GLIDING

A YEARBOOK PUBLISHED BY THE DORSET GLIDING CLUB

1931

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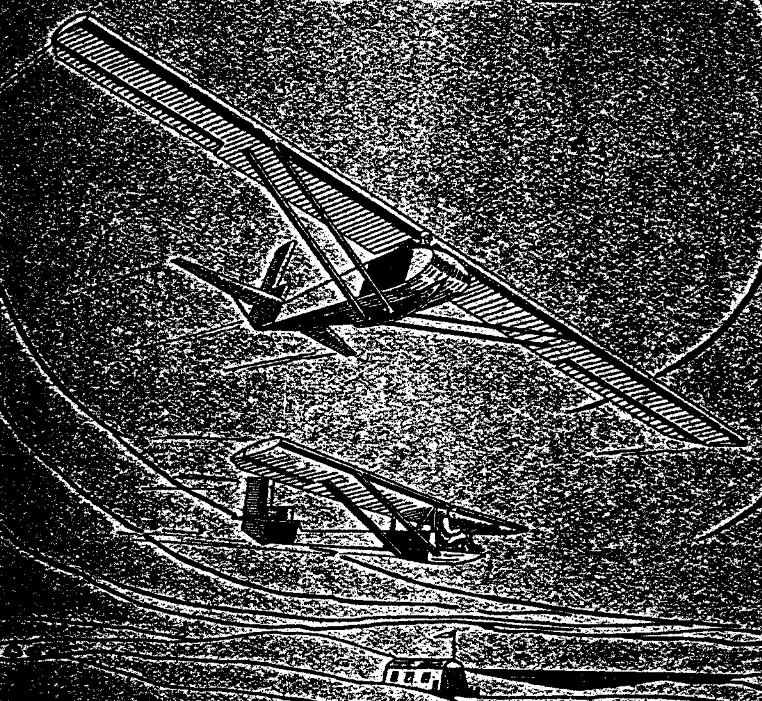

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Jan. 9, 1931

THE SAILPLANE AND GLIDER

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GLIDING

A Yearbook published by Dorset Gliding Club dealing with every aspect of motorless flight

——— *"Methinks Wisdom is oft-times nearer when we stoop than when we soar"* ———
Wordsworth

1931

Edited by H. R. R. Goodyear

WEYMOUTH

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Photo, Evening World, Bristol.

FOREWORD

From Col. The MASTER of SEMPILL, A.F.C., F.R.Ae.S., Vice-President of the International Commission for the Study of Motorless Flight, and the British Gliding Association; Past President of the Royal Aeronautical Society.

I AM proud to have been invited to write a short foreword to this useful book as I am a firm believer in the future of motorless flying and consider that its development will exercise a beneficial influence on the general advance of aviation.

The progress that has been made during little more than six months has surpassed all expectations. Nearly one hundred clubs have been formed and this figure will shortly be exceeded. Many of these are already in active operation and have become affiliated to the British Gliding Association, the national governing body. This new, or I should rather say, resuscitated movement opens up for the first time a real possibility of flying for the majority. It will enable those interested to obtain an insight into the scientific and technical aspects of aeronautics and meteorology as well as practical ideas on construction and operation.

The sailplane has considerable sporting possibilities and the art of soaring calls for the exercise of the best physical and mental qualities in the individual.

All those who wish to become pilots will be well advised to start their training on a glider as they will more readily obtain a true air sense and possess an advantage over those who learn to fly on power driven machines. Aeroplane pilots should take the first opportunity, which they will never regret, of becoming proficient sailplane pilots.

This book will, I am sure, be of value to members of the various clubs and others interested, and the many authorities who have contributed to this work are to be thanked for helping forward the cause we all have at heart.

W. Sempill

January, 1931.

EDITORIAL NOTE.

THIS year-book, the first of its kind in the British Isles and perhaps in the world, is produced by Dorset Gliding Club as a modest effort to stimulate interest in motorless flight.

A unique feature of *Gliding* is that its contents have been contributed and collected together voluntarily by authorities and enthusiasts, not only from all parts of the British Isles but from Australia, India, Europe, and America too. A manual containing such information could not otherwise have been produced save at a cost which would prevent it from reaching its proper "public"—men and women in every walk of life who have scant opportunity of appreciating the significance of this fascinating subject.

All this voluntary effort has, of course, a purpose; and it is this:—To show that the sphere of activity covered by the term gliding is vitally important; that gliding is not just a jolly—if somewhat laborious—sport, indulged in for sheer joy of sliding down slopes in a winged machine, but is the ideal means of fostering democratic air-mindedness.

A secondary, but none the less fundamental, purpose of *Gliding*, is to be of help to established gliding clubs (about a hundred such organisations have come into existence in the British Isles in less than twelve months) and to encourage the formation of others. Our twofold aim is not easy of accomplishment. Clubs need technical information, while the man and woman in the street hate to be bored by plans and formulae. We have tried to use discretion in this direction, and hope the contents of *Gliding* attest that we have not altogether failed.

Any imperfections in *Gliding* we plead to be forgiven on the score that the British gliding movement is in its first infant year—and we are part of it. We considered the job needed doing. The publication was not thought of before late in October 1930, so to bring it out in time to be of use this year we had to "hustle."

Thanks are due to every contributor to and advertiser in *Gliding*, and to many other willing helpers. To mention one name when space limits debar a host equally worthy would be out of keeping with the splendid team spirit in which all our friends have helped us in the effort. Apologies are due to many who have provided material which unavoidably cannot appear in the present issue.

Profits, if any, on the sale of *Gliding* will be devoted to Dorset Gliding Club funds. It is intended to continue the publication year by year, dealing with new phases of the movement as they arise. All inquiries with regard to *Gliding* should be addressed to:—

"Gliding,"
10 Victoria Street,
Weymouth, Dorset.

COME GLIDING.

How healthy, enjoyable, and within the reach of everyone is the new sport of gliding is described in this happy article by Mr. Charles Byron, an expert aeroplane pilot and an enthusiastic "A" pilot member of Dorset Gliding Club.

"I WISH I could afford to fly!"

Says the Young Man in the Street, gazing enviously at the small aeroplane that has just passed overhead.

"Lucky blighters!"

The Modern Maiden sighs wistfully as she too watches the aircraft humming cheerily. Then she departs, with an unspoken malediction against her

Ideal Soaring Country—*Photo, "The Sailplane."*

bank balance, which does not permit (or so she thinks) indulgence in flight as a hobby.

Both, however, are wrong in this idea that the thrills of aviation are available only to the wealthy few or to those whose profession is in aeronautics.

It is true that, although everybody now realizes the vital importance of air transport in modern life, only comparatively a few are favoured with the opportunity themselves to fly powered planes; but it has to be remembered that the already stupendous aerial achievements of to-day are the result of only 27 years' development.

It is inevitable that with the march of progress, the handicap of expense which at present deters the man of modest means from running his aeroplane as he at present runs his car will be very substantially reduced.

But the average person whose enthusiasm has already been stimulated by the dawn of the air age, will feel but cold comfort in the hope that some day in the problematical future he will be able to afford a 'plane. He wants to fly *now*.

BENEVOLENT DJINN.

At this moment, in answer to such air-minded aspirations, which do without doubt exist in the minds of tens of thousands of young people to-day, a door has opened and the absorbing sport of gliding enters like a benevolent djinn—a djinn moreover unmixed with any bitters !

Through gliding may be experienced not only all the glorious sensations of flight, but a great deal of the fundamental knowledge of design and construction of machines and of the theory of flight may be acquired ; without which, it need hardly be said, nobody can hope sucessfully to pilot a power-plane when sooner or later the long-looked for opportunity to do so presents itself. This last fact alone constitutes reason enough for the sincerely interested student of aviation to enter upon the sport of gliding, and successfully counters the opinion sometimes uttered that the whole sport is objectless.

Gliding may be made to serve as the novitiate stage to the later " full profession " without more than a very nominal expenditure. Any self-constituted club, for the purpose of gliding, can obtain the necessary primary machine for round about £50, and the normal membership fee of such a club varies from one to two guineas.

After this, a gentle slope, a moderate breeze, an elastic rope, an old shirt and an old pair of " bags " are all the equipment one requires—and after all, most of us possess an old pair of " bags," some of us nothing *but* old ones ! At any rate, the charges under " initial outlay " are not very formidable, are they ?

SO GOOD FOR YOU.

Lest you should be scared by the thought that gliding is much too technical or educational a game at which to spend your playing hours, let us think of other attractions it offers. Firstly—and of primary importance with any spare time hobby—gliding takes you into the open air. More, it takes you into the hills which, like Guiness, are good for you (there is no objection to a combination of the two, I believe). To this add the vigorous exercise in which (if you are a loyal member of your club) you are compelled to indulge ; for no one member can be launched solo without the energetic co-operation of at least eight others.

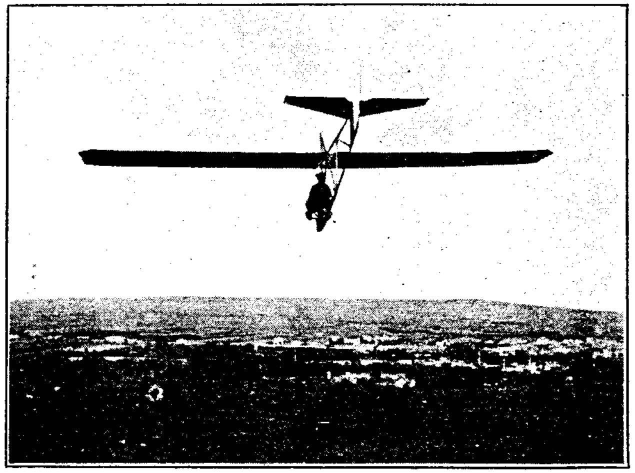
There he sits, directing his team. " Walk ! " he says, and the rope tightens : " Run ! " he shouts, and the rope quivers at tension : " Let go ! " and he is catapulted off ; but the team has exerted all its muscular strength and has duly profited thereby. Fresh air then, and exercise ; interest, and adventurous thrills ; for nobody quite knows when a novice is launched whether he will soar " sky-high " or won't get off the ground at all ; whether he will make a good landing, or a " pancake " one—there is so much of the personal element in the sport. I have seen a lady member on her initial launching " soar to the ceiling," and come down perfectly safely. For with all its thrills and variety, gliding is noticeably free from hurtful accidents.

I have sometimes heard doubts expressed by those more than their fair share of " avoirdupois " that this regrettable " tubbiness " will prevent their taking the air successfully in a glider : and it is a fact that lightness is a very advantageous condition in the would-be soaring pilot. Nevertheless, there is no reason why a heavy man should not make as good a show as a light one. He will probably give his launching team the finest possible opportunity of that healthful exertion to which I have already alluded ; and he must, of course, allow for a flatter " take off " than his more sylph-like friends, else he perchance may find part of the landscape ahead intruding on his path of flight ! When this happens and he has extricated himself from the embraces

of the particular portion of the landscape in question, he must repeat to himself the Service motto " Per Ardua ad Astra " flavoured with comments to taste. And anyway, was there ever an Astra worth having which did not entail considerable Ardua in its attainment ? In gliding at any rate, the Ardua is of a very cheery and jolly kind, allayed only very rarely by untoward incident. Certainly, motoring is much more dangerous.

LIKE THE BIRDS.

So, even in the early training stages, we are able to rebut the charge of " dullness." Far transcending them in thrill and skill are the later stages of proficiency, when the pilot takes the air in his sailplane as a gull flies, silently and with a superb elegance that must be seen to be fully appreciated. When our doubters do have the privilege of being present when some experienced " C " pilot exponent of this supremely beautiful art is in the air, their attention is rivitted in admiring astonishment at the grace and consummate ease with which the pilot uses the air-currents of the hills and clouds silently to fly—*really* like a bird. Generally, there is a marked increase next day in application for membership of the local club.



A primary Glider in flight—*Photo, " Airways."*

Gliding comes nearest of all aerial achievement to the natural effortless flight of birds of the gull class. Most of us pilots of powered machines admit that we have extracted a far greater thrill from our first glides than ever we got from our first " solo " in power-planes. No doubt it is the silence which makes so vivid the illusion of being carried through the air on bird-wings : whatever it is, the sport is fascinating and absorbing to an extraordinary degree. I, who fly power-machines pretty regularly and glide whenever I can, certainly maintain that the latter sport offers thrills every whit as great as the former.

AND SO.

So now then, all you fellows who cannot afford a power-plane, cease repining, wail not for the moon ; instead, come gliding ; take your turn in the air, take your turn on the rope : Are you ready chaps ? Then Walk,

Run !

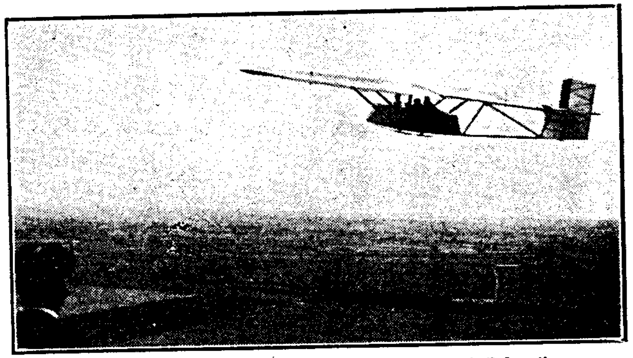
LET GO ! !

FORTY YEARS OF GLIDING.

In this resume of the history of gliding and soaring flight, Herr Enrich Offerman shows how greatly the world is indebted to Germany for the development of the movement. He deals with vital factors in gliding history. Dorset Gliding Club is indebted to "Airways" for permission to reproduce this article.

THE German gliding movement of 1920 really represents the third epoch in the history of human flight. The first epoch to be taken seriously began with Lilienthal's engineless flights in 1891, and ended with his death in 1896. The second epoch began with the engineless flights of the brothers Wright in America in 1901, and ended when they fitted an engine to their machine; this was in 1903. The third epoch, as already mentioned, began in the year 1920.

This last epoch differed fundamentally from the first two in that its object from the outset was soaring flight, whereas the flights of Lilienthal and the brothers Wright were only preliminary steps to power flight. What was then



The Poppenhausen, a 2-seater machine—*Photo, "The Sailplane."*

a necessary preliminary step is still very valuable, as in soaring flight the flying characteristics of the aircraft can be studied, and experiments made in a natural manner.

A LONG PAUSE.

The Wright brothers flew with an engine for the first time on December 17, 1930. From this time onward all work was concentrated on the improvement of flying bodies until nearly 1916. The progress in the building of aero engines diverted all interest from the aero-dynamical improvement of the flying body. It was only after the problems of lift and resistance had been elucidated that the teaching according to Junkers' patent of 1910 that all parts causing resistance and not producing lift should be avoided, finally produced a change. This change first became evident in 1916, when the unbraced cantilever thick wing was first built by Junkers.

It was these aerodynamical principles that to all intents saved the life of the soaring flight movement of 1920, and, regarded technically, rendered in any way possible the performance of the next ten years.

When in 1920, thanks to the initiative of a few men and more particularly the German engineer Herr Ursinus, the first soaring flight competition took

place on that famous ground on the slopes of the Wasserkuppe, it was the outcome of the enthusiastic desire of a group of young men to take up flying in spite of the terms of Treaty of Versailles, rather than for technical considerations. In this Treaty engineless flight was not taken into consideration, perhaps because its possibilities, from which the whole world is now benefitting, were not then realised.

GREAT ACHIEVEMENT.

The movement arising from this first competition in the Rhön, grew in power like an avalanche, and all forces capable of bringing about technical progress in its broadest sense were brought within its sphere of influence. The many branches of engineering were set in motion, the relation between meteorology and aeronautics changed fundamentally, and aeronautical knowledge was considerably increased. Those who have shared the experience of the past ten years can indeed say with conviction that the soaring movement in Germany deserves to be regarded as the most gratifying achievement in post-war times.

To begin with, the work of Lilienthal and the brothers Wright, so far as it related to practical engineless flight, was recorded historically as former epochs of the modern soaring flight movement. This was right as, strictly speaking there is no difference between gliding and soaring. It is generally said of Lilienthal that he merely made gliding flights. This is, however, only partly true. In order to make the position clear it may be well to give the following brief definitions of gliding and soaring:—

Gliding is flight, accompanied by progressive loss of height, the direct motive power being gravity.

Soaring flight is a gliding flight without loss of height, the direct motive power also being gravity.

In the case of soaring flight the loss of height is only compensated by the machine being lifted by the vertical up currents which originate in various ways. From the outset, those interested in soaring flight have sought to investigate these up currents. Direct evidence of the progress made in the knowledge of the sources of energy governing soaring flight is to be found in the corresponding improvement of the maximum performance. When it was said that gliding is gliding flight accompanied by progressive loss of height, and soaring gliding flight without loss of height, the opinion may be advanced that Lilienthal may be credited with having performed short soaring flights. It was natural that owing to the aerodynamical inferiority of his machine, this soaring could be only of short duration. If, however, an absolute and just standard is adopted, Lilienthal's undulating flight may be classed, not as pure gliding, but rather as soaring. His literary works prove that he was aware of the existence of vertical up currents. As is well known, such ascending currents are caused by the wind being obstructed, particularly by woods, hills, and mountains, and thereby being deflected upwards. That is, in fact, our most elementary knowledge regarding the sources of energy governing soaring flight. The use of these sources of energy is, of course, immediately connected with the dependence upon the ground in question, which in conjunction with the wind is able to provide this source of energy.

The brothers Wright provided the first data relating to actual soaring flight. History relates that in Kitty Hawk in America, with a machine of their own construction, they flew over a measured distance of only 33 yards in one minute twelve seconds. These figures are sufficient to satisfy an airman that this must certainly have been soaring flight, that is, use was made of the ascending winds produced by the dunes on the coast.

SACRIFICE.

When in 1920, with the most primitive material, the first Rhön soaring competition was arranged, the enterprise was at first marred by ill luck. The weather was extremely bad, and the performances rendered possible were consequently poor. It was not until August that fairly long flights were achieved. On August 9, Eugen von Lössl crashed with a broken elevator, but not before he had proved that he had sacrificed his life in a worthy cause.

Then, on September 4, 1920, Klemperer in the *Schwarzer Teufel* covered a distance of one mile, and one may say that this flight saved the soaring movement. The *Schwarzer Teufel* was the first machine to be built according to Junkers' principles, and it was the forerunner of what we now term the high performance soaring aeroplane. In 1921 Klemperer, with an improved machine of similar design, flew for 13 minutes. In September of the same year, Martens flew a distance of 4½ miles, and then followed a series of record flights, both in respect of distance and duration, which awoke the interest of the whole world and brought German soaring to the fore. On August 19, 1922, Hentzen covered 5½ miles. In 1923, Botsch, a student of Darmstadt, covered 11 miles. Then, in 1924, Martens flew a distance of 11½ miles. In 1925, Nehring, who has become well known as a soaring pilot in the last few years, flew a distance of 15 miles. At the same time the soaring flight duration record of 21 minutes 30 seconds established by Harth, was increased in 1922 to 1 hour 6 minutes by Martens in the *Vampyr*. In the same year Hentzen in the *Vampyr*, remained in the air for two hours, and a few days later, on August 24, 1922, he beat his own record by a flight lasting 3 hours 6 minutes.

ASCENDING CURRENTS.

In all these performances merely ascending currents were used as source of energy, apart from assistance obtained from any difference in height between the starting point and the landing point, and considerable progress was made in 1926, when, on August 12, Kegel succeeded for the first time in utilising an ascending wind of a line squall, and thanks to the height to which he was carried, created a distance record of 34 miles. After this flight by Kegel began the systematic use of such ascending wind zones, which, in terms of meteorology or physics, are of thermal origin, and their presence in the atmosphere is indicated by clouds, generally cumulus clouds. Thus, this kind of soaring is called cloud-soaring, and there is good reason for saying that this offers a method of soaring which cannot be disregarded, but leads one to expect great results.

After the duration flights of Martens and Hentzen in 1922, there occurred a crisis in the soaring movement, in as much as many believed that soaring for its own sake should be abandoned. These people were of the opinion that the possibilities of soaring had been exhausted and that the time had come to turn to power flight.

It was certainly true that the power-driven aeroplane had much to learn with regard to construction and aerodynamics from the high performance soaring aeroplane which had in the meantime become more or less standardised. It would have been possible to develop more economical power-driven aeroplanes by applying some of the experience gained in soaring flight. Contrary to the interests of soaring flight. it was decided to arrange competitions for soaring aeroplanes with auxiliary engines or (what is more or less the same thing) light aircraft in the Rhön, at the same time as the soaring competition. If this course had been pursued it would have meant the end of the soaring flight movement. The known stagnation which then occurred came to an end the moment when, thanks to the efforts of certain far-seeing people, light aircraft disappeared from the Rhön.

MOVEMENT EXPANDS.

It was then duly recognised that the soaring flight movement had reached a point in its upward way where it could and should expand. The increasingly insistent demand that other grounds besides the Rhön should be made available for soaring flight, was recognised. Thus in 1924, the first soaring flight competition in Rossitten, on the Kurische Nehrung, in East Prussia, took place. As was expected, the completely different character of the ground

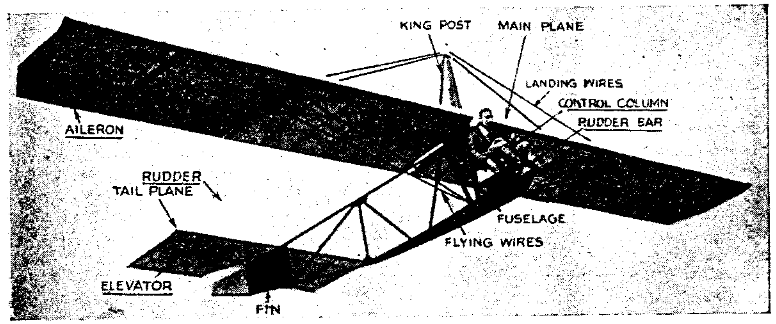
enriched the technique of soaring by new experiences, and indicated new possibilities. Here in Rossitten, it was particularly the well-known instructor Schulz who continued the chain of German world records in soaring flight. The crash on June 16, 1928, which cost him his life, meant an irreparable loss to the soaring flight movement.

As far back as 1924, Ferdinand Schulz made the duration record of 8 hours 42 minutes at Rossitten. In 1927, also at Rossitten, he remained in the air for 14 hours 7 minutes. In the same year, at Rossitten, Schulz flew a distance of 37 miles, and also made a number of local records.

In the meantime the decentralization of the soaring movement spread increasingly. Germany has now nine recognised soaring flight grounds, recognised inasmuch as the prescribed duration flight of one hour has been carried out there.

CLOUD SOARING.

Soaring in an ascending wind, as already stated, is more or less dependent upon the nature of the ground, but it is apparent that the improving technique of cloud soaring is gradually overcoming this dependency. Soaring records and their recognition were hitherto dependent upon the ground. The conditions for these records were made to suit the limited possibilities as regards



Main features of a primary glider. A Channel Club pilot is at the controls—*Photo,* "*The Sailplane.*"

aeronautics. It seems that this must now be changing. As symptoms of this are the distance flights of 45 miles such as Nehring made in 1928 in the Rhön and in 1929 in the Bergstrasse. In general, the increasing altitudes gained may be regarded as an indication that the soaring pilot, by means of cloud flight, is making himself increasingly independent of the nature of the ground. In the meantime Kronfeld gained a height of more than 3,280 feet above the starting point in the Rhön. Still more interesting is the record of Kronfeld of 62 miles measured in a straight line, which he made in the Teutebourger Wald on May 15, 1929.* Moreover, this was a flight in which Kronfeld made use of all the knowledge gained regarding soaring technique, and particularly cloud flying.

Thus, within ten years of the introduction of soaring flight, Germany achieved this world record which would have been considered impossible in 1920, and she is entitled to be optimistic with regard to the further extension of the soaring movement.

The soaring flight movement was already taken up abroad in 1922. The English soaring competition at Itford Hill will be remembered. A number of expeditions made by German soaring pilots have contributed to the propagation of the movement, for instance the expedition to Italy in 1924, to the Crimea in 1925, and to France and the U.S.A. in 1928.

* Since surpassed (see Records).

GLIDING IN THE BRITISH ISLES:

1930 in Retrospect.

The growth of the gliding movement in the British Isles during 1930 is detailed month by month in this valuable contribution from Mr. L. Howard-Flanders, A.F.R.Ae.S., M.I.Ae.E., A.M.I.Mech.E., first Secretary of the British Gliding Association and now a member of the B.G.A. Council, Mr. Howard-Flanders is also joint author of "Gliding and Motorless Flight," the first handbook on gliding produced in Britain.

ALTHOUGH gliding in the British Isles commenced with the experiments of Sir George Caley in 1807, and periods of interest in the science occurred in the years 1896-1899 (Percy Pilcher), 1906-1910 (Dunne, Weiss and others), and again in 1922 (contest at Itford), it may be correctly stated that gliding as a club movement started in 1930.

The foundation of the British Gliding Association in November, 1929, formed a focus for the interest in motorless flight which reached this country as a result of the work done by the Rhön Rossitten Gesellschaft in Germany during the preceding decade.

Interest and enthusiasm was very great, and for a time had no outlet. Gliders were well nigh unobtainable; very small available output from the German manufacturers were subject to many weeks' delay in delivery, while transport and packing increased the prices fifty per cent. There was no supply of British-built gliders and no one seemed to have the necessary knowledge of this type of aircraft to design and build in this country.

The National Glider Association of the U.S.A. very kindly sent drawings of a primary type glider, which with modifications became the prototype of a well-known make. This design was based on German practice and had many features which appear to be peculiar to German aircraft design which are unsuitable for British workshop methods. When these were modified the gliders proved most satisfactory.

HIGH SPEED WORK.

At the same time, Mr. Lowe-Wylde, assisted by the Kent Gliding Club produced a primary glider in the amazingly short period of five weeks from starting the design to the first test flights. The experience gained from this machine made it the forerunner of another successful make of glider.

British gliding clubs started with the Kent Gliding Club, founded in January. The members proceeded to build their own glider, which made its test flights on February 23. Early in February the Harrogate Aircraft Club was formed with a gliding section, commencing work by making a "Dickson" glider.

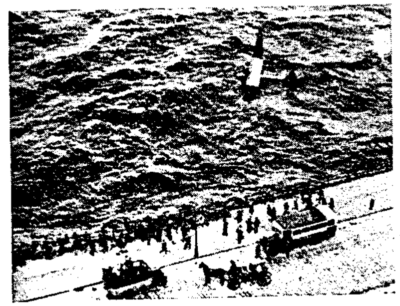
The London Gliding Club held its inaugural meeting on February 20, and held its first gliding meet at Guildford on March 16 with the trials of a "Dagling" glider presented to the Club by Mr. R. F. Dagnall. The subsequent week-end the tests were continued at Aldbury, near Tring.

During February, the North Cotswold Club was formed, and the Lancashire Aero Club formed a gliding section.

March was more productive of events of importance. The Midland and Winchester Clubs were formed. The first number of the "Journal of the British Gliding Association" appeared with a reprint of the lecture which Dr. Georgii and Herr Stamer had read before the Royal Aeronautical Society on February 19.

IMPORTANCE OF THE B.G.A.

The inaugural meeting of the British Gliding Association on March 27, definitely centred the responsibility for the development of the movement on that Association. The late Air Vice-Marshal Sir Sefton Brancker, then Director of Civil Aviation, presided and stated that the Air Ministry had decided to allow the British Gliding Association to provide for the safety of gliding by the issue of certificates of air-worthiness, that he held it responsible for the air-worthiness of gliders.



Magersuppe's Sailplane after his forced "landing" in the sea at Scarborough.

It is of some interest that the Air Navigation Acts are so worded that gliders may be included in their scope. Thus, it could be enforced that all gliders be built under Government inspection and receive certificates of air-worthiness from the Air Ministry, the minimum charge for which is £25. The late Sir Sefton Brancker, first President of the B.G.A. freed the gliding movement of charges which would have increased the price of gliders by at least 25 per cent.

Lord Wakefield of Hythe made a donation to the Association of £1,000 in January which enabled it to undertake the work of organisation before income from membership and affiliation could provide necessary funds.

The first glider pilot certificates were granted by the Royal Aero Club to (No. 1) Mr. Lowe-Wylde, (No. 2) Captain Latimer Needham, for qualifying flights made on March 29 at the London Gliding Club ground at Aldbury. This completes the series of events which makes March, 1930, the virtual date of the commencement of the gliding movement in the British Isles.

CROSS CHANNEL PRIZE.

In April, the Dorset and Leicestershire Clubs were formed. Mr. Wallace Barr offered on behalf of Messrs. Cellon, Ltd., a prize of £1,000 for the first glider to soar across the Channel, limited to British gliders and pilots. Up to time of writing no entries have been received for the contest.

Kent Gliding Club moved to their gliding ground at Lenham Cross in this month. North Cotswold, and Nottingham Clubs held their inaugural meetings.

Events in May included the formation of the Essex, Oxford and County, Surrey, Scarborough, and Channel Clubs.

Herr Kronfeld arrived in London on May 28 at the invitation of the British Gliding Association to give demonstrations in soaring flights with his sailplane "Wien." Although "Wien" was built at Cassell in Germany it was presented to Herr Kronfeld, who is an Austrian subject, by the Austrian Government.

June was chiefly notable for the demonstrations by Herren Kronfeld and Magersuppe. This was the first time true soaring flight had been seen in this country, apart from the Itford contest in 1922, when soaring flight was made possible on inefficient aircraft by the strong N.E. wind at Firle Beacon.

On June 5, Herr Kronfeld gave a demonstration on Itford Hill to the Press, and on the following Saturday, June 7, the British Gliding Aviation demonstration opened. By a coincidence the "Daily Express" had decided to give demonstrations of soaring flight with Herr Magersuppe as pilot on a standard "Professor" sailplane. Consequently, the two demonstrations were amalgamated.

London Gliding Club brought their "Prufling," Kent brought their well-travelled glider, and the B.G.A. provided a "Dagling." For the Whitsun there was a good north wind which was strong enough for Mr. Lowe-Wylde and Captain Latimer Needham to put up flights of 20 minutes on primary training gliders. Flights of over an hour were made on the "Prufling."

Primary training was given by Herr Kronfeld which enabled club instructors present to learn the way to teach gliding sans crashes.

The following glider pilot certificates were qualified for :—C. H. Lowe-Wylde, "B" ; C. H. Latimer Needham, "C" ; M. D. Manton, "B" and "C" ; M. L. McCullock, "B" ; E. Lucas Mole, "A."

Colonel The Master of Sempill qualified for "A," "B," and "C," the following week.

The meeting was prolonged until the Tuesday, but adverse weather (fog) prevented flying on Tuesday.

CROSS-COUNTRY FLIGHT.

The following week-end the meeting was again in progress, but the wind was not favourable, being very light and southerly. Nevertheless, good flights were made by both the foreign pilots.

On Sunday evening, June 15, Herr Kronfeld flew across country from Itford Hill and landed at Bedhampton, near Portsmouth, about 60 miles in a straight line. This was one of the longest cross-country flights that had been made and of course, quite the longest in the British Isles. It was not officially observed for record purposes.

Cardiff Aero Club's first crash.
Photo, "Western Mail and Evening Express."

Gliding took place on June 21-22, at South Harting, near Portsmouth. The wind was unsuitable, and even the "Wien" could only make long glides.

The demonstrations were continued at Folkestone (June 28-29), Askerswell (July 5-6), Ilkley (July 9-10), and Scarborough (July 11-12), where Herr Magersuppe had to make a forced "landing" in the sea.

The third quarter of 1930 opened with demonstrations organised by the British Gliding Association drawing to a close. After this many new clubs were busy forming and making arrangements to start.

A date which may prove of interest is July 6, when successful experiments in auto-launching were carried out by the Experimental Light Plane Club. With these experiments in launching no runway or block and tackle was used, and three persons only were required to effect a launch.

INTER-CLUB CONTEST.

The first inter-club gliding contest took place on July 27 between the London Club and the Gliding Section of the Lancashire Aero Club at Ivinghoe Beacon. Both clubs used the "Prufling" belonging to London.

The times registered were :—London, 12 mins. 52 secs. ; Lancashire, 8 mins. 5 2/5 secs.

The first gliding camp was held by the London Club at Ivinghoe Beacon, July 27-August 3.

At this camp seven ab-initio pilots qualified for their "A" certificates.

Among gliding clubs started in July were Bradford, Herts and Essex, Isle of Wight, Kilmarnock, Merthyr, and South Essex.

August produced no events of outstanding interest. The most noteworthy feature of September was the first appearance of "The Sailplane," the first weekly publication in the world solely devoted to gliding.

The fourth quarter of 1930 was marked by the inter-club competition organised at Ditchling Beacon by the B.G.A. on October 18 and 19. This meeting produced some satisfactory results in the form of pilots' certificates and the prizes won by the competing clubs—London, Kent, Lancashire, Channel, Portsmouth and Southsea, and Surrey.

Short notice and the rather remote situation prevented the bulk of clubs from entering. The centre of the gliding movement is considerably north of London.

This meeting at Ditchling terminated the major events of the gliding year. November and December were devoted to the formation of new clubs and the training for pilot certificates, but the Scarborough Club held a notable rally on Boxing Day.

RAPID PROGRESS.

Reviewing the year as a whole it is an undoubted fact that progress in the formation of clubs has been much more rapid than was expected. On the other hand the number of "B" and "C" pilot certificates issued has been very small.

No cross-country flights have been made by British Pilots, and it is a regrettable fact that no scientific work has been attempted. The day of the British gliding movement will dawn when club members begin to make cross-country flights, and when it becomes a general custom to land on the top of the hill instead of at the bottom.

THE SAFETY OF GLIDING.

The safety of gliding is here discussed by Captain C. H. Latimer Needham, M.Sc. (Eng.), F.R.Ae.S., who, with a distinguished career in aviation and wide experience in the light aeroplane movement, is a founder-member of the British Gliding Association. With a flight of 1 hour 5 minutes in June, 1930, he was the first Englishman to qualify for the "C" glider pilot certificate. He is also the designer of the first English sailplane, the "Albatross."

GLIDING has now been carried out on a large and increasing scale for the past ten years, and one factor which seems to stand out above all others is the remarkable freedom from casualties among its thousands of participants.

The first season's operations have just concluded in this country, and although clubs have sprung up almost everywhere and many thousands of flights have been made it is a very satisfactory and convincing fact that very few personal injuries have been recorded, and not a single fatality.

It is the more surprising when it is realised that at the beginning of 1930 there were scarcely a dozen people in this country with experience of gliding so that it has been a case of the blind leading the blind, and certainly many experiments have been made that would startle the experienced gliding pilot. Yet we have come through.

Although different nations, according to their national characteristics, have different ways of carrying out a sport, and while gliding in this country is not being run on the same lines as in other parts of the world, at the same time much can be learnt from a perusal of the statistics of other countries.

Germany, the birthplace and nursery of gliding flight, holds the most remarkable record of over ten years' intensive operations with less than one fatal accident per year. Is there any other form of sport with such a clean sheet ? This shows quite conclusively what may be achieved where proper care is exercised and dangerous practices are discouraged.

On the other hand America cannot make the same claim and in fact, accidents there have been far too numerous. This has been solely due to the adopted policy of introducing motor power in one form or another.

Captain C. H. Latimer Needham.

WHY IS GLIDING SAFE ?

Gliding is infinitely safer than power flying largely because the causes of accidents applying to aeroplanes are either non-existent or greatly reduced with gliders and sailplanes. The chief dangers of flying are fire, the results of stalling, and high landing speeds. Fire cannot, of course, take place with gliders, landing speed is low, whilst the effects of stalls are seldom serious. Owing to the light wing loading, stalls are little more than parachute descents, and flying speed is regained in a very short distance. Even when the stall turns into a spin to the ground, the machine generally takes the brunt of the crash.

One other factor contributing towards safety in gliding is the light structural weight. There is no heavy engine or petrol tank to pull the machine down and, although crashes are quite common occurrences with both gliders and sailplanes, contact with the ground is comparatively gentle, so that the force is spent in breaking up the wings or fuselage, leaving the pilot unhurt. This at first appears hard to believe, but after seeing many crashes take place, this conclusion is forced on one.

AUTO-LAUNCHING AND TOWED FLIGHT.

German gliding authorities believe that gliding and sailplaning should be entirely motorless and that engines should not be used in any form, apart from which this has been found to be the only safe course. America has desired quicker results and has therefore resorted to auto-launching (launching by motor car), auto-towing and aeroplane towing. This has accounted for many accidents, so many in fact, that towing by aeroplane has been prohibited.

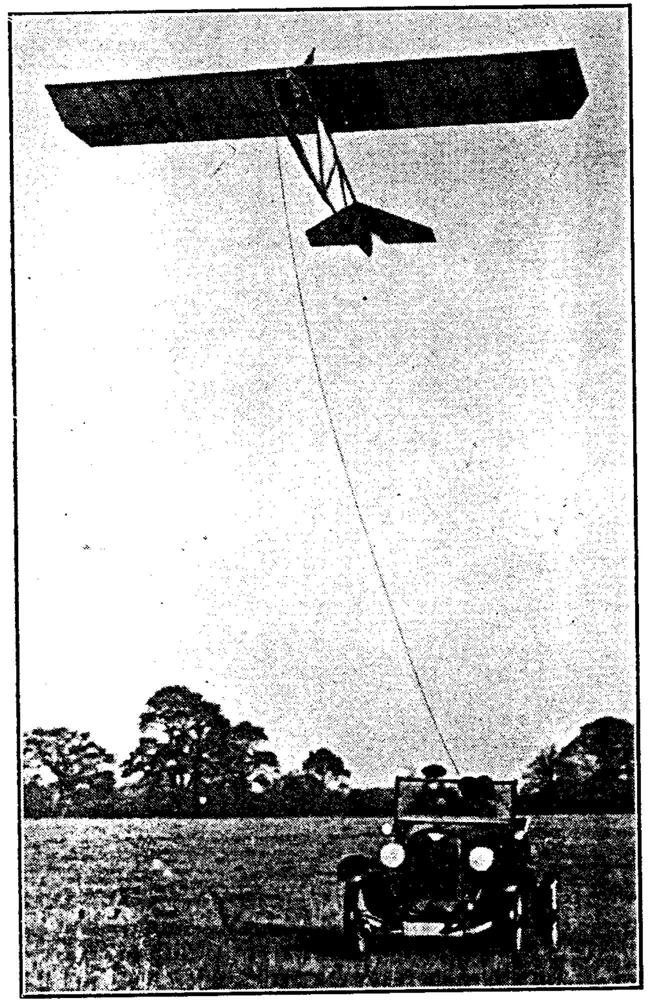
After a year's successful operating with hand launching in this country several clubs are beginning to experiment with methods of replacing the team by motor cars and also auto-towing and the time is ripe for issuing a warning.

Motor launching possesses the advantage of enabling gliding and sailing flights to be started with a very small crew, but is is attended with dangers.

If it is resorted to, the utmost care should be exercised and it should only be undertaken by those having considerable flying and sailplainng experience and should never be used for novices.

Auto-towing and motor boat towing enable long flights to be made and have certain instructional advantages, but can easily lead to disaster. Such flights should only be carried out directly into wind ; turns out of wind or down wind should be avoided. To explain this :—Consider a glider being towed at 20 m.p.h. into a 10 m.p.h. wind, giving a flying speed of 30 m.p.h. As soon as the turn down wind has been made the air speed is 10 m.p.h. and a stall to earth is inevitable. Or again, it is possible for the glider pilot to hold the machine in a stalling attitude but owing to the continuous pull from the motor, the glider stays in the air. This induces bad habits which will prove

disastrous when free flight is returned to. Auto-towing therefore, should only be attempted when experienced persons are in charge of operations, and is more suitable for schools than clubs.



Auto-towing as practiced by the Oxford Club—*Photo, " The Sailplane."*

Aeroplane towing, now condemned in America, and only done by competent authorities for experimental and research purposes in Germany, cannot be carried out in this country without special Air Ministry permission as the glider is subjected to much heavier loading than designed for.

STICK TO THE SHOCK CORD.

Power pilots find it difficult to get used to the small element of danger attached to gliding and stand aghast when they first see pupils stalling elementary machines at about 30 or 40 feet off the ground or at the sight of sailplanes being landed down-wind or side-wind with perfect safety, or again when they see pupils of only a few minutes' instructional flying experience make their qualifying flights for the " A," B "," and " C " certificates.

Let the British gliding motto remain " Hasten slowly." Do not forsake the elastic rope method of launching until it is " found wanting " and if motor power must be used let there be no lack of caution. And remember lastly that *safe gliding means safer flying.*

Elastic Rope launch—*Photo, " The Sailplane."*

THE THEORY OF FLIGHT.

Mr. H. J. Penrose, A.F.R.Ac.S., sets out here an exposition of the theory of flight which is of especial use to beginners in gliding, carrying them far into the why and wherefore of the subject. Mr. Penrose, who made his first glide in 1924, is an R.A.F. Reserve and Civil Pilot, being on the sales staff of Westland Aircraft. A " B " glider pilot, he is hon. instructor to Dorset Gliding Club.

Mr. H. J. Penrose.

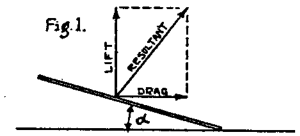
WHEN an inclined plane is presented to the wind two forces are exerted on it :—

(*a*) A lifting or upward force, acting perpendicular to the chord, and

(*b*) A drag or backward force at right angles to it.

Of these two forces, the lift is the greater for small angles of incidence. The lift and drag can be resolved, or combined into a single resultant force which usually forms an angle to the chord, and the point at which it acts on the surface is termed the Centre of Pressure.

Fig. 1.



α = Angle of Incidence.

This principle is made use of in the kite, the centre of pressure being the point of attachment of the string. However, a flat plate is not the most efficient surface, and it has been found through study of the bird's wing and by means of countless experiments that a cambered surface offers a much higher lift and a lower corresponding drag.

When the lines of air-flow round a cambered wing-section are studied it is found that they follow fairly straight lines below the surface but that on the top surface they curve upwards as shown in fig. 2.

Fig 2

Now if the flow line meeting at the leading edge and dividing there takes a steady streamline flow on the lower surface but has to curve on its journey when going over the top surface, it must gain velocity to get round the curve.

If the pressure is high the velocity is low, and vice versa. This means that if our flow line above the wing increases velocity on the top surface there must be a decrease in pressure or a suction there compared with the pressure below, and in consequence the wing will lift upwards.

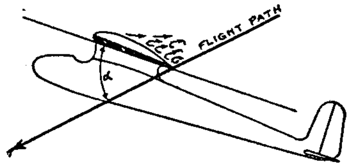
As the angle of the wing to the wind is increased so the amount of suction or Lift, increases, and with it the ever present evil Drag, until an angle of some sixteen degrees is reached, when the airflow breaks down and becomes turbulent. When this point is reached the wing is said to have stalled, and the Lift suddenly and rapidly falls off thereafter, while the Drag mounts up.

THE STALL.

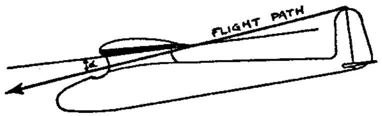
The Stall is usually associated with slow flying when the relative flight path of the glider has steepened and virtually increased the angle of the wings. If a glider of a given weight and area is flown slowly then it must fly at a large angle of incidence where the Lift is great in order to make up for the loss of lifting power due to the slow airspeed. This slow speed tends to become more and more reduced owing to the rapid increase in the Drag, and the gliding angle becomes steeper.

In power-driven aircraft and gliders this condition usually results in complete loss of control due to lack of force on the ailerons and rudder, followed by a very heavy landing or a crash, depending on the height above the ground of the machine. On a glider it is usually possible to recover from the stalled condition by depressing the nose and thus reducing the angle of incidence, diving for some 50 feet and then flattening out to a normal angle again. It will be shown later that there is a most efficient angle of incidence at which a glider should fly, and this angle is invariably a small one; therefore the machine flies fast.

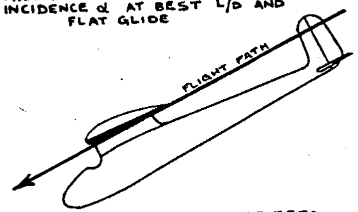
To fly fast, the glider wing is placed at a small angle of incidence to the relative flight path (and this must not be confused with a flat flight path—below the stall point the steeper the flight path the less the incidence). At the small angles of incidence it is true that the lifting power is small, but so is the drag, and it is due to the velocity that the necessary lift is produced and the glider maintained in flight.



SLOW FLIGHT AT LARGE ANGLE OF INCIDENCE α BEYOND STALL AND STEEP FLIGHT PATH AT SLOW SPEED



FAST FLIGHT AT SMALL ANGLE OF INCIDENCE α AT BEST L/D AND FLAT GLIDE



HIGH SPEED DIVING FLIGHT AT ZERO ANGLE OF INCIDENCE AND VERY STEEP GLIDE

Fig. 3

FUNDAMENTAL RELATION.

Aeronautical engineers have made a unit, the lift co-efficient, or Kl, to express the lift of each square foot of surface at each angle of incidence, and it can be shown that:—

Lift = Weight of Glider, is proportional to the Lift Co-efficient × Area × (Velocity)^2, and from this it follows that small weight, combined with a big area or light loading, produces a slow speed of flight for a given Kl.

It has been found in practice that a loading of some $1\frac{3}{4}$ to 2lbs. per square foot gives a slow enough forward speed and landing speed for the primary type glider, and although the angle of the downward path along which the machine glides is relatively steep compared to sailplane, because of the slow forward speed necessary to sustain the glider, the time to descend is fairly long (*i.e.* the sinking speed is low). Lighter loadings prove dangerous in gusts.

MEDIUM PERFORMANCE.

Some sailplanes also have this light loading and can therefore work in winds of low velocity, but the usual high performance sailplane is designed to operate in higher winds and the loading is therefore made about $2\frac{1}{2}$lbs. per square foot or very slightly more, the landing speed increasing with the load.

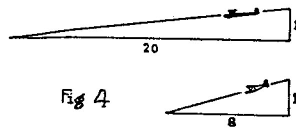
However, in the case of these machines the drag is very much reduced and the lifting power of the large span wing is great in proportion, so that the nett sinking speed is even lower than that of the elementary glider and at the same time the angle of the glide is at least three times as flat.

ANGLE OF GLIDE. RATE OF DESCENT.

It can be proved that the angle of glide is equal to the inverse ratio of the lift to the drag, L/D.

Therefore, the greater the ratio the greater the efficiency of the glider and the flatter the angle, so that in a sailplane a wing giving the highest possible value of L/D must be secured.

Thus, an L/D of 20 to 1, which is quite feasible with a sailplane, would mean that in still air the machine would glide for a distance of 200 feet from a height of ten feet, but the usual school glider with open body would only have an L/D of about 8, and therefore from the same height would only glide 80 feet. It is found in practice that the best ratio of L/D is found usually at a fairly small angles of incidence of about 0 to 5 degrees or so.



However, if the lift coefficient corresponding to optimum L/D ratio is low the machine will descend at high speed though at a flat angle, and the nett rate of descent will be high. Thus it is obvious that a high lift coefficient at small angles of incidence must be obtained at the same time as the high L/D ratio in order to obtain the slowest possible rate of descent,

$$\left(\frac{L}{D}\right)^2 KL$$

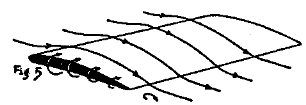
and the angle of incidence of a particular wing of a given loading producing the highest value of this ratio will be the most efficient attitude at which to fly the glider if a long flight is desired.

In practice, the speed can be calculated from the lift coefficient at the angle, and the pilot must then fly his machine at this speed as indicated on his airspeed indicator if he is to secure the best result.

SPAN AND DRAG.

However, a wing section conforming to the factors previously mentioned, would not necessarily produce an efficient soaring machine if the wing was of any shape. The greater the span (or the higher the aspect ratio) the greater is the reduction in drag.

At the wing tip the air spills over the edge from the underside to the top owing to the suction on the top surface, imposing on the normal flow from leading edge to trailing edge a motion towards the centre of the wing on the top surface, and vice versa. This motion induces the formation of vortices at the tip, and the downwash on the top surfaces causes the resultant of lift to slope slightly back instead of at right angles to the wind. The lift is then aiding the drag, and this drag is termed the induced drag. This induced drag is proportional to the square of the lift coefficient, and as it has been shown that in a sailplane it is necessary to have a high lift coefficient it is obvious that the question of induced drag is serious.



It has been found that the greater the span of a wing the less the induced drag, until with a wing of infinite span there is no induced drag at all. Therefore the greater the span of the sailplane the greater its efficiency.

Whatever the span, there will be a secondary, or profile, drag due to the friction of the air passing over the wing surface. This drag is substantially the same whatever the lift coefficient or angle of incidence.

SOARING.

It may be concluded therefore, that in designing the sailplane it is necessary to utilise a lightly loaded wing having a section giving a high lift and a good ratio of lift to profile drag, and that in addition the span must be made as great as possible to reduce the induced drag, at the same time making the overall resistance of the body and components small by good stream-lining so that the overall L/D is very large.

It should be noted by all embryo soaring pilots that soaring is only gliding downwards at the angle giving the slowest rate of descent combined with the best L/D or the highest value of $\left(\frac{L}{D}\right)^2 \times KL$, and that the machine will only maintain level flight or climb when the air currents have an upward trend equal to or greater than the sinking speed of the sailplane. Sailplanes have a vertical sinking velocity of not more than 2½ft. per second. In a wind of that upward speed the machine will maintain height, if less it will descend, and flying at greater angles of incidence, *i.e.*, getting towards the stalling point, will not help matters in the least; rather, due to the increased drag at the higher angle, the flight path will become steeper.

STABILITY.

It is interesting to discover why a given arrangement of wings and tail, etc., should provide a machine that will fly safely and not plunge to the ground at the slightest disturbance by wind.

Imagine a beam balanced on a fulcrum.

Then, for the beam to be in balance, the moment of the beam on the right must balance that on the left, or the fulcrum must be placed at the centre of gravity. In the same way a glider to be in equilibrium (*i.e.* to glide steadily without altering its attitude), must have the resultant of the air forces passing through its centre of gravity.

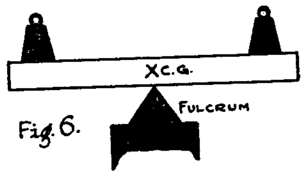


Fig. 6.

LONGITUDINAL STABILITY.

Assume a cambered wing in equilibrium (*i.e.* with the forces balanced) for a given angle of attack.

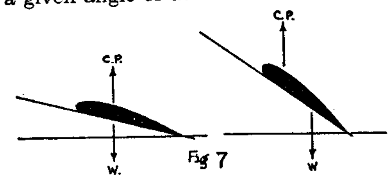


Fig 7

If the wing has its angle of incidence increased then the centre of pressure or C.P. will move forward and the wing will tend still further to increase its incidence. With decrease of incidence the C.P. will move in the opposite direction.

Now attach a tail to the main plane at zero angle with the wing in flying position. If there is no disturbance the combination will fly in equilibrium as the tail can exert no force, neglecting any downwash on the tail.

Then, if the angle of the wing is increased (*i.e.* the nose goes up) the tail is dropped, so increasing its angle of incidence and therefore lifts in opposition to the Lift of the wing and tends to bring the system back to equilibrium. If the wing incidence decreases the tail is placed at a negative angle of incidence and again exercises a force in the opposite sense to that of the wing.

DIRECTIONAL AND LATERAL STABILITY.

In order that the glider may have weathercock (or directional) stability, it should have a preponderance of area to the rear of the centre of gravity. Then, if the glider swings sideways, the resultant air force is composed of the forward motion of the machine and the side gust (or side slip) and this resultant force acting on the major area behind will swing the machine into the gust or side slip.

Directional and lateral stability are very closely allied, and lateral displacement or roll, if left uncorrected, will turn into side-slip and the fin will then be brought into play to turn the glider into the side slip. However, it is desirable to prevent the roll from becoming side-slip and to this end wind tunnel experiments have indicated that a dihedral (or upward) angle to the wings as viewed from the front, gives a powerful restoring moment. The major effect of this is due to the relative angle of incidence of the wing entering the side slip which is greater than that on the wing furthest from the slip.

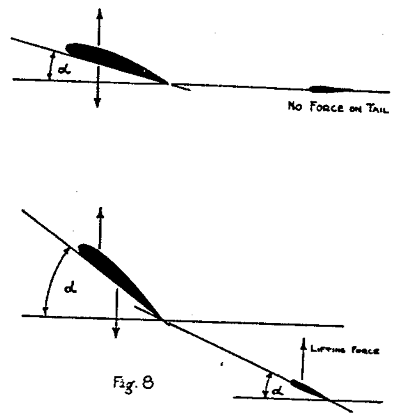


Fig. 8

Imagine the glider slipping to the left and with forward speed. Then the wing is not meeting the air symmetrically but on a plane inclined to the axis, and it can be seen that if a section of the wing is taken on each side the effective angle on the left wing will be the greater.

Dihedral also has the effect of throwing the resultant lift to a line passing perpendicularly through the C.G. in a manner similar to the beam example first mentioned, and thus equilibrium is achieved.

HOW GLIDING IS TAUGHT AT THE WASSERKUPPE.

By courtesy of "The Sailplane" we reproduce here some remarks by Mr. C. H. Jackson dealing with his experience at the predominant gliding school in Germany. Novices at gliding will find themselves well repaid by study of Mr. Jackson's account of methods of instruction at the Wasserkuppe.

THE students at the Wasserkuppe are divided up into three groups: beginners training for the "A"; those with the "A" training for the "B"; and those with the "B" training for the "C."

The "A" certificate is now a nominal affair. It is not considered important enough for a certificate and a badge with one gull is granted instead. One must however do the 30 seconds in a straight line before attempting anything other than a straight flight.

The possession of a "B" certificate labels one as a glider pilot, and of a "C" certificate as a sailplane pilot, or *Segelflieger*. The former requires five flights each of not less than one minute's duration and of "S" path. The "C" licence requires a flight of five minutes above the starting point.

When the best wind is available, the pilot who is trying for a "C" certificate usually starts from the Kuppe, the right-hand point of the horseshoe, turns left and goes with the wind to a point across the valley and more or less at the head of the horse-shoe. This is ideal for soaring but involves the unofficial recommendation that the pilot return to the starting point—if possible. Some pilots managed to overshoot the first point and then landed on the road about half a mile away and well across the plain.

STUDENTS' LOG BOOK.

Each student has a log book which should have a record of each flight and even each attempt at flight. Its pages are most impressive. The information required is :—strength and direction of wind: the flying ground (three are available and these are used according to students' capabilities and the prevailing wind): pilot's mistakes; damage (to the machine); the height and the duration of the flight; also any remarks. This may seem to savour of red-tape, yet such a detailed record is of great use both to instructors and pupils.

How not to hold the "joy-stick."

The procedure with *ab initio* pupils is sketched in the following notes. It is usually reckoned that a beginner who is going to spend a month at camp should leave with at least the "A," possibly with some "B" flights accomplished and certain lucky pupils might get the "B." The "A" should be gained after between 15 and 25 flights, on occasion with even fewer. On the other hand gliding, even at the Wasserkuppe, is at the mercy of the weather, and the time required varies between ten days and four weeks, but the course does not guarantee the gain of even an "A."

The "B" is subject to the same limitations but the five flights counterbalance the pupils' increased rate of learning, so that even a month might not yield a "B" licence. Yet, a power pilot can gain his "C" after two weeks' tuition; but with the machines used, he must have a fairly good wind; one good enough for the Professor type is not necessarily sufficient for a student on a Leichtwindsegler or on a Hangwind.

MACHINES USED.

Both "A" and "B" licences are still taken on the Zögling. The "C" is taken on the two types above mentioned. The former has the normal type built-up fuselage which is covered with fabric; the latter has a nacelle and the tail unit is carried by a form of grid on the Zögling. There is also the Prüfling but this is used as little as possible, only when the other machines are not of use. It is most unpopular owing to its heavy build and large forward and sinking velocities. A machine, the Falcon, or Falke, has recently been produced to replace these types, or be intermediate between them and the Professor.

The beginner is given a lecture on the controls. The rudder control is contrasted with that of a bicycle; the use of the control-stick is explained, and the need of thought before each movement is emphasised. The fallacy of pulling back the stick with its loss of speed and consequent danger of stalling is early demonstrated.

N. Cotswold's stationary training machine for teaching use of controls.

It is found that many pupils consider that it is correct to gain as much height as possible and that it is absurd to fly at anything less than an altitude of fifteen feet. This does not show at an early stage and does not matter much at later stages when the slopes allow a reasonable altitude without an unduly large angle of incidence, but it definitely becomes obvious with some pupils after the first half-dozen flights. If it is not done consciously it is often caused by the acceleration at the start. To counteract this pupils are told to manipulate the stick so as to maintain a balance between the amount of land and the amount of sky in sight. If it is in favour of the latter and one feels the speed, or the noise of the wind in the wires decreasing, one is told to ease the stick forward, to flatten out before landing and once on the ground to put the stick forward and stay on the ground.

ABOUT THE RUDDER.

But at all stages of tuition, pulling was considered a serious fault, worse than pushing. Another point emphasised was the danger of applying right rudder and pushing the stick to the left or *vice versa*. This was continually harped upon and the general advice was not to use the rudder unless previously given permission. This meant that the instructor had to choose the direction of flight to avoid obstacles and to be into wind. The pilot had to select a distant point for his direction and keep his eyes on it so that if he flew off the course he should use rudder to regain it. This apparently contradicts other instructions but I soon found that it was advisable to leave the rudder alone, indeed, many found it hard enough to keep it in a neutral position.

Dorset Club "mock-up" for accustoming beginners to launching.

With regard to the control stick, further instructions were given to use it to control any tendency to hang to right or left, but when doing this neither to pull or to push. The instructor adjusts the elevator controls while the machine is on the ground. This done, the pupil is informed that a good flight can be obtained if the stick is maintained in that position, relative to the ground, throughout the flight, that is one must consider the machine pivoting about the base of the stick. As progress continues, pupils gradually get the idea of keeping correct flying position, with the nose slightly down, but even then there often remains some tendency to pull at the start.

Other points are that one must not put one's foot to the ground before the machine is at rest and not to get out before there is somebody at hand to hold the machine.

ORAL EXAMINATION.

Now all these instructions are given before the first flight and most of it is repeated for each succeeding one. Not only that, but the instructor asks the pupil what he would do, if in some unfortunate predicament such as barging into a clump of trees or drifting to the left and hanging to the left. Two men only are put on each side of the rope for the first flights and the pupil is not permitted to give the words of command, he was to repeat them according to the instructor's timing.

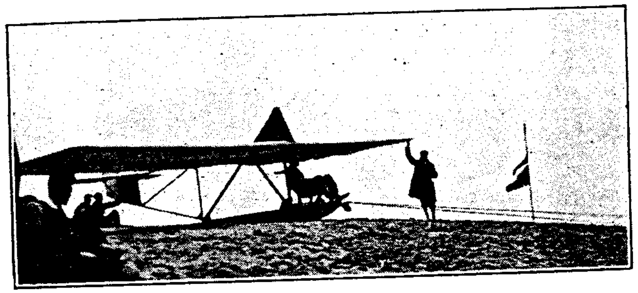
On later flights, say for the "A" and those preceding it, an interval of about six seconds between each command is satisfactory, on the earlier ones, three to four.

The instructor has full control over these early flights. He adjusts the elevators so that even if the pilot does pull a trifle the machine will not leave the ground. This precaution is necessary. The procedure is to let each student have three successive "flights." Of these at least the first two are merely " skids " along the ground. They are, of course, quite short and merely to accustom one to the acceleration of the machine, but, apart from that, the instructor can see if the rudder has remained neutral and if either of the wings dropped; also, if the pupil felt this and made any attempt to correct it. It can be seen that such flights are fairly useful tests.

JUST KEEPING STRAIGHT.

For his third flight the pilot is allowed to rise anything from one to six feet above the ground. This is entirely the work of the instructor, he adjusts the controls and the timing of the words of command to his own satisfaction. The pupil's job is to maintain a straight course. At this stage and the next few flights the instructor can see if pupils are capable of keeping the machine straight, in the pre-determined direction and without banking to right or left. The real test of these flights is the landing. The usual early effort is either to push the machine down to the ground with an awful thump, or to over-do the flattening-out, and proceed with a series of hops and bumps till the machine stops.

After the first three or four flights the number of men on each side of the rope is increased, first to three, then soon after to four. The maximum number of men on the ropes up to the "A" stage is ten, and two on the tail.



Ready for the launch—*Photo, " Airways."*

Later, when " B " flights are approached, the former number was increased to 12 men. This was found to be enough, even for the heavier Hangwind and Leichtwind machines. Such a number are rarely used on a Zögling.

The procedure described is carried on until the " A " stage is approached. Up to this stage and after the very beginning the number of successive flights was reduced to two and often to only one. The correct placing of the landing team is important, not only to the flight, but to the men. On one occasion when the " V " was narrow the start was bad because the machine was not placed so as to fly down the centre-line. The result was that the left wing dropped, and since the machine was not at any height a somewhat lazy starter was damaged in the ribs. Fortunately the damage was not serious, merely two cracked ribs and no flying for five days, but we took more care in the future.

CLUBS, PLEASE NOTE.

Around the 10th flight pupils give their own words of command and are started-off from a reasonable height. The gradient of the slope is about the same as the gliding angle of the machine and it is an important point that absolute beginners must only be trained on slopes of this kind. Even on this slope three Zöglings were badly damaged. On one occasion a pilot pulled

badly at the start, he did not stall, but went right off his course. He tried to correct this and to hang to the right at the same time, side-slipped and the machine was completely written-off. Another machine was almost as badly damaged through a stall, pure and simple. The third crash was of this type, but it only smashed one wing, the flying and landing wires and also the nose of the skid. The danger to the machine of a sideslip was continually emphasised and on several occasions demonstrated. Even a hop on comparatively " early " ground produced two cartwheels. This was not a serious matter at the Wasserkuppe, but it would be for a small club with one machine.

When trying for the " A," students are allowed three flights in succession and indeed the majority only succeed on the third. The usual successful flights were between 33 and 48 seconds in duration.

CONTINUAL PRACTICE.

Practice in long straight flights is continued before anyone is allowed to attempt curved flight. Students for the "A" are not allowed to go off the top of the Kuppe because there is a considerable drop before the slope approaches the gliding angle of the Zögling. Spot-landings are not attempted before the "A" certificate has been gained. When the pupil has got this and made some left and right-hand turns as well as an " S " path, spot-landings are introduced for turning practice. This spot is a white flag which is placed at the foot of the Kuppe so that a pilot who takes-off from there has to turn through 180 to 270 degrees if he is to land anywhere near the flag.

When I was at the Wasserkuppe the first good soaring wind was the signal for the advanced pupils to attempt their " C " tests. The power-pilots, if they managed to get to the correct place, came out quite well on this. Three of them obtained their licences after nearly three weeks' training. They fared far better than those who had only flown gliders and had obtained their "A" and " B " certificates. But it must be noted that these had to serve an apprenticeship on the Zögling before passing on to the Leichtwind. This latter and the Hangwind were used for the " C " licences, the Prüfling not at all.

A ZOGLING POINT.

The particular type of Zögling used for "A" and " B " flights had a rough fairing built on behind the pilot, this was said to improve the general performance by about 20 per cent.

Two things worth noting are that the safety belt was fixed to the fuselage by pieces of elastic cord. This saved many a wrench when a bad landing was made. All three machines mentioned had as " foundation " a triangular structure, familiar to those using the Zögling, with the upper part acting as a cabane. It is easy enough to pass the belt round the upright of this structure. The other point is that the Zögling is flown with knotted cord hanging from the wing root on the front spar. This enables the pilot usefully to dispose of his spare hand so that he will not overdo movements by putting two hands to the stick.

TAIL-LESS GLIDERS.

The value of a glider as a weapon of research is demonstrated in this notable contribution by Captain T. R. Hill, M.C., M.Sc., F.R.Ae.S., inventor of the "Pterodactyl" tail-less aeroplane. Captain Hill, who is a member of Dorset Gliding Club, describes how be carried out trials of his first "Pterodactyl" as a glider and furthermore gives an engrossing account of the work of his fellow pioneers in this specialised realm of aircraft design.

WHAT is all this talk about tail-less aeroplanes? Look at birds; they all have tails; why is anyone so foolish as to think that a flying machine can fly without a tail?

This is what I am always hearing, though it is wrapped up in varying degrees of politeness, so as not to hurt my feelings.

Captain T. R. Hill.

While to some minds, the modern conventional aeroplane appears as a highly perfected piece of apparatus, it is only too painfully clear to others what a long way there is to go in the achievement of safety, comfort, speed and real fitness for one of the many duties now performed by aircraft of the present day.

The object, then, of the tail-less type, is the achievement of greater safety, comfort, speed and effectiveness than can be obtained from the conventional design.

THE WING AND THE LOAD.

The broad argument on which this hoped-for advance is based, is simply that while a wing is required for lifting the useful load, all the other surfaces, such as tail plane, elevators, fins and rudder are in the nature of parasitic surfaces; these parasitic surfaces are productive of unnecessary weight and air resistance, but they are essential on the conventional type of aeroplane to make good the shortcomings of the main wing or wings in respect of stability and control of the aeroplane as a whole.

The whole problem therefore is to design a wing so that good stability and control are inherent in its shape, and it is to this end that a number of people are now working all over the world.

The conception of an aeroplane without a tail is by no means new, and in the early days of this century, when the aeroplane designer was classed with the seeker after perpetual motion, there were one or two bold spirits not content to follow the general trend of design, although it must be remembered that in those days design was infinitely less stereotyped than it is now.

To those of us who are keen on gliding, it is of the greatest interest to see how the glider has been used and is being used almost without exception in the development of the various types of tailless aeroplane, and I propose to make brief reference in this article to the work of those pioneers who have sought success in what is aptly named in Germany the "wing only" type.

DUNNE'S PAPER MODELS.

The two names which first spring to mind are those of Dunne and Weiss. Dunne's gliding experiments began as long ago as 1906, I believe, if not before, and were carried out with great secrecy in a remote part of Scotland. In his earlier work his gliders were biplanes, as were his first power-driven aeroplanes, while later he built a monoplane of roughly the same plan form.

He used a plain V-form with a heavy sweep-back and washout in incidence towards the wing tips, and his planes were of constant chord along the span. Those readers who are lucky enough to possess the early volumes of "Flight" will find some good pictures in the issue of September, 1910; so fascinating are these volumes that those not possessing them are strongly recommended to come by them by any means whatsoever.

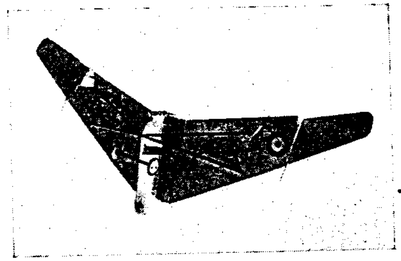
In these days of tunnel tests in small wind tunnels, large wind tunnels, compressed air tunnels and all the paraphernalia of modern aeronautical research, it is interesting to remember that Dunne carried out many of his preliminary experiments on paper gliders, dropped from the top of the Balloon Shed at Farnborough. It seems to us now almost incredible that he successfully managed to fix the position of his centre of gravity from his paper glider trials, yet he has assured me that that was actually his method. From his gliding trials Dunne then progressed to power-driven aeroplanes, which suffered, along with many other types of that time, from an excess of struts, and thereby lost the fine performance they might otherwise have had. It is sad to think that one of his undercarriages had no fewer than 42 struts in it!

WEISS AT WORK.

The Weiss gliders were much more bird-like than the Dunne types; Weiss often used a small tail, though he derived his stability primarily from his gracefully curved and tapered wings; most modern looking in their heavy camber near the body. One of his gliders is illustrated in "Flight" of May, 1912. Weiss made great use of large gliding models, just as they do in Germany to-day and launched his man-carrying gliders with ballast from the downs near Amberley, in Sussex,

In Austria, Ettrich was working along lines somewhat reminiscent of Weiss, and in Germany since the war, tail-less types have blossomed forth on all sides. Most notable among them are the designs of Herr Lippisch, who has produced the extremely efficient "Storch" series, starting with the machines as gliders and then equipping them with very low powered motors.

Lippisch's work is approximately contemporaneous with my own experiments on the Pterodactyl, which is illustrated here in flight after the engine had been installed. I carried out the trials of this first Pterodactyl as a glider in December, 1924. These trials nearly ended in disaster to the machine, owing to the heavy gales which raged in continuous succession just at that time. The road along the sea-front along which the glider had to be taken to its tent on the downs was nearly washed away by the sea and the tent, an old wartime R.E. 7 tent, was so rotten with age that constant repair day and night was needed to prevent it collapsing on to the glider trembling in the darkness beneath.

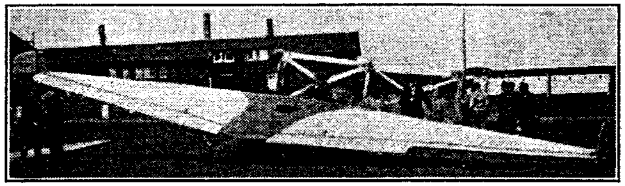


Captain Hill's "Pterodactyl" Aeroplane in flight.

However, in spite of these difficulties, I carried out some successful glides and proved that the machine flew the right way up, with the sharp end first, and was well under control. It is at this stage in development that a glider is of great value; the structure being designed to carry two people and an engine, there is a large reserve of strength when flying as a glider; and if a crash does occur, the light loading ensures that contact with the ground will be of relatively moderate severity.

CEASELESS EXPERIMENT.

Since the days of these gliding trials in England, Herr Lippisch, as previously stated, has been experimenting continuously with tailless types, in addition to designing what are generally agreed as the most successful conventional type gliders which have ever been seen. The Wien, so ably demonstrated over here during the summer by Herr Kronfeld, is a beautiful example of Herr Lippisch's skill in the art. I was recently privileged to see the very latest products of the Rhön-Rossitten Gesellschaft at the Wasserkuppe.



Lippisch Tailless Machine—*Photo, "The Sailplane."*

Although it is not possible to give any details. I can say that the new machines from Herr Lippisch's board are truly wonderful pieces of work, commanding the greatest admiration both for their clever construction, and also for the way in which his extensive theoretical investigations have been embodied in the design of the wings and their control surfaces.

Space limits forbid the description of the tail-less gliders of Dr. Kuppe and others, but without doubt the German investigators are deriving an immense amount of help from their gliding experiments in the development of their tail-less aeroplanes. Is not their work an example to us over here of the value of the glider as a weapon of research?

CHOOSING GLIDING SITES.

A subject which is of first importance to all gliding clubs is dealt with here by Herr Robert Kronfeld, the Austrian soaring flight expert and the world's foremost exponent of the science. His demonstrations in Britain last year under the auspices of the British Gliding Association did much to spread public interest in the movement. We are indebted to Herr Kronfeld for permission to reproduce this article, which has also appeared in "Airways."

PERHAPS the most important question that confronts the founders of every new gliding club is the choice of a suitable site from which to commence operations. For upon this choice depends to a great extent the choice of machines, as different sites require different types of gliders and vice versa.

The three main requirements to be met in the selection of a site are these: the site should be readily accessible, it should involve no dangers of any kind for either pilots or machines, and its position should be such that the air and wind currents are favourable to gliding.

THE DIFFICULTY.

Unfortunately, any one of these requirements is, in most cases, incompatible with the others. In the majority of cases the sites that are most suitable for gliding and which offer the most favourable meteorological conditions are situated far away from human habitations. A case in point is the Rhön site in Germany, which, though it was only decided on after a search extending over several years, is an hour and a-half distant from the nearest small township and three hours distant from the nearest large town. It is equally probable that the ideal gliding site in England will prove to be situated somewhere remote among the mountains. However, the aim of the several clubs now being formed is not so much to discover an ideal site suitable for a great national training centre, but rather a suitable local venue where they can practise their sport conveniently. And such sites are to be found practically everywhere.

For gliding and soaring, grounds of quite different natures are necessary, but in selecting a site for the one sport the possibility of practising the other branch of engineless flying must also be taken into account.

The ideal site for gliding is a conical-shaped hill or slope which slants downwards first steeply on every side and then more gently towards the level. It should have a plateau on its summit to allow of launching gliders, irrespective of whatever the direction of the wind may be. Any obstacle, either in the form of roads, houses, trees or large stones on the landing site is a drawback and even dangerous. The most favourable soil is grass soil, such as meadow land. The wind should be free to flow in from as many sides as possible, so as to remove all risk of eddying or unnecessary buoyancy. In no case should the site be situated in a deep valley or crater-shaped cavity or be in the immediate vicinity of high mountains, as in both cases down currents and other undesirable air flows would result. Abrupt changes of level, such as might be created by large bridges or precipitous coastlines should be avoided at all hazards, as treacherous eddy currents are invariably found in all such localities.

The site chosen should be adapted for the type of machine employed, in so far as the major part of the drop should slope only a little more steeply than the maximum gliding-angle of the machine. In order to satisfy the tests for an "A" licence, which demands a glide of thirty seconds duration, a difference in height of 180 to 300 feet will generally suffice, while for the "B" licence test the available height must be just about double. For "A" licence tests, a flying stretch of 1,200 to 2,400 feet should be available, with a stretch of twice this length or over for "B" licence tests. These figures should give some idea of the unobstructed area required.

SOARING FLIGHT.

Gliding alone, however, is not the sole ambition of those who have taken up this fascinating sport. Soaring flight, with its noiseless, unhurried progress through the air is the real aim of gliding enthusiasts. Hence anyone entrusted with the selection of gliding sites will have to consider whether these will also be suitable for soaring flight at a later date. In soaring, the slope must be such as to face into the prevailing wind. The longer the slope, the fewer will be the curves necessary, and the more easy will it be to fly in a "C" licence test. A quarter of a mile may safely be taken as the lowest limit admissable for the slope's length, while a half-mile is considerably more favourable and one mile the ideal. The height and steepness demanded depend on the adjacent ground-levels and the wind conditions, and no hard-and-fast rule can be laid down for every case. On sites which are completely accessible to the air, such as coast-lines, lesser heights will frequently suffice. Hence it is that the sand-dunes of the soaring-flight training centre at Rossitten, which are less than 180 feet high, yield splendid up-currents, whereas the lift would prove inadequate in the central mountain chains or in the interior. The majority of the favourable soaring sites known to me all possess, in their upper reaches, a gradient of at least 20 to 30 degrees.

If our gliding sites are to allow of soaring flight also, we shall have to adopt the conical, stump-shaped site in preference to a pyramidal multi-sided one. In other words we shall require a hill with a small plateau on top sloping away on each side towards different wind-directions. As an example of these features the Cliff Hill at Lewes may be cited.

OBSTACLE-FREE SLOPES.

By soaring, I mean flying at a height either above the starting spot or at least on the same level. When, therefore, a site is considered from the soaring pilot's standpoint, it is not absolutely necessary that the slopes and the valley

Herr Kronfeld (left) **talking to H.R.H. the Prince of Wales at Ivinghoe.**
Photo, " The Sailplane."

below them should be free from obstacles The landing is, in most instances, effected on the summit of the hill, or it may happen that the gliding angle of the machine, allied to high proficiency, allows the pilot to select from several suitable landing-sites in the valley. In any case these should not be too scanty, to avoid the risk of mishap in trial flights.

Many clubs will find it impossible to secure, within reasonable reach of their town headquarters, a site combining all the virtues to which I have referred. But this by no means need deter clubs from starting operations. Provided that their organisation is flexible enough, it will depend entirely on the proficiency of the members, and on the type of machines and the experience of the different pilots, to choose a site that will at least satisfy requirements. A normal aerodrome, for example, will serve for the first " hops."

To the regret of the pilot of power-driven aircraft the majority of aerodromes are not by any means level, and as a rise and fall in the ground level of several feet are common everywhere, training in rising above these can also be given.

Some shed or hangar will doubtless be found available for storage, and a complete course of training can be carried out to enable each member to accomplish his first fifteen or twenty " hops."

SEEKING WIDER SCOPE.

Later, when all the members are so far advanced that the aerodrome site offers no further appeal, and provided, of course, that the pilots have gained sufficient control of their machines, there comes a day when the club must depart to a suitable slope with a favourable wind direction. Then, one after the other, they are launched into the air for their thirty-second flights to qualify for their "A" licences.

Admittedly, training of this nature is not ideal, but it may be essential in some districts and certainly permits of a sound preliminary education in handling a glider. Further, there is the advantage of being able to acquire for training purposes sites which are not available the whole year through, such as grain fields after the harvest.

The system may even be extended to " B " licence tests and to training in soaring. In the latter case it is essential that the machines used can be easily entered and left and that they should be capable of rapid transport to any desired site on a small truck. For the carrying out of soaring flights of this nature, which demonstrate how effectively it is possible to adapt oneself to unfavourable conditions in sailplaning, no hangars are necessary, and the machines may, when not in use, be stored on the transport-trucks in any garage.

TAKE CARE.

The care which should be taken in the selection of a site cannot too often be emphasised. It is far better to devote days, weeks, or even months, to finding a site that is the best the whole locality can offer, rather than, as is so frequently done, to set about erecting a hangar anywhere, which will probably have to be demolished, at trouble and much expense, a few months later in favour of a more suitable site, probably about a mile away. The best method of all is to hold a series of demonstration trials at each of the possible sites available, and to make the final selection as the result of these trials.

ACHIEVEMENTS IN GERMANY.

The setting up of a new distance flight record by Herr Robert Kronfeld of 100 miles and other achievements at the Wasserkuppe and elsewhere are described by Herr Ronald Flinsch in this instructional account, which gives useful information also as to the form taken by German contests during 1930.

OF all gliding meetings held in Germany the International Rhön Soaring Competition is by far the most important and popular. The 11th Rhön Competition, held on the Wasserkuppe from August 9-24, 1930, was a complete success for the international gliding movement. Several records were broken by high-performance pilots and the competitors in the training competition also progressed considerably.

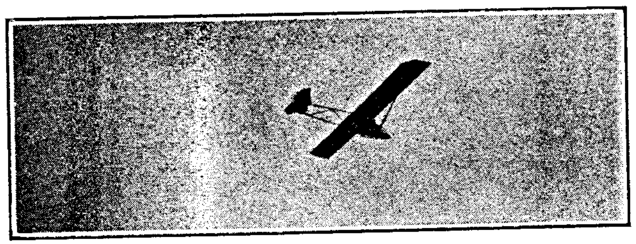
There are two classes included in the Rhön contests. The training competition is reserved for pilots who have passed their " C " tests, and who have not taken part in any performance-competition. The performance-competition is open to anyone.

TRAINING COMPETITION.

I.—Prize given by the Prussian Ministry of Commerce and Industry for the largest total of time flown in different flights, divided among three machines :—1, " Darmstadt," pilot Starck, total 27 hours 28 minutes ; 2, " Luftikus," pilot Bedau, 24 hours 35 minutes ; 3, " M 1.", pilot Pätz, 16 hours 31 minutes. Any number of flights could be undertaken for this prize, a minimum of two flights being required and only flights of at least 60 minutes each being counted.

II.—Prize given by the Bavarian Ministry of Foreign Affairs for the largest sum total of heights attained was divided among :—1, " Luftikus," pilot Bedau, sum of heights attained in five flights, 2422 feet ; 2, " Darmstadt," pilot Starck, five flights and 1716 feet ; 3, " Mainberg," pilot Hemmer, five flights and 852 feet.

Altitude over starting point was measured, and only flights of more than 330 feet in height were allowed for.



Hols der Teufel in Flight—*Photo, " The Sailplane."*

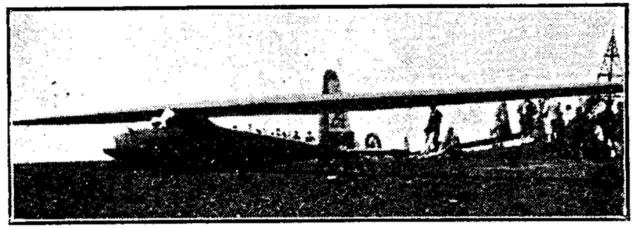
III.—Prize for first pilots to succeed in flying a distance of three miles away from the Wasserkuppe and returning again without making a landing. Won by :—1, " Darmstadt," pilot Starck, 3¼ miles ; 2, " Luftikus," pilot Bedau, 3 miles.

PERFORMANCE CONTEST.

I.—Prize for distance, given by the German Minister for Transport. Won by Pilot Robert Kronfeld on his " Wien " for a flight of 100 miles from the Wasserkuppe to Wölsauerhammer on August 24. Kronfeld, under the same conditions and on the same day, flew four times as far as the next best pilot.

II.—Prize for distance flight to a given point, divided between :—" Wien," pilot Kronfeld, and " Fafnir," pilot Groenhoff. Both flew to a given point, more than nine miles from the Wasserkuppe, and back to starting point.

More than two hundred flights were carried out during the competition. Duration varied from one minute to eight hours 37 minutes. Actual distance flights were small in number. The longest flight made was by V. Husen on " Jupp-Pitter " on August 17. On August 24, Bedau on the " Luftikus " achieved a height of 5,412 feet above starting point, the greatest height reached during the competition.



The Meinigen, a high-efficiency Sailplane—*Photo, " The Sailplane."*

Besides three prizes given in each class there were many other smaller so called " day-prizes," for which certain conditions had to be fulfilled. Flights undertaken for these prizes were often most interesting.

Bedau, when reaching his greatest height, climbed to an altitude of about 3,000 feet at a rate of 30 feet per second, through a cloud. From below one suddenly saw a plane come tumbling out of a cloud in a spin, make two sloppy loops, begin to spin again ; and after another sloppy loop, Bedau at last was able to steady the machine again. He continued to fly for several hours. To come out of a cloud in a spin because you have lost all sense of balance in blind-flying is unnerving enough, but to go on flying after that requires a tremendous amount of energy and iron nerves.

NEW WORLD'S RECORD.

During the competition, to give some statistics, ten flights of over six hours were performed by the pilots Muschick, Pätz, Starck, Mayer, V. Husen, Bedau and Hemmer ; five of these were in the training competition and only Mayer and V. Husen belonged to the performance class. The performance competition did not include a prize for duration, which is the reason why you do not find such names as Kronfeld and Groenhoff among them. Prizes for duration given in the " training-class " are intended to get the young pilots accustomed to their machines during the long hours of these flights.

Six flights of more than 25 miles were accomplished by pilots Kronfeld, Mayer, and Hurtig, and of these three alone were made by Kronfeld, among them being the now officially recognized world's record of one hundred miles to Wölsauerhammer measured as the crow flies, on August 24. Pilots Groenhoff, Starck, Bedau, Mayer, Röhm, and Hemmer reached heights of over 1,500 feet in altogether 11 flights.

Forty machines entered the competition, among them an altogether new design, the " Fafnir," flown by pilot Groenhoff. The shape of the wings closely resembles those of the gull having a bend or shoulder. The likeness to a bird is thus emphasized when in the air. Mayer's machine, his own construction, was very successful.

During the first week of October a Bavarian soaring meeting was held near Bayreuth on the Hesselberg. Unfortunately on several occasions the wind proved to be too strong and on these days some flights had to be called off. The longest flight was made by pilot Medikus with one hour and nine minutes. More than 150 starts were undertaken and although the site cannot be compared to the Wasserkuppe, performances shown were extremely advanced. On October 18 and 19, another gliding meeting was held on the Herchenhainer Höhe in the Vogelsberg. Although here too, unfavourable wind conditions predominated some fine flights were made.

At the' two West German gliding meeting performances shown were crippled by unfavourable wind conditions. The longest flight undertaken there was one of only 3 minutes 46 seconds.

Besides the competitions mentioned above, others have taken place in different parts of Germany, but after all, the most important event in German gliding always is the one at the Rhön.

PILOTS AND MACHINES.

In the German gliding and soaring movement up to date 400 " C " certificates, 1200 " B " certificates and 1500 "A" certificates have been issued.

In 1929, 643 machines were registered in clubs affiliated to the Deutsche Luft Verband, *i.e.*, not counting machines of clubs not affiliated. In 1927 there were 124 machines and in 1928, 231.

GLIDING IN AMERICA.

America's gliding problems and her aims and achievements in soaring flight are unfolded in this article by Mr. Donald F. Walker, Manager of the National Glider Association, which fulfils for the United States the functions undertaken by the British Gliding Association in the British Isles.

IN 1884, John J. Montgomery of Otay, California, made the first heavier-than-air flight in America, using what to-day would be known as a very crude glider. Professor Montgomery's experiments lasted for several years, ending in his death, and included the work of several assistants. One of these took a glider to a height said to have approximated 4,000 feet above the ground and executed on his way down, quite possibly by accident, the equivalent of the modern " barrel-roll."

Years later Chanute at Chicago and the Wright brothers at Dayton, Ohio, used data secured by Montgomery in developing innovations of their own.

In 1912, the Wrights, flying a glider at Kitty Hawk, made a true soaring flight of over nine minutes, which remained as a world record until after the world war and an American record (un-official) until August, 1928, and officially until November, 1929.

There are many members of the " Early Birds," a society of pilots who flew before 1917, whose sole claim to membership is based on being able to prove that they flew a glider of sorts during 1910-1915. Among these are Lieut. R. S. Barnaby, U.S.N., first American pilot to pass the modern " B " test for an F.A.I. glider certificate, and W. H. Bowlus, former official holder of the American duration record.

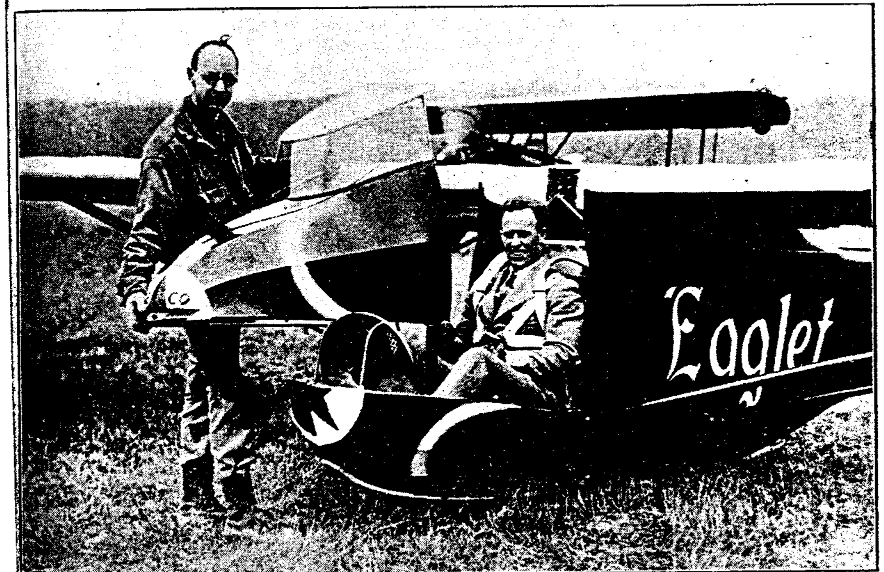
Following the revival of interest in gliding in Germany in 1919 in which Dr. Wolfgang Klemperer, now first vice-president of the National Glider Association and chairman of its technical committee, played an important

part, Professor Edward P. Warner, of the Massachusetts Institute of Technology encouraged his students to design, build and fly gliders. In 1922, the Professor took a team to the Wasserkuppe. The " star " pilot was Eddie Allen, a former war pilot.

In 1928, J. C. Penny, Jr., financed an expedition to America headed by Paul Franz Roehre, head of the Rossitten School in Germany. In addition to Zoglings and Pruflings, they brought with them the first of the great soarers to bear the actual name of " Darmstadt." Herr Hesselbach flew this great ship on Cape Cod for over four hours, establishing a new un-official American record.

EXTENT OF THE MOVEMENT.

Early in 1928, Edward S. Evans, chairman of the Aircraft Bureau of Detroit Board of Commerce, launched a national organization for the promotion of the sport in America which is now the National Glider Association.



Frank Hawks in the cabin-type glider in which, towed by an aeroplane, he travelled 2,000 miles across America—*Photo, " Airways."*

As time went on clubs were formed throughout the country. Many requests for assistance were received from Canada, Mexico, Australia and New Zealand, and contacts were established with the Rhön-Rossitten Gesellschaft and the British Gliding Association.

To-day the Association numbers 60 clubs and approximately 1,800 members. There are nearly 200 glider clubs in the United States with roughly 3,000 members.

Too much emphasis has been laid in America on the primary training glider, copied from the Zogling. It was thought that aircraft manufacturers would be able to sell them for as little as £50 each. This was found to be impossible, and manufacturers' sales prices have ranged from £70-£100 for this type. Many clubs sought to build their own from plans provided by the

National Glider Association, but relatively few of these were completed and very few were very satisfactory.

Americans have never liked the shock-cord method of launching. It is too much labour.

Early in 1929, University of Michigan students began to experiment with towing primary gliders on ice behind an automobile. They found that, under proper leadership, this method of training was more efficient than shock-cord from a hill-side.

Where a trained instructor is available the auto-towing method of primary instruction is preferable. In no case should a primary training glider be towed to an altitude of over 30 feet from the ground and only then at a speed that would just permit of getting it there. Training by this method in high or gusty winds should be avoided.

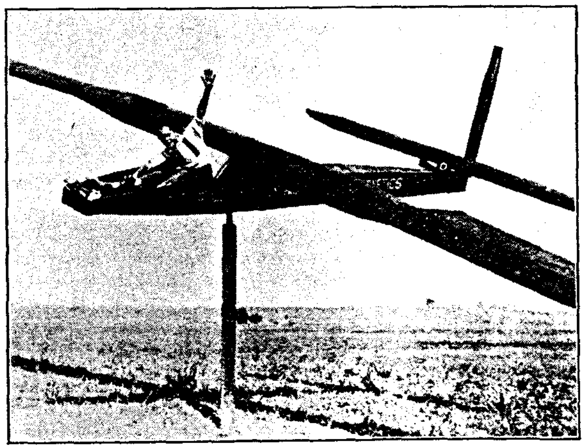
Professor Franklin, of the University of Michigan, pioneered the " utility " glider. This is a ship with an enclosed steel-tube fuselage, not very different in general appearance to the Prufling. Stressed with great care for every type of gliding it can be used for shock-cord primary work, is especially suited for auto-towing primary and advanced work on account of a single balloon-tyred wheel set in the centre of the fuselage and is a very efficient soaring glider. It sells for between £120 and £140 and could be built for £40. There have been but two deaths in this type, both of them due to physical failure on the part of the pilots. There have been eighteen deaths in primaries.

Over 600 gliders have been identified by the Department of Commerce and of these it is probable that more than 40 were utilities.

AEROPLANE TOWING.

Although aeroplane-towing has been given a bad name in the United States (—and is now forbidden—*Ed.*) due to the death of two poor fellows who unwisely attempted to tow primary training gliders, there has been but one mishap in all of the aeroplane towing by persons connected with Professor Franklin, and his work has included building the glider for and to a large extent supervising the spectacular flight of Captain Frank M. Hawks across the continent behind an aeroplane.

Aeroplane-towing offers a method of gaining the altitude of clouds which are indicative of the presence of up-winds and, after releasing from the tow-ship, engaging in soaring flight for quite long periods of time. This may be done over level as well as hilly country. It also offers means of getting into the up-wind along ridges and hills where there are no clearances for shock-cord take-off points on the summits.



A stationary instructional apparatus used in America—*Photo, "Airways."*

After having been one of three glider pilots to be towed to an altitude of some 7,000 feet behind an aeroplane at Cleveland, Mr. Wallace Backus, a native of England, but now of New York, brought his ship into the up-wind beneath a cumulus cloud and flew from Cleveland Airport for several miles out over Lake Erie, returning with sufficient altitude to permit of landing back again on the airport in September, 1930.

In 1929, the Baker-McMillen Co of Akron, Ohio, built what became known as the " Akron-Kondor," an American " Darmstadt " which attracted national interest especially as it was used by Dr. Klemperer.

BOWLUS SAILPLANE RECORD.

For several years at San Diego, Cal., Mr. William Hawley Bowlus has been experimenting with gliders. In 1929, he finally completed a sail-plane with a 60 ft. span in which he has increased the American official duration record to over nine hours. When Colonel Charles Lindbergh visited him at San Diego the Colonel on his first glider flight stayed in the air for 40 minutes.

Edwin S. Evans, Founder and Hon. President of the N.G.A.

While Mr. Bowlus was in California on business, one of his pupils and associates, Jack Barstow, took up a sail-plane of Bowlus manufacture for what he thought would be a relatively brief afternoon's flight. Finding conditions unusually favourable, he stayed aloft for 15 hours and 13 minutes, beating the official international record by over an hour and the unofficial record of Dinort by 28 minutes.

An interesting experiment in gliding was made early in 1930 by Lieut. Barnaby, U.S.N. The Navy purchased a Prüfling, and this was attached to the " Los Angeles," American naval dirigible. The ship then went aloft and at several thousand feet altitude, the Lieutenant stepped into the cock-pit of the glider, released it and glided to earth.

FIRST NATIONAL CONTEST.

The first national soaring contest opened at Elmira, N.Y., on September 21 and lasted until October 5. Entries were limited to enclosed fuselage gliders and pilots were required to be either holders of the F.A.I. first-class certificates; the second-class license; holders of the Department of Commerce commercial glider pilot license or motored airplane pilots with prior successful glider experience.

The ridges where the contest was held are quite " sporty." Their sides are largely wooded and in nearly every case there were fringes of either trees or bushes along the base of the take-off points. With the exception of the south, there were ridges facing in every direction and that is why the spot was chosen. We have found no Wasserkuppe in America as yet.

In all, there were 118 hours of soaring flight by the 14 gliders and 24 pilots registered. The longest flight was made by Albert Hastings of Los Angeles, Cal., in a Franklin " Utility," lasting for seven hours and 43 minutes. He is first winner of the Edward S. Evans Trophy for duration. Second place went to Warren Eaton, of Norwich, N.Y., flying a Baker-McMillen utility with a flight of seven hours and 21mins., and third place to J. K. O'Meara, flying a utility of the same company, whose flight of six hours and 48 minutes established a new official American record as he landed at the take-off point as required by F.A.I. rules.

Five ships accomplished 109 miles of measured distance flying, and here the German soarers established a definite supremacy over the American utilities. Herr Wolf Hirth made the greatest distance of 33 miles flying. A. C. Haller of Pittsburgh, Pa. flying a German soarer, made the next best flight of 13 miles. O'Meara in his utility flew 10.43 miles.

Nine " C " tests were passed. The contest was sanctioned by the National Aeronautic Association, representing the F.A.I.

GOVERNMENT REGULATIONS.

The Unites States Department of Commerce issues an approved type certificate for gliders manufactured by standard firms. The department requires data of all builders. Pilots engaging in gliding as a business must pass a physical test and flight examination, including 360 degree turns. Non-commercial licences are issued without the physical examination and on completion of a general test including at least 180 degree turns. Students are supposed to register for a permit and to agree to fly only under a licensed instructor. The Department, however, has little authority over aircraft not engaged in inter-state traffic.

Evans Glider Trophy for American Championship flights.

American pilots look forward to the time when conditions will enable them to be the hosts of an international meet and when they may have the privilege of visiting the *terrain* of their friends overseas.

Our British friends have different problems to face than we have, but we are all working towards a common end—the further advance of aviation in general through that wonderful sport, soaring flight.

BRITISH GLIDING ASSOCIATION.

The aims and objects of the British Gliding Association are described here by Mr. Douglas W. Genge, a founder-member of the Association and the representative of Dorset Gliding Club on the Council of the organisation. The address of the B.G.A. is 44a Dover Street, London, W.1.

TO all those who, like myself, have followed the progress of aviation for many years, the revival of interest in gliding and motorless flight must have awakened considerable curiosity as to its future and development.

Towards the end of 1929, it became apparent that in this country there was so great a desire on the part of such a large number of individuals over a widespread area wishing to commence the sport of gliding, with its ultimate aim of soaring flight, that before long many clubs would be formed for that purpose.

It was therefore desirable that a central body, who would be responsible for the proper development and control of the sport, should be formed to which the various clubs might become affiliated. To that end, the British Gliding Association came into being and I think it may safely be said the Association has met with some success, much good work having been done since its inauguration.

On March 27, 1930, the inaugural meeting of the British Gliding Association was held, the first president, the late Sir Sefton Brancker, being in the chair.

Subsequently, Herr Robert Kronfeld was selected by the Association to give demonstrations in different localities, the first public meeting being held at Itford Hill during Whitsun and the following week last year. These demonstrations drew very large crowds, and evoked considerable excitement, especially in those people who had no previous knowledge of the wonderful possibilities of a high-performance sail-plane.

Although in almost every case the soaring ground was in rather an inaccessible locality the size of the visiting crowds was a good augury for the future of the sport. Certainly I think the Dorset Club's particular show at Eggardon Hill on July 5 and 6, was a distinct success, and the numbers present must have surprised many.

AIMS AND OBJECTS.

The Association sent representatives to the international meeting held at the Wasserkuppe, in August, 1930, and offered a prize for the pilot flying the longest distance not less than 60km., the prize taking the form of a week's visit to England. This prize was won by Herr Kronfeld, who we thus again had the pleasure of meeting in October. A complimentary dinner was held at the Trocadero Restaurant on October 14 to welcome Herr Kronfeld.

I must now outline some of the Associations objects and hopes for the future.

The Association, which is an association of affiliated clubs controlled by the clubs themselves for their own benefit, is engaged in the promotion of motorless flight within the British Isles, and is available for help and is willing to give information to any country in the world. Its constitution provides for two main classes of membership, affiliated clubs and personal members, and the control of the Association is in the hands of the representatives of affiliated clubs who comprise the majority of its council.

The rules provide for every affiliated club to have a member on the council at the time of affiliation, and another representative on the Council is allowed for every 100 members of the club. There are 40 clubs affiliated to the British

Some of the Surrey Club—*Photo, " The Sailplane."*

Gliding Association, and approximately 60 clubs just formed or in process of formation will no doubt become affiliated as soon as they are able to qualify, Isolated clubs cannot hope to obtain the benefits which become available on affiliation to the Association. The personal membership has now reached the gratifying total of 173, and one wishes that all those interested in the gliding movement would endeavour to increase the membership of the Association by every means in their power.

The Association has made, and is making every effort to form gliding clubs all over the country.

JOURNAL AND BLUE PRINTS.

The Association publishes a Journal which contains valuable information. This is issued free to members, and copies may be obtained by non-members at the price of 2/6.

Many valuable cups and prizes have been presented to the Association to be competed for by affiliated clubs.

The Wakefield Trophy—*Photo, "The Sailplane."*

The Association has had blue prints prepared of an approved type of training glider, which may be purchased, and it is expected that other blue prints will be available in the near future.

The Air Ministry having accepted the proposals put forward by the Association by which gliders do not come under the regulations for airworthiness applicable to light aircraft, it will be noted that this is distinctly advantageous, as these proposals substitute a cheaper and easier system.

The Association is in close touch with the Rhön Rossitten Gesellschaft, which is the parent body of the gliding movement in Germany, and sent a delegate last year to the conference on international regulations.

It is also in touch with Associations which are being formed in the British Dominions, and receives many requests for information from most out-of-the-way places. The movement, which is now seen to be of world-wide importance, is being developed and promoted by a group of national associations of which the British Gliding Association is the representative for the Empire.

Glider pilots' licences are issued in accordance with the regulations of the Federation Aeronautique Internationale, and by the Royal Aero Club, through the British Gliding Association, to whom all applications must be made for the appointment of observers and the issue of licences.

All gliders that are to be used either in competitions, or for the purpose of obtaining glider pilots' licences must be approved as airworthy by the Association.

HELP IN FORMING CLUBS.

The Association will send to anyone desirous of forming a local club, the fullest information as to the best way to proceed with the organisation. A representative is available to go to any locality, and would be prepared to assist in the formation of a gliding club if requested, provided that reasonable expenses only are paid.

The Association will also, in the event of any clubs or individuals desiring to establish gliding and soaring sites in their vicinity, be pleased to send a representative to any place to advise on the suitability or otherwise of the site, provided reasonable expenses only are paid.

With regard to the question of insurance, the Association will on request furnish the names of insurance companies willing to effect this.

The Association, as the body governing the sport in Britain, is responsible for the administration of the gliding movement. In addition to organising on a national basis the numerous gliding clubs already established, it is the purpose of the Association to gain for the new sport the official recognition it so rightly deserves, and it is hoped that public interest will manifest itself very strongly in order to obtain the Government's financial support.

ABOUT THE FUTURE.

With regard to the future it may be said that there is a great need for study of the various problems of a technical and meteorological nature, and were it possible for the Association to set up a central research and testing institution similar to that of the Rhön Rossitten Gesellschaft at the Wasserkuppe, there would be plenty of work to keep it fully occupied. In point of fact it is hoped that funds may be shortly available to enable such an institution to come into being.

One cannot conclude even a short account of the Association's work without mentioning the great assistance received from the Royal Aeronautical Society, and its past-president, Colonel The Master of Sempill, A.F.C., A.F.R.Ae.S. Mr. E. C. Gordon England, the chairman of the Association, is also most active in its service. Mr. L. Howard Flanders, who was the secretary on the formation of the Association, and Mr. J. L. R. Waplington, the present secretary, have had a strenuous time dealing with all the enquiries and organisation incidental to a new body.

ASSOCIATION OF NORTHERN GLIDING CLUBS.

Mr. E. T. W. Addyman (hon. sec. pro tem) supplies the following information concerning the Association of Northern Gliding Clubs.

AN organisation with headquarters in London is of limited usefulness to clubs in the North of England. The chance of sending representatives to council meetings, etc., is such a great drain on finances that in actual practice northern clubs cannot be properly represented on the council of the British Gliding Association in London.

Many folk do not understand the vast differences between the North and the South in weather, character of the country, density of the population and temperament of the people.

Existing regulations controlling civil aviation as applied to northern conditions give so little scope and contain so many restrictions that for the average northerner flying is beset with difficulties.

The above are some of the reasons which have led to the formation of the Association of Northern Gliding Clubs.

EXCHANGING EXPERIENCES.

Three meetings of the Association had been held up to December, 1930. Preliminary discussions have taken place with regard to provision of hangars, and sailplanes to be used jointly on joint sites by several clubs. Very useful exchanges of experiences have taken place. To give an example, after hearing of the experience of the Bolton and Ilkley Clubs with their gliders, the Aircraft Club of Harrogate decided to adopt a more forward loading on the glider which they were then building. This was done with beneficial results.

British Gliding Association representatives were invited to a meeting, where a number of matters were explained which were not previously clear to the Northern Clubs, and some concessions were obtained.

Although the chief function of the A.N.G.C. has been to enable clubs to meet regularly and discuss matters of mutual interest there are possibilities in the future of more definite activity. It is felt that the present moment is not ripe for such an extension, as clubs are all in their babyhood and do not yet fully realise the problems they are up against.

No club is pressed to join the A.N.G.C. The expenses of running the Association have been almost negligible. It has not been necessary to send round a request for subscriptions, although clubs attending regularly are expected to send along £1 to the hon. treasurer when it suits their convenience.

The A.N.G.C. does not force itself on any club, neither does it issue a host of regulations. It simply exists for the benefit of its members, and it rests with them whether they make use of it or not.

The hon. secretary's address is The White House, Starbeck, Harrogate. The hon. treasurer is Mr. E. Craven, 15 Kirkgate, Bradford, and the chairman is Mr. R. F. L. Gosling.

THE FEMININE POINT OF VIEW.

Over 130 women are among the flying members of gliding clubs in the British Isles, and the national movement already boasts of lady "A" pilots. This was reason enough for asking Mlle. Susi Lippens to give her views on the sport, for this Belgian sportswoman first flew in a glider in January, 1930—and gained her "C" certificate at the Rhon (Germany) in the following May! A member of the Channel Gliding Club, Mlle. Lippens made several flights in her "Professor" in Britain last year. She is also an "A" aeroplane pilot.

I FEAR I have only my own private point of view to put forward, as I do not know any of the other ladies who soar, and so, have not had the opportunity of discussing the matter with them and therefore cannot give a more general point of view.

However, I do not believe that it is necessary for me to discuss this subject, for everyone will agree with me that there is really no reason at all why women should not go in for soaring as well as men.

And after having said that, I find that I have not much more to say, because women's success in other sports speaks for me.

Most people know by this time that ladies do a great many things as well as men, and, in the sphere of flying only, the names of Lady Bailey, Miss Spooner, Miss Amy Johnson, Miss Winifred Brown, and the Hon. Mrs. Victor Bruce prove this.

I do not think that in the realm of soaring they will stay far behind.

I feel that as soon as a proper gliding and soaring school is established in England, it will be crowded with girls—who, after all, often have more time at their disposal than men.

Mlle. Susi Lippens.

LOOKING AHEAD.

Gliding is a very healthy kind of sport, and gives one quite a lot of exercise, as all people who have pushed or pulled a glider up a hill will tell you. . . and although I do not think that it will be included in the prospectus of one of the bigger girls' schools for 1931, I should not be surprised if we read quite as a matter of course in a few years' time:

"Highcliffe School . . Ideal school for girls. Sewing, gliding, cookery and hockey included."

Nor shall we be surprised when we see busy city workers gliding down to their work from Hampstead Heath, inhaling thus a little invigorating fresh air on the way. They would alight on one of the big aerodromes that at the moment do not exist, but which it is proposed to erect over the stations of London.

Nothing will surprise us.

Even when we hear of such surprising things as Herr Kronfeld reaching the altitude of 9,000ft. in his sailplane, we are not taken aback, but discuss it

Miss Katrine Alexander, an enthusiastic "A" pilot of N. Cotswold Club.

quite calmly and even believe and hope that some day we will do as well if not better. . . .

That would have sounded preposterous a few years ago.

The great thing is never to lag behind but to move forward always. And in this respect women will always be ready, I am sure, to help and further the fascinating and interesting science of soaring.

TALK GLIDING AND WRITE GLIDING.

Mr. C. F. Carr gives this advice to all who want to help the gliding movement. He is joint author of "Gliding and Motorless Flight."

ALTHOUGH gliding is an all-the-year-round sport (providing, of course, that the periods of air activity in the winter are discreetly chosen), the British gliding movement has not yet succeeded in making this fact generally known. This is not the fault of the movement, which is still sufficiently young to have much spade work before it.

So far as gliding in this country is concerned, it may be said that so far it has only had one season in which to accomplish anything. It would be unfair to expect that in only a few months much progress would be made in educating the general public in a gliding sense.

As a matter of fact, excellent progress has been made in this direction in the short time which has passed in which gliding has been brought prominently to the notice of the public generally. Already the public is beginning to realise what gliding is, and just what possibilities it holds for the future, both as a sport and as a means for the spreading of air-mindedness.

At the same time, it is only too obvious that there are still many misconceptions concerning gliding and sail-planing. Only a few days ago, for instance, the writer casually showed an excellent photograph of a sailplane in flight to a male friend who takes a great interest in most other sports. He evinced great surprise when he saw the photograph, and explained that he had always been under the impression that a sailplane was a thing which looked like a boat and which had sails. He had apparently thought that the curious contrivance of his imagination sailed through the air in some obscure way like the small smacks which we occasionally see bringing fish into harbour.

There is probably some sort of excuse for little misconceptions of this kind, which may be rather amusing to the initiated. but are really understandable when so many people have had no opportunity of seeing a glider or a sailplane at close quarters.

LOSE THIS PREJUDICE.

This preamble is intended to lead up to the point that one of the important considerations for the immediate future in the gliding world is the question of gliding propaganda and publicity. Both "propaganda" and "publicity" are words against which many people have some sort of prejudice. They do not know quite why it is, but the reason probably is that they associate both words with the activities of people who spend their time trying to get them to buy things they do not want, or to join movements in which they have not the slightest interest. It may be said, however, that both propaganda and publicity have an important part in modern life, whether in the commercial, industrial, social service or purely social spheres. It is not too much to say that no movement can really succeed without a well organised and a persistent publicity department.

As far as gliding is concerned, it is not a matter of thrusting upon the public, for ulterior motives, something which they do not want. It is plainly evident that a very large section of the public is keenly interested in gliding, and there is no doubt that this proportion will be even larger when more publicity is given to the sport.

This is a matter in which every club official, and, for the matter of that, every club member, should have a special interest. The first concern, of course, is to make one's own club as strong as possible. There is little doubt that the most effective method of building up a club is to get as large a nucleus as possible of people who are actively interested in gliding, but are keen not only to get into the air, but also to take a fair share of ground work, including the launching and recovery of gliders, and constructional and repair work.

Mr. C. F. Carr.

These are the members who are the most valuable to a club, and unless they are fairly numerous then it follows that nearly all the hard work will fall on the shoulders of a few. But it must not be thought that these are the only people about whom a club should worry. Each club should be the centre for spreading the "gospel" of gliding. Each member should seize every opportunity which presents itself of interesting "outsiders" in the new sport. Most people have a habit of talking about new experiences, and if you succeed in interesting one person by getting him to go to the "meet" of a gliding club, you can be assured that he will talk about gliding for a good many weeks afterwards. All this is good publicity, which helps not only an individual club but the movement generally.

THE HELPFUL PRESS.

Another important point to which clubs should be careful to give attention is press publicity, which is of the greatest possible value because it reaches so many people. Every club secretary should take care to see that his club's activities are regularly recorded in the local newspapers. It is, indeed, a very good plan for a club to appoint a press secretary especially for this duty. New clubs especially should be careful to keep in touch with their local newspapers, and should invite the editor of each paper to send a representative to their inaugural gliding meetings.

It is important, too, in this connection to see that the press representatives are given a careful and accurate explanation of what gliding is, and they should be given every facility for obtaining any details of which they are in need. Any club member who has a facile pen can render useful service by offering a series of brief articles on gliding to a local newspaper.

There are one or two outstanding points which should always be emphasised in publicity matter concerning gliding, whether it be for publication or whether it simply forms the basis of a conversational explanation. They are :—

1.—Gliding is a sport with a thrill in it.
2.—Gliding is remarkably safe.

3.—Gliding tends to develop sterling traits of character and invaluable human qualities. It is an unselfish sport, because the work has to be shared; and it helps to develop individuality, the faculty of quick decision and self-reliance.

4.—Gliding is a fascinating and comparatively safe introduction to ordinary flying in a powered machine.

5.—Gliding has a stimulating competitive aspect, and Great Britain should be in the forefront as in other sports.

6.—The design and construction of gliders in club workshops give welcome opportunities to young people who are interested in handicrafts and who like to make things for themselves.

Get these points well home whenever you have an opportunity of talking or writing about gliding, and you will be doing quite a lot to give the new sport an abiding national popularity.

WHAT IS A GLIDER?

Newcomers to the gliding movement are advised to read this "schoolboy" explanation of the nature of engineless aircraft.

A GLIDER is an engineless aircraft. How does it work? Well, think of a kite which is maintained in the air by the wind acting on its sloping surface, which is kept at its right angle by a cord attached at the correct point and anchored on a small boy on the ground. A glider is a kite, but the pull of the cord is replaced by the weight of a man placed at just the right position, but who can vary the angle of the wing relative to his position and so make his weight more effective or less effective, just as the boy pulls the string and so can sometimes increase the height of his kite.

A primary glider is a machine of simple form for teaching beginners. The pupil sits on an open seat to which he is strapped. Then the centre of a 100 foot length of elastic cord is attached to the nose of the machine in such a way that it will fall off when the machine takes the air. Men on each end of the rope pull until the elastic is stretched to about twice its original length, whilst the machine is held back by other men or by an anchoring device with a quick release.

At the correct moment the pilot shouts "Let go," and the men holding back leave go (or the quick release is "tripped,") and the stored up energy of the elastic cord which the pulling team continue to pull, then causes the machine to slide forward, gathering speed so that when faced into a wind of five to 15 miles per hour the machine will, if the controls are correctly held, become air-borne.

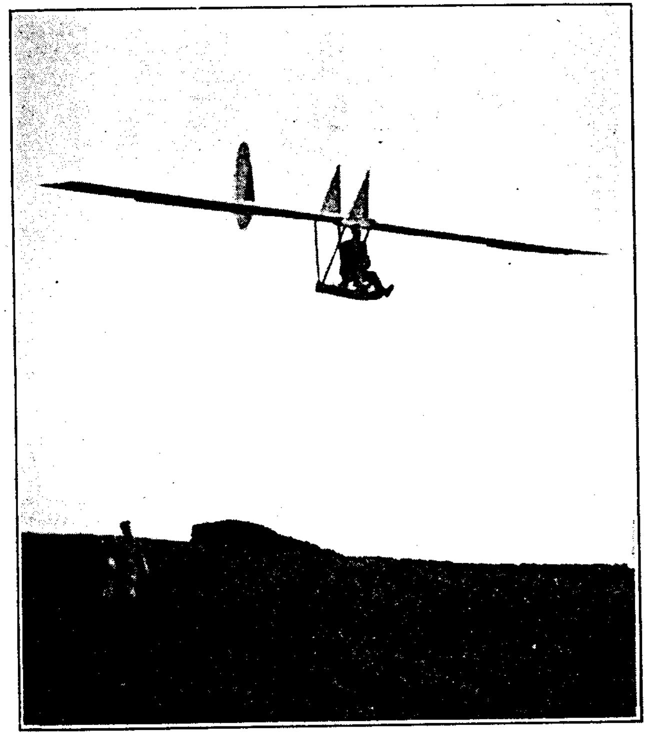
The primary type is robust and simple, and has therefore a wing of oblong form, with a span from tip to tip of only 30 feet or so. The centre section is a large skid with a seat and control mounted in front and carrying the tail on struts behind. The gliding angle of this type is about one in eight.

SECONDARY TYPE.

Secondary training is carried out on an intermediate type machine, where the pilot is seated inside a faired body which reduces the resistance to motion through the air. This type of machine has other improvements, all of which are to make it cleaner in form and so make it travel through the air more easily. It can therefore be held more nearly level and will descend in still air at a gliding angle of 1 in 12 to 1 in 18.

THE SAILPLANE.

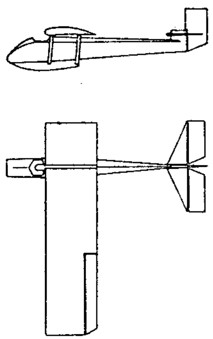
The third type of machine is called a sailplane and is a much more efficient type. Not only is the body very carefully designed for true streamline shape but also the wings are of greater span, usually from 50 to 60 feet from tip to tip. The chord, or front-to-back width of the plane is often tapered from say five to six feet at the centre to two or three feet at the tip. The careful fairing of all parts of a sailplane and the elimination of external

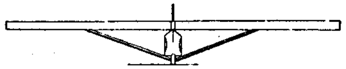


Primary Glider in Flight—*Photo, "The Sailplane."*

wires and struts wherever possible makes this machine so efficient that its gliding angle is often only one in 30, and with such a slow sinking speed it is obvious that if launched on the brow of a hill up which the wind is blowing the upward force will be sufficient to keep the machine in the air, just as the gulls can be seen to soar.

On the following pages appear specifications and drawings of important designs of the three classes of machines.

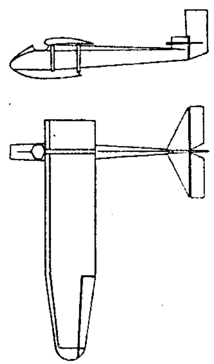


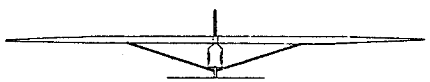


BAC. III.

SPAN	33'-9"
CHORD	5'-0"
WING AREA	169 SQ FT
WEIGHT	180 LBS
GLIDING ANGLE	1 : 14
WING SECTION	GOTTINGEN 532
LENGTH	19'-10"

CONSTRUCTED BY.
BRITISH AIRCRAFT CO.
MAIDSTONE
KENT

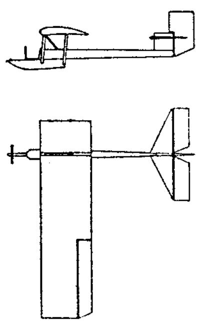


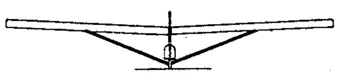


BAC IV.

SPAN	40'-9"
ASPECT RATIO	9 : 1
WING AREA	204 SQ FT
WEIGHT	200 LBS.
GLIDING ANGLE	1 in 18
WING SECTION	GOTTINGEN 532 (MODIF.)
LENGTH	19'-10"

CONSTRUCTED BY:
BRITISH AIRCRAFT CO.
MAIDSTONE
KENT

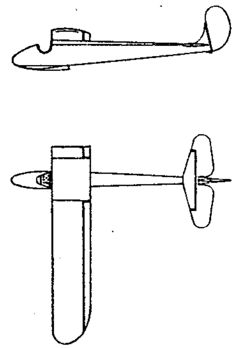


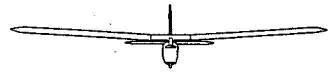


BAC II.

SPAN	33'-9"
CHORD	5'-0
WING AREA	169 SQ.FT.
WEIGHT	161 LBS
GLIDING ANGLE	1 in 11
WING SECTION	GOTTINGEN 532
LENGTH	17'-8"

CONSTRUCTED BY:
BRITISH AIRCRAFT CO.
MAIDSTONE
KENT

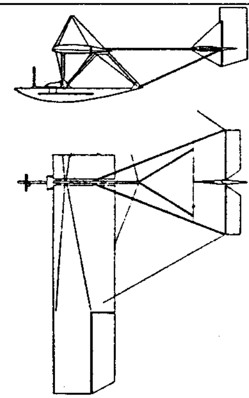


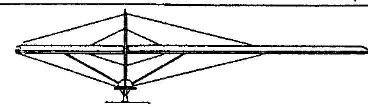


R·F·D SAILPLANE

SPAN	48'-0"	WING AREA	210 SQ.FT.
LENGTH	26'-3"	WEIGHT EMPTY	260 LBS.
CHORD	4'-6"	GLIDING ANGLE	17 : 1
HEIGHT	5'-6"	SINKING SPEED	3 FT./SEC.
ASPECT RATIO	10.2/3-1	FORWARD "	35 FT/SEC

CONSTRUCTED BY:
R.F.D. CO.
17 STOKE ROAD
GUILDFORD
SURREY

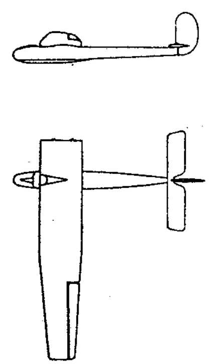




DAGLING

SPAN	33'-0"
LENGTH	17'-10"
CHORD	4'-11"
HEIGHT	6'-8"
WING AREA	160 SQ.FT.
GLIDING ANGLE	12 : 1

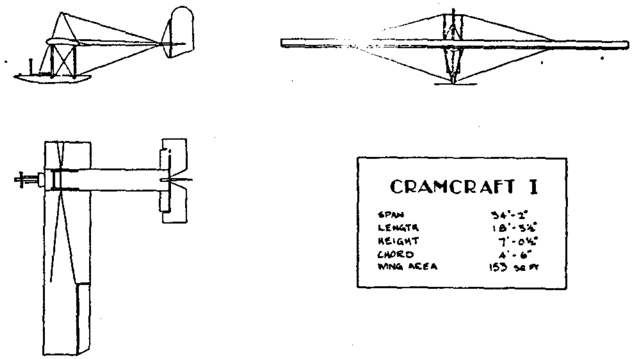
CONSTRUCTED BY:
R.F.D. CO.
17 STOKE RD.
GUILDFORD
SURREY



ALBATROSS

SPAN	42'-0"
LENGTH	20'-8"
MAX. CHORD	5'-0"
HEIGHT	4'-0"
WING AREA	200 SQ.FT.

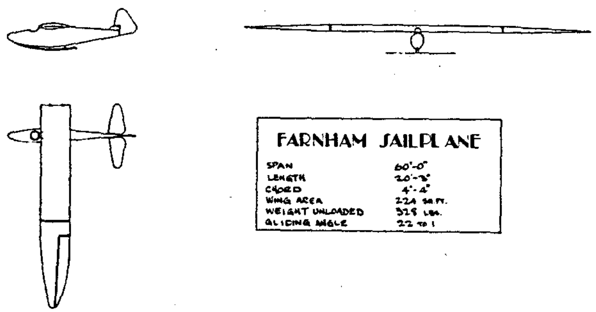
CONSTRUCTED BY:
R.F.D. CO.
17 STOKE RD.
GUILDFORD
SURREY



CRAMCRAFT I

SPAN	34'-2"
LENGTH	18'-5½"
HEIGHT	7'-0½"
CHORD	4'-6"
WING AREA	153 SQ FT

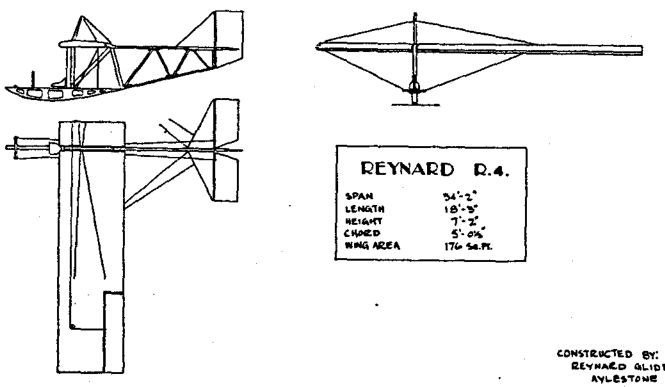
CONSTRUCTED BY.
CRAMLINGTON AIRCRAFT LTD
CRAMLINGTON AERODROME
NORTHUMBERLAND



FARNHAM SAILPLANE

SPAN	60'-0"
LENGTH	20'-3"
CHORD	4'-4"
WING AREA	224 SQ.FT.
WEIGHT UNLOADED	329 LBS.
GLIDING ANGLE	22 TO 1

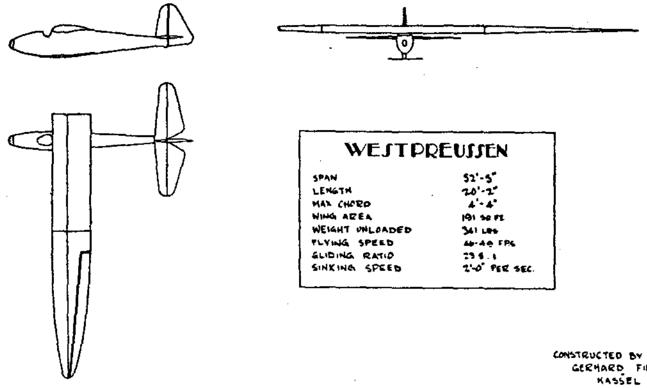
CONSTRUCTED BY.
MR. E.D. ABBOTT
FARNHAM
SURREY



REYNARD R.4.

SPAN	34'-2"
LENGTH	18'-3"
HEIGHT	7'-2"
CHORD	5'-0½"
WING AREA	176 SQ.FT.

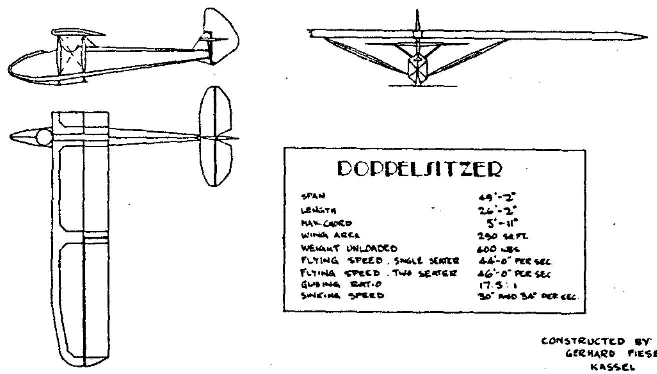
CONSTRUCTED BY:
REYNARD GLIDERS
AYLESTONE
LEICESTER.



WESTPREUSSEN

SPAN	52'-5"
LENGTH	20'-2"
MAX CHORD	4'-4"
WING AREA	191 SQ FT
WEIGHT UNLOADED	341 LBS
FLYING SPEED	46-49 FPS
GLIDING RATIO	23.5 : 1
SINKING SPEED	2'-0" PER SEC.

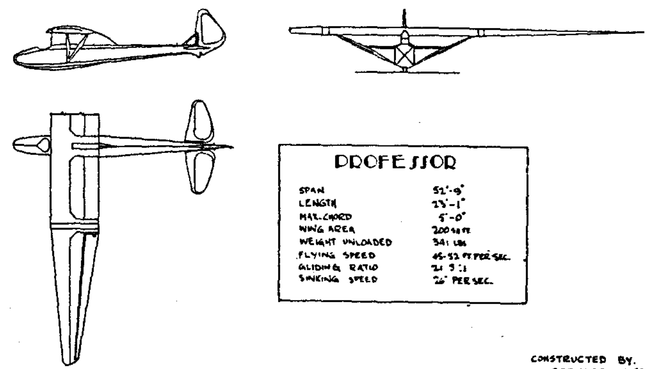
CONSTRUCTED BY
GERHARD FIESELER
KASSEL
GERMANY



DOPPELSITZER

SPAN	49'-2"
LENGTH	26'-2"
MAX CHORD	5'-11"
WING AREA	290 SQ.FT.
WEIGHT UNLOADED	600 LBS
FLYING SPEED. SINGLE SEATER	44'-0" PER SEC
FLYING SPEED. TWO SEATER	46'-0" PER SEC
GLIDING RATIO	17.5 : 1
SINKING SPEED	30" AND 34" PER SEC.

CONSTRUCTED BY
GERHARD FIESELER
KASSEL
GERMANY

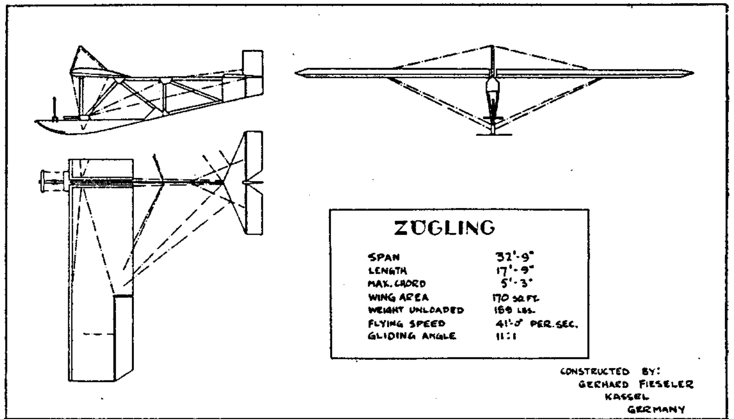


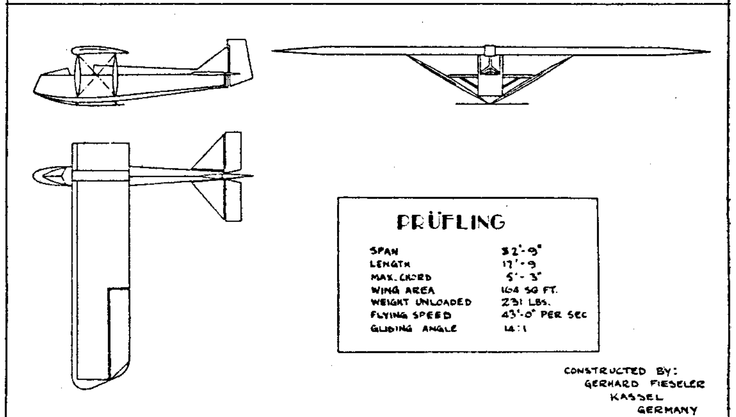
PROFESSOR

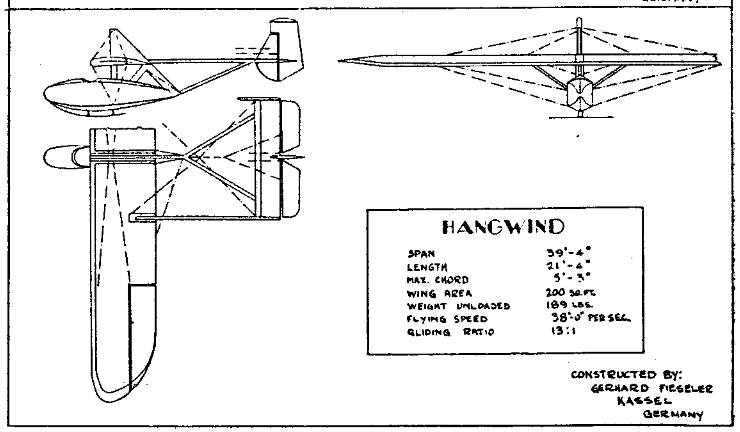
SPAN	52'-9"
LENGTH	23'-1"
MAX. CHORD	5'-0"
WING AREA	200 SQ FT
WEIGHT UNLOADED	341 LBS
FLYING SPEED	45-52 FT PER SEC.
GLIDING RATIO	21.5 : 1
SINKING SPEED	26" PER SEC.

CONSTRUCTED BY.
GERHARD FIESELER
KASSEL
GERMANY

E







CONSTRUCTIONAL WORK.

WHAT CLUBS CAN AND CANNOT DO.

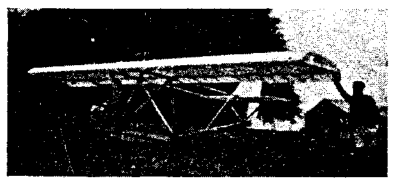
Mr. J. H. Payne, Captain of the Imperial College Gliding Club, is well qualified to write on this subject, for his club is among the few in Britain which have successfully constructed their own machine. Every "tip" he gives is of importance.

AMONG those who join a club for the sport of gliding, there are generally some who, overflowing with mechanical ability, have a natural desire to build their own glider. Constructional work is extremely interesting in itself, and is amply rewarded by the feeling of real ownership which attaches to a home-built machine, changing to justifiable pride when (or if) the glider finally flies. A considerable number of the most successful German sailplanes have been produced by clubs and schools. To mention only one example, a very successful series of sailplanes, including the "Vampyr," "Greif" (1921-22), and "Pelikan" (1924) were designed by students of the Hanover Technical High School.

For sailplane construction a club has this advantage over the business firm, that the methods of construction employed are less dependent on the cost of manufacture, and in particular the cost of labour need not be considered. To offset this must be reckoned the very serious disadvantage that an ordinary club has rarely the use of machinery and tools, or the experience, necessary for this highly specialised work. By careful design the need of special tools can be overcome, but experience can only come with practice. The building of advanced sailplanes therefore, whilst it should be the ultimate aim of a constructional group, must at first remain a goal towards which to strive by less spectacular, but none the less exacting, constructional efforts.

THE EXPENSE FACTOR.

At this point a word about the cost of building a glider may not be out of place. Granted that a large percentage of the price of a bought machine (£35 for a primary machine in Germany, but £55 for a similar British machine) consists of the cost of labour, and manufacturer's profit—for neither of which the club has to pay when constructing its own machine—nevertheless, I should not advise a club to construct its own glider if the saving in cost were the only consideraiton. When one has taken into account that the material is probably going to cost a club perhaps fifty per cent more than the manufacturer pays owing to the smaller quantity ordered; and when one has also considered the cost of experience, in the form of mistakes and bad workmanship (of which more anon), the cost of a club-built machine will not be very much less than that of a similar bought machine—and may even work out to be more. The construc-



Primary machine built by Imperial College Club.

tion of a complete machine should not be undertaken unless there is a sufficient number of members, say ten at least, enthusiastic about doing the thing for the pleasure of it and for the experience.

A comparatively new club, in which most of the members are still striving for their "A" certificates, cannot do better than start with the common or garden "Zogling." When they have finished this, they can use the experience they have gained to build the more difficult intermediate type of glider. By the time they have finished building this, they will have reached a stage of flying experience which will enable them to fly it. In this way constructional work will keep pace with the flying, and the machines built will be of real use to the club. Also, what is just as important, the constructors will gradually accumulate that experience, and acquire that skill which is absolutely necessary for sailplane construction.

Ribs are threaded on to spars and secured with glue and screws.

There are many practical advantages in starting with the primary type of glider. It is the cheapest to construct. Working drawings are easily and cheaply obtainable (from the British Gliding Association, and elsewhere) so that the work can begin right away. The glider will not take a great while to build; six men working 20 hours a week should finish it in eight or ten weeks at the most. Last, but not least, when the machine is finished the constructors will have the pleasure of flying it.—and if they have "botched" the work, their sins will descend on their own heads, and not on the head of some unfortunate "C" pilot borrowed to "try it out." Whilst it is quite easy to terminate one's existence with a badly constructed sailplane, a primary training glider is comparatively harmless.

GOOD WORKSHOP ESSENTIAL.

Before starting construction of a glider, it is essential to have a good workshop. It should be well lighted, and particularly *it must be perfectly dry*. It is advisable that it should have an adequate sized entrance, so that it is not necessary to pull down the building to get the glider out.

Another, and not less important, requirement is to have someone capable of taking charge of the construction. It is not necessary that he should have had previous experience of aircraft work, but a good general knowledge of wood and metal working is essential. As he will be responsible for the airworthiness of the finished glider, he must be able to spare the time so that is he always present when construction is going on. In the absence of rigid Air Ministry inspection (as in the case of engined aircraft), the onus on the man in charge is very great. In amateur work, frequent mistakes and a good deal of waste are inevitable, and there is often a great inclination to let through a doubtful job, especially if it represents many hours' work. This inclination must be checked every time, though it may mean putting back the work by a whole week, or more. Every job must be correct to the designs, and a good sound piece of work.

Club members helping in the construction must feel the responsibility of giving of their very best. Any attempt to cover up a mistake would indicate an entirely wrong spirit. A man who bends a metal fitting in the wrong

direction, and, finding his mistake, surreptitiously bends it the other way, should be cast out from the workshop amid howls of indignation.

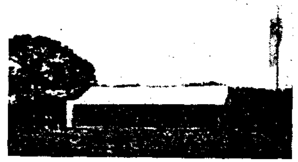
Nothing tends to lower the quality of work more than rushing. It should never be said "we must get her finished by such-and-such a date." Difficulties and set-backs are bound to crop up, and for several weeks the work ahead will appear enormous in comparison with what has already been done. Don't worry, and don't keep thinking ahead. Take an interest in the job in hand, and do it as well as you possibly can, without hurrying, and in a remarkably short space of time the glider will begin to sit up and take nourishment.

ALWAYS USE THE BEST.

Materials used should be the best obtainable. When making a machine to an approved design, the materials for each part are specified. But in any case, it pays in the end to get the best.

Most of the tools required for the work will be found in an ordinary set of carpenters' tools. There should be at least one set to three constructors. Other tools can be bought as required. Great care should be taken of the club's tools. The use of a chisel for removing nails should be viewed with disfavour, as also should planing off the heads of panel-pins.

Covering the wings of a primary glider presents little difficulty, but a sewing machine (lockstitch of course) is a great help for sewing the strips of fabric together. It makes a strong and neat job, and reduces the time to about a quarter. Any hand sewing that is required can be done by the ladies, if there are any in the club. If not, it should be quite easy to find a married man who knows how to use a needle.



Bedford Club constructed their own hangar.

Doping requires great care, especially if undertaken during the winter months, and generally it will be found better to arrange for the doping to be done by an aircraft firm, if one exists in the district, with a proper doping shop.

Though only a few clubs may undertake the construction of a complete machine, most clubs do some construction, such as repairing their own minor crashes. The remarks above are generally applicable to all such work. A dry shed on the gliding ground, and a strong box fitted with proper racks for the tools, should be obtained by the club at the outset. Some capable person should be made definitely responsible for all repairs.

WINTER THE TIME.

Winter is the time to make spare parts for your gliders. A pair of new wings, made in the dark evenings, may prevent the waste of many precious flying hours during the following year. A further outlet for mechanical ingenuity lies in the "cleaning -up" of the club's present machine. A new coat of dope and varnish, and the addition of a streamlined fairing behind the pilot will make a remarkable improvement in the performance of the aircraft, and may prove a telling factor in competition work.

AIRWORTHINESS AND HOW TO ENSURE IT.

Attention is drawn to the vital need for the airworthiness of gliders, and thorough, practical means for ensuring it are given in this article by Mr. V. S. Gaunt, A.M.I.Ae.E., chairman of technical sub-committee and hon. ground engineer to Dorset Gliding Club. Mr. Gaunt is a licensed Air Ministry Ground Engineer in categories A, B, & C, and is hon. secretary of Westland Aircraft Society (Yeovil branch Royal Aeronautical Society).

WHAT is airworthiness ? Those who have to deal with the maintenance and construction of power-driven aircraft may know the answer but those who have first come into touch with matters aeronautical through the medium of gliding will perhaps desire to know more of the why and the wherefore.

Mr. V. S. Gaunt.

In 1919 there was convened a gathering of representatives of various nations with the object of introducing regulations governing the design, construction, operation and maintenance of aircraft. As a result commercial aviation (in its broadest sense) has progressed on a sound basis. Generally speaking, the designs of aircraft approved as airworthy in one country will, with but slight, if any, modification, be given official approval in another country. Much research and study has enabled factors of safety to be specified which will ensure that the aircraft designed thereto will be safe to fly *IF* and only if, those aircraft are maintained in condition.

What we must understand by " condition " is that in all essential structural requirements the factors of safety laid down have been maintained. For power driven aircraft the Air Ministry have issued very detailed regulations (see Air Ministry Publication No. 1208) which should be in the hands of every engineer who is concerned with the maintenance of gliders.

REGULATIONS TO FOLLOW.

The maintenance of aircraft used for hire or reward is in the hands of certified ground engineers whose experience and knowledge has been proved by oral examination by Air Ministry officials. Before the first flight of the day the ground engineer in charge has to issue a certificate to say that he has examined the aircraft and found it airworthy. Apart from the " clearance for flight " a ground engineer must see that the log books are entered up-to-date with details of all adjustments, repairs and alterations.

These, then, are the lines on which glider maintenance should be based. Every club should appoint one or more ground engineers, preferably those holding Air Ministry licences. Regulations for power-driven aircraft should be our guide in so far as they are applicable and bearing in mind the reasonable interpretation which an engineer of experience should exercise in their use.

A log book should be kept for every glider, and suitable column headings are as follows :—

Entry No.	Date	Rigged by	Team Capt.	Flown by	Remarks	Wind		Place	Yds.	Time.		
						Force	Dir.			Hrs.	min.	sec.

Before the first flight of the day the ground engineer should sign in the third column that the machine is O.K. After a heavy landing or other abnormal treatment the machine should again be examined and certified.

In the sixth column the pilot making the first test flight of the day (presumably the team captain) must certify that the machine is O.K. from the flying point of view. Similarly, after any but the simplest of adjustments or repairs there should be a test flight. Only by observing such elementary precautions can we ensure for the members of our movement that degree of safety which will promote the gradual development of the sport without Air Ministry restrictions. The British Gliding Association has been formed to organise the movement so that, whilst exercising the necessary control, it does not interfere with reasonable development, and it is up to every member of a gliding club to comply with the B.G.A. requirements as far as possible. Otherwise there is a danger of unsafe gliders being used and if serious accidents ensue the Air Ministry will be compelled by public opinion to issue regulations which, however carefully devised, will prove irksome.

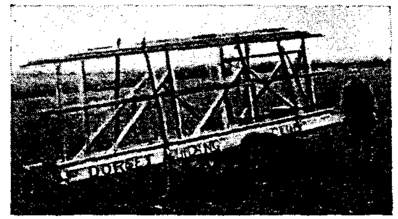


Fig. 1—A trailer unloaded.

In addition to the log book entries referred to, clubs are recommended to keep a members' record book which might be in the following form, one or more pages being allotted to each member in order of membership number :—

Entry No.	Date	Duration			Place	Remarks
		hrs.	min.	secs.		

PRACTICAL MAINTENANCE.

Turning now from paper-work to the practical routine of maintenance the following notes may be of service. They are based on my experience of the R.F.D. type of glider as used by Dorset Gliding Club.

TRANSPORT.

Having ordered your glider you must consider what is the cheapest way of taking delivery, and bearing in mind the probable need for moving the machine from site to site (and possibly back to the workshops for repair) the best solution is to build or obtain a suitable trailer. This matter may at first sight be considered beyond the scope of this article but, as the incorrect ground handling of machines may easily render them unairworthy, it is felt that a brief reference to a suitable trailer may be of some value to new clubs. A suitable trailer (Figs. 1 & 2), comprises a " Ford " back axle and wheels mounted with suitable stays to a draw bar, comprising telescopic tubing which allows one section to over-ride the other when the trailer is moving down hill or otherwise tending to move faster than its tractor and in so doing applies the brakes to the trailer wheels. The superstructure is of rough deal members suitably braced and comprises essentially two sides troughs in which the main planes rest on their leading edges in canvas slings, whilst padded uprights opposite two ribs in each plane have their complement in two clamp bars dowelled to the trough longitudinal below and bolted to the top framework above. Similarly, felt lined supports serve for the support and location of tail unit (less rudder), centre section (skid), tail outrigger tubes and the rudder. The illustrations will make clear the general layout, from which an intelligent carpenter, millwright or handy man can produce a suitable trailer.

IDEALS TO AIM AT.

Ideals to aim at are to secure adequate support and location for all components at their strong points, which should be protected from chafing by means of felt, rubber or sacking. Clamps should be easily removed and refitted so that loading and unloading can be quickly carried out. A number plate board with celluloid facing and provided with a tail lamp will enable cards bearing the appropriate car no. to be easily fitted, as it is hardly to be expected that one car will always do the towing. The tail light should be wired up to plug in to the rear lamp socket of the car, and sufficient slack cable must naturally be left to permit of full-lock steering. A tool-box can conveniently be mounted on the trailer for general use.

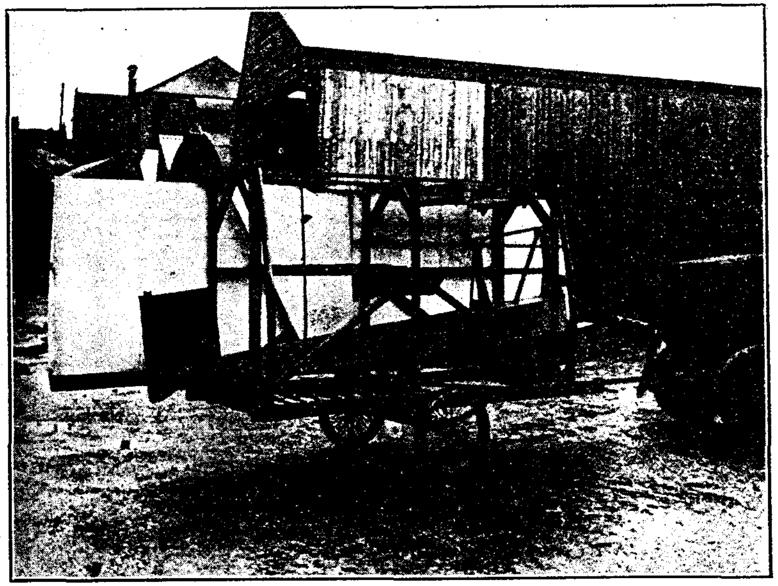


Fig. 2—A trailer partly loaded with a B.A.C. primary glider.

LOADING.

The above notes and illustrations will make clear this operation, bearing in mind that the order of loading is :— 1, centre section skid ; 2, outrigger tubes ; 3, tail unit ; 4, rudder ; 5, main planes.

UNLOADING.

This operation will naturally be carried out in the reverse order given for loading. Novices should be warned to handle the planes by the spars at root and tip, and never to touch the trailing edges. Ailerons can be conveniently kept from straining their hinges by a simple clamp (fig 3), which can be made from the solid, or two pieces of 3-ply joined by a bolt. The clamp is slipped

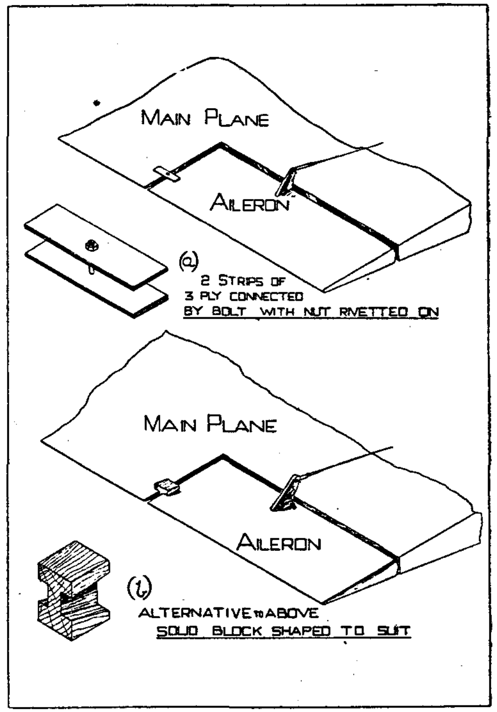


Fig. 3—Aileron clamps.

in the gap between main plane and aileron end ribs and so aligns these until controls are coupled up. Planes can safely be laid flat on the ground providing someone is told off to see that spectators, dogs, etc., do not stumble over them. If the weather is gusty these light components must be held until erected.

ERECTION.

Erection procedure is as follows :—

(*a*). Place centre section skid at a suitable, preferably sheltered and level, point.

(*b*). Attach main planes by their root joint pins, letting tips either rest on ground or be supported by a helper.

(*c*). Attach landing wires to both planes. These wires should always remain on centre section and after first accurate rigging can be set to " dead length " and uncoupled by removing lower end pins, so leaving turnbuckles locked. The weight of each plane should be taken care of until both sets of wires are attached, to avoid straining the king post.

(*d*). Attach flying wires on both sides loosely before tightening any. Then proceed to tighten the front wire on each side, then the rear wire on each side finally the diagonal wires in turn, thus maintaining even bracing, otherwise the centre section may be strained out of its correct vertical alignment.

(*e*). Attach tail plane outrigger struts to skid with a member holding each until the tail unit is affixed and bracing wires (" X " in Fig. 4). are attached. This prevents undue strain on the welded, trapped ends of the tubes where they are bolted to the skid.

(*f*). Fit rudder and couple up all controls remembering :—

(1). Joy stick upright means ailerons should be level with main planes (sometimes both ailerons are rigged with, say, ½in. droop below main plane trailing edge to allow for air pressure bringing to neutral), and elevators in line with tail plane in side view.

(2). Pulling stick back should cause trailing edge of elevators to rise.

(3). Moving stick to right should cause right hand aileron trailing edge to rise.

(4). Rudder should be in line with fin with rudder bar true athwartships, and on pushing right foot the trailing edge should move to right.

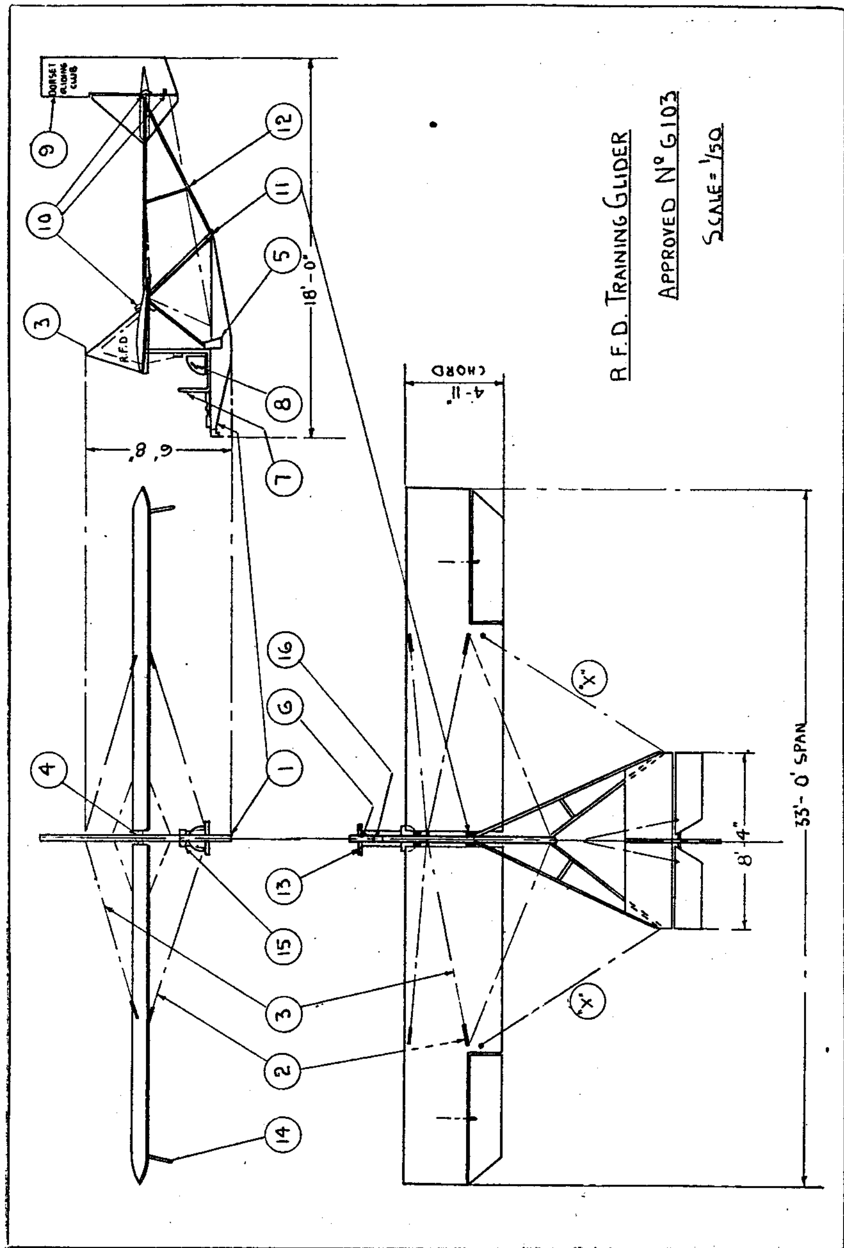


Fig. 4—Dorset Club R.F.D. Machine modifications.

(*g*). Lock main attachment bolts and strainers after checking alignment of tail with main planes by eye. (This assumes that the glider has been previously rigged and checked by measurement).

(*h*). Finally, look round to see that all bolts, nuts, and pins are in place and again check control movements before signing the machine as airworthy—Remember that a man's life depends on your careful attention to these points.

DISMANTLING.

This will naturally proceed in reverse order to " erection," and as each pin is removed it is best to replace it in one of the members dismantled and lock it there by wire or safety pin. Similarly, where strainers are uncoupled the barrel portion should be screwed well on to one male end and wired there. Wires should be neatly coiled and taped to some convenient portion of the centre section.

The leaving of the landing wires " dead length " has been already mentioned. Another time saving method is by leaving one of the tail unit bracing wires (" X " in Fig. 4), locked dead length and uncoupling the strainer of the opposite wire. All strainers should be painted whilst the machine is rigged so that the paint marks serve as a guide in subsequent re-assembly.

INTERESTING MODIFICATIONS.

GENERAL IMPROVEMENTS.—The R.F.D. glider of Dorset Gliding Club has been modified in several minor respects which it may be of interest to enumerate. References are to Fig. 4.

1.—The R.F.D. skid shoe plate was worn out in one day on the rough ground from which we first operated. We re-shod the ash-sole with a stainless steel channel 3-½in. by ½in. by 6ft., secured by screws through lugs welded on at about 2ft. intervals. This shoe is still in use, after over 450 landings (December 1930).

2.—Where diagonal and rear flying wires converge a 2 B.A. bolt replaces the A.G.S. pin.

3.—Landing wires were changed from high tensile steel to 15 cwt. cables, and a new top anchorage fitting made with a ½in. thick block of rubber interposed between the fitting and the cabane king post. This fitting has elongated bolt holes to allow the rubber to absorb the landing shocks.

4.—Main plane joint bolts replaced by pins in stainless steel and with a tapered end to facilitate entry. Safety pins replace split pins wherever possible.

5.—The joint between skid and upright strut was too weak in the early machines so we made and fitted a dural, flanged flitch plate on each side and fastened with through bolts.

6.—The rudder bar pivot fitting was replaced by a slightly stronger plate with edges turned over sides of skid, and using longer fixing screws.

7.—Joy stick reduced in length.

8.—A handle was fitted to left-hand side of seat pan to induce " ab initios " to use right hand only on joy stick.

9.—A larger rudder designed to our requirements and built for us by the R.F.D.Co. was fitted and proved far more effective than that originally fitted.

10.—Control levers of all moving surfaces attached more securely to spar and adjacent rib by fillets and screws.

11.—Forward ends of tail outriggers cut off, and new trapped end of stronger type fixed by 2—3/16in. diam by 20G. tubular steel rivets.

12.—To restrain bowing tendency in tail outriggers (due to ground handling we fitted dural spacer tubes as shown, the ends being secured by clips clamped around but not pinned or bolted to outriggers.

13.—A stronger ash rudder bar made and fitted.

14.—Stronger wing tip skids and sockets fitted.

15.—A stronger safety belt fitted after the first type broke in a crash.

16.—A guard was fitted to prevent the elevator cable "jumping" the pulley just forward of joy-stick.

All the above improvements were carried out to the requirements of the Club's technical sub-committee comprising :—Captain G. T. R. Hill, M.C., F.R.Ae.S., Mr. F. J. Wingfield Digby, A.F.R.Ae.S., Mr. H. J. Penrose, A.F.R.Ae.S., and myself. Clubs are recommended to appoint a committee to deal with technical points and to whom the ground engineer should be responsible.

Clubs using, or contemplating using the R.F.D. glider, need not look upon the above minor improvements as in any way essential, with the exception of items 2 and 5, both of which have already been attended to by the R.F.D. Co. in all their later machines.

The fact that this particular machine has withstood over 450 launches without any serious trouble shows that the glider is of robust construction. The further fact that Dorset Gliding Club has been able to train, and obtain a considerable number of members up to the "A" certificate stage on this machine. and that one member has already obtained his "B" certificate indicates that the design is aerodynamically sound.

Clubs will do well to place any of their troubles before Mr. R. F. Dagnall, who has shown himself to be always willing to consider suggestions."

GENERAL PRECAUTIONS.

(*a*). Always see that strainers or turnbuckles are adjusted so that the barrel screws equally on the two ends and covers the threaded portion, then lock with wire.

(*b*). Always check the rigging of a new glider by reference to the maker's rigging diagram or instructions. This should be done initially in a shed with a reasonably level floor from which dimensions can be taken to centres of leading and trailing edges at equidistant plumb lines. Usually there is no dihedral angle, *i.e.*, the port and starboard planes should be level and lineable. A taut thread from tip to tip along the leading edge will be useful to check this. For incidence check, *i.e.*, the angle of attack, which is the angle of a line joining the centres of radii of leading and trailing edges relative to horizontal flight line, the most convenient method, in the absence of a level floor, is to use "boning" strips. These are merely straight laths of wood which should be placed below both port and starboard planes on ribs at the root and at the point of attachment of lift wires or struts and at or near the wing tip.

These laths should be about 2 feet longer than the chord (*i.e.*, plan view width) of the plane and should be held in place by tape or string passing over the top of the wing and tied just tight enough to hold the laths tangential to the undersurface of the rib, leaving the 2ft. extension in front (see Fig. 5).

Dimensions a & b should be checked at each lath—All (a)s and all (b)s being equal; then, by sighting from wing tip, the incidence of each wing can be checked by sighting the laths and the wires adjusted accurately.

(*c*). Always check the tail unit setting by "boning" fin and rudder with centre section cabane or king post either by eye or plumb lines. Similarly the horizontal level can be checked by "boning" by eye the tail plane with the main plane as "horizon." Remember that the machine will tend to fly with tail level and any inaccuracy of rigging will tend to throw one wing low.

(*d*). Always check rigging after a crash. If the wing is twisted wrinkles in fabric will usually show. Cut open the fabric near compression members and you will probably find internal drag bracing wires have stretched or broken.

(*e*). Always use best quality (aircraft) materials for repairs. Silver spruce is usually used for ribs and spars, but clean grained ash, though heavier, could be used in many repairs. If a rib boom or bracing is broken it is not always necessary entirely to replace. A piece of spruce or ash of same section can be glued and lashed with glue-soaked twine or tape alongside the re-set member, extending at least 3in. to 4in. on each side of the break, and tapering as shown in Fig. 5.

(*f*). If a spar is split a repair can be made by two flitch plates of good quality 3-ply, each having a thickness of half that of the spar and extending three to four times the depth of spar, beyond either side of the extent of fracture. The ends should be cut with an "open bird-mouth" shape in order to avoid abrupt change of section, and the "plates" glued and screwed in place. Glued tape binding will give additional strength.

(*g*). To facilitate inspection of the inside of planes, rings of $\frac{1}{2}$ m/m thick celluloid can be obtained and doped to the fabric at suitable points. When required to open up, the inside of the ring is cut out, leaving a 4in to 5in. dia. opening—which is "framed" with celluloid, thus preserving fabric tension. After inspection a patch is merely doped over the opening and can be peeled off for subsequent inspections. This saves the time and trouble of sewing, and is worth while for a primary training machine which requires frequent examination.

(*h*). Never overtighten bolts and nuts. Never overtension wires. The landing wires will feel taut by reason of the weight of the wing. The flying

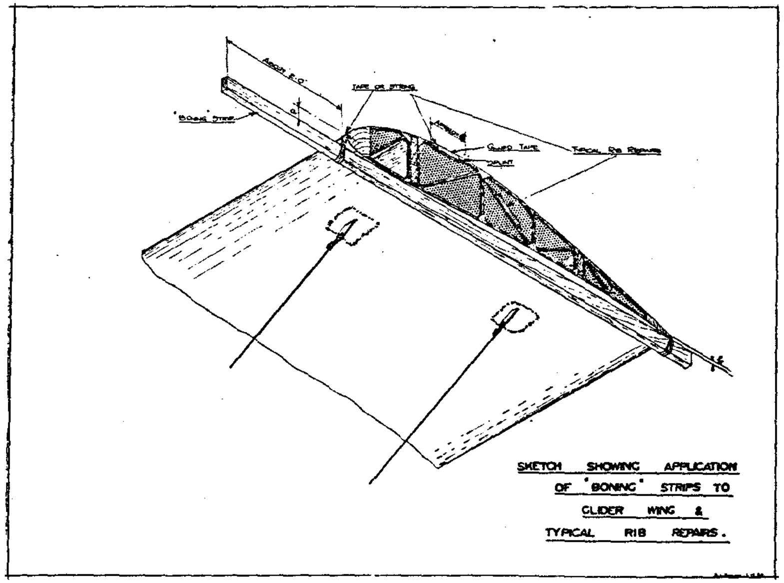


Fig. 5.

wires should be tensioned to "just straight," having practically no initial tension. Control wires also should merely take up the slack to avoid lost motion and not be tight enough to feel harsh or stiff.

(*i*). Frequently inspect splices to see that the serving is intact, as, if frayed or loose, the splice may be pulling. Examine cables, where they pass through fair leads or over pulleys, for signs of fraying, (usually discovered by pricked fingers) and replace when strands are broken.

(*j*). Never be persuaded to pass a machine as airworthy if you are not entirely satisfied. Disappointed members may be willing to "risk it," but better be safe than sorry.

(*k*). If the glider has to be left in the rain, drainage holes should be made in the lowest points of fabric surfaces. Small celluloid eyelets can be obtained for doping on.

(*l*). Small holes in fabric surfaces should be immediately repaired by doped-on patches. Large holes or tears above 2in. should be sewn before doping on patches, which should overlap sewing by 1in to 2in.

(*m*). Oil all moving parts and paint exposed metal fittings, tubes and wires, remembering that paint is heavy but rust is dangerous.

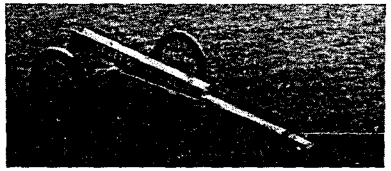


Fig. 6—A glider bogey.

(*n*). To save the machine from rough man-handling up-hill a suitable light bogey as illustrated in Figs. 6 and 7 is a useful item of ground equipment. It can be towed up by a rope passed around a pulley block anchored to a tree or to stakes, a car being used along the hill top where the surface permits. Failing this, members will find it easier to pull the rope-end down hill than to push the machine up.

(*o*). With a privately designed and built glider it will be advisable to submit the design for B.G.A. approval, for which a fee of £5 5s. is charged for first machine and £2 2s. for subsequent certificates of airworthiness. An authorised inspector will need to approve of the wings and other components before covering, and the completed machine will require to be weighed and have its centre of gravity checked. Unless clubs include aircraft designers and engineers amongst their members they would be well advised to buy their machines and reserve their constructional energies for repair work and the building of spare components to approved designs.

(*p*). Finally, all members should be encouraged to learn how to rig and maintain the club machines and not rely entirely on the ground engineer. Every member should be considered as a prospective private owner of a sailplane. Lectures should be held to teach the elements of aeronautics and to explain the practical points of aircraft maintenance more fully than I have been permitted to do in this short article. The B.G.A. or the Royal Aeronautical Society (which has branches in Leeds, Coventry, Bristol, Oxford, Manchester, Cambridge, Halton and Yeovil) will no doubt be willing to advise as to suitable lecturers, etc.

Fig. 7—A glider bogey loaded.

Additional improvements to Dorset Club's R.F.D. glider worthy of mention are :—

Fairing panels with hinged inspection flaps fitted to gap between root of main planes and skid pylon.

Fabric closing strips doped over top of rear spar, thence down aileron gaps and beneath aileron spars, so preventing air leakage, without interfering with hinging.

Main plane fabric formerly glued to ribs had come loose due to damp, so was strung thereto by kite cord at 6in. intervals in the orthodox power plane method.

MATERIALS USED IN GLIDER CONSTRUCTION.

FROM the point of view of diversity of materials used, the aeroplane with its equipment is as complicated as any other piece of mechanism or transport vehicle. The modern tendency is towards all-metal construction, but the composite construction of yesterday is more likely to hold its own in the construction of gliders and sailplanes, partly on account of the reduced cost when only a few machines are contemplated, partly because of the ease of construction and repair and lack of plant in glider workshops, but largely because for the light loadings and stresses met with in gliders it would be hard to obtain a greater economy of weight than is possible with timber of light scantlings as the main material.

The main materials used for glider construction, their purposes and where they may be met with are as follows :—

1. **SILVER SPRUCE.**—Spars, ribs, struts, bracings and skid framework, in fact anywhere where the part is to be as light yet strong as possible and where it is not liable to be unduly bent or subjected to wear.

2. **ENGLISH ASH.**—Packing blocks, wing tip skids, main skid shoes, wing tip bends or any other bent members and parts liable to wear and tear where a tough resilient timber is needed.

3. **AMERICAN ROCK ELM.**—Can be used in lieu of ash, but its main advantage is that it withstands moisture better and is therefore used largely in float and hull construction.

4. **PLYWOOD.**—For leading edge covering, webs of box spars, rib and other gusset plates, etc., etc.

5. **OREGON PINE.**—As a substitute for spruce where its use has been authorised by the designer.

6. **MAHOGANY.**—For straight members subjected to such wear and handling as would invalidate the use of the softer and lighter spruce, also for veneers, ply and planking for hulls or other monocoque construction.

7. **BALSA WOOD.**—A very light, pithy wood only used for packings, fairings and sometimes as the centre laminae of sheets of 3-ply.

8-14. **MILD STEEL.**—For metal fittings of all types, especially where a welded construction is indicated or for parts required to withstand much wear and tear. Also for stay tubes and struts, bolts and nuts, strainers and wood screws.

15-17. **STAINLESS STEEL.**—For replacing mild steel where the stainless characteristics justify the higher cost.

18-23. **HIGH TENSILE STEELS.**—For link plates, wiring plates, bolts, pins and shackles; fork ends, tie rods, streamline and other wires, and in tubular form for struts and axles. Some stainless steels are of much greater strength than mild steel and may therefore be used for most of the above purposes. Non-stainless H.T.S. often requires heat treatment.

24-26. **BRASS.**—For bearings, rubbing plates, turnbuckle barrels, woodscrews and thimbles of control cables.

27-29. **DURALUMIN.**—For metal fittings especially of flat plate or flanged, also angles and channels, etc. In bar form for spindles, pins, rivets, bolts (lightly stressed). In tube form for struts, etc. In general duralumin can be used for metal fittings where the parts do not require to be welded or bent nor are subjected to hard wear, as duralumin is softer and less tough although lighter than M.S., It should not be bent ot otherwise cold-worked without very careful heat treatment.

30-33. **ALUMINIUM.**—For cowling, fairings and very lightly stressed fittings such as clips, also for air speed indicator tubing and pitot heads.

34. **COPPER.**—For bushing holes to serve as fairleads, etc., also in the form of wire for locking strainers, etc.

35-38. **FABRIC, THREAD & TAPES.**—May be of Irish linen but in most gliders are of Egyptian cotton and in some sailplanes of silk, for covering of planes and control surfaces.

39. **ELASTIC CORD.**—For shock absorbers and launching ropes.

40. **FLAX CORDAGE.**—For sewing fabric to ribs, etc.

41-42. **GLUES.**—For 3-ply construction and for joining together all timber parts as well as for reinforcing latter by taping and wrapping, also for attaching fabric to ribs in many gliders.

43-44. **DOPES.**—For treatment of fabric supporting surfaces to tauten and proof against weather.

45. **NON-FLAM CELLULOID.**—For inspection panels, windscreens, drainage eyelets, etc.

WEIGHTS, STRENGTHS, AND SPECIFICATION NUMBERS.

The afore-mentioned materials are tabulated on pages 72-73 to show their comparative strengths and weights, and in most cases the specification number has been added. This should be quoted when ordering. Approved suppliers of aircraft material will furnish, when required, a release note certifying that the material complies with Air Ministry requirements. As such certification costs money it will be to the advantage of glider clubs to mention when quoting specifications that the material is for glider construction and/or repair as by so doing they may be supplied with suitable materials at lower prices.

(The list of materials and the table of weights and strengths is compiled by Mr. V. S. Gaunt, A.M.I.Ae.E., hon. ground engineer, Dorset Gliding Club).

WEIGHTS AND STRENGTHS OF MATERIALS FOR GLIDER CONSTRUCTION.

Item No.	Material.	Specification. D.T.D.	B.E.S.A.	Weight lbs. cub in.	STRENGTH. Timbers. Lbs. per sq. in. Mod. 'E.'	Compr.	Metals. Tons per sq. in. Yield	Ult.	Remarks.
1	Silver spruce (Picea Sitchensis)	28A. 36A.	..	.0156	1,500,000	5,000 (end grain)	..	..	D.T.D 28A is for rough timber
2	Ash	31	3.V.4	.0231	1,700,000	5,800	..	..	BRITISH
3	Rock elm	34A.	V.8	.0255	1,400,000	5,800	..	..	DTD 34A is for rough timber
4	Plywood	..	3.V.3.	.024	1,300,000	3,000/8000 (Tension)	..	..	Outer plys Birch. Inner—Poplar
5	Oregon Pine	36A.	..	..	..	..	..	..	See item 1.
6	Mahogany	33A.	3.V.7	.0185	1,500,000	6,250	..	..	DTD 33A for rough timber
7	Balsa Wood	None	None	.003/.0078	..	..	..	..	
8	Mild Steel sheet	..	2.S.3	.28	..	..	18	28	For welding
9	Mild Steel Bar	..	3.S.1.	.28	..	..	20	35	For Bolts, Nuts, etc.
10	Mild Steel Tube	..	T.26	.28			11	20	For sockets and stays
11	Mild Steel Tube	..	T.1.	.28	..	..	30	35	Blued. For oval tubes
12	Mild Steel Tube	..	T.21	.28	..	..	18	28	Annealed
13	Mild Steel Tube	41	T.6	.28 }	Need not be normalised after welding		28	30	For welding
14	Mild Steel Tube	89A	..				40 25	45 30	Before welding After welding
15	Stainless Steel Tubes	102 97	.. ..	.28 .28	.. ..	.. ..	30 18	35 28	See item 11 See item 12
16	S.S. Sheet	39	..	.28	..	..	15	28	
17	S.S Bar	53	..	.28	..	..	18	28	
18	H.T S. Tube	..	T.5	.28	..	..	40	45	For struts
19	H.T.S. Tube	..	T.2	.28	..	..	65	85	For axles
20	H.T.S. Sheet	..	2.S.4.	.28	..	..	..	48	Not for welding. Harden and Temper
21	H.T.S. Bar	..	S.2	.28	..	..	45	55	
22	H.T.S. Stainless Sheet	57B	....	.28	..	..	40	54	
23	H.T.S. Stainless Bar	..	S.80	.28	..	..	45	55	
24	Brass Bar	..	2.B.6	.3	..	..	..	22/26	
25	Brass Sheet	..	3.B.5	.3	..	..	..	30	Hard rolled
26	Brass sheet	..	3.B.12	.3	..	..	..	18/24	Soft
27	Duralumin Sheet	..	3.L.3.	.1	..	..	15	25	
28	Duralumin Bar	..	3.L.1.	.1	..	..	15	25	
29	Duralumin Tube	..	3.T.4	.1	..	..	16	26	
30	Aluminium	..	2.L.4	.1	..	..	..	9	Hard Sheet
31	Aluminium	..	2.L.16	.1	..	..	..	7/8½	Half-hard sheet
32	Aluminium	..	2.L.17	.1	..	..	..	5/6½	Soft sheet
33	Aluminium Bar	..	2.L.32	.1	..	..	..	12	
34	Copper Sheet	..	2.B.15	.32	..	..	..	14/19	Half hard
35	Linen Fabric	..	4.F.1	4 oz. sq. yd.	83/87 lbs. per inch tensile strength				
36	Cotton Fabric	..	4.F.8.	4½ ,,	80 lbs. per inch tensile strength				
37	Linen thread	..	F.34	..	..	..	..	..	For sewing
38	Cotton tapes	..	2.F.47	..	..	..	..	..	
39	Rubber cord	..	3.F. 16	200 lbs. pull gives 100°/ₒ stretch of 5/8in. dia. cord as used for launching of gliders					
40	Flax cordage	..	3.F. 35	..	..	..	..	..	No. 1 for stringing
41	Gelatine glue	..	2.V.11	Shear strength=1100 lbs. per sq. in.					"Hot-water Glue"
42	Casein cement	..	2.V.2	Shear strength=1100 lbs. per sq. in.					"Cold-water Glue"
43	Dope (clear)	26	..	1 coat weighs about ¼ oz. per sq. yd.					
44	Dope (alum.)	27	..	1 coat weighs about ½oz. per sq. yd.					

THE DOPING OF GLIDERS.

The following information is supplied by Messrs. Cellon, Ltd.

THE doping of gliders differs in several respects from the doping of power-driven aircraft. In the first place it is very seldom that ordinary dope shop facilities are available, and secondly the dope must not tighten the fabric to the same extent as for the heavier machines, otherwise the framework of wings may become distorted.

The object of the dope is to render the fabric of the glider water and air proof and to provide as smooth a surface as possible and so reduce skin friction. A well doped wing also facilitates cleaning the glider, as it is only necessary to wash it down with soap and water.

To meet the conditions under which the average glider is built at present, Cellon, Limited manufacture a special glider dope, in which the solvent mixture is modified so as to permit application under unheated conditions. Even then, of course, it is advisable to choose the best possible site for the doping, which should be done in a yard, if possible surrounded by high buildings or near buildings so that strong draughts and gusts of wind are reduced to a minimum. Weather should preferably be warm and dry, and doping should never be done if the temperature drops below freezing point, or if the relative humidity exceeds 90 per cent.

It is essential that brushes and containers into which the dope is poured should be absolutely clean before use. A fairly stiff flat bristle brush should be employed, preferably rivetted or rubber set to avoid loosening by the solvents in the dope.

The first coat of dope should be brushed into the fabric with just sufficient pressure to ensure impregnation, the brush being worked from left to right and then up and down. Doping is best carried out by working in sections of about one square yard at a time, and must never be worked after it has once become tacky. Half an hour must elapse between each coat of dope. The number of coats necessary depends on the class of finish required, and for an average result three or four coats would be required, which will give an increase of weight of approximately 1.73 to 2 ozs. per sq. yard. These figures refer to transparent types of dope, and a slight increase in weight will of course be obtained if pigment coloured dopes are used.

In the event of the glider becoming damaged new fabric or a patch can be applied to the damaged portion by softening the old dope with a suitable solvent and then sticking on the patch and doping over it.

An important point to remember is that owing to the inflammable nature of the dope it is impossible to forward it by passenger train, and therefore in the event of a glider beconing damaged, there may be a delay in obtaining a supply of dope for repairs. As dope will keep practically indefinitely it is recommended that all clubs should keep at least one or two gallons in stock so as to meet any emergency which may arise.

REGISTER OF GLIDING CLUBS.

The following register of gliding clubs is not claimed to be complete or in every detail accurate, but care was taken to ensure that the information was correct on December 31, 1930.

Names of clubs which answered the GLIDING questionnaire are printed in bold type.

Abbreviations used: M., member; F.M., flying member; L.F., lady flying member; N.F., non-flying or associate member; hon., honorary member; A, B, C, "A," "B," or "C," F.A.I. pilot certificates claimed. Sun., Sunday; Mon., Monday; Tues., Tuesday, etc.; entrance, entrance fee. §, affiliated to the British Gliding Association; §§, affiliated to the Association of Northern Gliding Clubs; §§§, affiliated to the B.G.A. and A.N.G.C. Officers are honorary unless otherwise denoted.

Date of club's foundation is stated before other details, where known. Best duration, altitude above sea level and longest straight line distance attained by members is given in brief form, together with total number of launches of machines.

The register can be used in conjunction with the table of statistics relating to clubs, and with the list of gliding centres in the British Isles.

ABERDEEN GLIDING CLUB.

Sec., A. F. J. Ord, 299 Hilton Drive, Aberdeen.

ABERGAVENNY & DISTRICT GLIDING CLUB.

September, 1930. Entrance, 10/6. Subscription, F.M., £1 1s.; N.F., 10/6.

President, Sir Leolin Forestier-Walker, Bart., M.P.; chairman, D.E.M. Jones, M.B.E.; sec., Arthur R. Barnes, Trossachs, Park Cresecnt, Abergavenny; instructor, Walter Jones, late R.A.F.

ACCRINGTON AND DISTRICT GLIDING CLUB.

September, 1930. Entrance, 10/6. Subscription, £2 2s. F.M., 22; N.F., 11; L.F., 1.

Hanseat machine.

President, Edgar Sharples; chairman, E.B. Stephenson; hon. sec., John Nolan, 67 Eagle St., Accrington; instructors, J. M. Bainbridge (ex R.A.F.) W. Sansom, C. R. Stuttard.

AIRCRAFT CLUB, HARROGATE.
Gliding Section §§§

Jan., 1930. Entrance, 10s. Subscription £1. Gliding ground, Weeton. Meetings, Sun. Constructional, Fri., 7 p.m.

Modified Dickson machine built by constructional section of club. Secondary type designed by member. Scheme for secondary type and sailplane under consideration. Best distance, 440yds.

Chairman, A. W. Woodmansey, M.S.C.; sec., E. T. W. Addyman, The White House, Starbeck, Harrogate, Yorks.

ASKERN GLIDING CLUB.

Sec., T. E. R. Burdett, 88 Alfred Road, Doncaster.

BANBURY GLIDING CLUB.

Sec., Capt. F. Gardiner, Tadmarton Lodge, Banbury.

BARNOLDSWICK GLIDING CLUB.

Sec., W. Catlow, 49 Church Street, Barnoldswick, Yorks.

BARNSLEY MOTOR CYCLE AND CAR CLUB. Gliding Section.

Sec., C. B. A. Brown, 20 Rowland Road, Barnsley.

BEDFORD GLIDING AND FLYING CLUB.

July, 1930. Entrance, £1. Subscription, 15s. F.M., 25; N.F., 10.

Gliding ground, Wilstead Hill, Beds.(on main Bedford-Luton road, 5 miles from Bedford. Hill marked with hangar and wind-sock) Meetings, evenings, 6 p.m. (summer only); Sat. 2 p.m. Sun., 10 a.m. Social and constructional meetings at clubrooms and workshop, 80a High Street, Bedford.

R.F.D. primary machine. 200 launches. Advanced sailplane under construction.

Patroness, the Duchess of Bedford; sec., Capt. A. W. V. Hendy, 5 Beresford Road, Bedford; club capt. and instructor, E. A. Lingard (London and Northampton Aero Clubs); asst. instructors, Capt. Hendy and Major Howard, O.B.E.; ground engineers, B. F. Skinner (Northants Aero Club), M. Crummie and T.I.C. Bevan.

Hangar built by members. Two-wheel slip under-carriage with 14in. pneumatic wheels used for launching.

BELFAST GLIDING CLUB.

Sec., Thomas Brown, 21 Deerpark Drive, Belfast.

BIRMINGHAM GLIDING CLUB.

Sec., A. Mearby, 105 Hunters Road, Handsworth, Birmingham.

BOLTON LIGHT AEROPLANE AND GLIDER CLUB §§

June, 1930. Entrance, 10s. 6d. (ladies and juniors, 5s.) Subscription, £2 2s. (ladies and juniors, £1 1s.). F.M., 30; L.F., 3.

Gliding ground, Height Farm, Harwood, nr. Bolton, (via Tonge Moor Road from Bolton, Harwood 'bus). Meetings, Sat., 2 p.m.; Sun., 11 a.m.

Dickson primary machine. Total flying time, 1 hour 50 min.; 163 launches. Best time, 1 min. 13 sec. (Flying Officer V. Foster); height, 80 feet (V. Foster); best distance, 790 yards.

President, Stanley Porter; chairman, R. S. Howarth; hon. sec., J. Denton, jnr., 7 Bute Street, Bolton; instructor, Flying Officer V. Foster, R.O. (pilot, R. A. F. Reserve of Officers); ground engineer, P. Monk.

BRADFORD GLIDING CLUB §§

July, 1930 Entrance, £1 1s. Subscription, £1 1s. F.M., 43; N.F., 8; hon, 2; L.F., 2.

Gliding grounds, The Pastures, Apperley Bridge, nr. Bradford (Bradford to Apperley Bridge, rail or 'bus); Dobrudden, Baildon Moor, Bradford ('bus from Bradford to Baildon). Meetings, Sat., noon; Sun., 9 a.m. Constructional class three nights weekly.

Dickson primary machine. Dickson type under construction. 303 launches. Best time, 12 sec. (R. Grosland); altitude, 45 feet; straight-line distance, 150 yards.

President, Sir Benjamin Dawson, Bart.; chairman, N. H. Sharpe; sec., S Young, 17 Roslyn Place, Great Horton, Bradford, Yorks; instructors, H. Jones (ex-flying officer and pilot instructor); A. M. Verity (ex-R.A.F. pilot, now on Reserve)

BRIDLINGTON GLIDING CLUB §

August, 1930. Entrance, £1 1s. Subscription, £3 3s., F.M., 12; A., 1.

Gliding ground, Forden, East Yorks.

B.A.C. II primary machine.

Chairman, Albert E. Wilkinson; sec., Alan Topham, Crescent Court, Esplanade, Bridlington; instructor, E. Dooks.

BRIGHTON GLIDING CLUB.

Sec., F. G. Leaney, Hanover Crescent, Brighton.

BRISTOL AND DISTRICT GLIDER CLUB.

Oct., 1930. Entrance, £1 1s.; Subscription, £2 2s. F.M., 35; hon., 1; L.F., 3.

Gliding ground, Crook's Peak, Somerset.

President, Lord Apsley, D.S.O., M.C., M.P.; vice-president, R. Wills; sec., Antony McLoughlin, 14 Woodstock Road, Redland, Bristol.

CARDIFF AND COUNTY AERO CLUB.

March, 1930. Entrance, £1 1s. Subscription, £1 1s. F.M., 40; N.F., 10; L.F., 5.

Gliding ground, Lower Stockland Farm, St. Fagans (3 miles from Cardiff). Meetings, Wed., Sat., 2 p.m.; holidays, 10 a.m.

Zogling primary machine. Best time, 30 sec., (L.R. Crouch); altitude, 60 feet (T. E.Llewellyn) straight distance, 170 yards.

Chairman, C. J. Page; sec., instructor and ground engineer, T. Elvet Llewellyn, 59 Queen Street, Cardiff (member B.G.A.).

CHANNEL GLIDING CLUB §

June, 1930. Subscription, F.M., £2; N.F., £1.

Gliding grounds:—Adjoining Aerodrome, Hawkinge (2 miles from Folkestone on main Canterbury road), training; Valiant Sailor, Dover Hill, Folkestone (1 mile from Folkestone on main Dover road), soaring. Meetings, Wed., Sat., 2.30 p.m.; Sun., 10 a.m. Constructional meeting, Thur.

Machines:—Zogling primary, R.F.D. primary, Prufling intermediate.

President, Sir Phillip Sassoon, C.B.E., C.M.G M.P.; chairman, Col. H. T. Kenny; sec., F. H. Worrad, 42 Rendezvous Street, Folkestone; instructors, Sqdrn.-Ldr. Probyn, R.A.F., C. M. C. Turner ("C" pilot).

COMRIE GLIDING CLUB.

Sec., N. Rockie, Lawers, Comrie, Perthshire.

CONONLEY AND DISTRICT AERO CLUB §§

June, 1930. Entrance, men £2 2s., women £1 1s.; Subscription, £1 1s. F.M., 30; N.F., 10; hon., 4; L.F., 6.

Gliding grounds:—Royd House Farm and Miners Dam Field, near Cononley (L.M.S. or W. Yorks Bus from Keighley or Skipton). Meetings Wed., 6.30 p.m.; Sat., 1.30 p.m.; Sun., 10.30 a.m. Winter, Sun. only. Committee meets club room, Cononley, Thurs., 8 p.m. Constructional work.

Cloudcraft primary machine; Dickson primary type under construction. Best time, 35 sec. (H. M. Sellers) straight-line distance, 900 yards (H. M. Sellers).

President, Miss Maud Reddihough; chairman, J. Marston; sec. and ground engineer (student for Grd. Eng.'s A and B licences), H.M. Sellers, 178, Skipton Road, Keighley, Yorks; instructor, G. Watson (Air Ministry "A" licence).

DALKEITH GLIDING CLUB.

Sec., A. S. McIntyre, Elmfield Works, Dalkeith.

DORSET GLIDING CLUB. §

March, 1930. Entrance, 10s. 6d. Subscription, F.M., £1 1s., N.F., 10s. 6d. F.M., 72; N.F., 8; L.F., 10; A, 13; B, 1.

Gliding grounds :—Askerswell (5 miles from Bridport, main Dorchester-Bridport road); Chickerell (2 miles from Weymouth); Maiden Newton ("Dorsetkuppe", by 'bus from Weymouth or Yeovil or train to Maiden Newton, G.W.R.); Upcerne (2 miles from Cerne Abbas, main Dorchester-Sherborne road); Westland Aerodrome, Yeovil.

Meetings :—Wed., 6.30 (summer only); Sat., Sun., 2.30. Constructional group in formation; technical sub-committee meets regularly.

Machines :—R.F.D. primary, 461 launches. Prufling Improved. Best time, R.F.D., 2 mins. 52 sec. (H. J. Penrose); height, 50ft. (H. J. Penrose); distance, 1 mile (H. J. Penrose).

President, R. A. Bruce, M.I.Inst.C.E., F.R.Ae.S., M.Sc.; chairman, N. W. Wright; sec., S. E. Wells, Pen Mill Hotel, Yeovil (phone 81); editor, "Gliding," H. R. R. Goodyear, c/o "Dorset Daily Echo," Weymouth (phone 804); for general information phone Weymouth 352; instructor, H. J. Penrose, A.F.R.Ae.S., ("B" glider pilot, R.A.F. Reserve and civil pilot); ground engineer, V. S. Gaunt, A.M.I.Ae.E. (licensed Air Ministry Ground Engineer in categories A, B, and C; hon. sec., Yeovil branch Royal Aeronautical Society).

DOVER GLIDING CLUB §

December, 1930. Subscription, £2. F.M., 20; N.F., 10; L.F., 3.

Gliding ground, Elms Vale Road (15 minutes walk from Priory Station, Dover). Meetings, Wed., Sat., p.m., Sun., all day.

B.A.C. II primary machine.

Chairman, Councillor F. Morecroft; sec., E. Morecroft, 106, High Street, Dover; instructor, C. W. Mason.

DRIFFIELD AND DISTRICT GLIDING CLUB §

May, 1930. Entrance, 10s. 6d. Subscription, £1 10s. F.M., 43; N.F., 15; L.F., 5. A, 4.

Gliding ground, Fimber (rail to Fimber station; road from Driffield or York; no buses). Various experimental grds. on Wolds.

Meetings, Sun., 10 a.m.; other days (summer only) by arrangement. Discussional meetings, Tues., 8 p.m., Keys Hotel, Driffield.

R.F.D. primary machine. 180 launches. Best time, 48 sec. (J. Young); altitude, 150 feet (R. G. Spencer).

President, Sir Richard Sykes, Bart.; chairman, Dr. E. H. Milner; sec., R. G. Spencer, School House, Gembling, near Driffield, Yorks; instructors, R. G. Spencer (ex R.N.A.S.); J. Young (Sherburn Aero Club); R. C. Tice (ex R.A.F.); ground engineers, Messrs. Southall and Slater, G. Wardlow.

Springs are fitted on the club glider from cabane to landing wires to take the shock in bad landing.

DUMFRIES AND DISTRICT GLIDING CLUB.

Sec., W. H. Davenport, Thornlea, Rotchell Park, Dumfries.

EDINBURGH GLIDING CLUB §

Entrance (F.M. only) £1 1s. Subscription, F.M., £2 2s.; N.F., £1 1s. F.M., 53; N.F., 3; hon., 7; L.F., 10.

Gliding grounds, Comiston Farm, nr. Fairmilehead; West Craigs Farm (between Corstorphine and Turnhouse aerodrome). Meetings, evenings (summer only); Sat., Sun.

Machines :—B.A.C.II primary. Hanseat. B.A.C. III under construction.

President, the Rt. Hon. the Lord Provost T. B. Whitson; chairman, Major J. A. McKelvie; sec., James D. M. Currie, 16 Bernard Street, Leith, Edinburgh; instructors, Major McKelvie, Flying Officer C. J. L. Jack, J. D. M. Currie, C. Collyns, J. C. Howden Ferme, J. T. Macgregor, A. B. Mayor, R. Whitelaw (power flight experience); ground engineer, W. Ogilvie (rigger attached to Schneider Cup team).

EGHAM GLIDING CLUB.

Sec., C. Redman, 46 WendoverRoad, Egham, Staines.

ELGIN GLIDING CLUB.

Sec., A. R. Garden, 71 Smith St., Elgin.

ESSEX GLIDING CLUB §

April, 1930. Entrance, 10s. 6d. subscription £1 1s.. F.M. 50, N.F., 10; hon., 12, L.F., 4.

Gliding grd., Havering Park Farm, near Romford (temporary). Meetings, Sat., 2 p.m., Sun., 11 a.m. Constructional meetings Tues., 7.30 p.m., 47 Station Road, Chingford.

Zogling primary machine; intermediate type under construction.

President, the Lord Lieutenant of Essex; chairman, H. A. Jones, M.C. (official air historian); sec., F. E. Darlow, 17 Randolph Road, Walthamstow, E. 17; instructor, W. R. Bannister, R.A. F.O. ("B" power pilot).

EVERLEY GLIDING CLUB.

Sec., Lieut.-Col. Catlet, Crown Hotel, Everley, near Tidworth, Wilts.

EXETER GLIDING CLUB.

Sec., W. Stephen, 5 Bank St., Newton Abbot.

FALKIRK AND DISTRICT AVIATION CLUB §

October, 1930. Entrance (F.M.), 10s. 6d. Subscriptions :—patrons, £2 2s.,; F.M., £1 11s. 6d.; N.F., 10s. 6d.; junior, 5s.

Meetings, Sat. Club meetings, Mon., 7.30 p.m., Welfare Hall, Falkirk Iron Works.

B.A.C. II machine; soaring type under construction.

Hon. President, Provost of Falkirk; Hon. vice-presidents, Marquis of Zetland, Marquis of Douglas, and Clydesdale, Capt. H. J. Kennard, R.N., D.L., Capt. T. Harvey, D. L.; president, Major R. H. Salvesen; sec., A. L. Tomison, 122 High St., Falkirk; chief instructor, J. W. Shaw.

FURNESS GLIDING CLUB.§

July, 1930. Entrance, 10s. 6d. Subscription, £1 11s. 6d. F.M., 32, N.F., 25; hon., 3.

Gliding ground, Gleaston Park Farm, Gleaston, nr. Ulverston (via coast road to Aldingham from Barrow or Ulverston). Meetings, Sat., 2.30 p.m.; Sun., 10.30 a.m.

B.A.C. II primary machine, and B.A.C. III fuselage. 53 launches.

President, Commander C. W. Craven, O.B.E., R.N.; chairman, Capt. John Fisher; sec., R. Cuthell, 31 Church St., Barrow, Lancs.; ground engineer, W. Butterfield (aircraft design and construction).

GLASGOW GLIDING CLUB, LTD. §

October, 1930. Entrance, 10s. 6d. Subscription, £2 10s. F.M., 67; N.F., 6; L.F., 1.

Gliding ground, Barrance Farm, Easter Whitecraigs, near Glasgow ('bus from Glasgow to Waterfoot, midway between Eaglesham and Clarkston). Meetings, Sun., 11 a.m.

R.F.D. primary machine. Glider under construction.

President, Gregor Cameron; sec., Arthur Young Paton, 70 Exeter Drive, Glasgow, W.I.; instructors, Messrs. Gregor Cameron, A. Houston Anderson, Thomas Graham, David Auld Graham; ground engineer, Reginald Brazier (A.M. certificate).

Arrangements are published in "The Daily Record and Mail" every Friday

HALIFAX GLIDING CLUB.

Sept., 1930. Entrance, £1 1s. Subscription, £1 1s. F.M., 20; L.F., 1.

Gliding ground, Ogden Moors, fields adjoining Withens Hotel (by 'bus to Wainstalls, then 15 minutes' walk). Meetings, Sat., 3 p.m. (summer only); Sun., 11 a.m. Winter constructional meetings, Sat.

Reynard primary machine. Total flying time, 1 hr. 54 min., 3 sec. 40 launches. Best time, 22 sec. (J. L. Stuart Gill); height, 150 feet (J. L. Stuart Gill); best straight distance, 440 yards.

President, Councillor G. H. Gledhill; sec., S. Redman, 94 Lister Lane, Halifax; instructor, J. L. Stuart Gill (power pilot, R.A.F. Reserve of Officers).

Club uses automatic launching release, a swivel hook on the glider tail, released from pilot's seat.

HERTS AND ESSEX GLIDING CLUB.

July 1930. Entrance, 10s. 6d. Subscription £3 3s. Gliding Ground, Wood's Farm, Birchanger, near Bishop's Stortford, Herts (1-mile N. of Stortford on main Newmarket road). Meetings, Sat. (summer only), Sun., noon.

R.F.D primary machine.

Chairman, R. D. Gerrans; sec., C. F. Baker, 110, Dunmow Road, Bishop's Stortford, Herts; instructors, R. D. Gerrans (private power flying experience), R. Hessey (ex-aircraftsman and pilot).

HUDDERSFIELD GLIDING CLUB.§

Sec., C. Brooke, the Cottage, Woodside, Fartown, Huddersfield, Yorks.

HUNGERFORD GLIDING CLUB.

Sec., Miss Pinckney, Hidden Cottage, Hungerford, Berks.

ILKLEY AND DISTRICT GLIDING CLUB. §

July, 1930. Entrance, 10s. 6d. Subscription. £1 1s. F.M., 48; N.F., 14; hon, 3. A, 1; B, 1; C, 1.

Gliding grounds, Ilkley, Bolton Abbey, Nesfield. All on main roads. Meetings, evenings, Sat., 2.30 p.m. (summer only); Sun., 9.30 a.m. Constructional meetings, club workshop, Tues., Thurs.

Zogling primary machine. Machine under construction. 468 launches.

Instructor, Hedley Crabtree (C. certificate, Wasserkuppe); ground engineer, Bernard Hartley, late R.A.F.; sec., P. T. Fawcett, the Red Lion Inn, S. Stainley, near Harrogate.

IMPERIAL COLLEGE GLIDING CLUB. §

March, 1930. Subscription, 10s.6d. F.M. 34.

Machines :—R.F.D. primary; Imperial College I.C., 1, ("Incredible," club constructed)

President, Professor W. E. Dalby, F.R.S.,; chairman, J. H. Payne; sec., P. Adorjan, Imperial College Union, S.W.7.; instructors, P. Adorjan and C. H. Jackson (trained at Wasserkuppe).

A students' club, open only to members of the Imperial College Union.

ISLE OF THANET GLIDING CLUB §

Subscription, F.M., £1 10s.; N.F., 10s. M., 93.

Gliding grounds :—Manston R.A.F. aerodrome, nr. Ramsgate; Wingham (Ramsgate, 12 miles, Canterbury, 7 miles).

Meetings, Sat., Sun., 2 p.m.

B.A.C. primary machine. Two machines under construction.

President, Capt. H. H. Balfour, M.C., M.P., chairman, P. Turner; sec., J. T. Huddlestone, 17 Chapel Place, Ramsgate (phone 457); instructors, F. O. Phillips, R.A.F., Mr. Bicknell (civilian pilot); ground engineer, Sqdrn-Ldr. Cuckney, D.Sc., R.A.F.

ISLE OF WIGHT GLIDING CLUB.

July, 1930. Subscription, F.M., £2 2s.; N.F., £1 1s. F.M., 40; N.F., 6; L.F., 2.

Gliding grounds, Whiteley Bank, near Godshill, and Somerton Aerodrome, Northwood, Cowes, Buses from all parts stop at grds. Meetings, Sat. (summer only), 2.30 p.m.; Sun., 11 a.m. Constructional meetings, Thur., Sat., Messrs. Saunders-Roe, Ltd., workshops.

Machines :—B.A.C. II primary; dual-control 2-seater. Advanced type dual control 2-seater machine under construction.

President, Sir A. V. Roe, O.B.E.; sec., J. B. Smith, 61 Swanmore Road, Ryde; instructor. Capt. F. Warren Merriam, A.F.C., A.F.R.Ae.S., (late R.N.A.S. and R.A.F., who took part in 1922 Itford contests with own machine); ground engineer, J. A. Thompson (W.O. Staff, Messrs. Saunders-Roe, Ltd.).

JERSEY GLIDING CLUB.

Sec., Major Holmes, Meadow Bank, St. Lawrence, Jersey, Channel Isles.

KENDAL GLIDING CLUB.

Sec., C. Pollitt, Messrs. Atkinson and Pollitt, printers, Kendal.

KENT GLIDING CLUB §

January, 1930. Entrance, 10s. Subscriptions, ab-initio, £3; power or certificated glider pilots, £2 F.M., 82; N.F., 26; hon. 4; L.F., 4. A, 6; B, 2; C, 1.

Gliding grounds, Lenham ('bus from Maidstone, 10 minutes walk to ground); Eastchurch, Isle of Sheppey.

Meetings, evenings, Sat., p.m. (summer only) Sun., 11 a.m. Constructional section meets twice weekly. Lectures monthly, winters.

Machines :—Zogling primary type (first in England, club-built); B.A.C. primary type, partly built by club and part by B.A.C. B.A.C. intermediate type under construction.

President, Col. The Master of Sempill; chairman, P. F. Haynes; sec., Ronald B. Haynes 14 King Street, Maidstone, 'phone 2237; instructors, C. H. Lowe-Wylde, A.F.R.Ae.S. (ground engineer), Flt.-Lt. Chas. Crawford, R.A.F.; Flt.-Lt. Graham Nicholls, R.A.F.

KILMARNOCK GLIDING CLUB.

Sec., M. Sinclair, 7 Lower Glencairn Street, Kilmarnock.

LADYBANK GLIDING CLUB.

Sec., D. Turner, Woodside, Ladybank, Fife.

LANCASHIRE GLIDING CLUB.

Sec., J. Meads, Broomfield, Alderley Edge, Cheshire.

LEEDS GLIDING CLUB § §

Sept., 1930. Entrance, 5s. Subscription, £2. F.M., 35; N.F., 4; hon., 2.

Gliding ground, Wharfedale (temporary). Meetings, evenings (summer only); Sat., 2.30 p.m.; Sun., 9.30 a.m. Constructional meetings.

Reynard primary machine. Sailplanes under construction by members.

Chairman, A. Gomersall; hon. sec., G. Jefferson, 32 Fearnville Grove, Roundhay, Leeds; instructor, A. G. Wilson (power "A" pilot, Yorkshire Aero Club); ground engineer, E. Jefferson (4 years with aircraft firm).

Each member keeps a log-book checked by the instructor.

LEICESTERSHIRE GLIDER CLUB.

March, 1930. Entrance, 5s. Subscription, £1 1s. F.M., 20; N.F., 10; hon., 1; L.F., 2.

Gliding grounds, Burton Bandalls, nr. Loughborough, Thrussington, Leicester. Meetings, Sat. (summer only), Sun. Constructional meeting Fri., club workshop, Cliffe Villa, Queen's Road, Clarendon Park, Leicester.

Reynard primary machine. 53 launches, total flying time, 610 secs. Dickson type under construction. Best time, 70 sec. (C. St. L. Jervis); altitude, 70 feet (C. St. L. Jervis); best straight line distance, ½ mile.

President, J. A. Hartopp; chairman, E. A. Goodman; sec., A. McLaren, at 12 Tichbourne Street, Leicester; instructors, H. Clarkson (late R.F.C., R.A.F., chief instructor), C. St. L. Jervis, G. Marsh; ground engineer, H. D. Hale (managing director, Reynard Glider Co.)

LINCOLN GLIDING CLUB.§

Sec., H. L. Seale, The Manor House, Cherry Willingham, Lincoln.

LITTLEBOROUGH GLIDING CLUB.

Sec., H. Hamen, Oakdale, Deainley, Littleborough, nr. Manchester.

LITTLEHAMPTON GLIDING CLUB.§

Sec., H. Carter, The Laurels, 17 New Road, Littlehampton.

LLANDUDNO GLIDING CLUB.

Sec., B. Hutchinson, Craigydon, Llandudno.

LONDON GLIDING CLUB. §

Jan., 1930. Entrance, 10s. 6d. Subscription, £3 3s. F.M., 112; N.F., 70; hon., 9; L.F., 12. A, 36; B, 11; C, 6.

Gliding ground, Turvey's Farm, Tottenhoe, near Dunstable. (National 'bus via Barnet by-pass and Tring; rail, Dunstable station (L.M.S.). Meetings, Wed., 5.30 p.m. (summer only); Sat., 2 p.m.; Sun., 11 a.m. Constructional group in formation.

Machines:—Kegel Zogling, 2 R.F.D. primaries, Kegel Prufling, Poppenhausen 2-seater dual control. Privately-owned:—Kegel Prufling, Kegel Professor sailplane, Dickson glider, Albatross sail-plane (first of British design and build). Best time (Prufling) 2 hr. 25 min. (R.F.D.) 27 minutes (Capt. Latimer Needham); altitude (Prufling), 1,000 ft. (Capt. Needham).

Vice-presidents, F. Handley Page, C.B.E., F.R.Ae.S.; Capt. G. De Havilland, O.B.E., A.F.C., F.R.Ae.S., Lt.-Col. N. Thwaites, C.B.E., M.C.; chairman, J. R. Ashwell-Cooke, B.A.; sec., H. A. Abdallah, Empire House, 8 St. Martin's le Grand, London, E.C.1. (phone National 8682). Instructors, M. Manton (pre-war flying instructor, Graham White School, late R.F.C. and R.A.F., A, B, C. (F.A.I.) glider pilot certificates; club captain, C. H. L. Needham, F.R.Ae.S., M.C., late R.F.C. and R.A.F., A, B, C certificates); M. Buxton, R.A.F. A, B, C, certificates.

London office:—Empire House, St. Martin's le Grand, E.C.1.

LOUGHBOROUGH GLIDING CLUB.

Sec., L. Jervis, Hoton, nr. Loughborough.

MALTON AERO CLUB.§ §

May, 1930. Subscription, £1 10s. F.M., 25. Dickson primary machine.

Chairman, L. Green; Sec., J. N. Gladish, Welburn, Yorks.

MALVERN GLIDING CLUB.

Sec., P. Harris, 32 Leinster Gardens, London W.2.

MANCHESTER BRANCH, ROYAL AERONAUTICAL SOCIETY.§

Gliding Section.

May, 1930. Subscription 15s. M, 150.

Gliding ground, Woodford Aerodrome, Woodford, Cheshire (rail or 'bus to Wilmslow, or 'bus through Stockport and Bramhall). Meetings, Sat., Sun., 10 a.m. Technical lectures every three weeks.

Primary machine, built by members to B.G.A. specifications 300 launches.

President, J. D. Siddeley, G.B.E., F.R.Ae.S.; chairman, R. Chadwick, A.F.R.Ae.S.; sec., F. Paxton, A.M.I.Ae.E., "Cyntra," Poplar Road, Didsbury, Manchester; instructors, F. B. Tomkins (test pilot, A. V. Roe & Co.), Basil Meads ("A" glider pilot, "A" power pilot); ground engineers, R. F. Taylor, C. Hatton.

MATLOCK GLIDER CLUB.

May, 1930. Entrance, 10s. 6d. Subscription £1 1s. F.M., 32; N.F., 4; hon., 10; L.F., 8.

Dickson primary machine. 174 launches.

President, G. H. Key, J.P.; chairman, E. Roy Drabble; sec., J. W. Walker, Dean Hill Villas, Matlock.

MERTHYR TYDFIL GLIDING CLUB.

Sec., C. Wills, Ingleside, The Walk, Merthyr Tydfil.

MIDDLESEX GLIDING CLUB.

Sec., D. Ussher, 36 Framfield Road, Highbury, London, N.5.

MIDLAND GLIDING CLUB.

March, 1930. Entrance, £1. Subscription, F.M., £1; N.F., 10s. M.F., 60; N.F., 6; L.F., 7.

Gliding ground, Clive Farm, Shipley, near Wolverhampton (Wolverhampton - Bridgnorth road). Meetings, Thur., 3 p.m.; Sun., 11 a.m. Instructional meetings, Wed., clubroom, Darlington Street, Wolverhampton.

Kegel Zogling primary machine.

Sec., John Knight, Central Arcade, Wolverhampton

NEWCASTLE GLIDING CLUB.§ §

May, 1930. Entrance, 10s. 6d. Subscriptions:—1st yr., £1 1s.; 2nd, 18s.; 3rd, 15s. F.M., 50; L.F., 2.

Meetings, evenings, 7 p.m. (summer only), Sat., 2 p.m., Sun., 10.30 a.m.

Cramcraft primary machine.

President, W. Leslie Runciman; sec., Alfred P. Miller, 27 Philiphaugh, Wallsend-on-Tyne, Northumberland.

Inaugural meeting held Nov. 25, 1930.

NORFOLK AND NORWICH AERO CLUB.

Sec., A. Rice, Norfolk and Norwich Aero Club, Norwich.

NORTH COTSWOLD GLIDING CLUB.§

April, 1930. Entrance, £2 2s. Subscription, £1 1s. F.M., 45; N.F., 6; L.F., 9; A., 2.

Gliding ground:—Broadway Air Park (Worcester-London main road, top of Fish Hill above Broadway Village, Worcs.; rail stations, Broadway, Campden and Moreton-in-Marsh, all G.W.R.) Meetings:—Summer, Wed., Thur., Sat. (evenings); Sun., afternoon. Winter, Wed., 2 p.m.; Sat., Sun., 10 a.m.

R.F.D. primary machine. 1,200 launches. Advanced sailplane and advanced power-assisted sailplane under construction. Best time, 34½ sec. (Horace C. Wright).

Presidents, Mr. and Mrs. Alan S. Butler; chairman, J. Whitehouse; sec., instructor and ground engineer, Horace C. Wright, 45 Merstow Green, Evesham, Worcs. (qualified power pilot R.F.C., 1913; aeronautical engineer); lady instructor, Miss Evelyn Moore.

Indoor stationary machine of miniature aeroplane type, mounted on pivot, used for balancing practice.

NORTH KENT GLIDING CLUB.

July, 1930. Entrance, 10s. 6d.; Subscription, £1 1s.

Gliding ground, Joyce Green Aerodrome. Meetings, Sat and Sun. 10.30 a.m.

B.A.C. II primary machine.

Chairman, L. O. Kekwick, B.Sc.

NORTH LINDSEY GLIDING CLUB.

Sec., G. Lloyd, 3 Wells St., Scunthorpe.

NORTH STAFFORDSHIRE GLIDING CLUB.

Sec., J. B. Yates, 71 York St., Basford, Stoke-on-Trent.

NOTTINGHAM GLIDING CLUB.§

March, 1930. Entrance, 10s. 6d. Subscription, F.M., £1 11s. 6d.; N.F., 10s. 6d. F.M., 21; N.F., 19; hon. 3; L.F., 3. A, 1.

Gliding grounds, Winkin Hill, Gotham, Notts.; Mr. Ellis' Farm, East Bridgford, Notts. Meetings, Thur., Sat. evenings (summer only); Sun., 11 a.m.

Machines:—R.F.D. primary; Searby. 400 launches.

President, Major S. A. Currin; vice-president, Lord Belper; sec., L. Burbidge, 117 Hilton Road, Mapperley, Notts.; instructor, H. A. Searby (20 yrs' experience in glider and aeroplane construction, pupil of the late Mr. Graham White)

OXFORD AND COUNTY GLIDING CLUB.§

February, 1930. Entrance, 10s. 6d.; Subscription, £3 3s. F.M., 50; N.F., 15; hon., 5; L.F., 1.

Gliding grounds, Lambourn, Berks (via Wantage); Ibstone, near Stokenchurch (High Wycombe route). Meetings, Sun., 10 a.m. Committee, Mon., 7.30

Machines:—Zogling, Dickson, all-steel Zogling type primaries. Machines constructed, Dickson and all-steel Zogling type. 600 Zogling launches (average flight, 15 sec.) Best time, 1 min. 25 sec. (J. Wardrop); altitude, 300 feet. (H. Clowser, T. D. Cole, V. C. Davis, J. Wardrop) straight distance, 400 yds. 200 feet altitude reached with car towed flight.

Patron, Sir William R. Morris, Bart.; president, Major G. Allen, M.C.; chairman, J. Beasley; sec., H. G. Cox, 11 Frenchay Road, Oxford; instructors, T. Cole, V. C. Davis, J. Wardrop (qualified power pilots).

PILNING GLIDING CLUB.

Sec., H. Sykes, New Passage Hotel, Pilning, Glos.

PORTSMOUTH & SOUTHSEA GLIDING CLUB.§

May, 1930. Entrance, 10s. 6d. Subscription, £2 2s. F.M., 40; N.F., 20; L.F., 4. A. 9.

Gliding ground, Wymering Race Course, Cosham, Hants. (Portsmouth - Southampton main road, 1 mile from Portsmouth).

Two primary machines. Best time, 8 mins. A. C. Price.

Chairman, J. Webb; sec., E. A. Finley-Day, 9 King's Terrace, Portsmouth.

PRESTON AND DISTRICT GLIDER CLUB.

October, 1930. Entrance, 10s. 6d. Subscriptions, F.M., £2 2s.; N.F., £1 1s. F.M., 30; L.F., 6; A. 1.

Gliding ground, Beacon Fell (10 miles N. of Preston, via Inglewhite; 4 miles from Brock rail station). Meetings, Sat., 2 p.m.; Sun. and holidays, 9 a.m.

R.F.D. primary machine. Best time 35 sec. (L. E. Falla); altitude, 150 feet (L. E. Falla).

President, Sir James Openshaw, D.L., J.P.; chairman, H. Spencer; sec., and instructor, L. E. Falla (R.A.F.R.O.), Lendor, Lawrence Rd., Penwortham Hill, Preston, Lancs.

RICHMOND (YORKS) GLIDING CLUB.

Sec., A Burns, West End Garage, Richmond, Yorks.

RUGBY GLIDING CLUB.

Sec., A. Bourne, Birdingham, near Rugby.

SAILPLANE CLUB OF T.M.A.C.§

Sec., E. G. Smettem, 2 Wine Office Court, Fleet Street, E.C.4.

SALISBURY GLIDING CLUB.

Sec., L. Moore, School of Army Co-operation, R.A.F., Old Sarum, Salisbury, Wilts.

SCARBOROUGH GLIDING CLUB.§

February, 1930. Subscription, F.M., £3 3s.; N.F., 10s. 6d. F.M., 35; N.F., 85; L.F., 3; hon., 5. A, 8; B, 3.

Gliding grounds:—Flixton Hill (main York road; branch left through Seamer, left again at cross roads); Sutton Bank, near Thirsk (via North Road). Meetings, Wed., Sat., 2 p.m.; Sun., 10.30 a.m. Constructional school every evening; lectures, Tues., 8 p.m., Royal Hotel.

Machines:—Zogling, Prufling, Professor and Doppelsilzer; 735 launches. Best time, 3 min. 15 sec. (A. E. Thompson); straight line distance, 2 miles (A. E. Thompson).

President, Lord Derwent; vice-president, Miss Amy Johnson, C.B.E.; chairman, S. C. Howard; sec., Mr. Batty, Royal Hotel, Scarborough (headquarters); instructor (1930) Carli Magersuppe (R.R.G. soaring expert); ground engineer, F. L. Slingsby.

SHEFFIELD GLIDING CLUB.§

Asst. sec., W. Wood, c/o Merris Cole Bros., Fargate, Sheffield.

SOUTHDOWN SKYSAILING CLUB.§

June, 1930. Entrance, 10s. 6d. Subscription, £2 2s. F.M., 39; N.F., 14; hon., 1; L.F. 2. A., 4.

Gliding ground, Ditchling Beacon, near Brighton. (from Brighton, via Ditchling road; by rail to Brighton, no reg. 'bus service. From London, main rd. to Preston, turn left Carden Av. and left at corner Stanmer Park, or by road to Ditchling village and up hill to Beacon). Meetings, evenings, Sat., p.m. (summer only); Sun. 10.30 a.m. Construction meetings, evenings, Caffyns Garage, Sillwood St., Brighton.

Machines:—R.F.D. primary; machine constructed by member. Machine under construction.

President, Earl Howe, C.B.E., V.D.; vice-presidents, Viscount Gage, Comm. Sir Cooper Rawson, M.P.; Mr. Gordon England; chairman, and captain, Fl-Lt. Lee Roy Brown, D.F.C., R.A.F.O.; sec., A. Yorke Bramble, New Yorke Hotel, Bedford Square, Brighton; ground engineer, Fl.-Lt. Brown (16 yrs' flying experience; 1½ yrs. officer in charge 'plane repairs section R.A.F. Flying Training School).

SOUTH ESSEX AERO CLUB.§

Founded 1910 as East London Aero Club. Entrance, 10s.6d.; Subscription, £2 2s. F.M., 36.

Gliding ground, Langdon Hills, Essex, near Laindon (rail to Laindon, L.M.S.). Meetings, Sat., 3 p.m. (summer only), Sun., 10 a.m. Constructional meetings, Tues., Thurs., Tupper Bros. Garage, Seven-Kings, Essex.

R.F.D. primary machine.

President, Sir George Hamilton, J.P., M.P.; chairman, F. G. Smith, M.I.A.E.; sec., H. Whalley, 41 Hall Road, Chadwell Heath, Essex; instructors, E. H. Lancoots, E. Morton-Hicks.

SOUTHAMPTON GLIDING CLUB.§

Entrance, 10s. Subscription, £1 10s.

Gliding Grounds: Bassett (Southampton); Atlantic Park, Wide Lane, Swaythling, Southampton (Hants & Dorset 'bus from Southampton; Swaythling S.R. station). Meetings, week-ends.

Dickson primary machine.

Secs., H. R. Goodall, 441 Winchester Road, Bassett, Southampton; L. W. Matcham, 14 Cumberland Place, Southampton; instructors, S. P. Woodley ("A" certificate), N.L.B. Puttock ("A" certificate).

SOUTH SHROPSHIRE and NORTH HEREFORDSHIRE GLIDING CLUB.§

Aug., 1930. Entrance, £1 1s. Subscription, £1 1s. F.M., 50; N.F., 14; L.F., 17.

Gliding ground, Dinmore, Hereford (on Bodenham road, ½ mile from main Hereford-Leominster road. Meetings, Thurs., 2 p.m., Sun., 10 a.m.

Cloudcraft primary machine.

President, Sir James Croft, Bart.; chairman, Gordon Griffith; sec., A. Handy, Bull Ring, Ludlow, Shropshire; instructors, P. Pritchard, A. Handy.

ST. ANNE'S-ON-SEA GLIDING CLUB.

Sec., J. Olroyd, 93 St. Andrew's Road South, St. Anne's on Sea, Lancs.

ST. HELENS GLIDING CLUB.

Sec., E. Bussey, Carn Brae, Moss Bank, St. Helens, Lancs.

Primary machine under construction.

STIRLING GLIDING CLUB.

Sec., C. Sharp, Blairlogie Park, Blairlogie, Stirling.

SUFFOLK AND EASTERN COUNTIES AEROPLANE CLUB, LTD.
Gliding Section.

Sec., W. J. Offord, Aerodrome, Hadleigh, Suffolk.

SUNDERLAND GLIDING CLUB.

SURREY GLIDING CLUB. §

March, 1930. Entrance, £1 1s. Subscription £2 2s. F.M., 80: hon., 2; A, 17; B, 4.

Gliding ground, Lockner Farm, Chilworth, Surrey (S.R. to Chilworth; 'bus to Chilworth from Albury and Dorking). Meetings, Sat., 2.30 p.m. (summer only), Sun., 9.30 a.m.

Machines:—R.F.D. primary. Prufling. 1,000 launches. Best time, 1 min. 58 sec. (Mr. Reffell).

President, the Duke of Sutherland; chairman, R F. Dagnall; sec., G. H. Taylor, 24 Woodbridge Hill Gardens, Guildford; instructor and ground engineer, Capt. A. N. Stratton.

WARWICKSHIRE GLIDING CLUB.

Sec., E. Hanson, Plymouth Arms Hotel, Stratford-on-Avon.

WHITEHAVEN GLIDING CLUB.

Sec., A. Wilson, Summerfield, 4 Hensingham Road, Whitehaven.

WILTSHIRE LIGHT AEROPLANE AND GLIDER CLUB.§

July, 1930. Entrance, 10s. 6d. Subscription £1 1s. F.M., 40; L.F., 2.

Gliding ground, Easton Hill, Bishops Canning (Marlborough-Devizes road; 'bus from Devizes, Marlborough, Swindon; nearest station, Devizes). Meetings, Sat., 2 p.m., Sun.

Kegel Zogling primary machine. 60 launches.

Chairman, C. T. Cuss; sec., L. S. Scarlett, 8 Savernake St., Swindon.

WINCHESTER GLIDING CLUB.§

Sec., W. Russell, Fordington Road, Winchester.

WOLSELEY GLIDER CLUB.§

Sept., 1929. Entrance, 10s.; Subscription, £1 10s. F.M., 80; N.F., 100; hon., 4; L.F., 2.

Gliding ground, Terry's Farm, Walmley, Erdington, Birmingham (Midland 'bus to Walmley). Meetings, nightly, 6 p.m. (summer only); week-ends, 9 a.m.

President, W. C. Cannell; vice-president, O. Boden, O.B.E.; chairman, A. Gigli; sec., A. M. Newell, Wolseley Motors (1927) Ltd., Drews Lane, Ward End, Birmingham.

WORTHING AND DISTRICT GLIDING CLUB.§

July, 1930. Entrance, £1 1s. Subscription, £2 2s.; N.F., £1 1s.

Meetings, Wed., Sat., p.m.; Sun.

B.A.C. II primary machine.

Chairman, V. C. Abel; sec., N. T. Whiteman, 101 Rowlands Road, Worthing; ground engineer, S. Steer (many years Rigger, R.A.F.).

WREXHAM GLIDING CLUB.

Sec., N. Whitehall, Waring's Service Garage, Bradley Road, Wrexham.

BRITISH CLUBS OVERSEAS.

R.A.F. GLIDING CLUB, KARACHI, INDIA.

F.M. 12.

Primary machine. Club constructed.

Sec., Squadron Leader K. Graeme Leask, R.A.F. Depot, Karachi.

TASMANIAN GLIDER CLUB.

Sec., K. Howe.

VICTORIA GLIDING CLUB.

Sec., N. Musgrave, Sevenoaks, Victoria, British Columbia.

GLIDING IN AUSTRALIA AND NEW ZEALAND.

The gliding movement is making rapid headway in these great Dominions, as is shown by the following incomplete list of organisations and clubs.

STATISTICS OF GLIDING CL

Name of Club.	Founded	Entrance Fee	Subscription Flying Members	Financial Year Ends.	Subscription Due.	MEMBERSHIP. Men Flying	Men Non Flying	Women Flying	Women Non Flying	Honorary	Flying Meetings. (Summer)	Constructional Meetings.	Lectures, etc.	M… Operat… Primary	Secondary or…
Abergavenny	Sept	10/6	1/1/0	Sept	Oct	..	..	..	..	—	..	..	..	..	..
Accrington & District ..	Sept	10/6	2/2/0	Aug	..	22	11	..	4	—	..	..	..	1	..
Aircraft, Harrogate***	Jan	10/- (a)	1/0/0	Dec.	Jan	8(a)	..	..	..	—	Sun	Fri	Yes	1	..
Bedford	July	1/0/0	15/0	Aug	..	25	10	3	2	—	EW	Yes	..	1	..
Bolton**	June	10/6	2/2/0	March	April	30	..	3	1	—	W	..	..	1	..
Bradford**	July	1/1/0	1/1/0	July	Aug.	43	8	2	1	2	W	(a)	..	1	..
Bridlington*	Aug	1/1/0	3/3/0	Sept.	Sept	12	..	..	..	—	..	..	..	1	..
Bristol & District ..	Oct	1/1/0	2/2/0	..	Oct.	35	..	3	..	1	..	..	..	..	..
Cardiff and County ..	March	1/1/0	1/1/0	..	..	40	10	5	8	—	MWH(a)	..	..	1	..
Channel*	June	..	2/0/0	March	..	..	..	..	..	—	MW	Thur	..	2*	1
Cononley & District**	June	2/2/0(a)	1/1/0	June	June	30	10	6	8	4	MW	Yes	..	1*	..
Dorset*	March	10/6	1/1/0	Jan.	Jan.	72	8	10	..	—	MW	Yes	..	1*	[illegible]
Dover*	March	..	2/0/0	..	..	20	10	3	..	—	MW	..	..	1	..
Driffield & District* ..	May	10/6	1/10/0	April	April	43	15	5	2	—	EW	Tues	..	1	..
Edinburgh*	..	1/1/0	2/2/0	March	April	53	3	10	..	7	W	Yes	..	2	..
Essex*	April	10/6	1/1/0	..	..	50	10	4	..	12	W	Tues	..	1	..
Falkirk & District* ..	Oct.	10/6	1/11/6(a)	Sept	Oct	..	..	..	..	—	W	Mon	..	1	..
Furness*	July	10/6	1/11/6	Sept.	Oct	32	25	..	..	3	W	..	..	1*(a)	..
Glasgow* (a)	Oct.	10/6	2/10/0	Dec.	Jan.	67	..	1	3	—	Sun	..	..	1*	..
Halifax	Sept.	1/1/0	1/1/0	Aug.	Sept.	20	..	1	..	—	W	Sat(a)	..	1(b)	..
Herts. & Essex ..	July	10/6	3/3/0	..	..	..	..	..	..	—	W	..	..	1*	..
Ilkley & District* ..	July	10/6	1/1/0	Dec	Jan	48	14	..	..	3	EW	Tues Thur	..	1	..
Imperial College* ..	March	..	10/6	Sept	Nov	34	..	..	..	—	..	..	..	2(a)	..
Isle of Thanet* ..	..	..	1/10/0	..	..	93	..	..	..	—	W	..	..	1	..
Isle of Wight	July	..	2/2/0	..	(a)	40	6	2	6	—	W	Thur Sat		1	1(
Kent*	Jan	10/0	3/0/0a	March	March	82	26	4	2	4	EW	(b)	(c)	2	..
Leeds**	Sept	5/0	2/0/0	Oct.	..	35	4	..	2	1	EW	Yes	..	1	..
Leicestershire	March	5/0	1/1/0	March	March	20	10	2	2	1	W	Fri	..	1	..
London*	Jan	10/6	3/3/0	Jan	Feb	112	70	12	2	8	MW	Yes	..	3(a)	2(
Malton**	May	..	1/10/0	May	..	25	..	..	..	—	..	..	..	1	
Manchester* (a) ..	May	..	15/0	Dec.	Jan	..	..	..	..	—	W	..	(b)	1*	
Matlock	May	10/6	1/1/0	..	..	32	4	8	..	10	..	..	..	1*	
Midland	March	1/0/0	1/0/0	..	..	60	6	7	2	8	(a)	Wed	..	1	
Newcastle**	May	10/6	1/1/0a	Sept	(b)	50	..	2	..	—	W	..	..	1	
North Cotswold* ..	April	2/2/0	1/1/0	..	..	45	6	9	1	—	MW	..	..	1	
North Kent	July	10/6	1/1/0	Jan.	(a)	..	..	..	..		W	..	..	1	
Nottingham* ..	March	10/6	1/11/6	March	..	21	19	3	4	8	W(a)	..	..	2(b)	

STATISTICS OF GLIDING CLUBS IN THE BRITISH ISLES.

Name of Club.	Founded	Entrance Fee	Subscription Flying Members	Financial Year Ends.	Subscription Due.	Membership: Men Flying	Membership: Men Non Flying	Membership: Women Flying	Membership: Women Non Flying	Membership: Honorary	Flying Meetings. (Summer)	Constructional Meetings.	Lectures, etc.	Machines Operated: Primary	Machines Operated: Secondary or Advanced	Machines Under construction: Primary	Machines Under construction: Secondary or Advanced	Total No. of launches.	F.A.I. Certificates granted: A.	F.A.I. Certificates granted: B.	F.A.I. Certificates granted: C.	Best Flights: Duration.	Best Flights: Straight Line Distance.	Best Flights: Height.	
Abergavenny	Sept	10/6	1/1/0	Sept	Oct	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Accrington & District ..	Sept	10/6	2/2/0	Aug	..	22	11	..	4	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	
Aircraft, Harrogate***	Jan	10/- (a)	1/0/0	Dec.	Jan	8(a)	..	..	..	..	Sun	Fri	Yes	1	..	..	1	..	..	..	..	..	440	..	(a) Gliding Se
Bedford	July	1/0/0	15/0	Aug	..	25	10	3	2	..	EW	Yes	..	1	..	..	1	200	..	..	..	..	..	..	Built own ha
Bolton**	June	10/6	2/2/0	March	April	30	..	3	1	..	W	..	..	1	..	..	..	163	..	..	..	0-1-13	790	80	T.F.T., 1-50-0
Bradford**	July	1/1/0	1/1/0	July	Aug.	43	8	2	1	2	W	(a)	..	1	..	..	1	303	..	..	..	0-0-12	150	45	T.F.T., 0-15-8
Bridlington*	Aug	1/1/0	3/3/0	Sept.	Sept	12	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	
Bristol & District ..	Oct	1/1/0	2/2/0	..	Oct.	35	..	3	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Cardiff and County ..	March	1/1/0	1/1/0	..	..	40	10	5	8	..	MWH(a)	..	..	1	..	..	..	..	..	..	..	0-0-30	170	60	
Channel*	June	..	2/0/0	March	..	..	..	..	..	..	MW	Thur	..	2*	1	..	..	..	1	1	1	..	..	..	
Cononley & District**	June	2/2/0(a)	1/1/0	June	June	30	10	6	8	4	MW	Yes	..	1*	..	1	..	..	..	..	..	0-0-35	900	..	(a) Ladies £1
Dorset*	March	10/6	1/1/0	Jan.	Jan.	72	8	10	..	..	MW	Yes	..	1*	1	..	..	461	13	1	..	0-2-53	1 mile	50	
Dover*	March	..	2/0/0	..	..	20	10	3	..	..	MW	..	..	1	..	..	..	..	..	..	..	..	..	..	
Driffield & District* ..	May	10/6	1/10/0	April	April	43	15	5	2	..	EW	Tues	..	1	..	..	..	180	4	..	..	0-0-48	..	150	
Edinburgh*	..	1/1/0	2/2/0	March	April	53	3	10	..	7	W	Yes	..	2	..	..	..	..	..	..	..	..	..	..	
Essex*	April	10/6	1/1/0	..	..	50	10	4	..	12	W	Tues	..	1	..	..	1	..	..	..	..	..	..	..	
Falkirk & District* ..	Oct.	10/6	1/11/6(a)	Sept	Oct	..	..	..	..	..	W	Mon	..	1	..	..	1	..	..	..	..	..	..	..	(a) Junior Me
Furness*	July	10/6	1/11/6	Sept.	Oct	32	25	..	..	3	W	..	..	1*(a)	..	..	..	53	..	..	..	..	..	..	(a) BAC II &
Glasgow* (a) ..	Oct.	10/6	2/10/0	Dec.	Jan.	67	..	1	3	..	Sun	..	..	1*	..	1	..	..	..	..	..	..	..	..	(a) Ltd.
Halifax	Sept.	1/1/0	1/1/0	Aug.	Sept.	20	..	1	..	..	W	Sat(a)	..	1(b)	..	..	..	40	..	..	..	0-0-22	440	150	(a) Winter (b)
Herts. & Essex ..	July	10/6	3/3/0	..	..	..	..	..	..	..	W	..	..	1*	..	..	..	..	..	..	..	..	..	..	
Ilkley & District* ..	July	10/6	1/1/0	Dec	Jan	48	14	..	..	3	EW	Tues Thur	..	1	..	1	..	468	1	1	1	..	..	..	District ideal
Imperial College* ..	March	..	10/6	Sept	Nov	34	..	..	..	..	..	..	..	2(a)	..	..	..	..	..	..	..	..	..	..	(a) 1 club con
Isle of Thanet* ..	..	..	1/10/0	..	..	93	..	..	..	..	W	..	..	1	..	..	2	..	..	..	..	..	..	..	
Isle of Wight	July	..	2/2/0	..	(a)	40	6	2	6	..	W	Thur Sat		1	1(b)	..	1	..	..	..	..	..	..	..	(a) year after
Kent*	Jan	10/0	3/0/0a	March	March	82	26	4	2	4	EW	(b)	(c)	2	..	..	1	..	6	2	1	..	..	..	(a) ab initios,
Leeds**	Sept	5/0	2/0/0	Oct.	..	35	4	..	2	1	EW	Yes	..	1	..	..	2	..	..	..	..	..	..	..	
Leicestershire	March	5/0	1/1/0	March	March	20	10	2	2	1	W	Fri	..	1	..	1	..	53	..	..	..	0-1-10	880	70	T.F.T., 0-10-1
London*	Jan	10/6	3/3/0	Jan	Feb	112	70	12	2	9	MW	Yes	..	3(a)	2(a)	..	..	..	36	11	6	2-25-0	..	1000	(a) also 4 pri
Malton**	May	..	1/10/0	May	..	25	..	..	..	..	..	..	...	1	..	..	..	..	..	..	..	..	..	..	
Manchester* (a) ..	May	..	15/0	Dec.	Jan	..	..	..	..	..	W	..	(b)	1*	..	..	..	..	..	..	..	..	..	..	(a) Mancheste
Matlock	May	10/6	1/1/0	..	..	32	4	8	..	10	..	..	..	1*	..	..	..	174	..	..	..	..	..	..	
Midland	March	1/0/0	1/0/0	..	..	60	6	7	2	0	(a)	Wed	..	1	..	..	..		..	..	..	..	..	..	(a) Thurs., Su
Newcastle** ..	May	10/6	1/1/0a	Sept	(b)	50	..	2	..	..	W	..	..	1	..	..	..	..	..	..	..	..	..	..	year
North Cotswold* ..	April	2/2/0	1/1/0	..	..	45	6	9	1	..	MW	..	..	1	..	..	2(a)	1200	2	..	..	0-0-34	..	..	power
North Kent	July	10/6	1/1/0	Jan.	(a)	..	..	..	..		W	..	..	1	..	..	..	..	..	..	..	..	..	..	(a) year after
Nottingham*	March	10/6	1/11/6	March	..	21	19	3	4	3	W(a)	..	..	2(b)	..	..	..	400	1	..	..	..	..	..	(a) and Thur
Oxford & County* ..	Feb	10/6	3/3/0	March	do.	50	15	1	..	5	Sun	..	...	3(a)	..	1	..	600(b)	..	..	..	0-1-0	400	300	(a) 2 club co
Portsmouth & Southsea*	May	10/6	2/2/0	March	April	40	20	4	..	..	W	..	..	2	..	..	..	..	9	..	..	0-8-0	..	..	
Preston & District ..	Oct.	10/6	2/2/0	March	..	30	..	6	..	..	HW	..	..	1*	..	..	..	..	1	..	..	0-0-35	..	150	
Scarborough*	Feb.	..	3/3/0	Jan	(a)	36	85	3	20	5	MW	(b)	Yes	1	3	..	..	735	..	3	..	0-3-15	2 mile	..	(a) year after
Southdown*	June	10/6	2/2/0	Dec.	..	39	14	2	9	1	EW	E	Yes	2(a)	..	..	2	..	4	..	..	..	..	..	(a) one certif
St. Helens	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	
South Essex*	1910	10/6	2/2/0	..	do.	36	..	..	..	..	W	Tues Thur	..	1*	..	..	..	..	..	..	..	..	..	..	
Southampton*	Dec.	10/0	1/10/0	Dec.	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	
S. Shropshire*	Aug.	1/1/0	1/1/0	..	..	50	14	17	..	..	Th. Sun	..	..	1*	..	..	..	..	..	..	..	..	..	..	
Surrey*	March	1/1/0	2/2/0	April	April	80	..	..	2	2	W	..	..	1*	1	..	..	1000	17	4	..	0-1-58	..	..	
Wiltshire*	July	10/6	1/1/0	Sept.	Sept.	40	..	2	..	..	W	..	..	1*	..	..	..	60	..	..	..	..	..	..	
Wolseley*	1929	10/0	1/10/0	Dec.	Jan.	80	100	2	..	4	EW	..	..	..	..	..	..	..	..	..	..	..	..	..	
Worthing & District* ..	July	1/1/0	2/2/0	..	..	..	..	..	..	..	MW	..	..	1	..	..	..	..	..	..	..	..	..	..	

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STATISTICS OF GLIDING CLUBS IN THE BRITISH ISLES.

Financial Year Ends.	Subscription Due.	MEMBERSHIP. Men Flying	Men Non Flying	Women Flying	Women Non Flying	Honorary	Flying Meetings. (Summer)	Constructional Meetings.	Lectures, etc.	Machines Operated Primary	Operated Secondary or Advanced	Under construction Primary	Under construction Secondary or Advanced	Total No. of launches.	F.A.I. Certificates granted. A.	B.	C.	Best Flights. Duration.	Straight Line Distance.	Height.	Remarks.
ept	Oct	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
ug	..	22	11	..	4	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	
ec.	Jan	8(a)	..	..	..	..	Sun	Fri	Yes	1	..	..	1	..	..	..	..	..	440	..	(a) Gliding Section. Club has 41 members.
ug	..	25	10	3	2	..	EW	Yes	..	1	..	..	1	200	..	..	..	..	..	..	Built own hangar.
arch	April	30	..	3	1	..	W	..	..	1	..	..	..	163	..	..	..	0-1-13	790	80	T.F.T., 1-50-0
uly	Aug.	43	8	2	1	2	W	(a)	..	1	..	..	1	303	..	..	..	0-0-12	150	45	T.F.T., 0-15-8 (a) 3 nights weekly.
ept.	Sept	12	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	
..	Oct.	35	..	3	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
..	..	40	10	5	8	..	MWH(a)	..	..	1	..	..	..	..	..	..	..	0-0-30	170	60	(a) Not Sundays.
arch	..	..	..	..	..	..	MW	Thur	..	2*	1	..	..	..	1	1	1	..	..	..	
une	June	30	10	6	8	4	MW	Yes	..	1*	..	1	..	..	..	..	..	0-0-35	900	..	(a) Ladies £1 1s.
an.	Jan.	72	8	10	..	..	MW	Yes	..	1*	1	..	..	461	13	1	..	0-2-53	1 mile	50	
..	..	20	10	3	..	..	MW	..	..	1	..	..	..	..	..	..	..	..	..	..	
pril	April	43	15	5	2	..	EW	Tues	..	1	..	..	..	180	4	..	..	0-0-48	..	150	
rch	April	53	3	10	..	7	W	Yes	..	2	..	..	..	..	..	..	..	..	..	..	
..	..	50	10	4	..	12	W	Tues	..	1	..	..	1	..	..	..	..	..	..	..	
Sept	Oct	..	..	..	..	..	W	Mon	..	1	..	..	1	..	..	..	..	..	..	..	(a) Junior Members 5s.
ept.	Oct	32	25	..	..	3	W	..	..	1*(a)	..	..	..	53	..	..	..	..	..	..	(a) BAC II & BAC III fuselage
ec.	Jan.	67	..	1	3	..	Sun	..	..	1*	..	1	..	..	..	..	..	..	..	..	(a) Ltd.
ug.	Sept.	20	..	1	..	..	W	Sat(a)	..	1(b)	..	..	..	40	..	..	..	0-0-22	440	150	(a) Winter (b). T.F.T., 1-54-23.
..	..	..	..	..	..	..	W	..	..	1*	..	..	..	..	..	..	..	..	..	..	
ec	Jan	48	14	..	..	3	EW	Tues Thur	..	1	..	1	..	468	1	1	1	..	..	..	District ideal.
ept	Nov	34	..	..	..	..	..	..	..	2(a)	..	..	..	..	..	..	..	..	..	..	(a) 1 club constructed. Club for students only.
..	..	93	..	..	..	..	W	..	..	1	..	..	2	..	..	..	..	..	..	..	
..	(a)	40	6	2	6	..	W	Thur Sat		1	1(b)	..	1	..	..	..	..	..	..	..	(a) year after joining. (b) dual control 2-seater.
arch	March	82	26	4	2	4	EW	(b)	(c)	2	..	..	1	..	6	2	1	..	..	..	(a) ab initios, Pilots £2 (b) twice weekly (c) monthly winters.
ct.	..	35	4	..	2	1	EW	Yes	..	1	..	..	2	..	..	..	..	..	..	..	
arch	March	20	10	2	2	1	W	Fri	..	1	..	1	..	53	..	..	..	0-1-10	880	70	T.F.T., 0-10-10.
an	Feb	112	70	12	2	9	MW	Yes	..	3(a)	2(a)	..	..	..	36	11	6	2-25-0	..	1000	(a) also 4 privately-owned machines.
ay	..	25	..	..	..	..	..	..	...	1	..	..	..	..	..	..	..	..	..	..	
ec.	Jan	..	..	..	..	..	W	..	(b)	1*	..	..	..	..	..	..	..	..	..	..	(a) Manchester branch R.Ae.S. (b) every 3 weeks.
..	..	32	4	8	..	10	..	..	..	1*	..	..	..	174	..	..	..	..	..	..	
..	..	60	6	7	2	0	(a)	Wed	..	1	..	..	..	..	..	..	..	..	..	..	(a) Thurs., Sun.
ept	(b)	50	..	2	..	..	W	..	..	1	..	..	..	..	..	..	..	..	..	..	(a) 2nd year 18s., 3rd 15s. (b) year after joining.
..	..	45	6	9	1	..	MW	..	..	1	..	..	2(a)	1200	2	..	..	0-0-34	..	..	(a) one power-assisted sailplane.
an.	(a)	..	..	..	..		W	..	..	1	..	..	..	..	..	..	..	..	..	..	(a) year after joining.
March	..	21	19	3	4	3	W(a)	..	..	2(b)	..	..	..	400	1	..	..	..	..	..	(a) and Thurs. (b) one certified.
March	do.	50	15	1	..	5	Sun	..	...	3(a)	..	1	..	600(b)	..	..	..	0-1-0	400	300	(a) 2 club constructed. (b) average 15 sec.
March	April	40	20	4	..	..	W	..	..	2	..	..	..	..	9	..	..	0-8-0	..	..	
March	..	30	..	6	..	..	HW	..	..	1*	..	..	..	..	1	..	..	0-0-35	..	150	
an	(a)	36	85	3	20	5	MW	(b)	Yes	1	3	..	..	735	..	3	..	0-3-15	2 mile	..	(a) year after joining. (b) school every evening.
Dec.	..	39	14	2	9	1	EW	E	Yes	2(a)	..	..	2	..	4	..	..	..	..	..	(a) one certified.
..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	
..	do.	36	..	..	..	..	W	Tues Thur	..	1*	..	..	..	..	..	..	..	..	..	..	
Dec.	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	
..	..	50	14	17	..	..	Th. Sun	..	..	1*	..	..	..	..	..	..	..	..	..	..	
April	April	80	..	..	2	2	W	..	..	1*	1	..	..	1000	17	4	..	0-1-58	..	..	
Sept.	Sept.	40	..	2	..	..	W	..	..	1*	..	..	..	60	..	..	..	..	..	..	
Dec.	Jan.	80	100	2	..	4	EW	..	..	..	..	..	..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	MW	..	..	1	..	..	..	..	..	..	..	..	..	..	

NOTE.—This table applies only to clubs which answered the GLIDING questionnaire. Abbreviations used :—* Affiliated to the British Gliding Association ; ** affiliated to the Association of Northern Gliding Clubs ; * affiliated to the B.G.A. and A.N.G.C. ; asterisk against machine, B.G.A. certificate of airworthiness ; E, evenings ; W, Saturdays and Sundays ; M, Wednesdays ; H, holidays ; T.F.T., total flying time ; Duration given in hours, mins., secs. ; distance in yards or miles ; height in feet. Unless otherwise stated, clubs were founded in 1930. Details given are not guaranteed to be accurate, and the table is only intended to serve as an approximate survey of clubs as they were at the beginning of 1931.**

G CLUBS IN

	Machines Operated: Primary	Machines Operated: Secondary or Advanced	Machines Under construction: Primary	Machines Under construction: Secondary or Advanced	Total No.
.	..	..	..	..	..
.	1	..	..	..	..
s	1	..	..	1	..
.	1	..	..	1	200
.	1	..	..	..	163
.	1	..	..	1	303
.	1	..	..	..	..
.	..	..	..	..	..
.	1	..	..	..	..
.	2*	1	..	..	..
.	1*	..	1	..	..
.	1*	1	..	..	461

NEW SOUTH WALES.

New South Wales Gliding Association, in process of formation.

North Shore Flying Club, 46 Musgrave St., Mosman, N.S.W. Primary and intermediate machines. 20 members.

Glen Innes Gliding Club, Glen Innes, N.S.W. Primary machine, club constructed. 25 members.

Sydney University Glider Club. Primary and intermediate machines. 40 members.

VICTORIA.

Glider Association of Victoria, in process of formation.

Colac Glider Club, Colac, Victoria. Primary machine, best height, 80ft.; duration, 40 sec.; distance, 1/3 mile. 35 members.

Warrnambool and District Gliding Club, Parker's Garage, Warrnambool, Victoria. Primary machine. This club claims the Australian duration record of 1 hr. 35 min., established at Tower Hill, Warrnambool. 30 members.

Castlemaine Glider Club, Castlemaine, Victoria. Primary machine. 30 members.

WEST AUSTRALIA.

Victoria Park Gliding Club, Savoy Theatre Buildings, Victoria Park, Perth, West Australia. Primary machine; intermediate under construction.

NORTH ISLAND.

Manawatu Gliding Club, Palmerston North. Primary machine. 67 members.

GLIDING GLOSSARY.

Compiled by Mr. H. J. Penrose, A.F.R.Ae.S., hon. instructor, Dorset Gliding Club. In compiling this list of definitions, reference has been made to the Glossary of Terms of the Royal Aeronautical Society. For information with regard to power-driven aircraft this work should be consulted.

AB-INITIO.—A novice or beginner.

AEROFOIL.—A wing-like structure designed to obtain a reaction from the air approximately at right angles to the direction of motion.

AILERON.—Hinged flaps let into the rear portion of the extremities of the main planes. These are operated by a lateral movement of the control lever, causing the machine to roll laterally (*i.e.* in banking).

AIR-SPEED.—The speed of the machine relative to the air passing it.

AIRWHEEL.—A spokeless wheel used on aircraft. Comprises a large pneumatic tyre at low pressure (15 to 20 lbs. per sq. ins) on a wide rimmed hub.

AIRWORTHY.—To be fit to fly from the design and constructional point of view. To be signed as fit to fly by a ground engineer.

ALIGHTING GEAR.—The system of sprung wheels or sprung or fixed skid incorporated in the glider on which the machine rests when in contact with the ground, stationary, alighting or taking off.

ALTITUDE.—Used colloquially as synonymous with height.

ANEMOMETER.—An instrument for measuring the force of the wind.

ANTI-CYCLONE.—The region of atmosphere surrounding a centre of high barometric pressure.

AREA.—The projected area of the surface of a wing—in a rectangular aerofoil the span chord *i.e.*, span X chord.

ASPECT RATIO.—The ratio of span to chord of the wing. The greater the ratio the more efficient the wing.

ATTITUDE.—Determined by the inclination of the three principal axes to the relative wind.

AUTO-TOWING.—The act of towing a glider behind a car into the wind to enable it to become air-borne.

AXIS.—*Longitudinal.*—A straight line in the plane of symmetry through the centre of gravity fore and aft. *Lateral.*—An axis parallel to a line joining the wing tips and passing through the centre of gravity. *Normal.*—A straight line in the plane of symmetry, at right angles to the longitudinal axis through the centre of gravity.

BACKING.—Change of the wind anti-clockwise, against the sun in the northern hemisphere.

BALLOON, to—The sudden upward flight of a glider when near the ground caused when about to land by the pilot pulling the control lever back too much or too quickly.

BANK.—To raise one wing relative to the horizon for the purpose of turning.

BAR.—The unit of atmospheric pressure, and equal to the pressure of one million dynes per square centimetre.

BAROGRAPH.—A recording barometer showing the pressure of the atmosphere. Used in soaring records to establish the height of a sailplane.

BAROMETER.—An instrument measuring atmospheric pressure.

BAY.—The space enclosed by a system of struts and spars.

BELT.—The safety strap which secures the pilot to his seat in the glider.

B.G.A.—The British Gliding Association. The Body controlling the sport of gliding and soaring in this country. Empowered by the Air Ministry to issue certificates of airworthiness for all gliders and sailplanes.

BIASSED FABRIC.—Fabric laid with its threads inclined to the longitudinal axis of the material.

BIPLANE.—An aircraft with two aerofoils set one above the other, usually with a gap between roughly equivalent to the chord.

BONING.—Lining-up by eye. Checking the alignment of a structure by sighting.

BOOMS, TAIL.—The main spars carrying the tail of a gliding machine in which the fuselage does not perform this function.

BRACING WIRES.—The wires taking the loads of the structure, comprising :—

(*a*) Lift wires transferring the lift of the wings to the fuselage or load carrying structure.
(*b*) Anti-lift or landing wires which resist force in the opposite direction to lift.
(*c*) Drag wires, transferring the drag of the wings to the body or other part of the structure.
(*d*) Anti-drag wires taking forces of opposite direction to the drag.
(*e*) Incidence wires cross bracing the wings in the plane of a pair of front and rear wing struts.

BUMPS.—Disturbances of the air due to changes of temperature, pressure or the wind striking ground obstacles.

BUNGY.—A slang term for the multi-strand elastic cord used to launch gliding craft.

CABANE.—The arrangement of struts on a monoplane over the centre line of the glider to which the landing wires are secured.

CAMBER.—The curvature of the centre line of an aerofoil with the convex side upwards.

CANTILEVER.—A wing or other structure without external bracing, supported at the root only.

CENTRE OF GRAVITY.—The point about which the mass of a structure will balance.

CENTRE OF PRESSURE.—The line at which the resistance of the air forces on a wing may be said to act. Usually located as a percentage of the chord. At steep angles of incidence the C.P. is forward and at small angles it is backwards.

CENTRE-SECTION.—The centre cellule of a wing structure. A portion to which the main planes are attached.

CERTIFICATE, PILOT'S (Gliding).—An official document issued by the Royal Aero Club indicating that certain regulations have been complied with.

"A".—30 seconds flight in a straight line with *normal landing*.

"B."—1 minute with two qualifying flights of 45 seconds each.

"C."—A flight of 5 minutes at a higher altitude than the starting point.

CERTIFICATE OF AIRWORTHINESS (C. of A).—Indicating that the glider is satisfactory to fly, from the design and strength requirements issued by the B.G.A.

CHOCK.—A piece of wood in a structure strengthening the juncture of two members.

CHORD.—The distance between the leading and trailing edge of the wing, obtained in a rectangular wing by dividing the area by the span.

CLIMB.—To gain altitude above the starting point. Only practicable when the upward velocity of the wind or thermal current exceeds the sinking velocity of the glider or sailplane.

COCKPIT.—The portion of the fuselage or nacelle accommodating the pilot or passenger.

CONTROL COLUMN.—Known as the "joy stick." A lever freely hinged at the base controlling the longitudinal and lateral movement of the machine.

CONTROL WIRES.—Cables or wires connecting the rudder bar and control column to their respective control surfaces.

CONTROL SURFACE.—The movable areas affecting the attitude of the machine on all three axes.

CRASH.—To smash the machine with or without fatal results to the pilot. Usually the result of bad flying, over confidence or careless judgment.

CUMULUS.—Clouds with a flat base and considerable height. These clouds are very favourable to cloud soaring, giving a strong up-current on the underside towards the centre and inside.

CYCLONE.—A depression. The atmospheric region surrounding a centre of low barometric pressure.

DATUM LINE.—An arbitrary line coinciding with or parallel to an axis and from which the rigging measurements are taken.

DIHEDRAL ANGLE.—The inclination of the wings from the centre to the transverse axis of the aircraft.

DIVE.—To descend steeply at a small angle of incidence, but steep flight path, relative to the ground.

DOPE.—A liquid preparation brushed or sprayed on to fabric of the wings to render them taut and weatherproof.

DRAG.—The component along the longitudinal axis to the rear of the resultant force due to the relative wind. The head resistance or resistance along the line of flight.

DRIFT.—Crabwise motion of the glider relative to the ground due to a side wind.

DUAL CONTROL.—A system of interconnected flying controls so that either pilot or passenger can fly the machine.

EDDY.—Caused when the motion of a fluid exceeds a certain critical value and the paths of some of the particles change from smooth to irregular.

ELEVATOR.—A horizontal hinged controlling surface at the tail operated by a fore and aft movement of the control column and causing the machine to change its longitudinal attitude, or pitch.

EMPENNAGE.—The tail unit of a machine, usually comprising rudder, fin, elevator and fixed tail plane.

EQUILIBRIUM.—A body is said to be in equilibrium when the forces acting on it are in balance.

F.A.I.—Federation Acronautique Internationale, the body controlling and governing the sport of flying internationally and by which world record flights are recognised.

FABRIC.—The usual covering material of aerofoil surfaces. Usually of strong linen, but in sailplanes often of high grade silk, and in gliders of Egyptian cotton.

FAIRING.—Additional streamline covering to the structure to reduce head resistance.

FIN.—A fixed vertical surface, generally fitted in front of the rudder to increase the directional stability of the glider.

FLATTEN OUT.—An expression describing the decrease of the gliding angle until the flight of the machine merges into the ground. In gliding and soaring machines the flattening out is very slight, the machine being flown on to the ground. Excessive flattening out will cause the tail to strike first and the fuselage structure to collapse.

FLYING SPEED.—Speed of a machine relative to the air necessary to maintain it in flight. At steep angles of incidence this speed is slow and at low angles it is fast.

FORCE.—That which tends to alter a body's state of rest or motion.

FULCRUM.—The fixed point on which a body pivots.

FUSELAGE.—The main structural body of a glider to which the main planes, tail unit, and other organs are attached.

GAP.—The distance between the upper and lower wings of a biplane.

GLIDE.—To fly on a descending path with gravity as motive force.

GLIDER.—A machine on which to glide. A *Zogling* is a training glider. The *Prufling* and *Hangwind* are advanced gliders capable of soaring. The *Professor* is a sailplane with a low rate of descent.

GLIDING ANGLE.—The angle that the longitudinal axis of the machine makes with the horizontal. Equal to the ratio of Lift/Drag for the angle of incidence of the wing.

GROUND SPEED.—The speed of the glider relative to the ground. Equal to the air speed plus or minus the wind.

GROUND ENGINEER.—One approved by the B.G.A. and/or the Air Ministry as qualified to maintain the glider in a state of airworthiness.

HANGAR.—Building in which aircraft are housed.

HEAVY-HANDED, or "Ham-Fisted."—Refers to a pilot who is clumsy with his controls and over-pulls.

HOIK.—To pull the machine steeply off the ground at the launch. This should never be indulged in by ab initios as the glider will stall before the pilot has time to move the controls into the correct position for recovery.

HORIZON.—The limit of ground in view. The plane of reference to keep the machine in equilibrium.

INCIDENCE.—For rigging purposes the angle that the chord of a wing makes with the longitudinal axis. The angle of a wing relative to the direction of motion.

KEEL SURFACE.—The side surface of a machine.

KING POST.—A bracing strut in a subsidiary stiffening system applied to a member subject to bending. Usually refers to the control lever on the control surfaces to which the control cables are attached and converting the motion of the cables to angular motion of the surface.

LANDING.—The action of a machine coming in to land under the pilot's conrol.

LAUNCH.—The act of getting the glider airborne. Usually by catapulting into the air by means of rubber cord.

LEADING EDGE.—The portion of the wing first entering the air stream.

LEEWARD.—Away from the wind.

LEFT & RIGHT.—The sides of the machine as seen by the pilot sitting in his seat.

LENGTH.—The overall dimension of the machine from nose to trailing edge of rudder.

LIFT.—The upward force exerted by the air on a wing in motion. The force perpendicular to the flight path in the plane of symmetry.

LINE SQUALL.—Indicated by a "cold front" and an arched cloud advancing in line over a great extent of country. Used by German pilots for long distance soaring records as the cold front pushes strong up-currents in front of it. Usually travels from N.W. to S.W.

LOADING.—The weight per unit area carried by an aerofoil (including fixed and movable parts).

LOAD FACTOR.—Represents approx. 1.1/3 times the maximum ultimate load that is likely to come on a member.

LOCKING WIRE.—A wire threaded through a hole drilled through boltheads and turnbuckles and twisted to prevent unscrewing.

LOCKING PLATE.—A plate made to fit against a nut or bolthead and secured in position to prevent unscrewing.

LOG BOOK.—A book of entries giving details of each flight, damage to machine, repairs, etc.

LONGERON.—The main longitudinal members of a fuselage or nacelle.

MOMENT (about a point).—A force multiplied by its distance from the point.

MONOCOQUE.—A type of fuselage construction in which the skin takes the main loads in the structure.

MONOPLANE.—A heavier-than-air craft having a single main aerofoil.

M.P.H.—Miles per hour.

NACELLE.—A short form of fuselage just large enough to enclose the pilot, but not carrying tail organs.

NOSE.—The front portion of a glider.

NOSE DIVE.—A very steep descent at a small angle of incidence.

NOSE HEAVY.—A state in which the glider tends to lower its nose in flight, and continuous backward pressure on the stick is required to maintain a normal gliding angle.

OSCILLATION (Longitudinal).—A periodic variation of speed combined with upward and downward movement in flight.

OUTRIGGER.—The lift struts going outwards from the fuselage to the wing spars and taking the flying and landing loads.

OVERHANG.—The portion of the wing extending from the last external bracing point to the wing tip.

PACKING PIECE.—A fitting of wood to make up vacant pieces in structural work. A block of wood used to take the pressure of boltheads, fittings, etc.

PANCAKE.—To drop to the ground from a small height, owing to losing flying speed and holding off too soon.

PITCH.—Angular motion about the lateral axis.

PILOT.—A person controlling the glider in the air.

PITOT HEAD.—Comprising a suction tube and pressure tube both connected to an instrument calibrated in M.P.H.

PLANE.—A term applied to the supporting surfaces and horizontal tail.

PLYWOOD.—Thin laminated wood (of birch or mahogany) used in the construction of spars and to cover fuselages. Often only 1mm. thick.

PUMP-HANDLING.—Vigorous and unnecessary backward and forward movement of the control column, due to over-correction.

R.Ae.C.—Royal Aero Club. The body controlling and governing the sport of flying and issuing pilots' certificates in Great Britain.

RATE OF DESCENT.—The vertical component of the flight speed of a glider. Not more than 2½ feet per second for sailplanes.

RIB.—A light member giving the desired shape to the outer fabric of a structure.

RIB, COMPRESSION.—A member which assists to give the desired shape to the outer covering of a structure and at the same time acts as a strut between the spars of that structure.

RIGGING POSITION.—Position in which an arbitrary datum plane in regard to the machine is horizontal.

ROLL.—Angular motion about the longitudinal axis.

R.R.G.—Rhön-Rossitten Gesellschaft, German Govt. subsidised research establishment controlling gliding in Germany.

RUDDER.—A vertical hinged control surface by means of which the yawing of a glider is controlled.

RUDDER BAR.—The foot bar, by means of which the pilot controls the angular movement of the rudder.

RUDDER POST or **FIN POST.**—The vertical structural member to which the rudder is hinged.

QUICK RELEASE.—A gear containing a cut-out and which allows the load in a member to be suddenly released (such as tension in the starting cord).

SAILPLANE.—A refined gliding machine of low drag, characterised by a slow sinking speed. Any glider having a sinking speed of not more than 2½ft. per sec. comes under this category.

SENSITIVE.—Usually applied to controls which respond quickly and easily to a light touch.

SEMI-CANTILEVER.—Applied to strut-braced wings with a large overhang in proportion to the span.

SHOCK ABSORBER.—A system of springing, either rubber or metal, which absorbs the landing load of the glider.

SIDESLIP.—To move broad-side to the relative air.

SKID.—A part of the alighting gear arranged to slide along the ground. Usually made of ash.

SOAR.—To glide downwards in an up-current of equal or greater strength than the sinking speed (rate of descent) of the glider.

SOARPLANE.—See Sailplane.

SOGGY.—Slow on the control and heavy to handle. Also used to describe fabric which has lost its tautness

SPAN.—The distance from wing tip to wing tip.

SPAR.—A principal member of a structure. It supports secondary members and is principally subjected to bending stresses.

SPIN.—A diving descent combined with a continued rotation about the direction of motion of the centre of gravity of the machine, the wings being at an angle beyond the stall.

SPLICE.—To unite the ends of two pieces of wire, rope, or timber. In splicing cable wire the strands are interwoven ; in timber a scarf joint is made at a minimum angle of 1 in 9.

STABILITY.—The quality by virtue of which any disturbance of steady motion tends to decrease, or the property of an aircraft to return to its normal position if left uncontrolled.

STAGGER.—The amount that the leading edge of one wing of a biplane is set in front of or behind the leading edge of the other wing.

STALL.—Occurs when the angle of incidence of a wing exceeds the critical angle and the air flow breaks down. The speed of the aircraft at the stall is so low that the machine ceases to be under control.

STERN-POST.—See Rudder post.

STIFFENER.—A part used for reinforcing a member or system of members.

STRAINER or **TURNBUCKLE.**—A fitting used to adjust the tension of wires to which it is attached. Consists of a barrel threaded internally, into each end of which is screwed a handed eyebolt.

STREAMLINE.—The path of a small portion of fluid, moving in a non-eddying path relative to a body, often referred to the particular shape of a body giving the minimum resistance to the air.

STRUT.—A structural member intended to resist compression in the direction of its length.

STUNT.—A colloquial term referring to exaggerated manoeuvres in the air.

SQUALL.—A strong wind that rises suddenly, and then dies away.

" S " TURNS.—A series of right and left turns with regard to a fixed object ahead. Used in approaching a field to land so that the field is always kept in view.

SURFACE.—A term for the area of a wing.

SWEEP BACK.—The angular set back of the main planes relative to the body.

TAIL.—The after part of an aircraft, usually carrying certain controlling organs (see Empennage).

TAIL BOOM.—See Boom.

TAIL HEAVY.—A state in which the glider tends to fly with the tail lower than the nose, and continuous forward pressure is required on the control column to maintain level flight.

TAIL PLANE.—A fixed horizontal surface attached to the tail of a glider and affecting the longitudinal stability.

TAIL SETTING ANGLE.—The angle between the chord of a wing and the chord of the tailplane. For rigging purposes measured in relation to the longitudinal datum.

TAIL-SKID.—A small skid at the rear preventing the tail from making contact with the ground.

TERRAIN.—A particular area of ground or locality.

TIE-ROD.—Adjustable tension members with swaged ends screwing in forks.

TRESTLE.—Wooden frames to support the tail or wings of a machine during erection.

TRIPLANE.—an aircraft with three aerofoils arranged one above the other.

TRUE-UP.—To adjust the rigging of a glider so that it flies correctly.

TURNBUCKLE.—See Strainer.

UNDERCARRIAGE.—The part of the glider taking the weight of the machine on the ground and the shock of landing. Usually takes the form of a skid, as wheels cause the glider to run too far on alighting.

VEERING.—To change the wind direction towards the sun (or clockwise).

VELOCITY.—The speed of a glider through the air. Usually measured in miles per hour for forward speed and feet per second for sinking speed.

WARP.—The lengthwise run of fabric yarn.

WARPING.—Twisting out of normal alignment. Light structures are subject to such distortion. Trailing edges of early aircraft were flexibly constructed so that planes could be warped (by control wires) to effect lateral control in lieu of ailerons.

WASH IN.—Increasing the angle of incidence towards the wing tip.

WASH OUT.—Decreasing the angle of incidence towards the wing tip.

WEATHERCOCK INSTABILITY.—The tendency of an aircraft to depart from straight line flight by a combination of side slipping and yawing.

WEFT.—The crosswise run of fabric yarn.

WEIGHT.—Mass X Gravity in pounds. The laden weight of a glider is composed of the weight of the empty machine and the weight of the pilot or crew.

WINDSCREEN.—A transparent screen placed in front of the pilot to shield him from the rush of air caused by the machine in motion. It is better to dispense with this in a sailplane as the rush of air on the face gives valuable indication of the machine's attitude in a cloud.

WINDSPEED.—The velocity of the wind relative to the ground.

WING.—The main supporting surface or aerofoil.

WING TIP.—The right or left hand extremity of the wing.

WINGTIP SKIDS.—Small skids of cane or ash fixed to the underside of the wing near the tip and taking the shock should the glider alight with one wing down.

WIRE.—See bracing wire.

WIRE, COMPENSATING OR BALANCE.—The wire connecting opposite ailerons.

WIRING LUG.—Any plate pierced to form a wire connection to the structure.

YAW.—Angular motion about the normal axis.

ZOOM.—To ascend steeply after increasing speed by diving. Useful in avoiding obstacles, which the glider pilot should never attempt to clear by trying to protract the glide owing to the danger of stalling.

GLIDING AND SOARING FLIGHT ACHIEVEMENTS, 1891-1930.

DURATION.

Date.	*Pilot.*	*Place.*	*Construction.*	*Country.*	*Time. hrs.*	*min.*	*sec.*
1891	Lilienthal ...	Germany	Own	Germany ...	...	...	...
1900	Wright Bros. ...	Kitty Hawk	Own	U.S.A. ...	...	...	...
1902	Wright Bros. ...	Kitty Hawk	Own	U.S.A. ...	0	0	26
1903	Wright Bros. ...	Kitty Hawk	Own	U.S.A. ...	0	1	12
1911	Wright Bros. ...	Kitty Hawk	Own	U.S.A. ...	0	11	0
1921	Klemperer ...	Wasserkuppe	" Blaue Maus "	Germany ...	0	13	0
1921	Harth	Rhon	" Harth-Messerschmidt " ...	Germany ...	0	21	30
1922	Martens... ...	Wasserkuppe	" Vampyr "	Germany ...	1	6	0
1922	Hentzen ...	Wasserkuppe	" Vampyr "	Germany ...	2	0	0
1922	Hentzen ...	Wasserkuppe	" Vampyr "	Germany ...	3	6	0
1922	Maneyrol ...	Itford	" Peyret-Tandem " ...	Gt. Britain ...	3	21	7
1923	Thoret	Biskra	" Hanriot "	Africa	7	3	0
1923	Barbot	Biskra	" Dewoitine "	Africa	8	30	0
1924	Schulz	Rossitten	" F.S.3 "	Germany ...	8	42	0
1925	Schulz	Krim	" Moritz "...	U.S.S.R. ...	12	6	0
*1927	Schulz	Rossitten	" Westpreussen " ...	Germany ...	14	7	0
1929	Dinort	Rossitten	" Dinort-Schwabe " ...	Germany ...	14	43	25
1929	Barstow ...	Point Loma	" Bowlus "	U.S.A.	15	13	0

NOTES.—Maneyrol's Itford performance in 1922 constitutes an official record for Gt. Britain. The best English effort at Itford in 1922 was by Squadron-Ldr. Gray, 1hr. 4 sec. The duration record for a U.S. citizen is held by J. K. O'Meara (Akron, Ohio) who at Elmira, N.Y., flew for 6 hrs. 48 mins. in October, 1930.

Continued overleaf.

DURATION WITH ONE PASSENGER.

Date.	*Pilot.*	*Place.*	*Construction.*	*Country.*	*Time hrs. min. sec.*
1922	Fokker	Wasserkuppe	Own	Germany ..	0 13 0
1922	Fokker	Itford	Own	G. Britain ..	0 37 0
1922	Olley	Itford	" Fokker "	G. Britain ..	0 49 0
1925	Seiler	Rossitten	Own	Germany ..	1 23 38
1925	Hesselbach ..	Wasserkuppe	" Margarete "	Germany ..	3 6 0
1925	Hesselbach ..	Krim	" Margarete"	U.S.S.R. ..	5 52 0
*1926	Schulz	Rossitten	" Cothen, D.1."	Germany ..	9 21 0

DISTANCE (STRAIGHT LINE).

Date.	*Pilot.*	*Place.*	*Construction.*	*Country.*	*Distance (Kilometres).*
1891	Lilienthal ...	Germany	Own	Germany ...	......
1900	Wright Bros. ...	Kitty Hawk	Own	U.S.A.	......
1902	Wright Bros. ...	Kitty Hawk	Own	U.S.A.	.622
1920	Klemperer ...	Wasserkuppe	" Schwarzer Teufel " ...	Germany ...	1.83
1921	Martens... ...	Wasserkuppe	" Vampyr "	Germany ...	7.5
1922	Hentzen ...	Wasserkuppe	" Vampyr "	Germany ...	9
1923	Botsch	Wasserkuppe	" Consul "	Germany ...	18.7
1924	Martens... ...	Monte Mazze	" Moritz "...	Italy	19.2
1925	Nehring... ...	Krim	" Consul "	U.S.S.R. ...	24.4
1926	Kegel	Wasserkuppe-Gompertshausen ...	" Consul "	Germany ...	55.2
1927	Schulz	Rossitten-Cranz	" Westpreussen " ...	Germany ...	35.2
1927	Nehring ...	Rossitten-Neukurer	" Roemryke Berge " ...	Germany ...	45.2
1927	Schulz	Rossitten-Memel	" Westpreussen " ...	Germany ...	60.2
1927	Nehring ...	Wasserkuppe-Bad Berka	" Darmstadt "	Germany ...	51.8
1928	Nehring ...	Wasserkuppe-Treffurt	" Darmstadt "	Germany ...	71.2
1929	Kronfeld ...	Wasserkuppe	" Wien "	Germany ...	102
1929	Kronfeld ...	Wasserkuppe-Lienlas	" Wien "	Germany ...	150
*1930	Kronfeld ...	Wasserkuppe-Wolsauerhammer ...	" Wien "	Germany ...	164.5 (98.70 miles)

DISTANCE WITH ONE PASSENGER.

1919	Jungmeister ...	Krim	" Niscegorodez " ...	U.S.S.R. ...	10 (6.2 miles)

DISTANCE WITH TWO PASSENGERS.

1924	Papenmayer ...	Wasserkuppe	" Margarete "	Germany ...	1 (.6 miles)

ALTITUDE.

Date.	*Pilot.*	*Place.*	*Construction.*	*Country.*	*Height (Metres).*
1891	Lilienthal ...	Germany	Own	Germany ...	......
1903	Wright Bros. ...	Kitty Hawk	Own	U.S.A.	......
1922	Martens... ...	Wasserkuppe	" Vampyr "	Germany ...	108
1922	Hentzen ...	Wasserkuppe	" Vampyr "	Germany " ...	200
1922	Hentzen ...	Wasserkuppe	" Vampyr "	Germany ...	350
1923	Descamps ...	Biskra	" Dewoitine "	Africa	546
1925	Auger	Vatour	"Abrial-Peyret " ...	France	700
1927	Schulz	Rossitten	" Westpreussen " ...	Germany ...	503
1927	Schulz	Marienburg	" Westpreussen " ...	Germany ...	653
1928	Dittmar ...	Wasserkuppe	"Albert "	Germany ...	755
1929	Kronfeld ...	Wasserkuppe	" Wien "	Germany ...	2160
*1929	Kronfeld ...	Wasserkuppe-Lienlas	" Wien "	Germany ...	2589 (8544 ft.)

HEIGHT WITH ONE PASSENGER.

1925	Jungmeister ...	Krim	Niscegorodez	U.S.S.R. ...	336

NOTE—At Elmira, N.Y. in October, 1930, Warren Eaton (Norwich, N.Y.) set up a height record for U.S.A. of 964 metres (3,159 ft.)

* F.A.I. official records, others of which are :—Greatest distance within given boundaries : 455.80 km (285 miles) by Schulz in the " Westpreussen," Rossitten, 1927 ; Greatest speed within given boundaries, 54·55 km per hour (34 miles an hour), Schulz, " Westpreussen," Rossitten, 1927. The longest sailplane journey made in England was on June 15, 1930, by Kronfeld, who flew in the " Wien " from Firle to Bedhampton (60 air-miles).

GENERAL INFORMATION.

CLUB TROPHIES AND COMPETITIONS.

BRADFORD.—Mitchell Prize.

DRIFFIELD & DISTRICT.—Silver Cup for first straight-line glide of one mile.

ILKLEY & DISTRICT.—Dinsdale Trophy.

LONDON.—Mathieson Tankard, awarded for longest duration single flight made by an ab-initio pilot in the club year in which he commences instruction.

LONDON GLIDING CLUB won the Pickering Cup in a Prufling match against Lancashire Aero Club.

NEWCASTLE.—Cup for annual competition, awarded to most proficient member.

NORTH COTSWOLD.—Whitehouse Trophy, awarded to first lady member to qualify for "A" certificate, Miss Katrine Alexander.

OXFORD AND COUNTY.—President's Cup.

PORTSMOUTH & SOUTHSEA.—Lord Mayor's Trophy; "Evening News" trophy.

SOUTH ESSEX.—£5 prize, first member to secure "A" certificate, £3 to second, £2 to third.

WORTHING & DISTRICT.—Selfe Trophy.

PRIZES FOR GLIDING AND SOARING COMPETITION IN THE BRITISH ISLES.

Lord Wakefield Trophy.—For annual and international competition: to be awarded for the fastest flight around a closed circuit.

Manio Cup.—Awarded by Mme. Manio to commemorate her husband, J. B. Manio, killed when flying a Bleriot monoplane near Lisbon in 1913.

H. M. Volk Challenge Trophy.—To be awarded as a prize for inter-club contest on suitable lines according to the development of the movement at the time of the competition.

Cellon Prize of £1,000.—For the first British pilot to accomplish a motorless flight in a glider of all-British construction from England to France, or vice-versa. Competition closes on May 31, 1932.

(Full details of the above competitions can be obtained from the British Gliding Association. At the time of going to press precise details are not available of the gliding competition the "Daily Mail" proposes to run during 1931).

B.G.A. INTER-CLUB COMPETITION PRIZE WINNERS.

(The first inter-club competitions organised by the British Gliding Association were held at Ditchling Beacon, near Brighton, on Oct. 18 *and* 19, 1930).

Best duration flight by member of affiliated club on a primary training machine. Silver Cup presented by Cloudcraft Glider Co.:—Captain Stretton (Surrey), 1 min. 40 2-5 sec., (R.F.D. primary machine).

Best duration flights by members of affiliated clubs on intermediate-type machines. 1, (Five guinea B.G.A. affiliation fee, presented by R.F.D. Co.), Mr. Mathieson (London), 4 min. 34 2-5 sec. (Prufling machine); 2, (launching rope) presented by Messrs. Burley, Ltd.), Mr. Mole (London), 2 min 53 1-5 sec.

Inter-club team match (primary machines): 1, Team prize (dope presented by Titanine-Emailite, Ltd.), Surrey Club (Capt. Stretton, Mr. Reffel, Dr. McGlashan); 2, (barometer, presented by Mr. R. A. Coley), Surrey "B"; 3, Portsmouth and Southsea "A"; 4, Portsmouth and Southsea "B." Surrey waived claim to second prize, which was awarded to Portsmouth and Southsea. Best flight in winning team (silver cigarette case presented by Titanine Emaillite, Ltd), Captain Stretton (Surrey), 1 min. 40 2-5 sec.

Inter-club team match, intermediate machines.—1, (dope, presented by Cellon, Ltd.) London "B" (Col. the Master of Sempill, Messrs. Mole and Mathieson) aggregate time, 8 min. 46 sec. (Prufling); 2, London "A," 3 min. 56 sec. Two Kent Club members put up 3 min. 29 3-5 sec. (B.A.C. III). Best individual flight (silver tankard, presented by Cellon, Ltd.), Mr. Mathieson (London), 4min. 37 3-5 sec.

Individual duration contest, open to British pilots.—1, Silver cigarette box, presented by A. E. Skinner & Co.), Mr. Mathieson (London), 4 min. 37 3-5 sec.; 2, silver tankard, presented by British Aircraft Co., Mr. Mole (London), 2 min. 53 1-5 sec.

Five clubs participated in the flying:—Scarborough (one member); Kent (two members), London, Portsmouth and Southsea, Surrey.

GLIDING TERRAIN IN THE BRITISH ISLES.

Apperley Bridge (Bradford).
Baildon Moor (Bradford).
Beacon Fell (Preston).
Bolton Abbey (Ilkley).
Birchanger (Herts and Essex).
Broadway Air Park (North Cotswold).
Burton Randalls (Leicestershire).
Chickerell (Dorset).
Chilworth (Surrey).
Comiston (Edinburgh).
Cononley (Cononley).
Crook's Peak (Bristol).
Dinmore (South Shropshire)
Ditchling Beacon (Southdown).
Dover Hill (Channel).
Easton Hill (Wilts).
Eastchurch (Kent).
Easter Whitecraigs (Glasgow).
Eggardon Hill (Dorset).
Elms Vale (Dover).
Flixton Hill (Scarborough).
Forden (Bridlington).
Fimber (Driffield).
Gleaston (Furness).
Harwood (Bolton).
Havering Park (Essex).
Hawkinge (Channel).
Ibstone (Oxford).
Ilkley (Ilkley).
Itford Hill.
Joyce Green aerodrome (North Kent).
Lambourn (Oxford).
Langdon Hills (South Essex).
Lenham (Kent).
Maiden Newton (Dorset).
Manston (Thanet).
Nesfield (Ilkley).
Ogden Moors (Halifax).
Shipley (Midland).

Somerton aerodrome (Wight).
Sutton Bank (Scarborough).
St. Fagan's (Cardiff).
Swaythling (Southampton).
Tottenhoe (London).
Upcerne (Dorset).
Walmley (Wolseley)
Wharfedale (Harrogate).
Westland aerodrome (Dorset).
Whiteley Bank (Wight).
Wilstead Hill (Bedford).
Wingham (Thanet).
Winkin Hill (Nottingham).
Woodford (Manchester).
Wymering (Portsmouth and Southsea).

Note.—Names of clubs in parenthesis. To ascertain routes to grounds see register of clubs, pages 74-81.

BIBLIOGRAPHY.

Gliding and Motorless Flight, L. Howard-Flanders and C. F. Carr (Sir Isaac Pitman & Sons, Ltd., 7s. 6d.)—This book explains the subject in an interesting way and does not soar so steeply into technical mysteries as to be above the head of the lay reader. For that reason, it should be bought by anyone who knows little or nothing about gliding and wants to gain a good general idea of the movement. Apart from this, the work contains plenty of sound advice for clubs—the chapters on organisation and management being of great value. Among the topics dealt with by Messrs. Howard-Flanders and Carr are:—history, achievements, progress; how a pilot is trained; choice of ground and care of gliders; types of gliders explained; meteorology; construction, repairs and workshop routine. Illustrated copiously and avoiding any suggestion of dullness this book, the first of its kind in Britain, has done, and is doing real service to the gliding movement.

Gliding and Sail-planing, F. Stamer and A. Lippisch (The Bodley Head, 5s.)—Described as a beginner's handbook this work should be studied by every would-be glider pilot. The authors being the principals of the famous German R.R.G. Flying and Technical Schools respectively, one expects nothing but sound advice from them—and gets it. Their aim, they say "is to state as clearly as possible all the beginner ought to know of gliding and gliding machines," and they achieve it in ten lucid chapters, every line of which can be assimilated with ease. The many diagrams are particularly praiseworthy. Reading this book could well be made obligatory to every gliding club member.

We regret space does not allow us to make fuller mention of these two books. It is a happy coincidence that they should be complementary in function to one another. To understand and be attracted to gliding read the first—to ensure proficiency study the second.

IMPORTANT ADDRESSES.

British Gliding Association.—Recognised by the Air Ministry as the responsible body for the British gliding movement. 44a Dover Street, London, W.1. Phone, Regent 3793.

Royal Aero Club.—Responsible to the Federation Aeronautique Internationale for the issue of glider pilot certificates. 3 Clifford Street, London, W.1. Phone, Regent 1327-8-9.

National Glider Association, Inc., Governing body of the movement in U.S.A.—Union Trust Building, Detroit, Michigan.

Rhon-Rossitten-Gesellschaft. — Responsible for the movement in Germany.—Langstrasse 42, Frankfurt a. Main, Deutschland.

Association of Northern Gliding Clubs, The White House, Starbeck, Harrogate, Yorks.

"*Gliding.*"—10 Victoria Street, Weymouth. Phone 352.

"*The Sailplane and Glider,*" 175 Piccadilly, London, W.1. Phone Gerrard 5407.

"*Flight.*"—36 Great Queen Street, London, W.C.2. Phone, Holborn 1884.

"*Airways,*"—6 Norfolk Street, Strand, London, W.C.2. Phone, Temple Bar 2801.

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CORRECTIONS, ETC.

The photograph on page 17 is copyright by Walker's Studios, St. Thomas Street, Scarborough.

On page 23, letters after Mr. H. J. Penrose should read A.F.R.Ae.S.

The author of the article on page 32 is Captain G. T. R. Hill.

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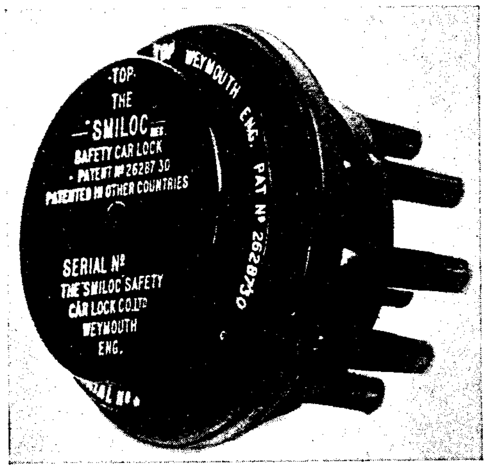

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A complete work providing full information on the origin, principles and achievements of Gliding ; types of machine, construction, piloting, formation and management of associations, metereology, certificate tests, etc. (*Full details post free*). Illustrated, 124 pp. 7s. 6d. net.

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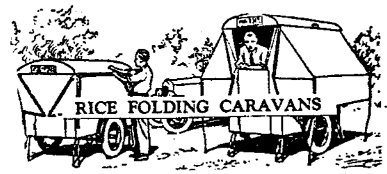

This ingenious job must interest you—there's brains in it. Sleeps 4, feeds 8, folds in half a minute. We cannot describe it here, write for details. We have an unrivalled experience of trailer design and make all types — glider trailers, dual purpose caravans, etc.

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