March 17th, 1933. Vol. 4, No. 5.

THE SAILPLANE & GLIDER

Official Organ of the
British Gliding Association

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THE SAILPLANE & GLIDER

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

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

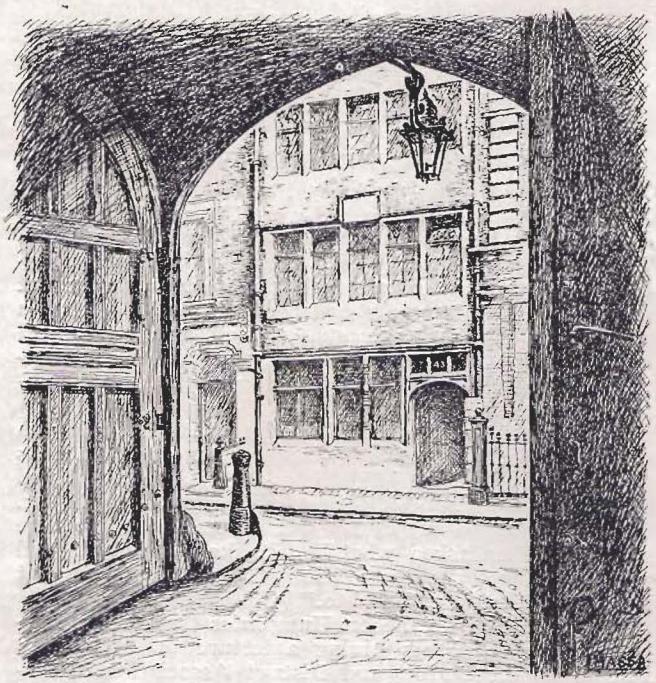
OFFICIAL ORGAN OF THE BRITISH GLIDING ASSOCIATION.

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The Offices of the SAILPLANE *viewed from the historic XVIth Century gateway of Lincoln's Inn.*

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EDITORIAL COMMENTS

In Cloudland.

Since the "cold front" of February 10th (mentioned in last issue's Club News), which nearly drowned Kingston-on-Thames, there has been a remarkable change in the general run of British weather. Cumulus clouds have been showing their heads once more, often in profusion. Then, a few days ago, another full-blown "front" passed across the sky. It arrived over Dartford with the twilight on March 7th, heralded by distant rolls of thunder, so for the next hour or two all editorial work was thrown to the winds. At 6.15 the whole of the north-western half of the sky was pitch-black, and up in the clouds the wind had already veered a third of the way round the compass. Only to the south-west had the cloud-front a sharp edge, which reminds one of what the soaring experts say—that if a "front" splits in half, the southerly portion is the one that the pilot should follow. At 6.35, down on the ground, there came a sudden blast of cool west wind and down fell the rain. "Down on the ground"—yes, but what about "up in the air"? There was not a sailplane in sight.

We make no excuse for starting off an issue of THE SAILPLANE with remarks about the sky and its clouds, as if this were the principal news of the past fortnight. It *is* the principal news, and if it isn't it ought to be. The devotees of soaring should have their thoughts ever in the sky, even if their bodies can't always be there too. And if they haven't, now is the time to begin. There may not be a special restricted season in this country for hill-soaring, as a correspondent once tried to make out there was, but for soaring in heat currents and under clouds there is quite definitely a "season" of sorts. The earth is now beginning to warm up for the year. Our Sailplanes are waiting. Is another such season to go by unused?

Whose Copy Are You Reading?

The run on our space is getting desperate. All sorts of matter has had to be held over until the next issue. We could easily fill sixteen pages a time instead of only twelve. Then why don't we? Because you, reader, are more likely to be reading someone else's copy of THE SAILPLANE than one you have bought and paid for yourself. If it really is your own, all honour to you!

Our Photographs.

It may have been noticed that all the photographs in the last issue, except for a foreign one, were of the same Club. Actually, not a single photograph of Club activities has been received at this office for over a month. The Editor has enough photographs of his own to keep THE SAILPLANE going for years, but such a collection necessarily has its limitations. Much as he would like to go round and see what other Clubs are doing, he refuses to spend week-ends anywhere but where there is a chance of flying. The first duty of those who intend to fly is to fly. So that's that.

Kronfeld's Two-Seater.

In giving the dimensions of this machine, which is presumably the one used for the recent mail-carrying flights from Vienna, we inadvertently gave those of the old AUSTRIA, which broke up in the air last July and is now defunct.

The dimensions of the two-seater are: Span, 22m. (72ft.); length, 7m. (23ft.); surface area, 26 sq. m. (280 sq. ft.).

WHO'S WHO?

WHO'S WHO IN BRITISH AVIATION, 1933 EDITION. T. Stanhope Sprigg and M. Glen Sedorski. (Airways Publications, Ltd.: 6s.)

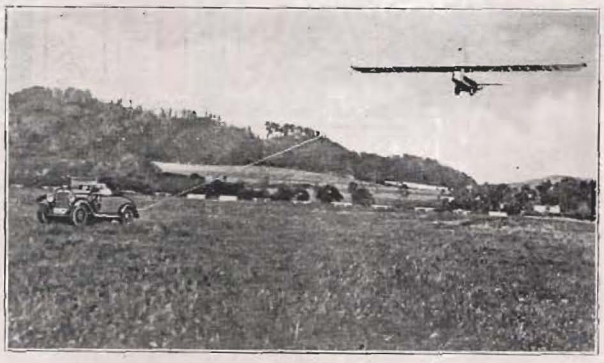
This useful book is not only a Who's Who, but a What's What, for, after the usual entertaining list of potted biographies, a mass of useful information is given, both about the Royal Air Force and the commercial side.

One of many new features introduced this year is a list of 37 Clubs affiliated to the British Gliding Association. One wonders what they all do. In the past year only 17 of them have sent in to THE SAILPLANE any report whatever of their activities; the number who still write in more or less regularly is now reduced to about seven. But THE SAILPLANE would sooner hear of seven Clubs who really fly than of 37 who have got themselves included in a printed list.

In the list of "Allied Manufacturers," gliders come between "Fuels and Oils" and "Instruments and Photographic Equipment." Seven firms are given: Messrs. Abbott, Bran (Brant?), B.A.C., Cloudcraft, Cramcraft, Reynard and Dagnall. We look forward to seeing next year whether Messrs. B.A.C. get promoted into the "Constructors of Aircraft" section!

The "Who's Who" part makes good browsing. It is a pleasant surprise to find how many people, prominent in aviation to-day, were already in it in the pioneer days before 1914. It means that they have not taken it up "just for something to do," but because it fired their imagination in the days when they were young enough to have an imagination to be fired. Aviation then was in much the same position as Motorless Flight is to-day, for its future was in the hands of a devoted few, and no one could forsee exactly how it would develop.

One notices that Capt. F. W. Merriam "organised the first gliding school in England in 1922," and that Will Hay, the comedian, "made practical flying models in 1909-10, and built and flew a full-sized glider in 1910." C. L. Pashley, of Southern Aircraft, Ltd., has been "flying consistently since 1908, in which year he was experimenting with gliders at Hockley." Other early glider flyers were Squadron-Leader J. A. C. Wright and E. W. Percival, designer of the "Gull." Group Captain J. L. Gordon, of Canada, "learnt to fly with Wright Bros. at Dayton, 1915." It seems strange that they should still have been teaching flying at that date. Mr. Dagnall's activities in connection with gliding are not mentioned in his biography. But how many knew that he was "flying small airships in 1910-13"? Mr. E. L. Mole is actually described as "B.Sc., R.A.F., glider pilot"; his height and duration records are given, as are also former duration records, such as Major Petre's and Mr. Gordon England's World gliding record of 58 seconds in 1910. Not a single distance record in soaring receives mention, so let us hope that this year some of our pilots will do something spectacular that the 1934 edition will be unable to ignore.



"THE POET ALOFT."

I often sit and wonder at
The eerie flutterings of a bat,
The crooked tail of our cat,
The man who wears a bowler hat,
The roundness of a butter pat,
The broken chair where father sat,
But what I cannot understand
Is where the deuce I'm going to land!

ANONYMOUS.

LECTURES PAST AND FUTURE.

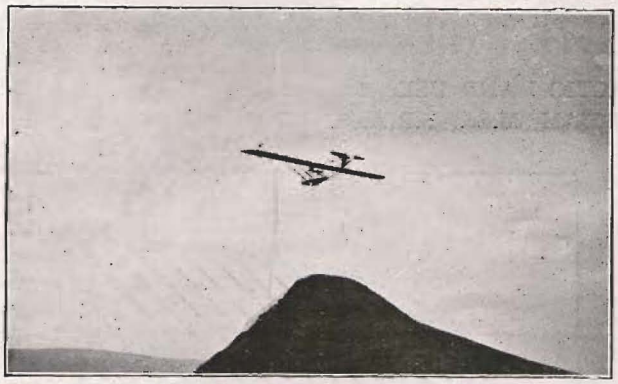
Mr. Lewis Slater ("C" pilot), one of the founders of The Matlocks Glider Club in May, 1930, gave an address on Gliding to the Matlock Rotary Club on February 20th. The *Derbyshire Times* is to be congratulated on an excellent report of the lecture, including an accurate account of the lecturer's remarks on soaring over hills and in clouds and thermal currents, as well as on technical matters. Such subjects are usually beyond the intellectual grasp of the average reporter from the more sensational Press.

Mr. J. Edge, who presided, claimed that Matlock was the first place to try gliding, inasmuch as some 100 years ago a local man fashioned himself a pair of wings and took a running jump with them off the top of High Tor. He was lucky to fall into a tree instead of on to bare ground. When asked what he felt like, he said "he did not mind the flying part, but it was the big bump at the bottom that he objected to."

On March 10th, Mr. Sebert Humphries (Instructor, London Gliding Club) is giving a lecture on "Motorless Flight" to the Barrow and District Association of Engineers, at their own request. This is a direct result of the stimulation of local interest by the holding of the Annual Competitions in the district last year.

We would urge all those who give such lectures (and may their numbers increase) to show either lantern slides or films at the same time. Anyone who has talked of gliding to the ignorant knows how surprised they are at meeting a glider pilot in the flesh. And as such people are usually convinced that soaring flight is an impossibility, or at most comparable to tight-rope walking, no amount of talk will persuade them that British pilots are now soaring over British hills, unless they can see pictures of it being done.

A selection of slides and films is kept by the British Gliding Association for the use of lecturers. Also the Editor of THE SAILPLANE has just had a set of 60 slides made from his own photographs (they are in fact being shown by Mr. Humphries at the Barrow lecture). He is willing to lend them for lecture purposes, provided that someone personally known to him will be responsible for them and for making good any damage. They include pictures of many types of machine (including gulls), of soaring in England (including models), of the Rhön Competitions of 1928, 1931 and 1932, of Rossitten Gliding School, and of clouds actually used by soaring pilots.



SOARING IN FRANCE.

M. Girod, who recently came over from France to spend a week-end flying at Dunstable (he hoped to go home with a "C," as his wife is a "B" pilot), left behind a number of photographs and a mass of interesting material in reference to Motorless Flying in France. We have borrowed this from the London Club librarian, and hope to pass on some of the information contained therein to readers.

Meanwhile, here is a photograph of a SULKY machine soaring. M. Girod himself possesses a similar machine, but recently, when on the way to take part in a competition, the trailer was run into behind by a woman motorist, and his entry became a non-starter.

OVER THE ALPS

OVER THE ALPS.

In our last issue we gave an account of the first crossing of the Alps by a glider; it was compiled from several sources—English, French and German.

We are now in a position to give our readers a first-hand account of this feat, through the kindness of Mr. Otto Frischknecht, of St. Gallen, who recently spent some months in England, and joined the London Gliding Club during the period of his stay.

"Staying in Arosa for some weeks," he writes, "I had occasion to welcome Mr. Farner and Mr. Fretz after their big flight. Most unfortunately they had to leave the sailplane at Bellinzona, and therefore they arrived very late in the evening in the PUSS-MOTH. Between the many telephone calls Farner told us of his experiences and his further plans. The homeward journey of the two pilots shows clearly that towed flight can be quite a difficult undertaking. Farner and Fretz stated that they had to use all their skill and energy while fighting with the heavy storm."

Mr. Frischknecht's account follows:—

THE FIRST CROSSING OF THE ALPS BY A SAILPLANE.

On February 13th, 1933, the first crossing of the Alps by an aero-towed sailplane was successfully achieved.

Robert Fretz, the well-known Swiss pilot of last year's "Circuit of Europe," was piloting the towing machine, his PUSS-MOTH (Gipsy III.).

Willi Farner, the leading Swiss glider pilot, is famous for his flights from the Jungfraujoch, the Rigi and Pilatus (near Lucerne). He was the first pilot in Europe to show aerobatics on a sailplane. His machine is a cantilever high-performance soaring plane, especially built for acrobatics. The span is 11 m. (36 ft.), length 5.3 m. (17.4 ft.), height 1 m. (3.3 ft.) and wing area 8.8 sq. m. (94.7 sq. ft.). For protection against the cold the pilot is completely enclosed in his cockpit.

The expedition had been carefully prepared, telephonic communication established between the two machines and a two-wheeled starting carriage constructed. Farner's intention to cast-off above the Alps in order to glide down to the Upper Italian Plain had to be abandoned. The sailplane was heavily overloaded by carrying 51.5 kg. (113.5 lbs.) of mail, representing an insurance value of 135,000 francs.

The start took place at 2.55 p.m. at Dübendorf (near Zurich). At a height of 2,500 m. (8,200 ft.) above Milan the sailplane cast off and landed at 5.07 p.m. at the Taliedo aerodrome. The greatest height attained was 3,200 m. (10,500 ft.). On the following day the two pilots started at 2.15 p.m. on their return journey to Arosa. They took the route over Como, Lugano, Bellinzona and the Lukmanierpass. Here they encountered an extremely strong wind of from 90 to 100 km. (62 miles) per hour, and were forced to return to Bellinzona to gain more height. On the second attempt they lost 3,270 ft. again. Up- and downward-gusts followed in quick succession. Over the crests of the mountains snow was blown up to a height of 980 ft. On one occasion both machines were flying in an up-draught. But when the aeroplane entered the passage of the Lukmanier it was caught by a downward eddy, which made it lose height rapidly. At the time the sailplane was still flying high up in the rising air. Then the machine was suddenly pulled down. The strain on it was so severe that the pilot feared its breakage at any moment. Having lost 650 ft. of height in a few seconds they decided to turn back and to land at Bellinzona.

Much was learnt on this expedition. The two-wheeled starting carriage had been very useful. It enables soaring planes without wheels to be used for aero-towing. The telephonic communication was most helpful. The 140 m. towing cable proved to be too long for flights in mountain regions where narrow turns have to be made and the machines are likely to get into different air-currents. The cable should be attached at the centre of gravity of the aeroplane and never at the tail as is now often done. The latter mode of fastening it would surely have led to an accident in the prevailing wind conditions. The soaring plane must be of extremely strong construction, as very often stresses are even higher than during the most difficult aerobatics.

Soaring in the high mountains is quite possible, but up- and down-wind regions have first to be explored systematically by aero-towed excursions. Then the sailplane must try each passage unaided.

Farner intends to take up all this preliminary work and then to start for the first unaided soaring flight across the Alps.

O. FRISCHKNECHT.

LOUIS PEYRET.

We regret to see from *Les Ailes* that Louis Peyret, designer of the tandem monoplane which won the Itford Gliding Competition of 1922, has died at the age of 51. A short account of his life and work will appear in our next issue.

A QUOTATION.

"In March, and at all seasons of the year when the judges are on circuit and there are criminals to be hanged, storms prevail.—Lincolnshire Superstition."

RICHARD INWARDS (*Weather Lore*).

FALCONS AS GLIDING INSTRUCTORS.

The *Illustrated London News* for February 25th contains some interesting photographs of tame falcons and eagles being made use of for the instruction of glider pupils in a flying school at Ortelsburg, in East Prussia. The birds are released, sometimes at the same time as the glider, and the pupils are instructed to watch their movements. As only a primary machine is shown in the pictures, it is doubtful whether the pupils are at a stage when the falcons can teach them anything useful. However, the idea is original, though it has frequently happened that a whole flock of birds has kept company with a sailplane in soaring flight, and without waiting to be asked.

BIRD FLIGHT VIII

THE ALULA: ITS ACTION AND USE.

By C. H. LATIMER-NEEDHAM, M.Sc., F.R.Ae.S.

Description.

The alula is in reality a small auxiliary aerofoil, or wing, situated on the leading-edge of the main wing at roughly the half semi-span position. It is sometimes referred to, though mistakenly, as the false, or bastard, wing, and forms, when open, the wrist-slot.

Until quite recently it was thought to be a useless appendage; in fact, it is often described as such even to-day; but it will be realised later that there is scarcely a superfluous feather in the structure of a bird; each individual feather having its prescribed function to perform and having been very carefully designed for that specific purpose.

The position of the alula has been shown in Fig. 14 (Vol. 4, No. 2, p. 19). It consists of three main feathers of varying length, generally, but more in the case of some very large birds, the lowest being the longest, and is often completed by a few minor feathers. They are attached to the bird's thumb, or its equivalent, which springs from the wrist.

In these days, when so much is known about slotted-wings, there is little difficulty in following the working of the alula; in fact, the two are identical, although this was not known to Mr. Handley Page, nor to Dr. Lachmann (who invented the slotted-wing in Germany co-incidently with the English discovery), at the time when their designs were worked out.

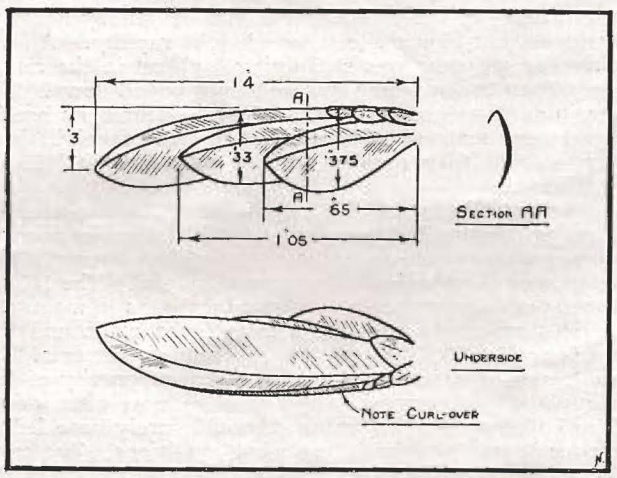


Fig. 19.—Alula of Starling—approximately full scale.

Fig. 19 shows two dimensioned views and a section of the Starling's alula, from which the feather arrangement can be understood. It will be noticed that the cross-sectional shape is in the form of a curve, or aerofoil, and that the leading-edge of the bottom feather actually bends back to fit over the leading-edge of the main wing, and in order to ensure that this shape shall be maintained there is a number of almost minute feathers (seven in this case) near the root of the alula, which press the bent-over portion on to the underside. These small feathers measure no more than 0.1 inch (chord) by from 0.2 to 0.4 inch in length.

This is not a usual feature of bastard wings, but supplies the reason why the Starling was chosen to illustrate this particular point. After noting the clever way in which the sectional shape has been obtained, by means of such apparently insignificant feathers, it becomes very unwise to assume that any single feather is redundant or lacking in importance. Instead, the purpose should be sought.

For comparison, Fig. 20 shows the forward portion of the aerofoil section, R.A.F. 28, slotted, the resemblance of which to the alula is unmistakable. One advantage

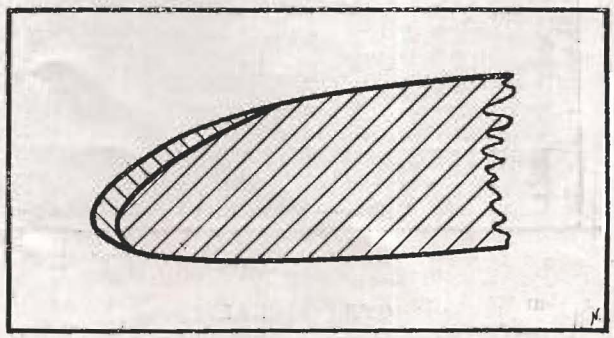


Fig. 20.—R.A.F. 28 Section slotted.

in the case of the bird, however, is that with the slot open the main wing section remains almost unaltered.

The length of bastard wings varies roughly from about one-tenth to one-quarter of the main wing span; in the case of the Changeable Hawk Eagle, of Northern India, with a length of 5½ inches, and several other species, whilst in the Red-legged Partridge it extends for nearly one-third of the span.

The alula chord bears a fairly similar proportion to the main chord, as does its span, or rather less, so that the area varies roughly from 1 to 5 per cent. of the wing area. For instance, the Hawk Eagle, mentioned above, has a main wing area of about 2⅔ sq. ft., or 384 sq. ins., with a combined alula area of 14 sq. ins., giving 3.65 per cent. of the total. It is thus seen that the relative values are in surprisingly fair agreement with those adopted for the Handley Page slotted-wing.*

Action of Alula.

The alula operates in exactly the same way as its mechanical equivalent. As the angle of the main wing to the air-flow is increased, so the actual leading-edge tends to become part of the top surface and thus comes under the influence of the decreased pressure, or suction (see Fig. 21). This suction force acts approximately at right angles to the chord of the alula, or auxiliary plane, and at a certain angle of attack the alula is drawn forward and upward into the open position (b) of Fig. 21.

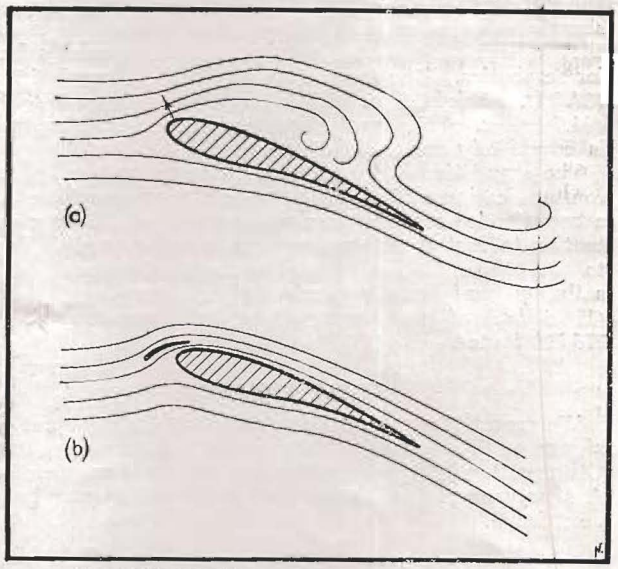


Fig. 21.—Air flow over Aerofoil at large angle of attack, (a) without auxiliary, (b) slotted.

*See "Sixteenth Wilbur Wright Memorial Lecture," by F. Handley Page, C.B.E., F.R.Ae.S., "R.Ae.S. Journal," August, 1928.

The air-flow over an unslotted aerofoil, at a relatively coarse angle, is unable to conform itself to the contour of the wing, and hence lift-destroying eddies are formed and stalling conditions set in. At (b), however, it will be noticed that the auxiliary aerofoil is presented to the flow at a negative angle of attack, and it is not therefore stalled. The air-flow follows closely the curvature of the small winglet so that at its trailing-edge the air is directed more downwards than is the case with the unslotted wing, and is thus able to form itself more nearly to the main wing shape. In both aeroplanes and birds the slot is arranged to open just prior to the stalling position being reached.

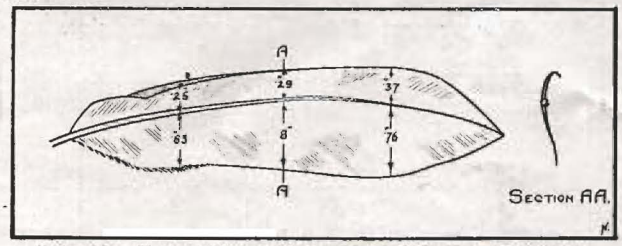


Fig. 22.—Underside of Main Alula Feather of Stanley Crane. Approximately half full size.

Movement of the alula is controlled to some extent by a system of muscles but, as has been suggested by Graham*, the probability is that the main duty of these muscles is to damp down the movements of the alula and to hold it in the open and closed positions, in a manner not unlike that of the springs of the Handley Page slotted-wing. This can be borne out to some extent by a simple experiment, as described here: Hold the wing of a live bird, or of one freshly killed, and blow over it from the front, slowly increasing the angle of attack until, at a fairly coarse angle, it will be seen that the alula springs forward into the open position. Decrease the angle again, which results in the winglet returning to its closed condition.

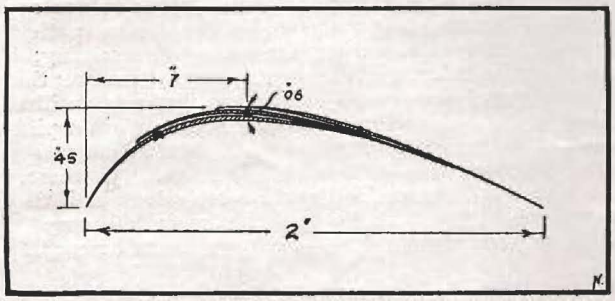


Fig. 23.—Section, at half-span, of Bastard Wing of Spotted Eagle. Approximately full scale.

Figs. 22 and 23 give dimensioned sketches, true to scale, of the main alula feather of the Stanley Crane and of the cross-section of the Spotted Eagle's alula respectively, both of which have been carefully measured from freshly-killed specimens. It will be seen that in some cases the front edge turns right back, whilst in one case the trailing-edge is reflexed.

Fig. 24 is reproduced from a photograph and illustrates remarkably clearly the wrist-slots in operation during flight at a high angle of incidence.

Some interesting remarks concerning the alula were made by Dr. Hankin† in the course of a presidential address to the Norfolk and Norwich Naturalists' Society, and reprinted in that society's "Transactions" for 1925-26. The notes referred to are peculiarly interesting, since, in putting his views forward, Dr. Hankin not only expressed his doubts as to the utility of the alula, but at the same time the method of use, together with the occasions on which the efficacy of the device is resorted

*"Safety Devices in Wings of Birds," Lieut.-Comdr. R. R. Graham, R.N., "R.Ae.S. Journal," January, 1932.

†"The Evolution of Flying Animals," E. Hanbury Hankin, M.A., Sc.D.

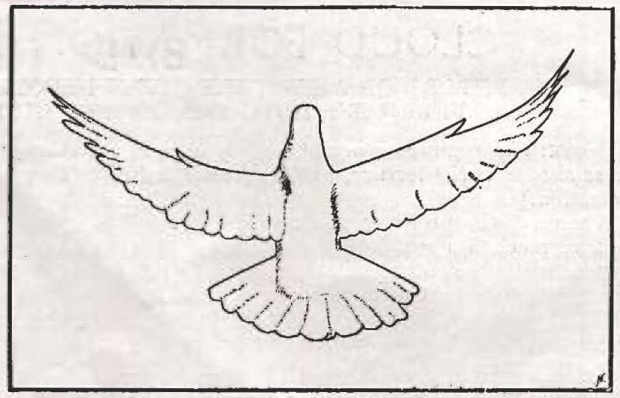


Fig. 24.—Pigeon in Flight, showing Wrist Slots open.

to, were most clearly outlined.

"In modern birds," said Dr. Hankin, "the first digit—the alula—carries a small tuft of stiff feathers. These feathers contribute no doubt to the strength and shape of the anterior border of the wing. Slight movements of the alula may be seen when the bird is checking speed in the air prepatory to alighting. These movements have been observed by me in birds of three different species. The alula is so small and its range of movement is so limited that it is rather difficult to believe that this movement can have any appreciable effect either in checking speed or in maintaining equilibrium. Such movements of the alula may be observed both when the bird is dropping feet foremost through the air with partially furled wings and also in what has been termed by me 'stop descent,' when the bird is landing with its wings fully extended and with their surface nearly at right angles to the direction of flight. That movements of the alula accompany two such different wing dispositions is a reason for doubting whether they have any significance from the point of view of flight. The movement is either advancing or advancing combined with rotation up. Sometimes, instead of keeping the alula in one position, the bird keeps moving it to and fro while descending. This appears to be a further reason for doubting the utility of the movements in question.

"Is it not possible that this change of position of the alula is a habit 'handed down from the dawn of avian development,' and that in fact Archæopteryx thus extended its first digit when springing on to its prey?

"An observation described on page 135 of my book, 'Animal Flight,' might possibly be regarded as evidence against the suggestion. An Adjutant, a bird of more than 9 ft. span, was noticed while circling to have the alula of the *inside* wing advanced, The extent of this movement was perhaps a little more than half an inch. Such change of position of the alula in circling is quite exceptional. Perhaps in this case it was an accidental accompaniment of a movement of the next digit, i.e., of the phalangeal quill mass, which may have been needed to keep the bird on a curved course."*

These observations serve as a fairly conclusive check on the uses of the alula outlined here, whilst the reference to the "to and fro" movement only shows that the alula was in an unstable condition, the angle of the wing being close to the critical position in which the air force acting on the alula is barely sufficient to hold it in the open position. The movement is more likely to be involuntary than intentional.

The flight of the Adjutant referred to is most illuminating. The circling was most likely being carried out at slow speed with a small radius of turn so that the inner wing travelled at slower speed than the outer and was thus set at an angle coarser than the critical. Reference to the book mentioned gives support to this theory, for it states that the bird was "well canted over," and that when "the bird was not so canted . . . no advancement of the alula occurred."

*"Animal Flight," E. H. Hankin, M.A., Sc.D., London, 1913.

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CLOUD FORMATION AND SOARING FLIGHT

A REPORT OF A LECTURE GIVEN BEFORE THE ROYAL AERONAUTICAL SOCIETY ON FEBRUARY 16TH, 1933, BY SIR GILBERT WALKER, C.S.I., F.R.A.S., F.R.S.

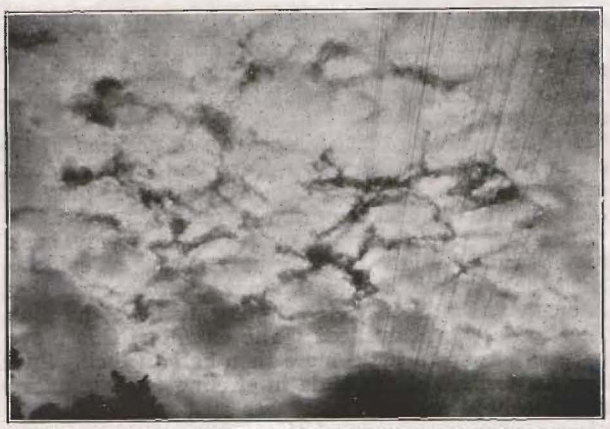
[NOTE: *The accompanying photographs were not among those shown at the lecture, but are from the Editor's own collection.*]

Whenever the progress of motorless flying has seemed to have reached a standstill, some new development suggested on the scientific side has come to the rescue and given new life to the movement. Such, in Sir Gilbert Walker's opinion, is the lesson to be learnt from gliding history, and his lecture was in the nature of a suggestion as to the lines on which such scientific work might now proceed.

Many attempts have been made to imitate different types of clouds in the laboratory, in the hope of learning something about the motions in the air which accompany their formation.

"Cells."

In thin layers of certain liquids, such as a solution of gamboge in spirit, the top layers get chilled by evaporation, and try to change places with the layers below. When this interchange has settled down into a steady and continuous process, it takes place in the form of "cells;" the warmer liquid below rises in the centre of each cell and liquid from the cooler top layers descends in the spaces between. As the "cells" are fairly closely packed, the shape of each is more or less polygonal, usually in the form of a hexagon or a pentagon so as to fit in with its neighbours. Thus a curious pattern is produced in the liquid. This, be it noted, is a result of the liquid being "unstable," i.e., cooler at the top and warmer at the bottom, so that the top and bottom layers are continually trying to change places.



"CELLS." A cloud sheet divided into polygon-shaped cloudlets. (Vale of Llangollen, July 19th, 1932, 6.24 p.m. G.M.T., looking about West.)

Longitudinal Rolls.

The polygonal pattern was first noticed in 1855 by E. H. Weber, and later studied by Bénard. But more recently, in 1920, another kind of motion in an "unstable" liquid has been studied by Idrac, who caused such a liquid to move along a trough, and watched results. He found that, as the lower edges were slowed up by friction with the trough bottom, this complicated matters and the "polygonal" pattern no longer appeared. Instead, a number of long straight vortices were formed, lying along the length of the trough, and it was found that alternate right- and left-handed vortices lay side by side.

As there has been some doubt as to how far experiments of this kind have any bearing on cloud formation, Sir Gilbert Walker has during the last six years been responsible for a further series of experiments at the Imperial College. In this case air was used, not liquid, and its movements made visible by smoke; much of the work was done in a wind-channel six inches wide and about a third or a quarter of an inch deep, with a glass top, and an electrically warmed steel bottom to render the air "unstable."

Vortices similar to Idrac's were obtained by a relative motion between top and bottom of over an inch a second, and a spiral pattern, alternately right- and left-handed, was visible in each of the long-drawn-out lines of smoke. The lecturer, having shown a photograph of these, proceeded to show pictures of similar effects in the sky.



Sir Gilbert Walker at the Barrow, Competitions, 1932.

Spirals.

Longitudinal rolls of cloud are to be seen at all levels; at medium and low heights they usually travel roughly in the direction of their length. This suggests an analogy with the laboratory experiments, but the spiral pattern is usually only visible when the cloud is dissolving; it is then, said the lecturer, "almost a normal feature; that meteorologists have so long overlooked it affords an illustration of the melancholy fact that however plain a pikestaff may be it is very hard to see it until some person or some theoretical consideration tells us that it is there."

At high levels these cloud vortices often look as if they are mere cylindrical shells, and the lower half may be absent owing to the cloud melting away on the descending side.

Transverse Rolls.

Now, cloud sheets are often divided into wave-like rolls transversely (or nearly so) to their line of motion. It was found in the laboratory that, by slowing up the motion along the wind-channel, transverse vortices could be made to appear, coincidently with the longitudinal ones (which were of course already there), and that even they rotated alternately in opposite directions, just as with the longitudinal ones. The appearance was then similar to the sort of alto-cumulus where the cloudlets are rectangular, the cloud sheet being divided by two sets of lines at right angles to each other. That these two sets of dividing lines arise simultaneously and not, as is usually supposed, one after the other, was shown by a photograph of a cloud sheet in which the sub-divisions were only just beginning to appear.

In the laboratory, on reducing the air velocity still further, the longitudinal vortices died out altogether and only the transverse ones remained. These resembled similar transverse rolls or waves in the sky in that the lines were sinuous and tended to branch, like sand ripples; in fact, it is by these characters that tranverse rolls of cloud can usually be distinguished from longitudinal ones. Such transverse lines, both in the laboratory and in the sky, often shows a ribbed texture or cross-striation, which demonstrates that there is no spiral motion within them.

(Continued on page 55, col., 2).



TRANSVERSE ROLLS or ripples. The sky was full of parallel bands of cloud, but only this one (or part of it) showed a rippled structure, though a photograph taken five minutes later showed the further band beginning to break into ripples. Towards the right the ripples are slightly "ribbed." (Dartford, September 1st, 1932, 9.55 a.m. G.M.T., looking S.E. Clouds moving from N.E., i.e., from left to right and not quite parallel to the bands. Surface wind N.W.) Turn the picture upside-down and imagine you are looking at sand ripples.

Polygons.

To obtain the polygon formation, smoke was drawn into the wind-channel and the motion then slowed down to zero, whereupon kinks began to appear here and there in the longitudinal vortices until at last the whole channel had become full of polygons. Actually it was as if the long lines had broken and twisted into something like a mass of smoke rings, except for their shape being polygonal instead of round.

When such "cell" formation takes place in the sky there is usually a rising current in the middle of the cell. This was well shown by a beautiful photograph by Captain Douglas, showing that each cloudlet is dome-shaped when seen from above.

Strange to say the opposite hold good in the wind-channel, for there the air descends in the middle of each polygon. This may occasionally happen in the clouds, in which case the position of each "cell" is shown by clear sky (descending air) and cloud only forms in the interstices, giving rise to a kind of "network" of cloud in the sky.

At this point the audience realised what all this preliminary work had been leading up to, for Sir Gilbert Walker raised a question of fundamental importance in soaring flight: how large are these "cells," especially in their vertical dimensions; do they ever reach to the ground; and, if so, what in that case is the nature of the air circulation within them?

(To be continued).

A NEW ORDNANCE SURVEY MAP

The Ordnance Survey has just begun publishing a new series of maps of a kind never before attempted. They are the result of the recent Land Utilisation Survey of Britain, and the object is to show at a glance, by various colours, to what agricultural use every bit of land in the country is being put. Woods are shown in dark green, meadows and permanent grass in light green; arable and tilled land and "rotation grass" brown; heath, moorland and rough pasture yellow; gardens, orchards, etc., purple, and unproductive land, such as buildings, red. The result is a curious patchwork which almost gives the illusion of an actual view of cultivated land from the air.

Two ways occur to one in which such a map might be useful in the realm of gliding and soaring flight.

In the first place, those who search the ordinary type of map for possible soaring sites find that, although it is possible with experience to judge by the contours how a machine, once in the air, is likely to perform, it is impossible to be sure without visiting the site whether such a glider could get into the air at all, or whether, in case of need, it could land anywhere with impunity. With this new map one can pick on the yellow areas for choice; if they are lacking, then light green (with farmer's permission). Brown is possible for an emergency landing; purple ditto, but with payment of compensation for damage, while red areas should be avoided at all cost, especially as the red is alleged to include graveyards.

The other question is how far such a map would give any indication of the "thermic" nature of the ground; that is, the relative capacity of different types of ground for producing thermal currents. According to Bachem, who has written the only real textbook on high-performance sailplaning (it will be reviewed here some day), the air becomes warmed over heath, cornfields, dry meadows and light-coloured rocks, while cooler air is found above water, moorland, marsh and woods. He mentions a kind of dead period, at about 5 to 7 p.m. in summer, much feared by long-distance "thermal" flyers, after which the positions of the up- and down-currents are reversed, and the woods, etc., give up to the air the heat which they have absorbed during the day.

Here the new map does not give as much help as might have been hoped. Probably most of the brown and red areas, if extensive, could be relied on to give up-currents on a sunny day, but heath and moor, which are stated to give opposing results, are both coloured yellow, and the map does not indicate whether the grassy land is wet or dry, except indirectly from the contours or the proximity of water. As for the woods (dark green), they are already shown quite well enough on the ordinary Survey maps.

It will be a long time before this special survey of the whole of Britain is completed, and so far only two sheets of the new map have been published, viz. Sheet 114 (area Brentford-Windsor-Aldershot-Reigate) and Sheet 142 (Isle of Wight and adjacent mainland). They are sold at 4s. each in plain sheet form, as against 1s. 6d. for the Popular Edition.

The contours are in red, and show quite distinctly against the kaleidoscopic background, provided one looks closely enough. In the Isle of Man map, most, if not all, of the hills in the southern half of the island are coloured yellow; certain of the lower slopes are brown, while at the foot of many of the ridges there are such large brown areas, or even purple, that it would be difficult to reach a light green patch if one lost the up-current and had to land.

So far, then, the map would be quite a lot of use in a preliminary search for a site. In fact, one has only to examine it to guess correctly the situation of the "First English Gliding School," which was founded by Capt. F. C. Merriam in 1922

When it comes to thermal currents, anyone who has watched cumulus at the seaside does not need to be told where it forms in a wind off the sea. But in that corner of the map which includes part of the New Forest there is the very striking feature of enormous areas of yellow—many square miles at a time—adjoining equally large patches of dark green. Here at least, one imagines, a pilot would know where to expect thermal currents with-

out having to smell them out entirely with the variometer

Three years ago there was much talk in this country of "charting" Britain for soaring purposes. Mr. Howard-Flanders, as old readers of THE SAILPLANE will remember, wrote a visionary story of the future describing how one Mr. Jones flies his glider from the Crystal Palace to Torquay in 4½ hours, relying on hills, clouds, a rocket or two, and an occasional glance at his "chart."

It is interesting to speculate on what sort of maps would be needed if ever soaring flight becomes so common as to make the issue of special soarers' maps worth while. The chief difficulty would be to devise a scheme for showing at a glance both the nature of the ground and its height. Probably most present-day pilots would prefer everything else to be sacrificed to a clear showing of the hills. But over extensive flat terrain this new Land Utilisation Map might be quite a useful adjunct to a soarer's equipment.

It should never be forgotten, however, that the proper time to pore over a map is not *during* a flight, but for hours, days, or even weeks before the flight begins.

A. E. S.

THIS GLIDING.

The following paragraph, which is taken from the *Nottingham Guardian*, shows what comes of trying to persuade the public that gliders are of "practical utility":

"It is being made a reproach against our authorities that continental countries are much in advance of us in trying out gliders as flying accessories. In Austria and Germany these engineless machines, towed behind a fast aeroplane with special detaching mechanism, are being at least experimentally used as aerial goods trains. It may be that big developments lie in that direction, but personally I rather hope not. What is going to happen to the glider-trailers when their towing-plane suddenly conks out, crashes, or has to make a forced landing? In the latter case conceivably there might be time to disconnect the trailers and allow them to make independent landings on their own. But it will add nothing to the *joie de vivre* of ordinary pedestrian mortals if, whilst proceeding below on their lawful occasions, they suddenly get a truck-load of aerial freight on their heads."

CORRESPONDENCE

1933 "ISTUS" COMPETITIONS.

Sir,

You have already given notice to the fact that the B.G.A. are anxious to send a team of machines and pilots to the Wasserkuppe in August to take part in the above Competition, and that a sum of £100 will be provided for entrance fees, transport, insurance and other expenses, but it is obvious that this sum cannot possibly cover all the above expenses.

I am, therefore, ascertaining if any individual would like to form part of the B.G.A. contingent and volunteer to pay his or her own expenses. The men should be prepared to help in every possible way, and a knowledge of glider construction and maintenance would be a great advantage. Ordinary out-of-pocket expenses should not exceed £10, but I am investigating this matter with all possible speed and further details will be issued as soon as they are available. The period would be from August 13th to August 20th.

Will any of your readers who are interested kindly write to me as soon as possible?

J. L. R. WAPLINGTON,
Secretary, British Gliding Assn.

THE "ISTUS" MEETING.

We have received a communication from the General Secretary of the ISTUS emphasising the fact that the provisional regulations described in Vol. 4, No. 2, p. 33, were only a draft prepared at the Paris Conference of the ISTUS. The actual conditions will differ in many respects from this draft, and will be published shortly, having now received the sanction of the German Air Ministry.

THE NYBORG SAILPLANE.

Sir,

May I comment upon your request in the issue of Feb. 17th for photographs and articles descriptive of the flying experiences of your readers?

Firstly, it is rather disconcerting to find that you have taken it upon yourself to alter the context of an article submitted without consulting the contributor prior to publication, and he finds himself apparently responsible for such editorial alterations, irrespective of his personal views.

Secondly, it is hardly encouraging to find that photographs and diagrams essential to prove and illustrate an article have been omitted, as was done with the diagram of the "conditional flight" and the photograph of the "glider in flight," which, in my opinion, formed a very necessary part of the article on the performance of "The Nyborg Glider" appearing in THE SAILPLANE on Jan. 20th.

T. G. NYBORG.

[The passage complained of was received in the following form: "I am, naturally, extremely careful to make any statement or claim which cannot be backed up with actual proof. . . ."

It appeared obvious that the word "not" had been inadvertently left out after "careful." Evidently this was not so, but we are still unconvinced that Mr. Nyborg meant exactly what he said. Perhaps the words "careful *in making* any statement" would meet the case?

We are informed that the photograph sent was not clear enough for satisfactory reproduction, but that it showed the sailplanes in the air.—ED.]

CELLON DOPE

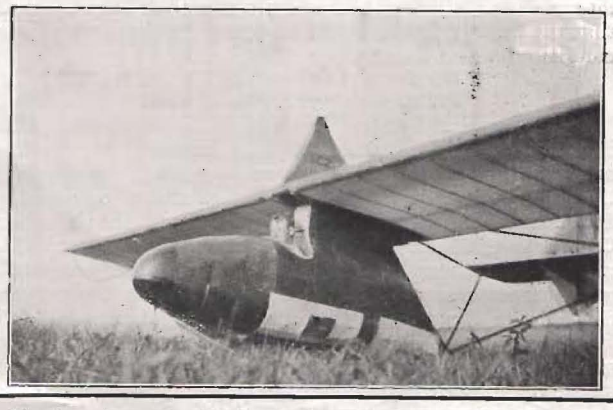
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NEWS FROM THE CLUBS.



The Imperial College Club's "Dagling" with its original nacelle. J. B. E. Keeble up.

BRADFORD AND COUNTY GLIDING CLUB.

Sunday, February 26th.—THE BLIZZARD.

Sunday, March 5th.—By now most of us had dug ourselves out of the snow round our homes, and a good turn-up explored parts of Baildon Moor to see if the rapid thaw had left our site swampy. Ground conditions were beyond our expectations, but the wind was southerly.

While we argued as to the advisability of trying our newly-found southern slope, Watson of York arrived with his PRÜFLING, accompanied by Slingsby, Noble and Rank. After lunch we rigged PRÜFLING, and Slingsby showed us how to soar in a southerly breeze on a low westerly ridge. Truly marvellous. Watson then tried his new mount, and each of the other visitors in turn. Sharpe also stepped into the cockpit, was launched, and performed very creditably, no doubt being helped by his experience in our nacelled DIXON.

LONDON GLIDING CLUB.

On Sunday, February 19th, the wind was all wrong in direction and too rough for ground-hops. Ski-ing was a failure, but a trimmed-up duck-board, launched by elastic, did some good times down the face of the main hill. Its controls were rather sluggish, and its drag disgracefully high. There was once a time when the hill was treated with respect, but familiarity has bred contempt.

Saturday, March 4th.—A delightful spring day, brilliant sunshine, a high lapse-rate giving strong lift, made manifest by a sky-full of growing cumulus clouds. Wind warm and hearty, about 20 m.p.h., from the south-west.

The HOL's revelled in it, squatting motionless over the Bowl for the best part of an hour except when a rude boy in the PROFESSOR caused her heart to flutter by cutting capers all round her—whence it appears that PROFESSOR's turning-circle is *not* so big after all. Having said which, one must be silent about pilots' identities, merely stating that the PROFESSOR was flown for half an hour with a hill-top landing, for 35 minutes, and for 20 minutes after sunset. Some people land better in the dark than in the harsh light of day; there are no beady-eyed armchair critics.

In the KASSEL 20 Collins flew for half an hour, landing on the top, and for one hour; Major Petre gave himself 15 minutes.

In the PRÜFLING, Hedges put himself on the unwritten list of Really Reliable Pilots by a first-class flight of 10 minutes. Richardson landed on the top after 8 minutes. Scott obtained his "B" with 2½ minutes. Monsieur Girod, from Paris, was given two ground-hops, and later, when the breeze was dropping, flew down from the top.

Sunday, March 5th.—Hedges was right on his form again, flying the PRÜFLING with real *joie de vivre* for 15 minutes, diving before his turns, and then climbing like a BRISTOL BULLDOG. Monsieur Girod was again unlucky with the wind, but scraped every fragment of lift out of it, using mole-hills and bushes for up-currents.

Major Petre flew the PROFESSOR for five minutes, and Robertson made a delayed descent. The KASSEL 20 flew down three times. Even HOL's was hard put to it, but soared twice.

The trouble was that the wind early on was fairly soarable, but it gradually backed until in the afternoon it had a downhill component. Consequently the width of the belt of lift gradually narrowed, and grew more erratic, until it vanished.

Ground-hops for beginners went on all day, the Watson-R.F.D. being easily launched with two-a-side. In spite of a considerable gustiness the machine survived intact. Testar, a brand new member, was particularly bright, possibly because he had previously received some dual instruction in engine-assisted flying-machines.

The **Imperial College**, whose middle name is undoubtedly Perseverance, subjected their R.F.D. to auto-launches and finished up with disintegrated landing-wires. The gusts were liable to kite the machine up too fast, whereupon either the rather frail tow-cord broke with a crack and a whizz, or else the ring came off the hook, leaving the machine in a climbing position too near the ground.

Auto-launching undoubtedly turns a day of flat calm from a flop into a glorious picnic, but in a good wind it is not half so funny.

One feels that the I.C. will not take any offence at these comments, which are only made in order to prevent far worse misadventures in other clubs, and to ease trade depression in the industry which manufactures rubber ropes for hand-launches.

Altogether it was rather a bright week-end, with side-shows, such as Monsieur Girod's lunch-time champagne which, mixed internally with beer, caused:—

(a) The filling of the club car's petrol tank with rusty water; and

(b) Inspired teaching by the ground-hop instructor, who eventually insisted on a hop for himself. [When a CRESTED WREN pilot shows a desire for an elementary machine's ground-hop, he is certainly very tight.—ED.]

BLACK COMBE.

The privately-owned CRESTED WREN is being taken North for a few days by Messrs. Dewsbery, Humphries and Petre. It is hoped to do some soaring from Black Combe (on the opposite side of the Duddon Estuary from Askam-in-Furness, where last year's Competitions were held). Particulars of this site were given in THE SAILPLANE, Vol. 3, No. 19, but it has never been soared over before.

Black Combe is 1,969 ft. high, and high ground connects it with the mountains of the Lake District to the northward. Those who were at Askam last year may remember how, on the first day of the Meeting, the Combe was covered by a mass of cloud, off which small clouds budded at regular intervals. These clouds did not increase in size, however, and after crossing the Duddon Estuary they gradually melted away. But under different con-

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ditions one might expect active cumulus to be formed, due to the presence of the mountain, and it is to be hoped that the CRESTED WREN will be lucky enough to find such conditions when it gets there.

SOUTHDOWN GLIDING CLUB, LIMITED.
Prenez Courage! Mes Amis!!

At the Annual General Meeting of the Southdown Gliding Club, Ltd., just held, a most interesting report of activity during the past year was presented. It disclosed that the year 1932 was marked by events of outstanding importance in the history of gliding in the Southern Counties. 1931 saw the amalgamation of the Surrey Club with the Southern Soarers' Club, which latter had really grown from a small nucleus developed from the original Southdown Skysailing Club. The amalgamated club, known as the Southern Counties' Soaring Club, made substantial progress, as was disclosed by its report issued at the opening of 1932. Then, in the early months of that year, the original Skysailing Club, finding its members losing interest, accepted a suggestion that had long been put forward to it, namely the consideration of joining forces with the now flourishing Southern Counties' Soaring Club. Negotiations were somewhat involved, but eventually, on March 20th, 1932, it was agreed to form a new club as the Southdown Gliding Club, with provision for its registration as of limited liability; and, finally, when certain claims, brought against the new club, had been settled by an arbitration board appointed by the British Gliding Association, Ltd., the Club settled down to some useful work.

Club property now included some nine machines, as follows: An R.F.D. Trainer, subsequently handed over to Mr. Wood under a scheme of his for training a small band of working men to fly in return for rigging and repair services; The DITCHLING, previously crashed, and the WOOD III., which suffered irreparable damage while lying in the barn at the site of the old Skysailing Club, both of which had to be scrapped; the nacelled R.F.D., which had also suffered similar damage, and which was salvaged in part; also the remaining five machines; the DAGLING, the PRÜFLING, the "Twin," the B.A.C. VII. two-seater dual-controlled machine, and (at a later date) the DAGNALL high-performance sailplane. These were all operated until the autumn, when repairs and overhauls had become necessary.

In the meantime, the figures for certificates held by members of the new Club had risen to the following approximate totals: "A," 50; "B," 26; "C," 12.

The Club entered for competitions at the B.G.A. Meeting held at Barrow-in-Furness in August, but was severely handicapped by the difficulties of transport of personnel and machines to so great a distance from the home site.

The method of training during the year has undergone a change, brought about by the addition of the two-seater to the fleet of machines. *Ab initios* are now trained by the dual-control system, and it is hoped that the new year will show still greater advances in this direction.

Other Club properties include four cars in various states of repair (two for auto-towing and two for retrieving machines), several spares for machines; a large quantity of repairs material; several launching ropes; pulley blocks; some retrieving cables and auto-towing cables and drums; and sundry other useful items.

In September a reconstruction programme was adopted and flying operations were suspended accordingly. Through the further generosity of the Chairman, Mr. R. F. Dagnall, a workship was placed at the Club's disposal at Guildford, and all machines except the two-seater were taken thither for repair.

In December registration papers were finally lodged for the registration of the Club as of limited liability under the Industrial and Friendly Societies Acts, through the B.G.A., Ltd., and some months earlier the Club had been registered with the local Justices under the Licensing Acts.

The Club year closed with some very useful work in quite a new direccion. Several members interested themselves in the search for still better soaring sites, and in the district of Shoreham and Steyning great possibilities are indicated. So much so that the Club's principal ground is now the area surrounding Steep Down at North Lancing. Here the Club has fine hangar accommodation, in which the renovated equipment is now housed, also one of the finest auto-towing sites in the country (900 acres of unbroken pasture land).

To mark the opening of the 1933 season, the Annual Club Ball was held at the Grand Hotel, Brighton, on March 4th last, and was, as usual, well attended and voted an unqualified success. The function was graced by the distinguished patronage of the President, the Earl Howe, C.B.E., V.D., and the following Vice-Presidents, the Rt. Hon. the Viscount Gage, Lissant Beardmore, Esq., and M. H. Volk, Esq., A.F.R.Ae.S. The programme of dancing included novelty dances and competitions with aeronautical titles, and provided much good fun.

A general invitation is issued to all interested in aviation (or desirous of learning to fly) to communciate with the Hon. General Secretary, Mr. A. York Bramble, at the registered offices of the Club at 61, Tisbury Rd., Hove, who will also welcome other gliding clubs visiting the district.

Flying News.

Sunday, January 8th.—In pursuance of the surveys of new soaring territory on the Southdowns, the Club PRÜFLING was taken to the Corporation Reservoir in Erringham Road, Shoreham, where a S.W. cup of varying steepness reaches for about three-quarters of a mile following the line of the Downs Road. The aspect from the top of the hill is that of a flat plain, intersected by streams and a road, stretching away to the Shoreham Aerodrome, and thence to the open sea. So that given a good steady S.W. wind one could have lunch aloft even on a tea-tray. The snag in this site is the landing, as the landowners below object to invasions of their territory. But this, of course, does not worry the expert. On the day of the test the wind blew obliquely along the cup from the South, and Little, McGlashan and Reffell made spectacular flights of an almost stationery order in a southerly direction, but at a ground speed rivalling Sir Malcolm's latest in a northerly direction. Rain and mud filled up the cockpit gradually, and eventually flying had to be abandoned. Subsequent operations on the new site at North Lancing proved more fruitful.—More of this in our next report.

BLUE PRINTS.

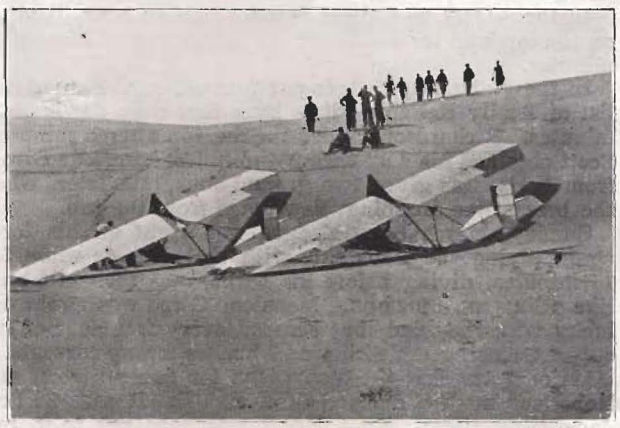
Complete Sets of Working Drawings of the **R.F.D.** primary type, and the **FALKE** secondary type machines, and the **GRUNAU BABY** Sailplane, with schedules of parts, are now available.

PRICES:

R.F.D.	£2	0	0 post free
FALKE	£7	10	0 post free
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(*Special reduction to Members of the B.G.A. or affiliated Clubs*)

THE BRITISH GLIDING ASSOCIATION
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Rossitten Gliding School, East Prussia.—Returning from picnic lunch on Pilkoppen sand dunes.

OFFICIAL NOTICES

NEXT COUNCIL MEETING.

The next Council Meeting of the British Gliding Association will be held at 7, Albemarle Street, London, W.1., on March 27th, at 6.30 p.m.

REGULATIONS GOVERNING AUTO-TOWING.

1. All gliders used for auto-towing must have a special certificate of airworthiness for that purpose, issued by the British Gliding Association. For training purposes a single track undercarriage (i.e., one with a single wheel and/or skid) is inadvisable.

2. Any existing glider holding a normal C. of A. which is to be adapted for auto-towing must be re-approved for the special C. of A. For this an appropriate fee will be charged.

3. The towing hook shall be fitted with a "fool-proof" release with the operating device close to the pilot's hand, and shall be of a type approved by the British Gliding Association.

4. Means for locking the release should be provided. (It is essential that beginners should be entirely under the control of the instructor.)

5. The towing cable shall be of not less than 10 cwt. breaking strength and of extra flexible construction. It must be examined before each flight. A shock-absorber consisting of a double link about 15 ins. in length of ⅝ braided elastic cord, with a 10 cwt. check cable to allow 50 per cent. extension should be fitted. Good quality ⅜ diameter sash cord may be used in lieu of steel cable if desired.

6. An instructor with experience of auto-towing shall always be in the car with the driver, seated in such a position that the glider and pupil are in full view throughout the flight.

7. The towing car shall be of sufficient power and reliability to make a quick "getaway" and avoid stalling the glider close to the ground. A minimum of 20 h.p. is recommended.

8. On wet grass or on ground where wheel-slip is likely to occur, chains should be fitted to both driving wheels.

9. The glider shall be fitted with adequate harness for the pilot (and passenger). Harness to be of a type approved by the B.G.A.

10. If primary type gliders are used for auto-towing they shall not be taken to a greater height than 10 ft. above the ground. Any infringement of this regulation will entail suspension of the certificate of airworthiness.

11. The point of cable attachment shall be within the limits as specified below:—

(a) For elementary training purposes: Within the angle formed by lines drawn through the C.G. position (loaded), forwards and downwards, at 10 deg. and 40 deg. to the horizontal; and

(b) For advanced work: Within the angle formed by lines drawn through the C.G. position (loaded), forwards and downwards, at 10 deg. and 80 deg. to the horizontal.

It is recommended that an airspeed indicator be mounted on the car well within the vision of the driver, and connected to a pitot head mounted on a strut, at least 5 ft. above any part of the car.

REGULATIONS GOVERNING AEROPLANE-TOWING.

1. Only pilots in possession of the "C" soaring certificate, and who have completed two hours' motorless flying, or "A" licensed aeroplane pilots who have completed ten hours' solo flying, will be allowed to pilot gliders towed by aeroplane.

2. No glider shall be used for aero-towing unless in possession of a current B.G.A. certificate of airworthiness duly endorsed for aeroplane towing. Proof that the necessary strength requirements have been complied with must be shown.

3. The strength requirements, extra to those for normal category gliders, are:—

(a) The fuselage shall be capable of withstanding a load at the cable attachment position of 200 lbs. horizontally, changing to 400 lbs. vertically, with a factor of 2. The loads to be taken as acting separately and together.

(b) Suitable drag bracing shall be present.

4. No elementary training type glider will be approved for aeroplane towing.

5. Gliders shall only be towed by aeroplanes properly equipped for aeroplane towing approved by the Air Ministry, and with the certificate of airworthiness endorsed to that effect.

6. The towing cable shall include a "weak link" to fall at a load equal to the loaded weight of the glider. The link to be fitted at the glider end of the cable.

7. The minimum length of cable shall be 300 ft.

8. All gliders used for aeroplane towing must have a release definitely operable by the pilot.

9. Gliders in aeroplane-towed flight must not exceed a speed of 60 m.p.h.

10. The angle made by the towing cable to the horizontal must not exceed 20 deg.

REGULATIONS and DIRECTIONS under which any MOTORLESS AIRCRAFT may be flown.

1. Regulations.

(a) The aircraft shall be certified as airworthy in accordance with these Regulations and Directions. Any terms or conditions on, or subject to which the certificate of airworthiness was granted, shall be duly complied with.

(b) When an aircraft has been so certified the certificate of airworthiness label shall be affixed to the aircraft in a conspicuous position, and the certificate shall be pasted on the inside front cover of the log book.

(c) A certificate of airworthiness shall remain valid for a period of not exceeding one year, subject to the provisions of 2 (a) hereof, unless renewed by the Council of The British Gliding Association, Ltd., for a further period.

2. Cancellation and/or Suspension of C.'s of A.

(a) A certificate of airworthiness issued under these Regulations and Directions may be cancelled, suspended, or endorsed by the Council of The British Gliding Association, Ltd., for just cause.

(b) The technical representative or representatives appointed by the Council of the British Gliding Association, Ltd., may temporarily suspend any certificate of airworthiness if he or they deem such action to be necessary in the interests of the safety of the pilot or other persons. When such action is taken a full inquiry shall be held at which the pilot, owner, and manufacturer of the aircraft may attend. The inquiry shall be held within seven days of such notice of suspension; five clear days' notice convening the meeting shall be given to the pilot, owner and manufacturer of the aircraft and to the Technical Committee of the B.G.A. Should the finding of the inquiry uphold the suspension of the certificate of airworthiness, the owner of the aircraft shall have the right to appeal to the Council of The British Gliding Association, Ltd., at the first regular meeting following the date of the inquiry. The owner or his representative shall have the right to appear in person throughout the hearing of the appeal.

3. Accidents.

The Council of The British Gliding Association, Ltd., may investigate any accident in which is involved the death or personal injury to any person, or such serious structural damage to the aircraft as is believed on reasonable grounds to have caused or contributed to the failure in the air of any part of the aircraft. The manufacturer or his representative and any person or persons directly connected with the accident shall have the right to be present at such investigation.

4. Load Factors.

The Regulations laid down in the Air Ministry Handbook of Strength Calculations A.P. 970, and published by H.M. Stationery Office, will be followed as far as is applicable. The following are the load factors for glider design and should be observed throughout:—

Main planes:—

(a) C.P.F.	6
(b) C.P.B.	4
(c) Nose Dive	1
(d) Inverted Flight...	3

Tail planes:—

(a) To be designed to withstand the loading imposed in pulling out of a steep dive so that the tail plane will collapse simultaneously with the main planes.

(b) Nose dive 1

Rudder:—

To withstand maximum loading with factor 2

Fuselage:—

(a) As in case (a) for tailplanes.

(b) Landing 4

Landing gear 4

5. Experimental Machines.

The Council of The British Gliding Association, Ltd., may, in special cases, issue certificates of airworthiness for experimental machines without charge.

6. Approved Type Machines.

Where a certificate of airworthiness has been issued for any one type of glider, it shall be known as the "B.G.A Approved Type."

7. Validation of C.'s of A. Issued Abroad.

Foreign-built machines will be subject to the same procedure unless holding certificates recognised by the Council. These certificates will be validated at the fee stated in paragraph 10 (g) of the directions.

8. Log Books.

Every machine carrying a certificate of airworthiness must be provided with a log book in the form approved by the Council of the B.G.A., and shall be kept up to date in the prescribed form and manner. The log books may be purchased from the B.G.A.

9. Test Flights.

All new type machines shall be submitted to flying trials before a certificate of airworthiness is issued. The flights shall demonstrate that the machine is correctly balanced; is stable; and that all controls function in a proper manner.

10. Inspection.

(a) The issue of a certificate of airworthiness will include two visits of inspection in the case of paragraph 10 (a), (c) and (d) of the Directions, and one visit in the case of paragraph 10 (b), (e) and (f) of the Directions.

(b) In all cases, except for renewals of certificates of airworthiness, a visit will be made prior to covering, and in cases of paragraph 10 (a), (c) and (d) of the Directions, a visit will be made when the major components are ready for erecting.

Directions.

1. Application for an "approved type" certificate of airworthiness should be made to the Secretary, The British Gliding Association, Ltd., 19, Berkeley Street, W.1.

2. An application for such certificate of airworthiness should be made at a very early stage in the design of the aircraft, as until such application has been received, no action by the Council can be authorised.

3. Sufficient data and drawings shall be lodged with the B.G.A. for the purpose of checking all calculations and examining details. If more than one machine is built, a complete set of drawings shall be lodged with the B.G.A.

4. At any time prior to the issue of such certificate of airworthiness the applicant may be required to make any modifications to the aircraft which are considered necessary by the Council of The British Gliding Association, Ltd.

5. After completion of the aircraft, flying trials will be carried out by the applicant in the presence of representatives of the Council of the B.G.A.

6. If, after flying trials under paragraph 5 hereof have been carried out, any modifications have to be made to the aircraft, compliance with paragraph 5 may again be required.

7. The Council of The British Gliding Association, Ltd., will not be held liable for any loss or damage caused to, or by, the aircraft during official flight trials, or in course of transit to or from the flying grounds.

8. On satisfactory completion of the official flight trials the representative of the Council of the B.G.A. shall send in a report in the following terms:—

Certificate of Safety for Flight.

Aircraft type .....

Constructor .....

I/We hereby certify that I/we have this day inspected flight trials of the above aircraft, and am/are satisfied that it is satisfactory in every way for flight.

The time at which the inspection was carried out was .....

Signed.....

Date .....

9. Application for the renewal of a certificate of airworthiness should be made to the Secretary, The British Gliding Association, Ltd., 19, Berkeley Street, W.1.

10. The following fees shall be charged for the issue of a certificate of airworthiness, and the requisite fee must accompany the application in the first instance:—

	Non-Members. £ s. d.	Members. £ s. d.	
(a)	7 17 6	5 5 0	New Types.
(b)	3 3 0	2 2 0	Subsequent machines of the same type built by same manufacturer.
(c)	4 14 6	3 3 0	First machine of the same type built by another manufacturer.
(d)	3 13 6	2 12 6	First machine built by any manufacturer to drawings supplied by the B.G.A.
(e)	2 2 0	1 1 0	Subsequent machines built by the same manufacturer to drawings supplied by the B.G.A.
(f)	1 11 6	1 1 0	Renewal fee for subsequent years.
(g)	1 11 6	1 1 0	Validation of approved foreign C.'s of A.
(h)	1 11 6	1 1 0	Re-examination for the renewal of C.'s of A. of machines found faulty in the first instance.

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