circularised that sympathy with the pilot's point of view must be the keynote fo design.



In order to gain experience of gliders the chief test pilot has a few days with a local gliding club which specialises in launching primaries by catapult. Test flights are postponed until he is able to sit-down without too acute agony.

As the maintenance department have constructed a winch by converting a crane that was surplus to their requirements, it is decided to carry out the initial test flights by winch launching. The first attempt proves disastrous as all the departmental heads get involved with the towing cable. Subsequent attempts prove that the wing is very weak in torsion, but after some consultation it is decided to merely reverse the aileron cables so that the ailerons act as trimmer tabs to the wings. The Chief Designer calls the attention of everyone to the paramount need to save weight.

FLIGHT AT LAST

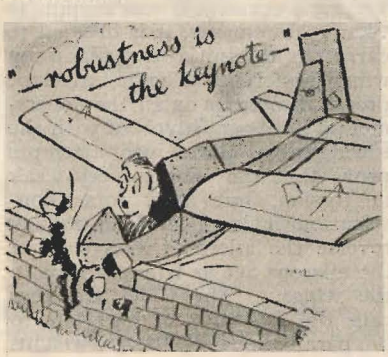
Eventually the machine is aero-towed to 5,000 feet at which height the engine of the towing aircraft overheats to the point of incandescence and stops with an expensive noise. The chief test pilot in the glider, perceiving what appear to be Véry lights fired from the towing aircraft but which are really red-hot cylinders, cuts loose. Within a few moments he is enthralled by the behaviour of the machine which handles better than any aeroplane in his experience, and only the recollection of the chief stressman's whispered warning before take-off discourages him from indulging in some spectacular aerobatics.

SELECTED CUMULUS

In order to give the photographic department a chance to get in some good shots the flight is carried out on a day when the sky is littered with carefully-selected cumulus clouds and the descent is prolonged by several minutes.

The Performance Office, with water-cooled slide-rules, immediately announce that the sinking speed is exactly as forecasted ; the Sales Manager knocks off a further 10%, on the strength of the aerodrome being 500 feet above sea level, and he doesn't pretend to be a mathematician anyhow, and manipulates the best gliding angle in proportion ; the combined staff of the Stress Office decide to carry out a proof-landing test which they'd forgotten all about and sit on the fuselage just behind the wing. The tail falls off with a little clicking noise before half of them are comfortably seated.

The Chief Designer sighs and circularises all departments that robust construction and ease of repair must be the keynote of design.



THE VIKING I SINGLE-SEATER HIGH PERFORMANCE SAILPLANE



This machine was designed by W. R. Scott and manufactured by the Scott Light Aircraft Co. The first of these was taken out to Buenos Aires by Mr. R. P. Cooper (now Lt.-Col. Glider Pilot Regt.), where it later broke records previously held by Germans.

TERENCE HORSLEY'S BOOK

may be obtained from

SAILPLANE OFFICE

Price 16/- *Postage* **9d.**

Too many applications have been received for the Editor to acknowledge individually, but the Directors of the GLIDER PRESS wish it to be known that all applications with remittances received before December 1st will be supplied at the original price of 12/6 even though the publishers have put up the price before publication to 16/-. The book is not now expected before the New Year.

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PHONE 48 *SKILLED CRAFTSMANSHIP*

ARGENTINE STORM FRONT FLIGHT OF 120 MILES

By ROBERTO M. MADSEN

ON the morning of the 30th January, 1944, I drew the first launch of the day in the Viking, but landed immediately, finding a ceiling of only 300 metres. As there were no indications of good thermal conditions till after mid-day I was in no hurry to take off again, finally getting away at 2.19 p.m. from an aerotow, releasing at 320 metres. I stayed up, drifting away from the field but never so far that I could not get back again if conditions changed. After 2 hours and 24 minutes I was some five miles upwind with a height of 1,450 metres, when I saw on the horizon the first signs of a storm.

Up to now there had been respectably large cumulus with upcurrents varying to 2 metres a second. By 4.40 p.m. I was flying towards the base at Merlo with the intention of landing, especially as I was out of training and already a little tired. But I was losing height at only 2 metres a second and while still at some distance I was caught in the upcurrent.

NO PARACHUTE

With inefficient brakes and no parachute I had no intention of touching the storm, since if I were sucked up into the cloud my only means of getting out would be by spinning, and in turbulent conditions that had no appeal. So I had no alternative but to fly on with a tail wind till I outdistanced the storm enough to land and put the machine in a safe place. I began gaining height immediately 4, 5, 6, 7 metres a second till I overtook the Rhonbussard Chiesa which had been consistently much higher above me. In the three minutes it took me to climb from 400 (1,200 ft.) metres to 1,350 (4,200 ft.) metres I was analysing the situation and deciding that we had been wrong in our previous ideas of storm front flights. Never before had we been able to use a front in Merlo, because, coming always from the South or South-east, we had calculated that the only direction available would be towards the River Plate or else over the Delta (an impossible district of marsh and jungle). But I found myself now flying in a zone of strong upcurrents with a continuous wall of tremendous black coming up, running from East to West, and the storm pushing me towards the Delta.

Along the front, in a steady upcurrent of 3 or 4 metres a second, I could fly at a speed of 90—110 kilo (60—70 miles) metres an hour in a straight line, so I turned West, passing 50 metres below the Chiesa and trying to signal him to follow. But he did not see me, so I put the nose of the old Viking down and never slackened the stick till I had done 90 kilometres (60 miles). Several times I looked back over the wing but none of my companions were following.

SPEED OF STORM

The displacement speed of the storms is generally 35—45 kilometres (20—30 miles) an hour, more or less towards the North. My speed along the front was at first more than double this, for which reason I was covering the ground rather more West than North, so that I soon lost sight of the river. My chief preoccupation, apart from the actual flying, was to see if the front extended very far to the West, knowing that I would have to land if it ended. Actually, if I had not wasted 52 minutes flying over Arrecifes, the relative westerly displacement would have been even greater, although the speed of the front at its western end was considerably less than at its eastern end.

I discovered in this particular flight that the most pleasant and also the most efficient zone (and probably the safest) was the well-



Trailer designed by Roberto Madsen, Mrs. Platt, Tony Platt and Nasim Fabre, Instructor.

defined area of the front itself. Further back it was very black, the dust was rising in clouds, and there was also heavy rain. But well out in front I found intense but smooth upcurrents for most of the first half of the journey. About halfway conditions changed and the front became less clearly marked, less efficient, and so uncomfortable as to be almost dangerous.

PRE-FRONT CUMULUS

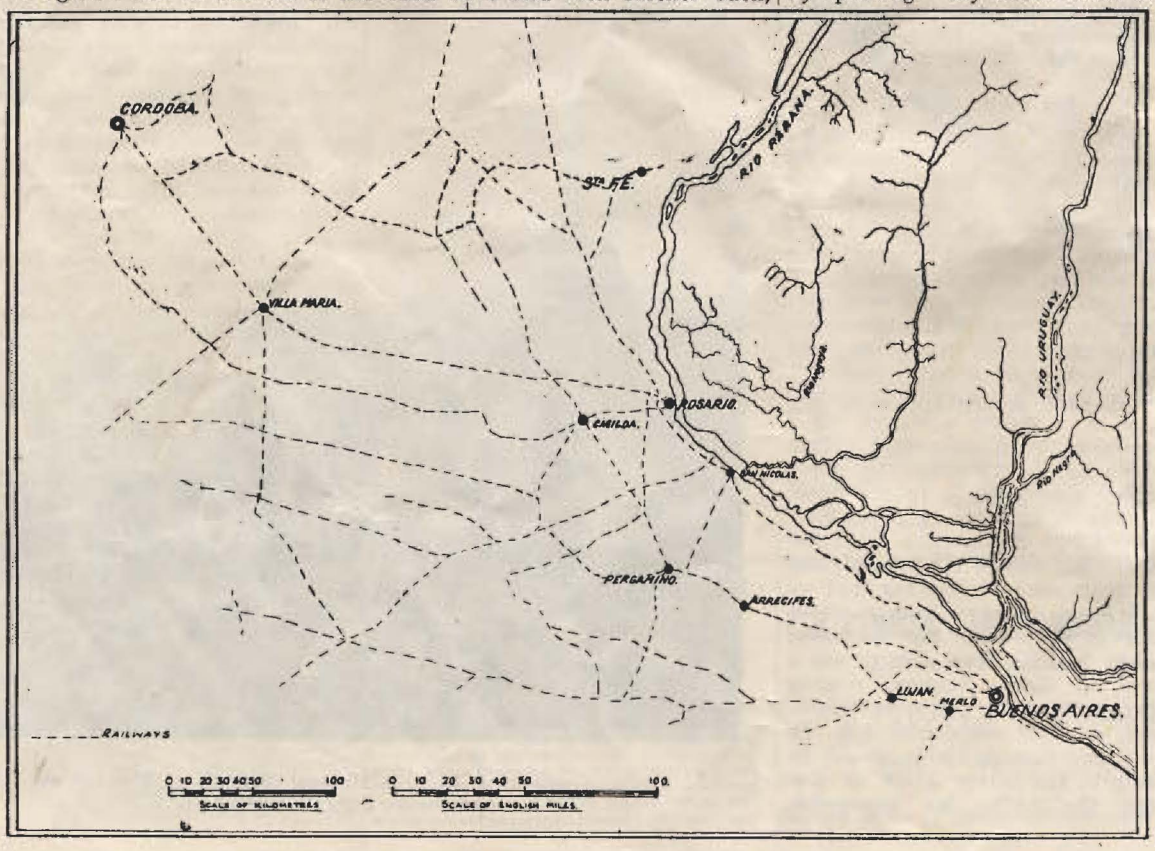
As the Viking flew westwards the depth of the front lightened. Rays of sunlight came through, the cloud border narrowed, the dust settled, the rain stopped and the storm was no longer a storm. At first it was so smooth that I could have flown much faster without straining the machine at all. Now, quite unexpectedly and every so often, without having changed my position relative to the line of the front I entered zones of such turbulence that the Viking's nose went sharply up and she shook all over, so I made a turn right and circled round a little till I found smoother air. Sometimes some of the pre-front cumulus were so near that the front almost overtook them, and here again I had to bear off to the right to avoid tremendous upcurrents. Although I lost height on each of these diversions it never disturbed me, because as soon as I escaped from the excessively turbulent zones I could always return to the upcurrents.

WAVY FRONT

The line of the front, perfectly marked by the clouds, was not so much straight as wavy, so that by following it I found myself 3 kilometres south of Arrecifes with 1,100 metres (3,600 ft.) in hand. It was now 6.53 and I had covered 140 kilometres (100 miles) in an hour and forty-five minutes. Up to now I had been able to choose the intensity of my upcurrents while still staying in the safe area, deviating a little right or left as I wished. But the front was slackening so that I had to go further inside it. I could already see what appeared to be the end of it—an enormous cumulonimbus, very black at the base but with no sign of rain nearby. I was flying a little undecidedly, because I had spotted a thin line which seemed to come from the ground. At first I took it for a streak of sunlight such as I had seen further back, but that was impossible, as the cloud was too thick. Actually it was a dust column ascending at an angle of 45° with the earth. It rose 200 metres (600 ft.) inclined towards the South, then straightened and disappeared vertically up into the centre of the cloud.

LANDING TOO RISKY

At that moment there were no upcurrents around me, so I decided that the front had filled up and that the column was directly a result of the evolution of that enormous cloud, purely a local storm. As it seemed already late I decided to return to Arrecifes and land there. The cloud South-west of me made it appear darker than it actually was, so I looked for a suitable field and a shed to house the Viking. Here I found upcurrents again, of 1 or 2 metres a second, but having cruised all around I decided landing was too risky. I could find nothing but fields of tall maize, and only one shed and that quite ungetatable. The situation was becoming more complicated because the upcurrents were strengthening again, and the only way I could lose height was by spinning. My brakes were out



of order, the landing spaces were small and bad, and with such conditions I should find upcurrents right to the ground. I decided to go on.

HANGING CLOUDS

I had 1,200 metres (4,000 ft.) in hand so I went off at great speed towards the West. My black cumulonimbus had become a local storm and joined on to the front, so I had no need to risk going into its centre to find upcurrents. While flying at 1,100 metres (3,500 ft.) I saw two small clouds 100 metres (300 yds.) away on my left and at the same height as myself. These seemed to be hanging from the immense storm front, whose base was another 500 metres (1,700 ft.) above me. I kept those 500 metres in hand to give me room to escape.

It began to rain, slowly and in big drops, making a horrible noise against the roof the cabin and the wing fabric, so I decided I was in too far and went away out in front again. I think this rain would hardly have reached the ground—the two small clouds must have been caused by raindrops evaporating and ascending again in the rising air. Here I found no gusty weather till I arrived at the western end of the front and had to cross scraps of it—thick clouds separated a little and scattered around the neighbourhood.

PERGAMINO

Then I recognized Pergamino, from a flight made the year before, so I decided to avail myself of their field and hangar. I was still a little worried by the turbulence. It was rougher than at any other stage of the flight. I could find no downcurrents in which to lose height, but slideslipping continuously I finally arrived above the aerodrome with 200 metres (600 ft. or so) to go. I was able to land a little way from the hangar with a South-east wind after 6 hours 4 minutes in flight, three and a half of which had been along the front where I had enjoyed only the company of clouds and storms, my trusty Viking, and a fleeting glimpse of two big hawks which had passed over my head soon after I set out.

STORM BROKE

While we were putting the Viking safely in the hangar, the storm broke overhead in a series of lightning flashes, and the next day as we returned by trailer I saw that throughout the journey it had rained torrentially.

It was an interesting flight, especially as the front had really ended at Pergamino. According to the meteorologists the line during the flight extended E.S.E. to W.N.W., but actually the eastern extremity had advanced more rapidly and been better defined along the coast, turning on a point at Pergamino till this filled and became a continuation of the same front which advanced raining all the way.

FUTURE PROSPECTS

Previously we have always made our long distance flights with the help of pure thermals—Merlo is not ideally situated for these, and with equally good thermals, a high ceiling and a good wind, these flights could easily be bettered in other parts of the country. But perhaps by using these classical storm fronts we could break the bonds which the geographical situation of our club imposes on us. The typical " pampas " storm front from the South or South-west could be used perhaps to reach Cordoba, as it frequently stretches from the Atlantic all the way to the province of Sah Luis, a good 650 kilos (950 miles) from Buenos Aires. When we can count on a meteorological service that can warn us of the approach of these fronts, and also of their speed, direction, and extent we shall have a magnificent opportunity of reaching really distant places to the West and North-west of our great country. Knowing of an oncoming front we could get out all the sailplanes we possess and by aerotowing them two or three at a time have every machine in the air to make use of it.

In cases such as the flight described where the front peters out there are two alternatives. If it is still early enough in the day for thermal flights, distance might be continued. Or one might do better to stay and allow oneself to be drifted along with the front and hope that it might extend again later.

Hitherto we have had to depend on European descriptions of storm flights—with their attendant difficulties of translation to our language, but with this experience we know that it is possible to fly straight along the front and not only in a series of figures of eight as in the textbooks. So from now on look for records from the Argentine.

(*Continued from page* 17)

NEWS FROM KIRKBYMOORSIDE

THE post-war version of the " Petrel " high performance sailplane has additional features such as landing wheel, adjustable rudder pedals, tail trimmer, and a choice of two cockpit covers. Details and modified General Arrangement drawing will be published in the next issue.

The single-seater " Gull " will be produced with a full cantilever wing, landing wheel, tail trimmer, adjustable rudder pedals of our own design. The prototype version has shown remarkable results which are well ahead of any other machine of the 50-feet span class. The performance of the strutted "Gull" is well known to all leading pilots; an increased performance is assured.

Two trainer type 2-seater sailplanes have appeared from nowhere in particular. These are known as the Type 20 and Type 21. Prototypes of both machines have logged many flying hours and promise to be valuable additions to post-war training equipment.

An entirely new elementary training machine is under design consideration with special features for rapid replacement of damaged parts, simple construction and large scale production. A very large batch will be made as soon as labour and materials are released for this purpose. Quantity production will ensure lowest possible selling prices and the prompt supply of spares.

A few machines of the " Meise " Olympia type are also on our programme for production as and when materials can be released. The cantilever " Gull," however, will have a better performance.

Within a few months of removal of restrictions, machines of all types will be available to clubs and private owners.

LEICESTER AVIATION CENTRE

Major H. A. Petre, D.S.O., M.C., will give a talk on Gliding on Friday, December 8th, at 7 p.m., at the College of Art and Technology. All will be welcome.

THE RECONSTRUCTION OF THE CARDEN BAYNES AUXILIARY

(MODIFIED TO STANDARD SCUD III)

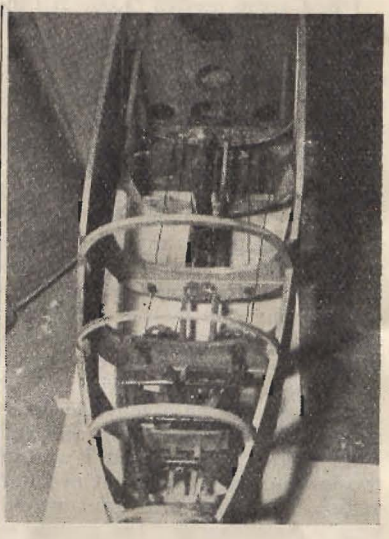
IT was with great interest that I read the article on this machine in the August issue of the SAILPLANE, and it occurred to me that many of your readers might be interested to read the sequel to that article.

Unfortunately, at least for the makers, my story begins rather sadly when the C.B. Auxiliary was crashed and pretty well written off during the demonstration flight at Dunstable. The pieces were very soon " swept up " and transported back to Farnham, where they were stored for some considerable time.

Thus passed from the public limelight what in my opinion was one of the most amazing light aircraft that had ever been built and flown successfully. It was very soon forgotten by the Gliding World, and once again our Designers set to work to produce some more very high performance Sailplanes ; the simple and sturdy Scud type construction was soon looked upon with scorn as being old fashioned, and was succeeded by some really superb looking designs ; Gull wings, Split Trailing Edge Flaps, and Cabin Top Fuselages became fashionable, and one frequently read of fantastic gliding angles of 25 to 1 and sinking speeds of less than 1.5 ft./sec. However, with all these so-called improvements one wonders just how many of these Super Sailplanes would have flown, if " motorized," with this power-loading.

BUYING THE BITS

It appeared to me, therefore, that this machine had never been fully developed, and I have always felt that it was a great pity, that in spite of the fact that the other Scud III (Barker's) was giving excellent service and had completed many cross countries, that the makers could not see their way clear to put this type into production. I decided, therefore, that although by the time it was rebuilt it would be " out of fashion," its performance would still compare favourably with that of the modern machine, and with this idea I first approached the makers early in 1937 with a view to purchasing the wreckage. After much discussion over the possibility of rebuilding it, I prevailed upon a sympathetic Works Manager to sell me the " bits " less power unit (I was not interested in the motorized version).



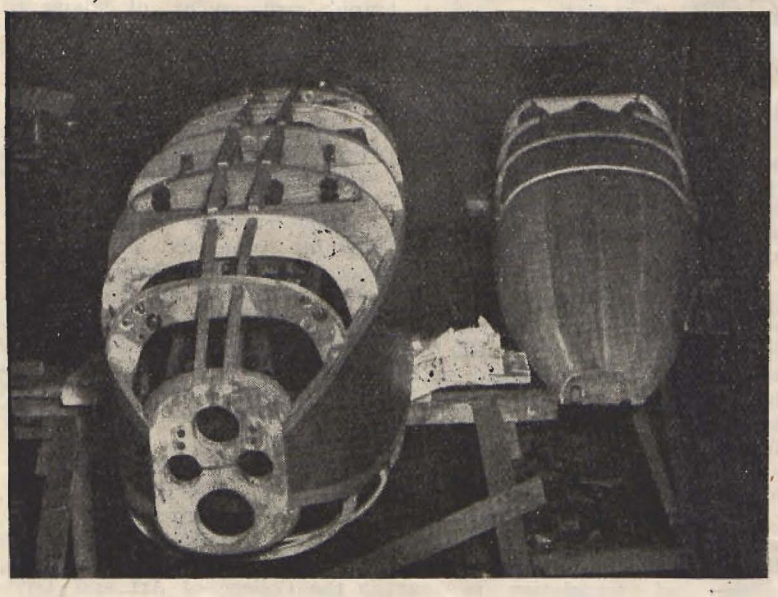
Fuselage after fitting controls.

From then on, however, my idea seemed doomed to failure since many of the Gliding Experts with whom I discussed this rebuilding, calmly predicted certain failure to anyone crazy enough to undertake such an extensive job without a full set of Working Drawings, numerous elaborate jigs, and a well-equipped workshop large enough to house the fully-rigged machine—to say nothing of the cost which was estimated to be anything up to £300.

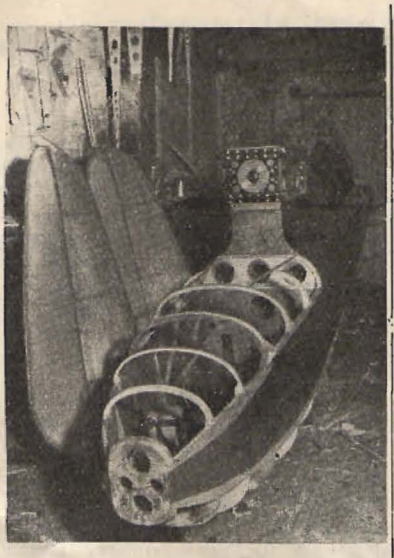
Being at the time a mere aircraft ground engineer, these prophecies were, to say the least, rather disturbing ; since, no drawing were available, elaborate jigs were obviously impossible, and the large workshop could not be obtained.

WHAT A WRECK

Thus, with this rather gloomy forecast, and the help of a few real enthusiasts, the job was commenced about the middle of 1937 in the old and leaky hangar of the Portsmouth and South Hants Gliding Club. The first step of course was the complete inspection of the



Underside showing nose ply skin still attached to solder.



Next Stage before rigging.

wreckage, and briefly this revealed the following: the Port Wing was badly damaged, the rear spar being fractured about 5 feet from the root end, most of the ribs and ply skinning were damaged in this area, but the front spar and the leading edge were undamaged. The starboard wing was in fairly good condition, requiring only a few minor repairs. The fuselage was in a very bad way, having had its nose completely " written off " as far back as rear main bulkhead, the fin was broken off just below the tailplane attachment, and the centre section neck and torsion ribs were completely wrecked. The elevators and tailplanes were slightly damaged, but repairable, and the rudder was practically non-existent.

FOR " LIGHTHOUSE KEEPERS "

The fuselage being almost completely destroyed, and appearing to be the worst job, was started first, and after piecing together the shattered bits of formers and bulkheads the rough dimensions were obtained. I well remember that the overall length was arrived at, after much argument, by measuring the rudder cables and adding sufficient length to conform to a smooth nose curvature. For some months the rebuilding progressed very slowly, since much of the work was carried out during the evening against almost impossible odds. Weather was bad, making glueing almost impossible in the very damp hangar, whilst the only light available for some considerable time was supplied by a battery of hurricane lamps. It may be mentioned, that by the time a workshop with an electric light was procured the few enthusiasts had become past masters in the art of wick trimming, glass cleaning, and reflector adjustment, and had qualified fairly well for the responsible position of " Lighthouse Keeper."

RULE OF THUMB

By the time we had settled ourselves in the new workshop the bulkheads and formers were completed and ready for assembly. As previously mentioned, the overall length was arrived at largely by guess work, but, if anything, was a little longer than the original and this enabled the cockpit to be deepened slightly. The layout was made full scale on large sheets of plywood on our Drawing Board, which consisted of nothing more than the workshop floor, and was the only " Drawing " used throughout. Our " Lofting " methods must have been fairly successful since a very accurate contour was obtained, so that the top and bottom surfaces of the nose were identical in curvature.

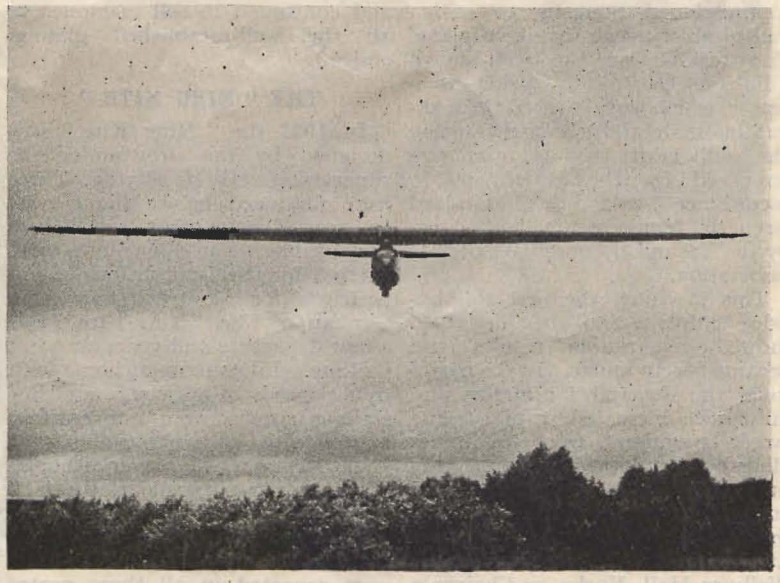
A simple jig was then built, securing the centre portion of the fuselage which positioned the nose formers and main bulkheads accurately. The longerons were spliced and the flat portions of the fuselage sides were covered with ply; the main controls and floor members were then fitted.

Since the top and bottom curvatures were similar, the whole ply skin was spliced up over a solid wooden cove, and glued as one panel over the fuselage formers; this method of plying differed from the original in that long tapered panel were used being spliced longitudinally, instead of using the double skin of parallel 2" ply strips, butt joined and running diagonally across the nose. The method was found to be simpler and quicker than the original.

LOBELLE QUICK RELEASE

The fin structure was next to receive attention, and new fin and stern post booms were spliced in, being reinforced by ash blocks. These carried the tailplane attachment fittings and also served as backing blocks for the 25 to 1 boom splices. The repair of this component was very straightforward, and the structure was soon fitted with the elevator control shafts and tailplane fittings, before being finally ply covered. A quick release hook of the " Lobelle " type was then fitted, and was so designed to provide the forward anchorage for the main skid which was mounted on two rubber buffers located on No. 4 former and main bulkhead respectively.

(*Continued on page* 18)



The Test Flight Scud III.

THE STORY OF SLINGSBY SAILPLANES LTD. KIRBYMOORSIDE

F. N. SLINGSBY commenced the manufacture of training type gliders in 1931 at Scarborough. In 1932 on the personal advice of Gunther Groenhoff (who visited the Scarborough Gliding Club to lecture and instruct in the art of soaring), Slingsby built and piloted the British version of the " Falke," known as the " Falcon." This prototype appeared at many gliding meetings throughout the country and contributed to the advancement of soaring in Great Britain. In 1932, at Ireleth, near Barrow-in-Furness, Slingsby, piloting the " Falcon," put up the greatest number of flying hours for any individual machine of the meeting, and G. M. Buxton used the machine for his record distance flight from the site to Lake Coniston, gaining the Wakefield Trophy for that year. The machine was later taken over by the London Gliding Club.

BIRTH OF THE TWO-SEATER

In 1933 other machines of the " Falcon " type were produced, one was purchased by Mr. C. E. Hardwick, of Birmingham, a well-known pioneer of gliding in this country. In the same year many primary and secondary types were produced, and Mr. C. E. Hardwick commissioned Slingsby to design and produce a two-seater sailplane. The result was the well-known " Falcon III " side-by-side two-seater, which was designed throughout and in detail by Slingsby during the winter of 1933-34, and was approved by the B.G.A. as in accordance with the standard strength requirements laid down by the Technical Committee of that association.

This machine, the first side-by-side sailplane to be designed, showed remarkable results and became very popular. In the meantime, the demand for gliders and sailplanes increased rapidly and larger premises were required. Slingsby then joined an engineering firm at Kirbymoorside and opened an aviation department, renaming the firm Slingsby, Russell & Brown, Ltd., with Major J. E. D. Shaw, Welburn Hall, Yorks, as Chairman of Directors.

THE " KITE "

In 1935 the now famous " Kirby Kite " was designed, produced and flown in 4 months, and on its first soaring flight during the B.G.A. competitions at Sutton Bank, was flown by J. C. Neilan to Roose, near Withernsea, a distance of 55 miles.

In the same year a high performance sailplane designed by G. M. Buxton was built by Slingsby and flown by Mr. P. A. Wills in many competitions and meetings. Mr. Wills, now our leading British Sailplane Pilot, put up a series of records on this prototype.

EMPIRE SALES

Slingsby Sailplanes were now being sent to many countries in the Empire, and the demand steadily increased. In 1936 the firm designed and produced the " Kirby Cadet " and " Tutor," both very useful and robust secondary trainers. Primary trainers were produced at an astonishing rate and at an equally astonishing low price.

German competition, backed by an exchange rate beneficial to German exporters, kept the selling prices of gliders and sailplanes down to starvation rates, but in spite of the uphill struggle the firm lived and continued to sell machines to all the well-established gliding clubs.

THE " KING KITE "

In 1937 the " King Kite " was designed by the firm under the supervision of G. M. Buxton. Three were produced before flight tests or any development work was carried out. These machines were entered for the International Competitions for Motorless Flying in Germany. The " King Kite " was a new departure and years ahead of its time. Pilots more at home with flying speeds of 35 m.p.h. and low stalling speeds were not entirely happy with a machine flying at about 45 m.p.h. Moreover, although the design was excellent, the lack of time for development work and the rush to complete the machine, resulted in wing jigging errors which were repeated in all these prototypes, and the error was not discovered until some considerable time after the competitions. Two of these machines are still in existence, and one is giving good service in the A.T.C. It is used for practice flights by certain Instructors, who speak highly of its performance and responsive controls.

THE " GULL "

During the winter of 1937, Slingsby designed and produced the strutted " Gull " high performance sailplane. This machine has special characteristics and was designed for cross-country flying in high wind conditions. The prototype made its first " public " appearance at Radcliffe Aerodrome, near Leicester, during the successful Easter meeting of 1938. After a demonstration flight by Slingsby the machine was purchased on the spot by Mr. Dudley Hiscox, who, in his usual business-like manner, immediately put the machine through its paces by a modest cross-country flight of about 60 miles to Bicester.

Several machines of the " Gull " type were sold in this country and abroad. One, known as the " Blue Gull," owned by that remarkably enthusiastic pair, Messrs. Greig and Stephenson, made the first genuine soaring flight from England to France. Stephenson, after a winch launch at Dunstable, flew to the South Coast, and with lots of height in hand, tackled cumulus cloud coming out at about 6,000 feet half-way over the Channel. He wisely continued his southerly cource and landed at a remote spot about 40 miles from an aerodrome in France. How he got back is another story.

BRISK BUSINESS

At the end of 1938 the firm was supplying and servicing sailplanes and gliders to every club in the country and many clubs and owners overseas. Business was brisk in spite of German activities. Primaries, " Kirby Cadets," sailplanes, were being produced in a steady stream.

The late Frank Charles, the well-known dirt track rider of that

time, already the owner of a "Kirby Kite," which he handled in a masterly way, persuaded the firm to build him a machine with "Rhonadler" characteristics, but with more up-to-date features. This machine was named by Charles the "Petrel."

The "Petrel" was a winner from the start, and four more were built, two with a stabilised tail unit instead of the pendulum type of elevator.

NEW FACTORY 1939

In 1939 the production of sailplanes and gliders became an established industry, and the firm felt justified in forming a separate company, "Slingsby Sailplanes Ltd," and built a new factory at Kirbymoorside. War broke out the day before the factory opened and all orders were cancelled. However, the factory carried on and finished its experimental types, which included a full cantilever wing version of the "Gull" and a two-seater high performance cabin type sailplane, the "Gull II."

In 1940 the "Kirby Kites" were taken over by the R.A.F. for special duties, and later a "Petrel" with J. C. Nielan as pilot, was detailed for similar work.

The factory gradually became involved in war work, and sports gliders slowly faded out of the picture and bigger and grimmer craft appeared.

In 1941 the A.T.C. went glider-minded with a scheme for encouraging its youthful members to build their own gliders. The firm loaned a set of "Kirby Cadet" drawings to the A.T.C. authorities to help the good work. Later firms commenced building the machines, and the "Kirby Cadet" is now the standard training machine for the A.T.C. Gliding Schools.

(*Continued on page* 13)

(*Continued from page* 2)

on their way home, which settled the "last look round" idea most effectively.

BRITISH SOARING ESTABLISHED

The 1935 Contests produced nothing spectacular, but the results were none the less positive. The Contests had become an established part of the Gliding Calendar, they had become representative of the year's progress, and were realized as the proving ground both of machines and pilots.

British Soaring was at last firmly established, and had entered on a stage of enthusiastic and active development.



THE NEW SLINGSBY SIDE-BY-SIDE 2-SEATER.

(*Continued from page* 15)

The " rebuilding " now seemed to be really progessing, and the mere psychological effect of seeing the fuselage and one wing all but complete caused us to descend on the badly damaged port wing with great vigour. Once again the experts were confounded, and the complicated jigs prescribed by them were found to be completely unnecessary ; even more, not even a " Clino " was used for this repair, It will be remembered that the leading edge and front spar of this wing were undamaged, and this, coupled with the fact that the other was intact and therefore available as a pattern saved a considerable amount of work.

THE METHOD

Firstly, an " L " shaped jig was built of hardwood, the short leg of which was then drilled to conicide with the two holes of the front spar attachment of the good wing. It was then bolted to this fitting so that the other leg was positioned just above the rear spar. The angle of the " L " was then well reinforced with a large gusset, and finally a small taper block was glued to the inside of the jig so as to just touch the rear spar top edge. Thus, the accurate relative positions of the two spars could be obtained by transferring the jig to the damaged wing, packing up the rear spar until it just touched the locating block and clamping into position before ply covering. When in the correct position the root end torsion rib was drilled and bolted immediately to the spar angle brackets. The secondary ribs were then repaired and the top surfaces covered before removing the spar clamps.

At long last the aircraft was ready for assembly, and all the " bits " were once more transported to a large field where the first trial assembly was made. Much to everyone's amazement, I think, (although no-one admitted it) the various components mated perfectly, and we saw for the first time just how pretty this little machine looked when completely rigged. The jobs that now remained were the usual incidental ones, such as the fitting of instrument panel, wing root, tailplane, and skid fairings, and the finally adjustment of all controls. These were of course child's play after what had already been done, and after a fortnight the machine was ready for the first " Test Flight."

WHAT A JOY

The Scud's behaviour during that first flight was perfect, the feeling of absolute aerodynamic cleanliness, the silence with which it flew, and the fine " crisp " feeling of controls which is such an admirable characteristic of the Scud family, were all that was necessary to assure me that the rebuilding had been a complete success.

It was a proud moment, and that night it was not unnatural that the " few " were to be found in the " Local Tavern " celebrating that success after 2½ years of hard work, and I am sure such was the feeling of our personal satisfaction, that even the " Experts," had they called in, would have been invited to join in the celebration.

R. E. CLEAR.

IRISH AVIATION CLUB

THE Irish Aviation Club, Limerick, re-opened its membership list on September 1st, and in less than two months exceeded the fifty mark. This is remarkable especially as the Club can offer no flying facilities, but only lectures.

At the moment there is a ban on private flying in Eire, and in any case there is little Gliding equipment. An attempt has been foreshadowed to begin again with bunjy launches and primaries, and it is possible that someone may come over to Great Britain to try to buy primaries and secondaries.

THE SOARING ASSOCIATION OF CANADA

WE have received from Mr. J. A. Simpson, the President of the Soaring Association of Canada, a full report of the proceedings which led to the formation of the Soaring Association of Canada, for which we are very grateful. A brief report has already appeared in SAILPLANE.

An outstanding difficulty in the organisation and practice of Gliding and Soaring in Canada is the ruling by the Department of Transport, Aviation Division, that Gliding can only take place in the presence and under the control of a qualified pilot holding a commercial license. Shades of Mother Grundy ! What on earth can a commercial power pilot know about Gliding and Soaring unless he is one of the elite who has graduated to power flying from Gliding. It is to be hoped that for the benefit and health of the Gliding Movement in Canada this quite arbitrary restriction will have been removed before these lines are read in Canada.

After this we shall expect B.O.A.C. to join our party any day, or shall we take over B.O.A.C ? We are just about as qualified to do it as any uninstructed power pilot has to run Gliding.

The chief concern of the Aviation Department seems to be the danger to the public. We imagine they cannot have had the benefit of a visit from Captain Lamplugh, who would soon make short work of any such objections which were solved in a much more crowded country—here—than is Canada, and that some years before the war.

In Canada any instruction in flying, or flying for a fee, even joy rides, is governed by the rules of commercial flying. Which is a bit tough on Canadians, and calculated to drive out of their heads all joy in the freedom of Gliding and Soaring.

POLISH GLIDER LEADERS IN CANADA

One interesting fact emerges from the report which is that Messrs. Czerwinski and Stepniefski are in Canada, as members of the Canadian Wooden Aircraft Ltd. Mr. Czerwinski is the designer of the Sparrow which was featured in SAILPLANE in April.

Mr. Stepniefski was also a Polish Sailplane Designer, and was on the Olympic Technical Committee with Mr. Shenstone as British Representative.

ACCIDENTS

During the discussion Mr. Twardowski said that few people realized the low percentage of gliding accidents involving the pilot. During three years he was instructing in Poland they had only twelve accidents. Most of these caused broken bones and two of them were fatal, but taking into account the fact that five thousand pupils went through the school the rate was very low. He found that the most serious accidents occurred.

(*Continued on page* 20)

New Deputy Director A.T.C.



TWO new A.T.C. appointments have been announced by the Air Ministry :—

Group Captain C. E. Maude succeeds Group Captain J. E. Allen as Deputy-Director, responsible for personnel, training, provisioning, and associated matters.

A second post of Deputy-Director has also been established, for dealing with other matters including general policy, administration, and equipment accounting. Mr. S. W. Warran (Principal, Air Ministry) has been appointed to this post.

NOTES ON CAREERS
Group Captain C. E. Maude

One of the earliest of the original R.N.A.S. pilots. Learned to fly, as a Lieutenant R.N. at the C.F.S. Upavon, in 1913. R.Ae.C. Certificate No. 529, June, 1913. Employed with the R.N.A.S. throughout the War 1914-1918. Transferred to the R.A.F. as Squadron-Leader on formation, 1st April, 1918. Promoted Wing-Commander 1924. Served with Coastal Command and F.A.A. 1924 to 1934, when he retired. Recalled September, 1939, and served at R.A.F. Record Office 1941-41, Technical Training Command 1941-1942, and for the last two years with R.A.F. Delegation, Washington, U.S.A., 1942-1944, from where he has just returned.

Mr. S. W. Warran

Mr. Warran has held a varied range of Civil Service appointments, including that of private secretary to the Secretary of State for Air during the late Sir Kingsley Wood's term of office. More recently he has served for two years in the United States, where he was attached to the R.A.F. Delegation in Washington.

ROYAL AERO CLUB
GLIDING CERTIFICATES

		Gliding School	*Date taken*
	"A" Certificates (88)		
2062	Francis Dennis James	W.70 E.G.S., Swansea	19. 8.44
2063	Cecil Redvers James	Ditto	14. 8.43
2064	Albert Weymouth Pettley	L.142 E.G.S., Stapleford Tawney	28. 7.44
2065	William Campbell Howart	S.4 E.G.S., Abbotsinch	3. 9.44
2066	Thomas Kenneth Bostock Lockhart	Ditto	3. 9 44
2067	Ian Paton	Ditto	27 8 44
2068	Howard Homfray	M 45 E.G.S., Meir	30. 7.44
2069	George Henry Newberry	L.148 E.G.S., Southend	10. 9.44
2070	Samuel Anderson	Ditto	10. 9.44
2071	Kenneth Walter O'Riley	Dito	9. 9.44
2072	Bruce John Jefferys	Ditto	10. 9.44
2073	Leonard Charles Layzell	Ditto	10. 9.44
2074	Wilfred Jones	N.E.22 E.G.S., Kirbymoorside	5. 3.44
2075	Ronald Frank	Ditto	5. 3.44
2076	Steven McNeil Welford	Ditto	14. 4.44
2077	Sydney Kelsey	Ditto	19. 9.44
2078	William Kelsey	Ditto	29. 4.44
2079	Charles Syndey Scott	Ditto	2. 7.44
2080	Frederick Rawlinson	E.107 E.G.S., Lincoln	29. 5.44
2081	Ralph Colin Stuart	M.44 E.G.S., Rearsby	10. 9.44
2082	Donald Norman Sleven	C.129 E.G.S., Waltham Cross	17. 9.44
2083	Gerald Anthony Baseden	C.123 E.G.S., Bray	7. 8.44
2084	Derek Bernard Jepson	183 E.G.S., Woodford	17. 9.44
2085	Frank Patrick Geary	M.44 E.G.S., Rearsby	10. 9.44
2086	Harry Cox	N.E.26 E.G.S., Greatham	17. 9.44
2087	John Hermann Hicks	Ditto	2. 4.44
2088	Sydney George Reginald Hart	S.W.83 E.G.S., Moreton Valence	17. 9.44
2089	Robert Swinney Bean	N.E.25 E.G.S., Hull	23. 7.44
2090	John Malcolm Kelsey	Ditto	23. 7.44
2091	Joseph Anthony Keith Blades	Ditto	23. 7.44
2092	Frederick Morley Barr	Ditto	23. 7.44
2093	Gordon Joel Clark	N.E. 25 E.G.S., Hull	23. 7.44
2094	Richard Michael Bradley	M.48 E.G.S., Bretford	10. 9.44
2095	William Watson	184 E.G.S., Woodford	10. 9.44
2096	Dennis James Booth	M.45 E.G.S., Meir	30. 7.44
2097	Gilbert Parker	183 E.G.S., Woodford	16. 1.44
2098	John James Cox	201 E.G.S., N. Ireland	12. 7.44
2099	Francis Henry Hunt Robinson	C.126 E.G.S., Booker	30. 6.44
2100	Horace Thomas Chellingsworth	M.41 E.G.S., Knowle	1.10.44
2101	Harold Percival Rhodes	184 E.G.S., Woodford	10. 9.44
2102	Albert Reginald Hester	182 E.G.S., Samlesbury	17. 9.44
2103	James Herbert Underwood	L.148 E.G.S., Southend	23. 9.44
2104	Peter George Hawkes	Ditto	23. 9.44
2105	Derek Henry Millard	Ditto	23. 9.44
2106	Michael Arthur Cunningham	W.65 E.G.S., Cardiff	26. 8.44
2107	Eric Guthrie Olsen	N.E.26 E.G.S., Greatham	12. 9.44
2108	William Alfred Timms	M.44 E.G.S., Rearsby	10. 9.44
2109	Francis Arthur Abbey	S.W.83 E.G.S., Moreton Valence	17. 9.44
2110	Alfred Sydney Hufton	E.107 E.G.S., Lincoln	29. 5.44
2111	Frederick Roy Eaton Hayter	S.W.89 E.G.S., Christchurch	14. 9.44
2112	John Michael Young	C.123 E.G.S., Bray	30. 9.44
2113	Anthony Cladue Jacob	M.48 E.G.S., Bretford	25. 8.44
2114	Roy Jack Sturgess	L.148 E.G.S., Southend	8. 9.44
2115	John Reginald Wyatt Millbank	Ditto	8. 9.44
2116	Derek David Lowen	Ditto	8. 9.44
2117	Douglas Clement Hay	C.126 E.G.S., Booker	16. 9.44
2118	Bryan Smith	C.126 E.G.S., Booker	16. 9.44
2119	Ronald Alfred Key	M.48 E.G.S., Bretford	10. 9.44
2120	Otto Heller	C.126 E.G.S., Booker	16. 9.44
2121	Peter John Shannon	Ditto	16. 9.44
2122	Royce Douglas Paine	M.48 E.G.S., Bretford	25. 8.44
2123	Gideon Thomas William Sellwood	L.1145 E.G.S., Colchester	2. 7.44
2124	Geoffrey Welton	L.143 E.G.S., Croydon	22. 8.44
2125	Reginald Henry Edmonds	C.126 E.G.S., Booker	12. 7.44
2126	Ralph Gordon Mitchell	M.41 E.G.S., Knowle	1.10.44
2127	Donald McGregor	S.4 E.G.S., Abbotsinch	14. 7.44
2128	Gerald Ian Janes	C.123 E.G.S., Bray	5. 8.44
2129	Richard John Knibb	N.E. 26 E.G.S., Greatham	12. 9.44
2130	Geoffrey John Gaston	M.48 E.G.S., Bretford	10. 9.44
2131	Albert Frederick William Burbidge	S.E.163, E.G.S., Portsmouth	1.10.44
2132	Robert James Johnston	203 E.G.S., Newtownards	8.10.44
2133	John William Atkinson	M.41 E.G.S., Knowle	1.10.44
2134	Joseph William Alexander Bloss	203 E.G.S., Newtownards	24. 9.44
2135	William Graham Reynolds	Ditto	8.10.44
2136	Harold Russell Johnson	184 E.G.S., Woodford	10. 9.44
2137	George William Gillmau	C.123 E.G.S., Bray	5. 8.44
2138	John Edward Hobbs	Ditto	6. 8.44
2139	Deric Vernon Tonge	Ditto	7.10.44
2140	Alan McKim Taylor	S.W.83 E.G.S., Moreton Valence	8.10.44
2141	Patrick George Rust	Ditto	8.10.44
2142	Clifford Flogdell	M.44 E.G.S., Rearsby	30. 7.44
2143	Douglas Oswald Martin	W.65 E.G.S., Cardiff	15.10.44
2144	Alfred Eric Campbell	184 E.G.S., Woodford	17. 9.44
2145	Leonard Charles Barnes	W.65 E.G.S., Cardiff	8.10.44
2146	Robert James Curry	203 E.G.S., Newtownards	8.10.44
2147	John Michael Bunce	C.126 E.G.S., Booker	8.10.44
2148	George William Rogers	Ditto	15.10.44
2149	William Ernest Lardner	M.43 E.G.S., Walsall	14. 5.44
	"B" Certificates (17)		
2062	Francis Dennis James	W.70 E.G.S., Swansea	20. 8.44
2063	Cecil Redvers James	Ditto	19. 8.43
2069	George Henry Newberry	L.148 E.G.S., Southend	10. 9.44

(*Continued on page* 20)

MIDLAND COMMAND A.T.C. GLIDING COURSES

IT is now possible to record the result of the four special courses run this year by the Midland Command A.T.C. All were held at Bretford, near Rugby, and consisted of two Instructors' Courses of a week each in July, and two Public School Cadet Courses of a week each in August.

The Commanding Officer of the first Instructors Course was F./O. Louis Slater, the Silver "C" joint founder of the Derbyshire and Lancashire Gliding Club, with eight instructors, chiefly from Derbyshire and Leicestershire. The second Course was under the command of F./L. J. Taylor, also with eight instructors, chiefly from the Knowle School. Both courses concentrated on precision flying with particular emphasis on accurate approaches from at least 300 feet at the approach end; marking was effected by deduction for error, both flying and positional, from a uniform allocation of 100 marks each. Exact circuits to instruction were the order of the day for the first days, each circuit being subdivided into three for marking purposes :—

1. Take off, climb, and release .. .. 1 mark
2. First turn, and circuit, to beginning of approach .. .. 1 mark
3. The actual approach and touch down .. 2 marks

A maximum of four deductions per circuit could be made at this stage, but in a later stage correct circle or circles at over 500 feet were added immediately after the release, for which a further deduction could be made.

BAD WEATHER

Unfortunately bad weather considerably hampered F./O. Slater's course, but during the four possible flying days, 120 launches were made with a total flying time of 7 hr. 8 min. 43 sec., giving an average length of flight during the course of exactly three and a half minutes. A taper "Kadet" was used in the early stages of each course, followed by a "Falcon I" and later by a "Kite." The quality of the flying was uniformly high and, after the first two days, few marks were lost, in spite of the eagle eye of the Commanding Officer, who seemed to miss nothing, shepherding all and sundry on to the straight and narrow path, with his mark flail.

THERMALS

Slight thermal activity was noted in an area over the Bretford Arms, and several delayed descents were recorded. One actual contact by the "Kite" was made in this area at about 5 p.m. on the last Friday, but had to be thrown away owing to the special Air Ministry restrictions. The outstanding performance was that of A. J. E. Benton, who was the least experienced at the beginning of the course, but finished all square with everyone else. There was no damage to report and the winch driving was of a high category, with launches varying from 700 to 1,000 feet, and taking from 25 to 35 seconds.

GOOD WEATHER

The second Course under F./L. Joe Taylor started on the following Sunday and was favoured throughout with remarkable weather. The results were further enhanced by a general decision to forego the evening meal and fly on till 10 o'clock. The net result being that the eight instructors put in the phenomenal flying time for the week of 19 hr. 40 min. with 340 launches, giving an average flight of 3 min. 28 secs. Thermal activity developed at two points, once again over the Bretford Arms, and also over a wheat field on the left side of the aerodrome. Numerous partial contacts were made from midweek on with flights of 8 and 11 minutes, while F./O. Farman established a full contact at midday Thursday which he used with skill up to the stage permitted by the Air Ministry regulations.

A GREAT SUCCESS

The Course was in every way a great success. The winch driving was good but was somewhat fast at times. There was no damage to report and everyone returned home feeling that they had learned a lot which they could pass on to the Cadets at their home School.

The two Public School Courses following in August, which were attended by eighteen and sixteen Cadets respectively, will be reported in detail in the next issue.

C. E. H.

(*Continued from page* 18)

during the B and C Certificate stages.

Mr. J. A. Simpson, lately of the Derbyshire and Lancs. Gliding Club, said in his experience the danger periods were: (i) during short hops; (ii) at the circuit stage; (iii) during very advanced competition flying.

GLIDING CERTIFICATES—*continued.*

"B"	*Certificates*	*Gliding School*	*Date taken*
2070	Samuel Anderson	Ditto	10. 9.44
2071	Kenneth Walter O'Riley	Ditto	10. 9.44
2074	Wilfred Jones	N.E.22 E.G.S., Kirbymoorside ..	23. 9.44
2006	John Thompson Patterson	203 E.G.S., Newtownards	7. 9.44
2097	Gilbert Parker	183 E.G.S., Woodford	9. 4.44
2098	John James Cox	201 E.G.S., N. Ireland	14. 7.44
2099	Francis Henry Hunt Robinson ..	C.126 E.G.S., Booker	16. 9.44
1957	Malcolm Sydney Cross	183 E.G.S., Woodford	6. 8.44
1814	Thomas Hutchinson Smyth	C.123 E.G.S., Bray	30. 9.44
2123	Gideon Thomas William Sellwood ..	L.145 E.G.S., Colchester	26. 7.44
2124	Geoffrey Welton	L.143 E.G.S., Croydon	26. 8.44
2125	Reginald Henry Edmonds	C.126 E.G.S., Booker	26. 8.44
1896	Francis James Sheldrake	184 E.G.S., Woodford	8.10.44
1729	Dudley Stanley Bradford	C.122 E.G.S., Harrow	23. 8.44

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