Sailplane and Glider

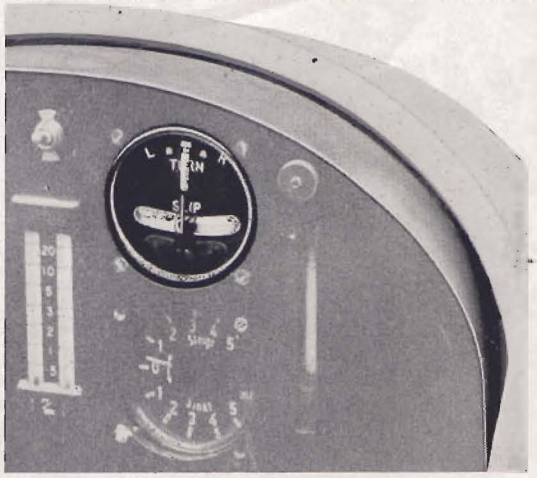
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JUNE 1953

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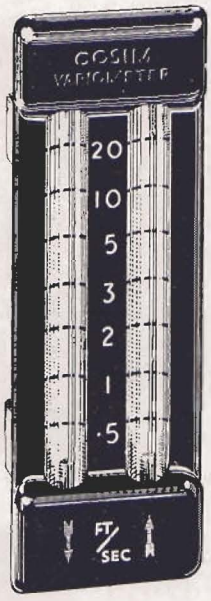
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THE FIRST JOURNAL DEVOTED TO SOARING AND GLIDING

JUNE 1953 ★ Vol XXI No 6

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Cover Photo :
The 'Slingsby Sedbergh Trophy', to be presented at the National Gliding Competitions for the best performance by a 'Sedbergh' or 'T.21B' two-seater glider, whether Civil or Services entry.

Editorial

LONDON is the most exciting and inspiring place in the world just now. As we go to Press the flags are being hung out, the streets are busy with the sound of feverish last-minute hammering, crowds of visitors from the country and from overseas drift and swirl through and round and over every inch of the Procession route, and we are all having the time of our lives. Even Nature is taking a hand, for the blitzed areas around St. Paul's Cathedral are gay with sheets of yellow flowers, bright weeds that have sprung up among the ruins and remained to decorate them for our great day. Enterprising people here and there have made formal gardens, the parks and squares have been planted and tidied, and all over the city there are gay window boxes, not only in red, white and blue but bursting with all the colours of the rainbow. West African robes, beautiful saris, bright uniforms, summer frocks (for we are in the midst of a very unusual heat wave, too) combine with a multitude of foreign languages to remind us that we are the heart of a great Commonwealth of Nations, and we are proud of our young Queen and of our ancient pageantry of heralds, red-robed peers, postillions, and gilded coaches. What matter if tomorrow the horses return to the brewers' drays and the peers to their market baskets and their battered Austin Sevens ? It will have been grand while it lasted and we are having a wonderful time. Long live the Queen !

For a new reign, a new policy. We in *Sailplane* believe that you—our readers—enjoy this paper and would like to keep it going. You may or may not know that, like a gliding club, it is run mainly on a voluntary basis, and again like a gliding club, that ingoings have to try and balance outgoings or else . . .

We depend on our contributors, our printers and our advertisers as much as we do on the subscriptions of our readers, and we need the goodwill of all. This is where you can help. If each and every one of you would try to let us have some news or a new subscription or even a small advertisement within the next couple of months we should flourish so nicely that we could at once increase the size of the magazine, besides making it a lot more interesting for everybody. Any kind of news is welcome, from the small cutting about something in your district to a full-length article with pictures and maps, and any type of story, from the beginner's to the expert's. Our readers cover all classes and all continents, and include 'C's' with diamonds as well as very small 'A's' with no experience at all.

All of these people buy the magazine for the simple reason that they want to know more about gliding—where to do it, how to do it, and what happens when you do. Experiences that have helped you to learn may help someone else to learn better. We are a clearing house for world-wide information and we are open for arguments and discussions in the same way as your own gliding club, only with a far wider reach. Our present subscription list covers 53 countries, to say nothing of the copies that circulate from hand-to-hand in clubs and schools and libraries. We like to keep it that way and to expand even further afield, but to do that we need your help. So roll up your sleeves, fill your fountain pens, and get cracking. We will do the rest.

An AUSTRALIAN TWO-SEATER GOAL FLIGHT

203 Miles—ADELAIDE to MILDURA—17th March, 1953

GLIDING anywhere in the world requires : firstly, machines and equipment ; secondly, pilots available to fly those machines ; and for cross-countries, suitable conditions. Therefore, this flight will be described under the above headings.

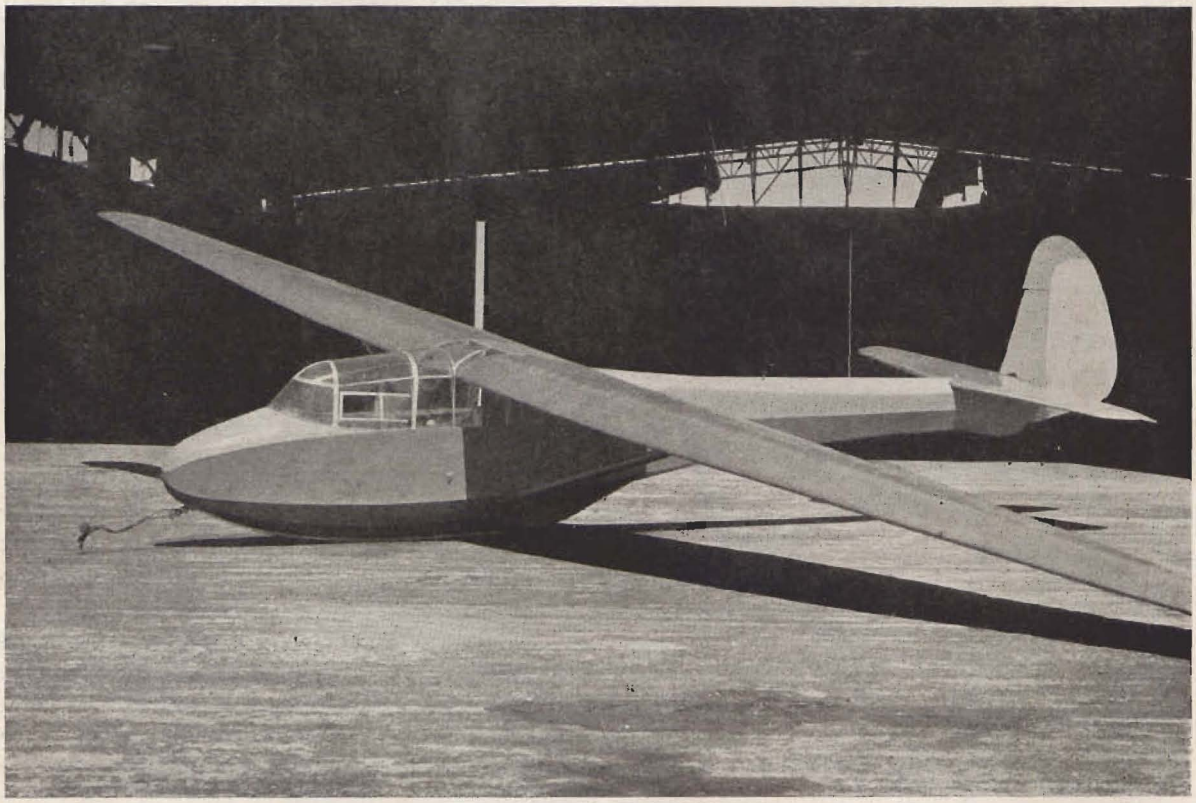
In various parts of the world, naturally these divisions assume different emphasis. In Australia we find that obtaining a machine to fly is by far the most difficult item, especially when one is concerned with retrieves, etc. The availability of machines also has a bearing on pilots, as of course, they will not be available unless machines are there for them to become proficient. The thermal conditions in Australia possibly are equivalent to the best in the world, excluding the fact that if one is forced down, then it may be difficult to ever come out alive. It is therefore necessary to stick to well defined routes.

Describing this particular flight then in the above order :—

MACHINE AVAILABILITY.

Harry and Edmund Schneider, who have settled in Australia from Germany, wanted a small factory to commence building gliders, and as I had something that could be made available for a start, it was next to no time before they were in action. We are now working together building machines in Adelaide.

The first machine built was a ' Grunau ' for the Victorian Gliding Club, and then they turned over to a two-seater for myself.



E.S. 49b Sailplane — ' Kangaroo '

Edmund had given a lot of thought to club training during and particularly immediately after the war, and had evolved the ' E.S.49 ' 16 m. trainer, but as I required a better performance, he converted his design for this machine into a 18 m. span, and generally cleaned the machine up ; the result being a beautiful machine to fly, with a gliding angle of approximately 1:26½ estimated. The machine is semi-aerobatic, and has turned out very well indeed, and handles like a true thoroughbred.

AVAILABILITY OF PILOTS.

This is described in particular reference to this flight.

The real cause of the flight was the fact that the machine had a week or so previously been sold to a group in Boggabri, New South Wales, and as this is

approximately 850 miles from Adelaide by the nearest reasonable direct air route, it will be seen that a big problem presented itself as to whether delivery should be made by road (over some very rough roads), or aero-tow over some very sparsely inhabited country. The aero-tow definitely was the way, if we had a tug plane and pilots available in the middle of the week, as the whole thing could not be done under approximately 5 days.

This is where gliding's good friend, Dr. G. Heydon of Sydney came in, who was at this particular week-end visiting Adelaide, and immediately he heard of our difficulty, arranged for Mervin Waghorn to fly his ' Tiger ' and a pilot, if he could find one, over, so that we could commence the tow during the following week. (Mervin was unable to do the towing himself, unfortunately).

The Waikerie and Adelaide Clubs were giving a gliding demonstration at Nuriootpa during this week-end, it being their wine festival, so that Arthur Norris (the pilot whom Mervin was able to dig up) was able to get some tow practice in, aero-towing being new to him.

The week-end was quite successful, and we found that for the three days we had a very moist unstable north-easterly stream over our corner of Australia, and heights were all of the order of 7,000 to 10,000 ft., with climbs up to 1,000 ft. a minute, some 100 hours being clocked up for the three days.

By J. G. WOTHERSPOON

The ' Kangaroo ' was aero-towed back to Parafield on Monday morning, and on Monday evening a flight plan prepared for our tow to Boggabri.

It will be appreciated that a tow of this length over long stretches of uninhabited country required to be well planned beforehand to save any dire consequences. We had Arthur Norris as tug pilot, making Harry and myself available as the glider pilots. Condition 2 was satisfied.

MET. CONDITIONS.

The week-end conditions were particularly good for climbs and for cross-countries to the south-west, but any distance to the south-west was restricted by the sea, and it was to dodge the bumpiness caused by this airstream that I suggested the tow should start Wednesday morning after the front. I was anxious to let this front pass first, rather than having it interfering en-route.

We therefore went to work as usual on the Tuesday morning. On telephoning the Met., indications were that the front was not expected to reach Adelaide until 6 o'clock that night, and that the wind was swinging to the north-west and increasing; sure signs of the approaching front.

All the relative symptoms were showing that there would be considerable activity in advance of the



At Mildura. H. Schneider, Arthur Norris (Tug Pilot), J. G. Wotherspoon (Tallest).

front. I knew the machine could easily go the distance given the conditions, so why not have a crack for Mildura, one-third of our way to Boggabri? The 'Tiger' was ready and it did not take long to convince Harry Schneider to stop working and to grab Arthur Norris out of his hotel to get airborne to start the flight.

THE FLIGHT.

The flight itself was uneventful, except that the 'Tiger Moth' in the gusty conditions had difficulty in taxying out, but eventually we left Parafield at 12.05 p.m. and 15 minutes later released 4 miles south-west of Gawler at 2,200 ft. with Harry in the back cockpit and myself in the front.

We quickly climbed to 9,000 ft. with climbs between 600 ft. and 700 ft. a minute, and then more slowly to a maximum height of 10,800 ft., which subsequently proved to be the highest climb of the trip.

I left the top of this thermal and set off cross wind to the next, which was soon found, and this again took us to over 10,000 ft. I had now a rough appreciation of the distance between thermals, and also of the down currents—some 20 ft. a second at times in between. I also felt that the wind was more westerly than north-west, which was a help. I decided to fly between 6,000 ft. and 9,000 ft., as between these two figures we obtained the best lift; and to fly on a correct course as near as possible, as there were no cloud streets, but just independent thermals with Cu's. I also flew at 65 knots indicated between thermals and if above 6,000 ft. flew straight through even the best of thermals, easing back only to take advantage of the lift.

In this way we were able to identify our 4 pin points only, i.e. the crossing of the Murray, Loxton, Lake Culleraine and Mildura. With the absence of pin points it was difficult to estimate our ground speed, but for the first three hours it would appear that we covered 35, 55 and 50 miles respectively, with corresponding lower ground speeds towards the end of the flight.

After Loxton, which seemed to mark the second stage of the flight, the thermals, although still strong, definitely showed the tendency to weaken, as would be expected. Also the wind swung north and eased as we got further ahead of the front.

The flight was flown at such a height, that I could see Mildura aerodrome at 20 miles away, and even at 10 miles, when we were at 8,000 ft., I worked every thermal to be sure of getting through. The heights playing such tricks with my judgment!

We arrived there with 5,000 ft. in hand, but owing to the bad nature of the country immediately ahead, decided that the best thing to do would be to land and not force on for more distance. We therefore landed after many steep turns and more gentle aerobatics at 5.35 p.m.

This meant that 203 miles from point of release was covered in 5½ hours; an average speed of 37 miles per hour.

As mentioned earlier, this flight was only part of a delivery flight to Boggabri, and the ensuing tow was just a delightful air tour.

Winners of B.G.A. Trophies

THE DE HAVILLAND CUP, for the greatest height—to S/LDR. A. A. J. SANDERS, for an absolute height of 16,050 ft. and a gain of height of 13,830 ft. during a flight from the Long Mynd on 18th May, 1952, in an Olympia. (In the absence of S/Ldr. Sanders the Cup was accepted by his parents.)

THE MANIO CUP, for the best goal flight—to LT.-CDR. TONY GOODHART, D.S.C., R.N., for a flight of 90 miles from Basingstoke to Lympne on 7th June, 1952, in a 'Meise.'

THE WAKEFIELD TROPHY, for the longest distance flight—to MR. WALTER KAHN, for a flight of 138 miles from Lasham to Coningsby on 28th June, 1952, in a 'Weihe.'

THE VOLK CUP, for the best out-and-return flight—to MR. GEOFFREY STEPHENSON, for a flight of 104 miles from Lasham to Dunstable and back on the 13th April, 1952, in a Slingsby 'Sky.'

THE SEAGER CUP, for the best two-seat sailplane performance—to F/O. E. J. MEDDINGS and F/LT. J. W. REILLY, for a flight from Detling to Chilbolton (91 miles) in 4 hours 24 minutes on the 22nd May, 1952, in a Slingsby 'T.21B.' (This flight, incidentally, is believed to be the longest ever made in this country in a 'T.21B,' which is a two-seat training glider and designed for only medium performance.)

The R.Ae.C. Gazette.

16th March, 1953

FLIGHT ADELAIDE TO BOGGABRI.

		Dist.	*Course*	*Var.*	*Time at 60 m.p.h.*
Adelaide *to* Renmark	.. ..	125	071	7°	2.5
Renmark *to* Mildura	.. ..	75	091	7	1.15
Mildura *to* Euston	Direct ..	45	123	8	45
Euston *to* Hay	.. ..	115	087	8	1.55
Hay *to* Griffiths	.. ..	71	073	9	1.11
Griffiths *to* W. Wyalong	.. ..	70			1.10
W. Wyalong *to* Parkes	.. ..	83	047	9	1.13
Parks *to* Dubbo	.. ..	62	019	9	1.02
Dubbo *to* Gilgandra	.. ..	37	004	9	37
Gilgandra *to* Tooraweenah	.. ..	22	038	9	22
Tooraweenah *to* Coonabarabran		25	061	9	25
Coonabarabran *to* Gunnedah	..	58	070	9	58
Gunnedah *to* Boggabri	.. ..	20	326	9	20

Full capacity—29 gallons. Consumption—7 gallons p.h.

PROPOSED DATES.

Adelaide — Renmark	a.m. Wednesday
Renmark — Mildura	a.m. Wednesday
Mildura — Hay	p.m. Wednesday
Hay — West Wyalong	a.m. Thursday
West Wyalong — Dubbo	p.m. Thursday
Dubbo — Boggabri	a.m. Friday

Note.—a.m. means first light.
p.m. means 4 p.m.

THE SLINGSBY 'SKYLARK'

45 ft. Span Sailplane

Here is a short description and photographs of the latest Slingsby prototype production—The 'Skylark.'

As you will observe from the article, this aircraft has been designed to meet the need for a sailplane of medium size, with a good performance and at an attractive price.

It will be noted from General Arrangement drawing that the production aircraft fuselage will differ in appearance from that of the prototype. Eventually it is intended to manufacture the nose cap and the upper part of the cockpit and coupe in moulded 'Fibreglass' and Marco Resin—a lightweight plastic moulding of considerable strength.

The wing is completely covered with plywood and a very smooth wing surface has been obtained thus retaining a high percentage of lamina flow.

The provisional price of this aircraft in a standard finish—less instruments is expected to be under £700 ex-works.

It is hoped that the prototype aircraft will be entered in the 1953 National Competition at Camphill, Derbyshire.

THIS sailplane has been designed and built in an endeavour to create a market in the British Isles and abroad for a medium span, high performance sailplane at a price that will be attractive to most gliding and soaring clubs and organisations throughout the world.

By incorporating the excellent qualities of the now well known Slingsby 'Sky' sailplane (the 'Sky' was the winning aircraft piloted by Mr. P. A. Wills in the 1952 World soaring championships) into this aircraft and by adopting new methods of production, Slingsby Sailplanes have designed a most attractive aircraft with flying qualities and characteristics which up to now have not been offered to the gliding enthusiasts in a sailplane of 45 ft. span.

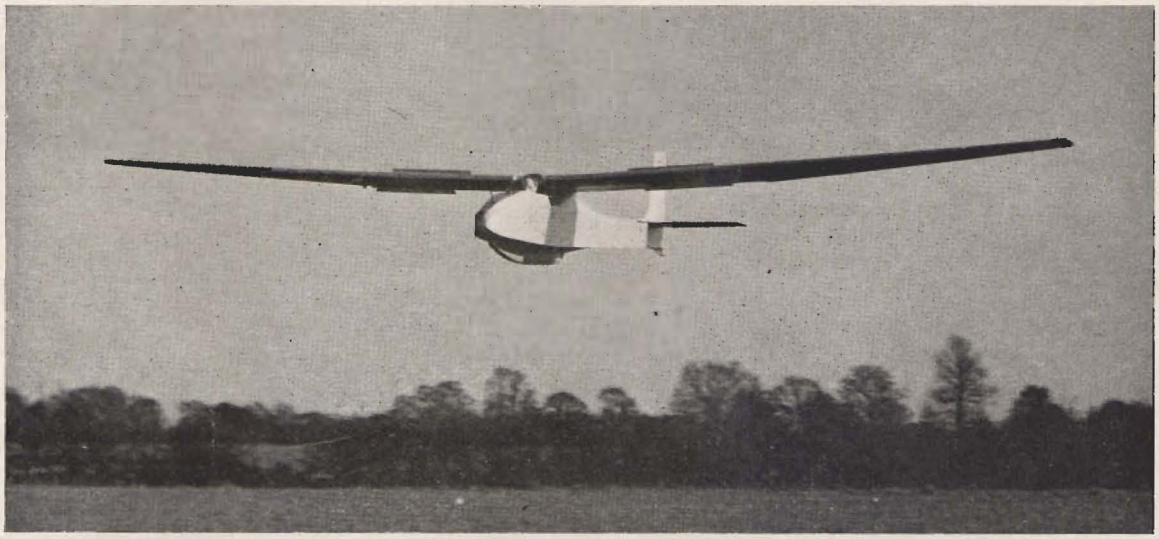
A one-piece blown Perspex hood is fitted to the removable canopy and it provides excellent vision and protection against the weather over a roomy and comfortable cockpit. Arrangement of the flying controls follows the normal practice. The control column rises from the floor in a canvas sleeve and is conveniently positioned to suit most sizes of pilots. The quick release control is placed on the port side of the cockpit under the instrument panel and consists of the usual yellow knob. This controls and operates the only towing release, which is positioned about the centre of gravity. The release is the Ottfur safety type which automatically drops the cable when it exceeds a certain angle to the aircraft during launching, thus obviating the danger of a pilot forgetting to release.

The Dive brake operating lever is also positioned on the port side just in front of the seat and is pulled back to bring the dive brakes into operation. The elevator trimming lever is located in a convenient position on the starboard side.

Instruments are of the usual types consisting of an Air Speed Indicator, Altimeter, Electrical Turn and Slip Indicator and a Slater Cobb Variometer. However, special instruments and panel would be fitted to suit any pilot's individual requirements to order.

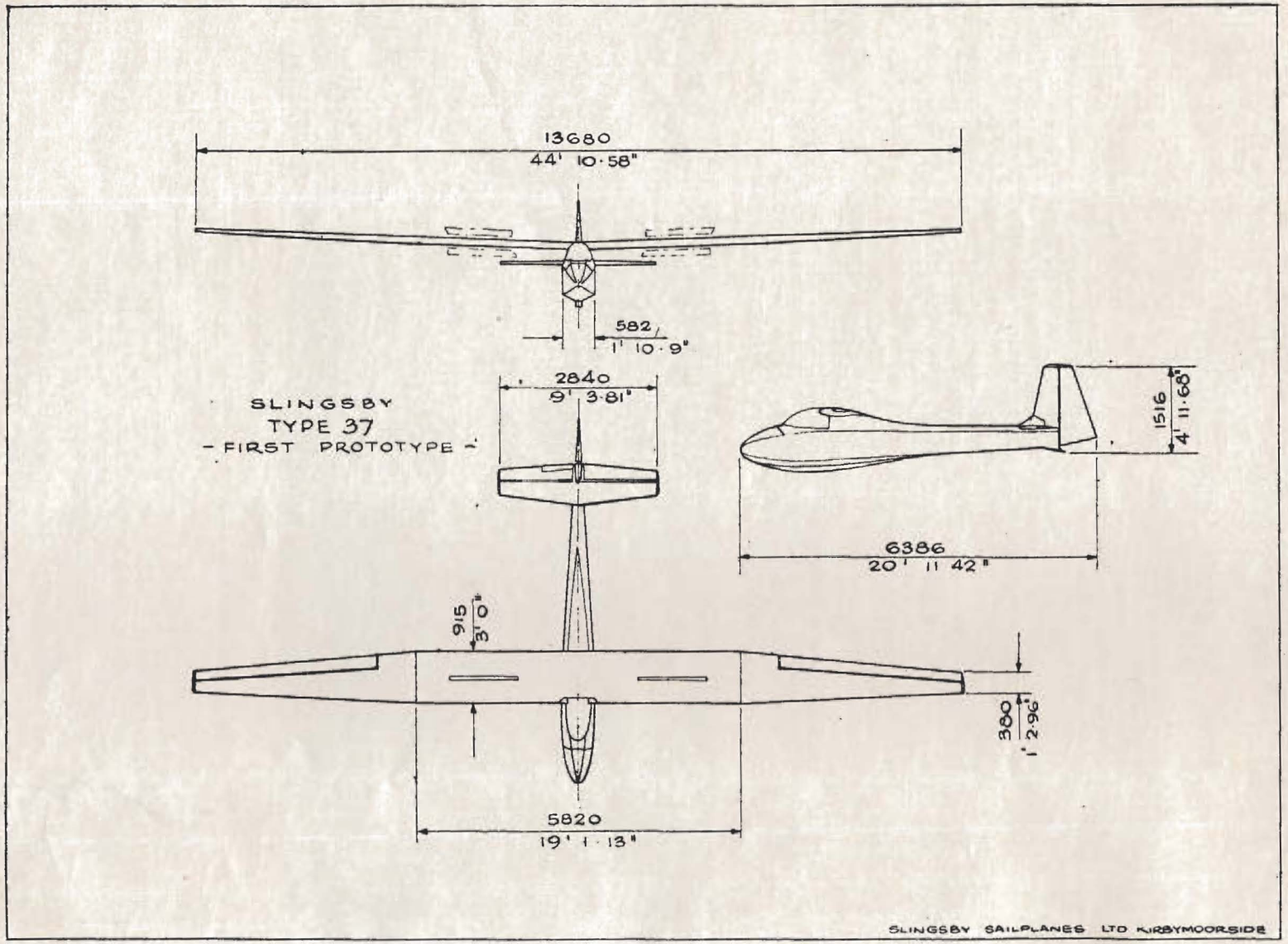
Provision is made in the fuselage neck to allow for the installation of a barograph and other small items of equipment, and access to the batteries for the Turn and Slip indicator is made by the simple removal of the parachute box.

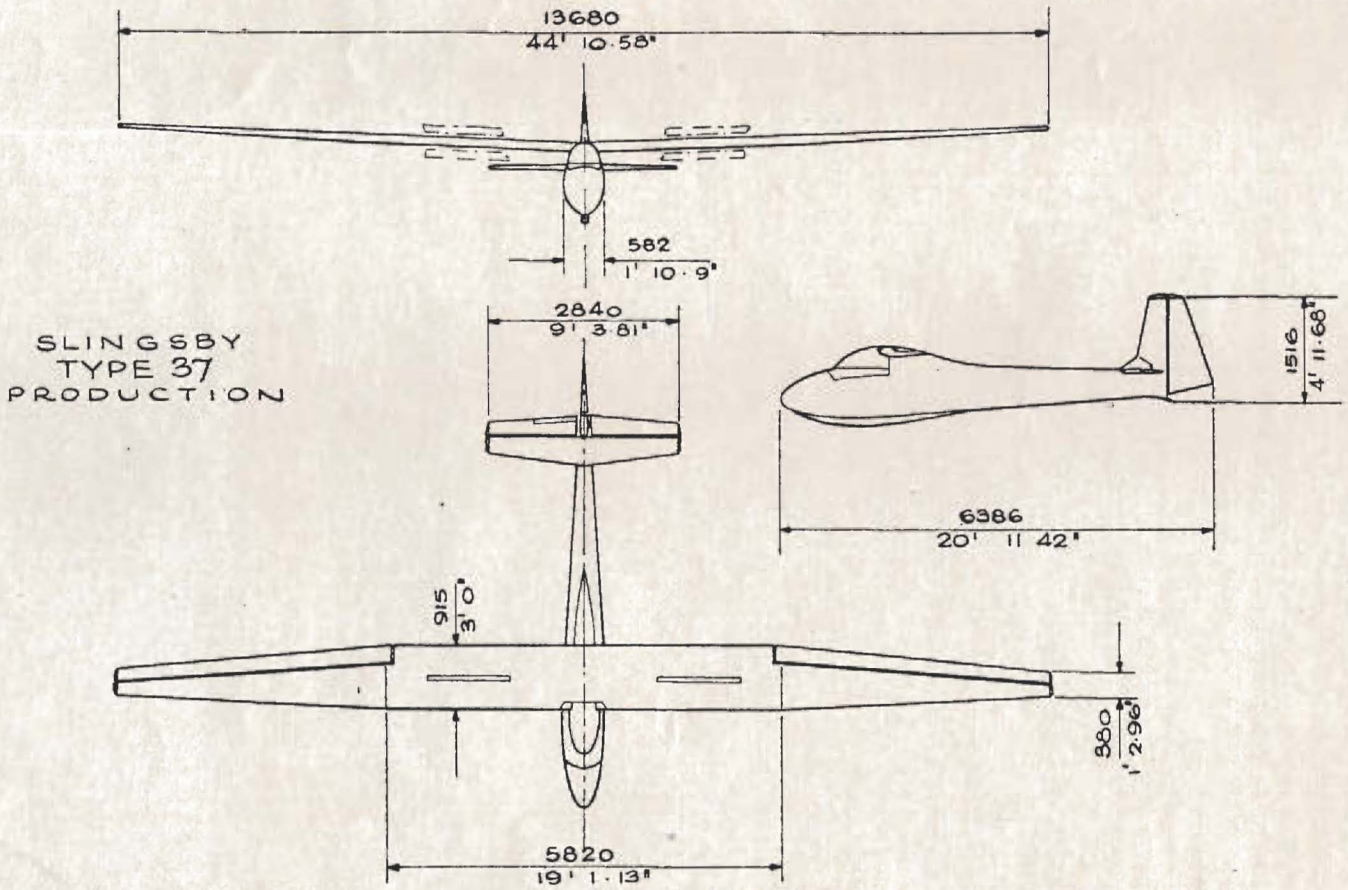
The fuselage aft of the cockpit and main bulkheads is fabric-covered over a diagonal braced wood frame-



The Slingsby 'Skylark' 45 ft. Span Sailplane

(*Continued on page* 8)


13680
44' 10·58"
582
1' 10·9"
2840
9' 3·81"
SLINGSBY
TYPE 37
- FIRST PROTOTYPE -
1516
4' 11·68"
6386
20' 11 42"
915
3'0"
380
1' 2·96"
5820
19' 1·13"
SLINGSBY SAILPLANES LTD KIRBYMOORSIDE



SLINGSBY SAILPLANES LTD: KIRBYMOORSIDE

work up to the tailplane attachment frames and fin, which are fully plywood covered.

The wings, which consist of a centre portion and two outboards, are completely covered over the full 45 ft. span with a resin bonded waterproof plywood skin, attached to ribs which are profiled to within fine limits in order to obtain an absolutely smooth surface to minimise the surface drag and its resultant drop in performance.

Dive brakes are located in the wings at points 3 ft. from the fuselage side. They are of the scissor type, and have proved themselves extremely effective during flight trials.

The attachment of the mainplane centre portion to the fuselage is by two pins inserted from the front of the cockpit in the horizontal plane and picking up the attachment fittings on the main bulkheads. Outboard sections are attached to the centre portion by two pins in the vertical plane. The simple method of attachment has resulted in a very low assembly and dismantling time.

To reduce manufacturing costs the installation of a landing wheel has been omitted but a jettisonable dolly can be supplied to special order.

The main skid is sprung with rubber shock absorbers and is completely faired in. The tail skid is of the conventional type.

From the results of the test flights that have taken place it appears that this sailplane will be sought after by the pilot of average experience to the top rankers of the gliding world as a sailplane worth having from the performance and monetary value.

DIMENSIONS.

Span	45 ft.
Length	20 ft. 11½ in.
Tare Weight	400 lbs.
Max. All Up Weight	620 lbs.
Wing Area	113 sq. ft.
Aspect Ratio	17.9 : 1
Aileron Area	12.4 sq. ft.
Tailplane and Elevator Area ..	17.0 sq. ft.
Fin and Rudder Area	11 sq. ft.

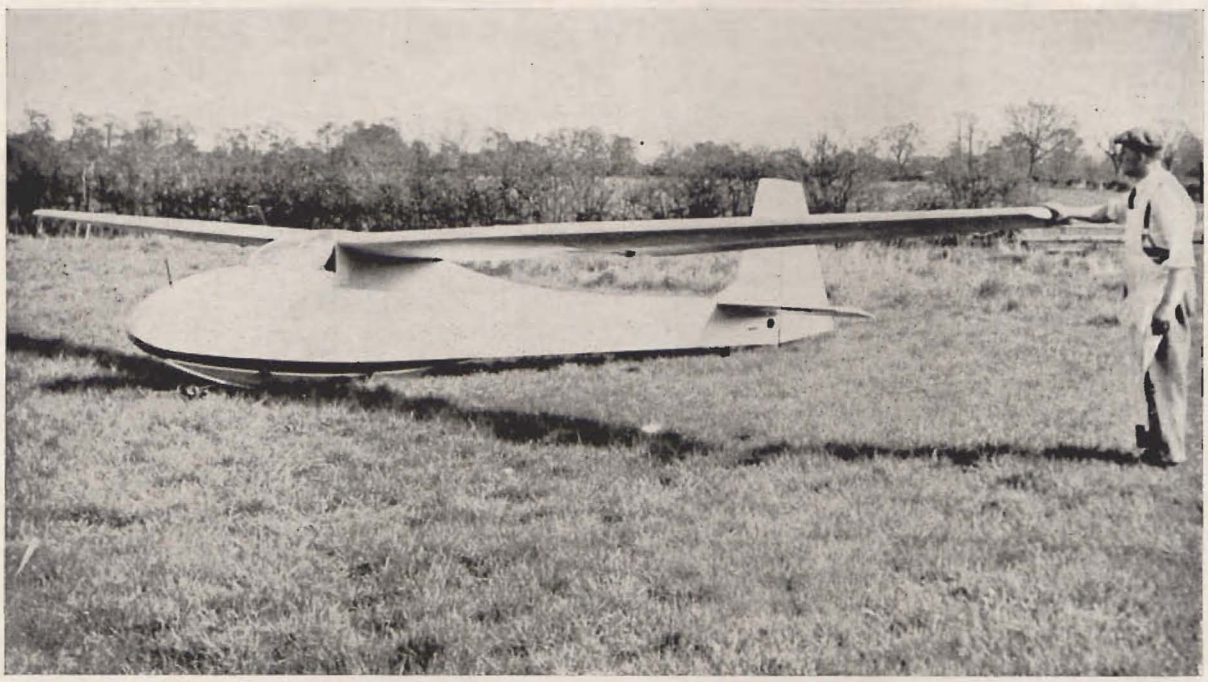
PERFORMANCE DATA.

Best Gliding Ratio. 1 in 27.3 at 46.3 m.p.h.

Min. Sinking Speed. 2.34 ft. per sec. at 41.6 m.p.h.

Flying Speed at 6 ft. per sec. sink, 74.5 m.p.h.

Min. Speed, 37.4 m.p.h.



An airline pilot discusses the effects of standing or lee waves and the advisability of increasing route regulation safety heights over mountainous areas.

Hill Standing Waves and Safety Heights

By Captain D. MASON

(British European Airways)

SINCE aviation started, aircraft have been flying into mountains for an assortment of reasons. Frequently, the cause has been tragically simple—an inexperienced pilot flying in cloud below the safety height for that particular area. Occasionally, the cause has been a descent commenced too soon, due to careless or improper fixing of the aircraft's position; sometimes, the aircraft has been at its correct safety height for a particular route but, because of navigational errors, has been so far off track that the original safety height no longer applied.

But now and again it has happened that an extremely experienced captain, supported by an exemplary crew, and with good radio navigational aids and conditions for reception, has ended up on a mountainside. What then are we to think in this case? We may possibly have known the individual concerned, known him to be absolutely meticulous and thoroughly reliable, and known that he never took a chance—we may even have discussed together this very problem, to find a similarity of views. What are we to think when such an incident happens to a man of this calibre—engine failure, other mechanical fault, or icing? Possibly, but not probably, for these circumstances would usually allow sufficient time for the transmission of a distress signal. A theory which satisfactorily answers the problem is that of standing waves, and this is borne out by the fact that examination of the weather conditions appertaining at the time of many of these accidents shows the gradient blowing across the line of the mountains, and with very marked wind-sheer.

In this article, therefore, the writer gives an example of the effects of standing waves on an aircraft which has a laden weight of 34,000 lb. and will discuss the problems involved, and make suggestions which it is hoped will eventually lead to greater safety over the mountains.

THEORY OF STANDING WAVES

Much work has been carried out recently in Great Britain by Dr. Scorer into the theory of the formation of standing waves, or lee waves as they are sometimes called. There have also been several interesting articles written in the meteorological press by glider-pilot meteorologists, describing their experiences of waves over this country.

Although Dr. Scorer admits the theory to be as yet unsatisfactory, it is, however, all there is to work on at the moment. Briefly, the present theory of standing waves states that when a stable airstream with suitable lapse-rate conditions strikes a mountain ridge, vertical displacement takes place, and if the wind gradient increases with altitude, the airstream over and in the lee of the mountain will form a series of waves, which may extend for a considerable distance down-wind, and to great altitudes. The air motion over the ridge itself, known as " hill-lift " is extremely complicated, consisting of rising air up to a certain altitude, but beyond this height, the air rises on the windward side of the hill, and is actually descending vertically overhead, with the waves streaming out down-wind. Sometimes this phenomenon is accompanied by a temperature inversion, although this is not a necessary factor, as suggested by some writers.

If, during its ascent to the crest of each wave, the air becomes saturated, condensation will take place, forming lenticular cloud, a superb example of which is shown below. Thus, very often, the crests of several waves are clearly marked by cloud caps, an unusual characteristic of which is the fact that the cloud remains stationary with regard to the ground, for it is constantly forming at the up-wind side of the wave, and evaporating in the lee, in just the same way as the more common orographic formations which sometimes cover mountain tops.

It has been estimated that under favourable conditions as many as eleven or even more lee waves may form down-wind of the mountain, gradually dying out farther away from the ridge.

The amplitude of the waves increases up to a certain height, and then decreases again, and is dependent upon the shape of the mountain barrier, and upon the dynamical characteristics of the airstream. Thus a high ridge, with fairly steep sides, will give rise to waves with the greatest amplitude. Obviously, also, the higher the ridge, the greater will be the total height of air displacement; the vertical extent of air displacement is, in fact, closely dependent on the height of the ridge.

The wave length depends upon the properties of the airstream, especially wind, and the effect will naturally be conditional upon the direction of the wind flow relative to the ridge, so that an air mass blowing over the range of hills at right angles will have the maximum wave effect. The length of a typical lee wave is given as up to about four miles.

AN OBSERVATION OF WAVE EFFECTS ON A MEDIUM-SIZED AIRCRAFT

On 18th December, 1952, the writer was flying a " Viking " aircraft from Gibraltar to London, and on the leg between Madrid and Bordeaux, where the

route crossed the mountains of Northern Spain, exceptional wave formations were found. Fortunately, there was little cloud and it was possible to observe the effects of the phenomenon, and to make notes. Needless to say, had the mountain tops been obscured by cloud or darkness the experience might have been rather worrying.

The safety height on this leg (allowing 1,000 ft. terrain clearance) was 9,000 ft., the true and magnetic tracks over the mountains being respectively 021° and 030°, so that the lowest quadrantal height, when flying northwards, became 9,000 ft. However, on this particular occasion, due to quite severe turbulence at 9,000 ft., it had been decided to fly at 11,000 ft., the cruise being carried out at 850 b.h.p. per engine (boost 30.5 in. mercury, and 1,900 r.p.m. for the " Hercules " under these conditions), which gave an indicated cruising speed of 155 knots (184 knots true).

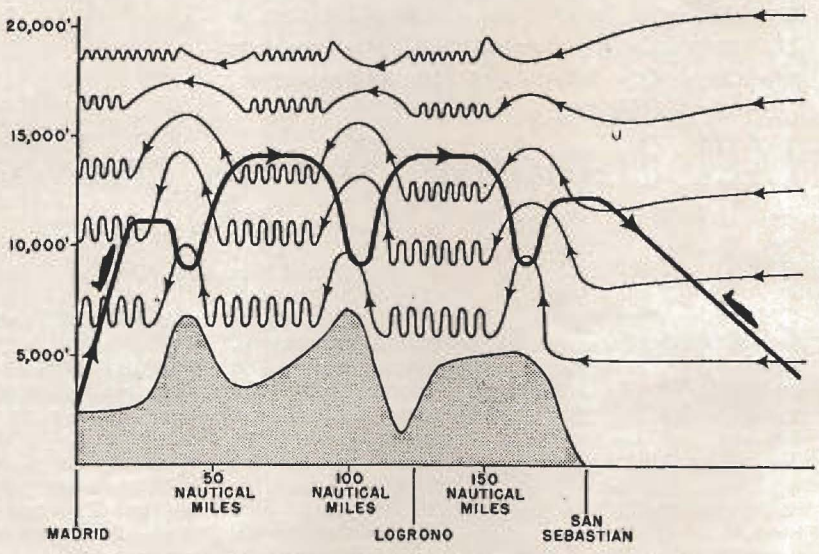


Fig. 1. Cross-section of the route Madrid to San Sebastian, showing the aircraft's flight path, and the possible streamlines over the mountains (after Dr. Scorer).

As a matter of interest, earlier in the morning, when flying between Gibraltar and Madrid, the turbulence in the lee of the mountains was first met at 9,000 ft., in the area just south of Toledo, a distance of some 80 miles down-wind of the first mountain range.

After take-off from Madrid at 12.56 G.M.T. there was considerable clear-air turbulence up to 10,000 ft., and as the mountains were approached at 11,000 ft., it could be seen that there was about $\frac{3}{8}$ alto-stratus, tending to become lenticular, at about 10,000 ft., immediately on the lee-side of the crests. Apart from these observed factors, the first definite wave effects were felt at 13.15 G.M.T., when the aircraft started to descend slowly at 200-300 ft./min., and as it was retrimmed to maintain altitude, so the airspeed fell gradually.

Within two minutes, in an effort to maintain height, the indicated speed had fallen to 125 knots. Power was increased in order to maintain this reduced airspeed, and by 13.18 G.M.T., the engine power was up to METO (1,290 b.h.p. at 11,000 ft., throttles at rated gate with automatic rich mixture and 2,400 r.p.m.). Nevertheless, the airspeed fell to 120 knots, and the aircraft commenced to descend, soon reaching 1,000 ft./min. As the 10,000 feet level was passed, turbulence started, and gradually increased down to 8,800 ft., where the downward path was arrested.

Gradually, then, the airspeed built up, the aircraft started to climb and power was reduced to 850 b.h.p. Within about thirty seconds, the rate of climb was almost 900 ft./min., the airspeed was 180 knots, and power was again decreased. At about 10,500 ft., the rate of ascent increased to 1,400 ft./min., despite the fact that the throttles were nearly closed. The climb continued, on very little power, up to an altitude of just on 14,000 ft. The time taken from 8,800 ft. up to 14,000 ft. was a little over five minutes.

Flying on " the crest of the wave " at 14,000 ft., was delightful, the air being quite smooth and extremely stable. This pleasant state of affairs lasted, however, for only about 11 minutes, and then a second down current was met. This time the procedure was the same, with METO power used, 120 knots indicated, and the rate of descent, which commenced at 300-400 ft./min., gradually increased to 1,000 ft./min., and reached a maximum of 1,500 ft./min., for about half-a-minute, then eased off again to 1,000 ft./min. By the time a height of 9,000 ft. was reached the rate of sink had ceased altogether. Between six and seven minutes was the total time taken on this descent.

Within two minutes, the cycle had recommenced and once again it was with relief that the 10,000 ft. mark was passed, and smooth air encountered. For the second time the aircraft was carried up to practically 14,000 ft., and stayed there for a further 11 minutes or so, before the seemingly inevitable descent. This time the conditions, rates of ascent and descent and timings were approximately the same as before.

At 9,000 ft., the ground position was over the coastal mountain range between Logrono and San Sebastian, and the waves seemed to be less powerful than previously. As a result, when the aircraft started to climb again, the ascent was simply to 12,000 ft. This height was maintained until after the coast was passed at San Sebastian, and a gradual powered descent was then made normally towards Bordeaux.

A cross sectional diagram of the flight is shown at Fig. 1. The mountains shown are those actually on track. There are higher spot heights than those shown at several places within 30 miles of either side of track, causing the overall safety height to be increased, but these have not been included on the cross section to avoid confusion. Hypothetical

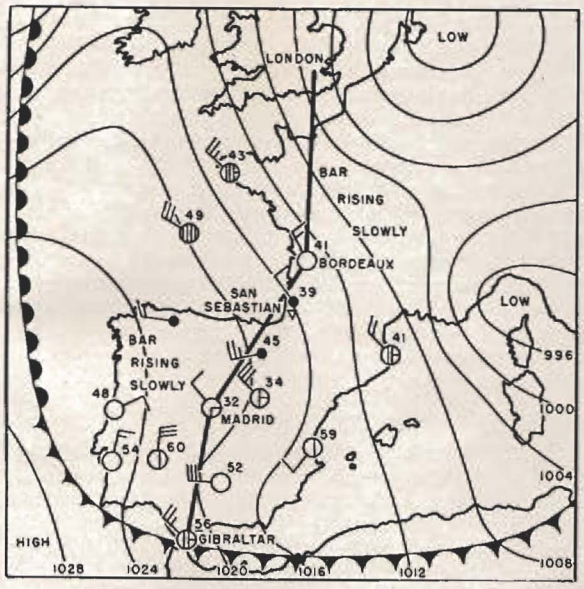


Fig. 2. Meteorological Office synoptic chart for 06.00 *G.M.T., 18th December,* 1952. *The isobars are drawn for every four millibars and temperatures are given in degrees Fahrenheit.*

streamlines have been added, based on the theories and diagrams of Dr. Scorer.

As far as the reactions of the passengers on board were concerned, most of them commented on the smoothness of the flight. None had been aware of anything unusual, except for the occasional turbulence when the altitude became less than 10,000 ft., and the fact that the ground speed was very much lower than had been originally estimated for the flight plan. The aircraft " rode " on the waves and changed altitude in a most stable and gentle manner, although at much higher rates of change than we normally prefer in unpressurized aircraft.

METEOROLOGICAL AND TOPOGRAPHICAL CONDITIONS

On the previous day (17th December), the route had been flown southbound, and there had been a cold front over the mountains, which resulted in solid cloud up to quite high levels. Accordingly, course had been set at 10,000 feet to fly through the weather. There was no sign of any tendency towards wave formations.

The synoptic chart for 06.00 G.M.T. on 18th December (see Fig. 2) shows a north-westerly gradient along the northern coast of the Iberian peninsula, with pressure rising slowly over the whole of south-west Europe. There was little cloud over northern Spain, and the cold front which had been encountered on the previous day was south of Gibraltar. By 12.00 G.M.T. the surface winds had freshened slightly along the northern coastline and the isobars showed a tendency to slight veering.

The upper air charts for this time are particularly interesting, the one for 700 millibars (approximately 10,000 ft.), giving a wind velocity of 40 knots from 340°, whilst at an altitude of 300 millibars, the wind was from 340° at about 100 knots (see Fig. 3.).

Observations from the aircraft showed no low cloud over the mountains, with about $\frac{3}{8}$ altostratus, which had lenticular traces. There was little high cloud. The wind calculated by air plot at 11,000 feet was 335° at 40 knots, with a very considerable strengthening between that height and 14,000 feet.

The air mass between 8,000 ft. and 11,000 ft. was practically isothermal at —1° C., and there was a temperature fall of some 5°C. between 11,000 ft. and 14,000 ft. No indications were given on the aircraft's thermometer of a temperature inversion, and unfortunately there are no ascents available for the North Spanish coast for that day. Ascents made in the same air mass over S.W. England at 03.00 G.M.T. of the same day did, however, show an inversion of 1°C. at about 15,000 ft. This small inversion found over S.W. England may still have been present in the air mass when it reached the northern coast of Spain some ten hours later (i.e. about the time when the " Viking " was at that position). Also, the presence of a high pressure area to the south-west may have caused slight subsidence. So it is possible that by 15.00 G.M.T. there may have been a tiny inversion at 10,000 ft. over North Spain.

The lenticular cloud appeared on wave crests at about 10,000 ft., and below this level, the air became extremely disturbed and turbulent.

The approximate line of the mountain ridges and valleys in the area is east-west, so it can be seen that the winds at all levels were blowing almost at right angles to the ridges. Also, these transverse ridges have fairly steep sides, so it is possible that the slope steepness may be about the optimum value, to which reference was made earlier. Thus, the situation was almost perfect for the formation of waves according to theory, and since the aircraft was flying within 35 degrees of the wind (allowing for drift), it would be subjected to almost the maximum up and down motion of these waves. One further point of interest is that the crests of the three mountain ridges shown are almost exactly equidistant from each other, possibly explaining why the aircraft's flight path should be so regular.

ALTIMETER ERRORS

In a recent article in *Shell Aviation News*, John Davis submitted a theory of errors in aircraft altimeters when flying in mountainous regions, caused by local areas of low pressure, in the lee of mountain ranges. The conclusion was that dangerous over-reading of the altimeter may result if an aircraft should pass through such a low pressure area. Thus, he assumes, a natural pilot reaction would be to dive the aircraft to be rid of the excess indicated height. This is certainly an ingenious theory which cannot be dismissed lightly but, assuming a safety height of only 1,000 ft. above the highest peak, the indicated altimeter error would have to be in excess of 33 millibars for there to be danger of a collision with a mountain.

As far as the present writer knows, there has not been any serious investigation into this particular

problem, but it does seem that in order to cause such a dangerously " deep depression " locally, a very considerable wind force would have to be necessary. The wave conditions set up by a wind of such force in a stable airstream would be far more likely to cause embarrassment, since it has been already demonstrated how a wind of only 40 knots, blowing over a 7,000 ft. ridge, can cause an initial loss of height of 2,200 ft., and a total vertical displacement of some 5,200 ft. to an aircraft which has a power reserve of over 50% at that altitude.

Furthermore, assuming an unstable airstream, under these conditions, the mass of air eddies set up would cause such severe turbulence, and increase the possible human errors of instrument flying to such a degree that most captains would, in any case, elect to fly at least a further 2,000 ft. above the mountain tops.

As far as the flight between Madrid and Bordeaux is concerned it is certain that there were no areas of pressure differential affecting the altimeter readings to any marked degree for there is no doubt that the aircraft was actually descending and climbing by the stated amounts, since, fortunately, there was slight cloud at 10,000 ft., and it was possible to estimate visually with fair accuracy when the " Viking " was 1,000 ft. below the base of this cloud, or 4,000 ft. on top of it. It is felt, therefore, that this type of altimeter error may certainly be a contributory factor, but possibly no more than that.

Apart from the possible error and the very obvious discrepancy which may be induced by incorrect pressure setting there are two further main altimeter errors, the first of which concerns the efficiency of the altimeter itself. The normal British sensitive altimeter, approved by the Air Registration Board, has an acceptable tolerance of 200 ± feet at 10,000 feet, and ± 300 feet at 20,000 feet. A small enough error, certainly, particularly when one considers the minute changes of pressure which we expect our altimeters to record, but certainly one which must be taken into account when calculating safety heights.

Yet another altimeter error may be caused by differences of temperature from ICAN conditions. If the ambient temperature is colder than ICAN, the air will therefore be more dense, and so the aircraft will actually be flying lower than the height indicated by the altimeter. The correction may be calculated on the circular slide rule of the navigation computor, and is approximately 350 ft. for a 10° C. discrepancy from ICAN at 10,000 ft. This is again only a small error but, combined with the others, may be a further contributory cause.

SAFETY HEIGHTS

Safety heights are frequently calculated so as to give 1,000 ft. clearance over all obstacles within 30 miles of either side of the track. This also includes a semi-circular area of 30 miles radius beyond the departure point and destination. When, however, the combined obstacle height plus 1,000 ft. becomes more than 10,000 ft., a further 1,000 ft. clearance may be added. This safety height is a minimum to fly in I.F.R. conditions, and most companies warn their captains to this effect. There is nothing to prevent a captain electing to fly higher than this minimum if he is not satisfied with the weather conditions *en route*—indeed, it is his overall responsibility to ensure adequate safety margins at all times.

There is no doubt that this method for determining safety height is quite satisfactory when considering flights over sea, low-lying land or even over mountains under ICAN conditions, and when the wind velocity is low, for it allows sufficient margin for altimeter

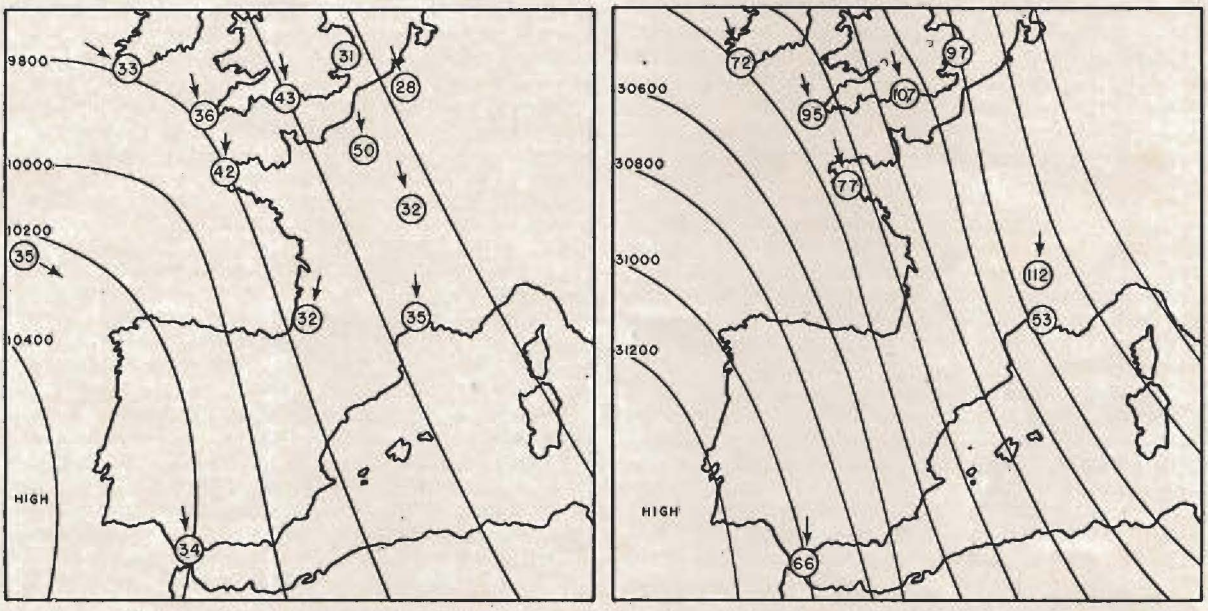


Fig. 3. Upper air charts for 700 mbs. (left) and 300 mbs. (right). 15.00 G.M.T., 18th Dec., 1952. The velocity of winds is given in knots.

tolerances and flight errors, giving an adequate safety factor. However, it is possible that 1,000 ft. clearance over an 8,000 ft. mountain may not be sufficient if the temperature is 10°C. or more colder than ICAN and there is a likelihood of an induced lee low, combined with a possible 200 ft. altimeter mechanical error.

Again, there can be little doubt that the present limits giving 1,000 ft. clearance may be insufficient for navigation over mountainous areas when winds are strong, and wave formations possible. In fact, one of the recommendations of the enquiry into the Aer Lingus accident concerned this very point, and on the 7th January of this year, the Ministry of Civil Aviation felt the position to be sufficiently serious for a circular to be sent to all pilots warning them of the dangers associated with wave formations over mountainous areas and recommending a revision of safety heights.

PREVENTION OF FURTHER INCIDENTS

Therefore, although the regulations of the various airlines and ministries adequately cover the situation, in that the attention of captains is drawn to the effects of strong winds over mountains, it is possible that a practical guide to captains may be necessary—perhaps some simple method for determining the likely effects on aircraft of the descending air currents associated with various wind velocities.

It has been shown how an aircraft may be affected by waves with very little prior warning, particularly if flying in cloud or at night. In an aircraft flying only 1,000 ft. above the highest terrain, assuming powerful wave formations, there may be insufficient time for a distress signal to be transmitted. It has already been demonstrated how, even in a " Viking " at METO power, the rate of descent reached a maximum of 1,500 ft./min., yet a " Viking " at this power, at 10,000 ft. and under ICAN conditions should normally have a rate of climb of exactly 1,000 ft./min., at a forward speed of 120 knots. Thus, it would seem that the actual rate of descent of the air mass in this case was in excess of 2,500 ft./min.

Assuming an aircraft with the power reserve of the " Viking " capable of climbing at 1,000 ft./min., at 10,000 ft., and that the captain took action to increase power immediately he encountered a wave condition such as that just described, the rate of descent would be 1,500 ft./min. ; so, with a safety height which only allowed 1,000 ft. above the highest peak, the time from first encountering the waves to possible incident could be as little as 40 seconds. Certainly this would be insufficient time for the gravity of the situation to be realized, and for the navigating officer to pass to the radio officer such details as aircraft's position, time, height, etc., for the distress message.

Furthermore, it is distinctly possible that once the aircraft had descended below a certain altitude, the danger of stalling would increase enormously. The captain in his efforts to prevent further descent would be using maximum engine power, with minimum safe forward air speed. Then suddenly, from the area of calm, stable waves, he would fly into an area of very great turbulence, possibly resulting in loss of control. Added to this may be the complications of being in cloud and flying on instruments.

Consideration of the case of a lighter aircraft in these circumstances would show the position to be even more serious for, assuming no reserve of power and lower forward speed at cruising altitude, the rate of descent may reach a maximum of 2,500 ft./min.. Furthermore, the light aircraft would sink almost to the bottom of each trough, whereas the " Viking " by reason of its power maintained altitude at 8,800 ft., although even at this height the down-current was still of the order of 1,000 ft./min. In addition, although the " Viking " was carried to 14,000 ft. in the up-currents, with the throttles almost closed, the airstream was still rising at this height and therefore a light aircraft would have been carried much higher.

Since it seems that it may be possible to forecast standing waves with fair accuracy, what action can be taken to prevent further accidents from a condition which can bring even large aircraft to grief ? The alternatives would seem to be :

(*a*) not to fly in an area where waves are forecast ;

(*b*) if powerful wave forces are found when not forecast, attempt to fly out of the area, if possible, although it has been shown that in the worst cases there may be insufficient time for this action to be taken successfully ;

(*c*) try to locate rising air, then turn to fly parallel to the ridge direction, so making the maximum use of the " lift effect," before continuing on course ;

(*d*) increase the route height over the area to such an extent that the aircraft may rise and fall with the currents with ample safety.

Considering (*a*) and (*b*) together from the point of view of an airline operator, it is undesirable economically to increase route mileage, or to have an aircraft return without landing at its destination. In suggestion (*c*) is an element of risk, in case an up-current cannot be located in time. Therefore, whenever possible, the route height should be increased. This would involve little extra cost, and would provide the extra safety required. The problem then becomes quite simply by how much should the safety height be increased ? What formula can be devised to give a safe guide to aircraft captains operating over these areas ?

Let us discuss the prime variables involved. It has been established that wave formations depend upon the angle of attack of the wind to the ridge, the worst situation being when the wind is at 90°.

A further variable is the height of the ridge, assuming optimum slope steepness, for the formation of waves, since wave amplitude and altitude of interference increase proportionally in relation to mountain height. Given a constant wind velocity, assuming that a hill of 1,000 ft. height causes disturbances up to 3,000 ft., then one would expect a ridge 5,000 ft. high to be responsible for 15,000 ft. of disturbed air. Therefore, it would seem to be advisable to increase safety height by a percentage of normal route height, rather than by a nominal fixed amount.

Of the remaining factors wind velocity in the undisturbed air on the windward side of the mountain and at crest height is the most important, so if these three parameters are considered, a graph may be

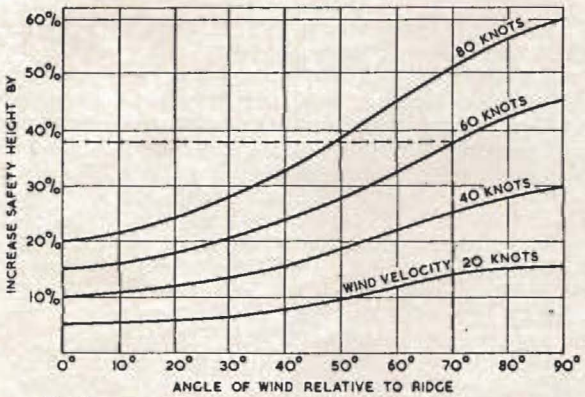


Fig. 4. Graph for estimating increase of safety height.

devised as at Fig. 4. With this graph, interpolation may be carried out, to arrive at a percentage increase of route height.

For example, assuming again the route Madrid to Bordeaux with a wind of 60 knots at the 7,000 ft. level blowing over the Bay of Biscay from 020°, and knowing that the mountain ranges run from east to west, the angle of wind attack to the ridges is 70°. From the graph 38% should be added to the normal safety height, i.e., highest obstacle within 30 miles, plus appropriate terrain clearance allowance. Therefore, assuming a safety height of 9,000 ft., we find that under these conditions the route should be flown at a minimum of 12,420 ft. Thus, the lowest quadrantal safety height when flying northwards would be 13,000 ft., and southwards, 14,000 ft., so giving an extra few hundreds of feet in hand to counter-balance possible altimeter errors.

It should be noted that this particular graph is based on practical experience of the effects of high winds over mountains, rather than on mathematical theory, although its accuracy has been checked against several reported incidents. The graph assumes the slope of the north Spanish mountains to be of optimum steepness for the formation of waves, and naturally, would only be suitable for an aircraft with the power reserve and forward speed of the "Viking." The pilot of a light aircraft in the circumstances described would, as shown previously, find his rate of descent to be about 2,500 ft./min.; thus, such a pilot, if using the graph, should add to the percentage increase of height, in order to arrive at a safe height to fly. Conversely, the captain of a faster aircraft, with greater power reserve, would be affected to a lesser degree and so would need to add slightly less to his safety height, for safe operation over the area.

This graph is only a suggestion, but the writer feels it to be at least a step in the right direction and there should be no insurmountable difficulties in producing a similar series of curves to cover all aircraft types.

We must make ourselves aware of the dangers of wave formations and we must allow ourselves to learn from the accidents that have already happened. If we do this, then another contribution will have been made towards Safety in the Air.

"Thus when the changeful temper of the skies
The rare condenses, the dense rarefies."
(*Virgil's Georgics*, Book I).

Acknowledgments to "Shell Aviation News."

CORRESPONDENCE

DEAR SIR,

I have read Mr. Fletcher's recent article on the simplification of sailplanes and following letters with great interest, for I think that, if enough interest could be aroused in this direction, gliding might eventually be possible for a great many who have no access to well organized clubs.

It seems to me that the forgotten man of gliding is the home builder—the man who cannot hope to pay the price asked for complete machines, or even existing kits, but who could and would build a good, sturdy machine if the plans were available. The type or types designed for home construction should be of a simplicity such as is not found in present production and so, like Mr. Fletcher, I should like to offer my suggestion for a glider which would seem to offer the best solution.

The machine I have in mind is the 'Kite,' designed in at least two marks, by Mr. M. Warner of Sydney, Australia. This glider was illustrated in *Sailplane* for February 1945 and again in February 1947, and is one of the prettiest designs in both conception and execution that I have ever seen. The construction is pod and boom with full cantilever wing, and is about as uncomplicated as it is possible to be. Material cost should be at a minimum and construction easy. What more could we ask?

The existing design fully enclosed and possibly with dive-brakes, and a modified type with a strut-braced single spar wing would provide a trainer and a more advanced example of a class which could be built anywhere in the world by clubs or individuals without too great a call upon either skill or pocket.

While on the fascinating subject of cutting costs, why not dispense with the usual blue prints costing around $50.00 or £25? A booklet of the size of *Sailplane* could provide all the dimensioned and perspective drawings, photographs and description necessary to build both machines and should not be too difficult to produce. The cost might be, say, $1.00 or 8s., and no license fee for construction should be charged.

If C. of A. is not now obtainable, would there be enough interested organizations, draftsmen, mathematicians and just plain would-be glider pilots to donate talent and funds enough to have the drawings and calculations run up? I think there would.

All this the merest outline of an idea which might fit in with the growing feeling that gliding is slipping away from the true amateur, as expressed by your other correspondents. I have made free with Mr. Warner's design because I believe it is the best possible for the job. I trust we shall hear from him, if he approves.

Anyone interested?

Yours,

W. J. CAMPBELL.

1603, 10th Avenue South,
Lethbridge, Alberta, Canada.
April 16th, 1953.

THE PREVENTION OF ACCIDENTS

By Veronica Platt

ON reading the accident analysis for British gliding during 1952 it is quite obvious that there is something wrong with British gliding instruction. When categorised instructors can themselves be responsible for no less than ten accidents in 1952, causing damage valued at £1,290, and qualified pilots break up materials to the value of £832 in another sixteen accidents, carelessness is only too apparent. Where does the fault lie?

It looks rather as if pilots are getting their licences too easily, after too short a period of training, or else that they do not follow what they have been taught. A crash in these days is hardly ever the fault of the machine—it can usually be attributable to human error—error arising either from excess of confidence or sheer stupidity. Gliding is essentially a safe sport, much safer than bicycling or rock-climbing, but elementary precautions have to be taken and one of these surely is to familiarise oneself with one's controls. What will happen if they are incorrectly used? A stall, a spin? Not very dangerous if you are high enough but the ground is hard if you hit it before you have time and space enough to regain control. Eleven accidents happened during approach and fifteen during landing. Why? Hundreds of pounds were wasted, hundreds of flying hours lost, just because someone had been careless. Gliding clubs just cannot afford this wastage, especially when most of it is utterly unnecessary. If instructors would only hammer home the points that most accidents are caused by loss of flying speed or lack of attention to surroundings we could point with pride to the lowest crash rate in the world.

Let me quote a letter from the Ministry of Civil Aviation. It was addressed to the pilots of light aeroplanes but applies equally well to all of us. It holds a lesson so elementary that I am ashamed it should ever have needed to be written . . . . .

26th February, 1953.

" A number of accidents involving light aircraft have occurred because the pilots lost control during turns close to the ground or during gliding turns on to final approach. A common feature has been that the aircraft were flying at a comparatively low air speed, and this has given rise to some doubts as to whether the pilots concerned fully appreciated that an aircraft's stalling speed increases during a turn. Such a failure on their part could account for these accidents. The possibility that they were due to lack of attention cannot be ruled out, but it is considered that a lack of attention in this respect must have its origin in a failure to appreciate fully the factors involved.

" Although this is a matter of elementary knowledge which one would expect a pilot to have firmly fixed in his mind, it would appear as a result of these accidents that a reminder may be desirable. We would be grateful, therefore, if you could see your way clear to taking such action as may be appropriate to remind pilots of light aircraft that an aircraft's stalling speed increases in a turn and that particular attention should be paid to airspeed in manoeuvres close to the ground.

Yours faithfully,

(Signed) D. W. H. Davies.

for Deputy Director of Operations and Safety."

CLOSE CO-OPERATION

By J. C. RICE

MR. George Thompson (right) is the C.F.I. of the combined clubs of Coventry and Leicester, Mr. Vic Carr being also an instructor. George has wide experience in the R.A.F. and at Camphill, while Vic is well known as a Dunstable instructor.

The Coventry Club is in operation at Baginton using the gliders and equipment of the Leicester club, an excellent arrangement that enables both clubs to proceed. Recent activities have been most gratifying and although Baginton is a flat site numerous flights off the winch have extended over 30 minutes with the two-seater, and flights with the ' Olympia ' naturally much longer.

The club offers very good training facilities in the Midlands and having made a good start this year expects a vigorous and fruitful future.



Gliding Down South— or Overcoming Obstacles

By Geoff Higginson

IN June, 1952, I was called to the telephone to answer a query from a couple of chaps who wanted to build and fly a glider. An interview was arranged and subsequently I had the pleasure of meeting two very likeable young Englishmen, Frank Hawkes and Ross Mill, who, having been dissatisfied with their profession of draughtsmen in the U.K., decided that opportunity was knocking in Australia, and took the plunge.

Soon after arriving in Western Australia they set themselves up as dam-sinking contractors at Gnowangerup.

Although fairly renumerative, dam-sinking is sheer hard labour, but by knuckling down to it they were able to acquire a 1,700 acre block of their own and are now preparing the ground for crop, at the same time carrying on with their dam-sinking project.

Having a couple of hours to spare now and then they decided to realise another ambition—to build and fly gliders.

Subsequent enquiries brought them into contact with this club. I gave them the tracings of the ' Rhon Ranger ' Primary and they had a set of plans made. Four months later, the ' Rhon ' was ready for testing.

During the building period they joined the club and trained up to low hop stage, their training taking place on odd week-ends when they could spare the time to make the 230 mile trip each way. This trip was made sometimes on a motor cycle and sometimes in their portable, self-contained home—an ex-army radio van.

During a recent trip around the south-west of W.A. I took the opportunity of calling on Frank and Ross and was able to give their ' Rhon ' the once over.

They have made a very creditable workmanlike job of the construction and it looks clean and airworthy.

I did not arrive there until the afternoon, so did not have the pleasure of seeing the ' Rhon ' in the air, although they assured me that it would be no trouble to rig and transport it a couple of miles to the gliding field.

However, my time of stay had to be curtailed, and I regretfully declined the offer.

Auto-towing is used, and the system entails removing the gates of three or four fences which gives them a mile run. The line is laid out and the pilot then has the rather hazardous task—while on the climb—of manoeuvring the ' Rhon ' so that the wire does not snag on the gate posts.

Some clumps of trees also present a slight obstacle as the tow car veers in an arc through the aforementioned gates which, owing to an oversight on the part of the original settlers, do not coincide.

The enthusiasm of Frank and Ross has drawn a couple more into the gliding at Gnowangerup. However, the ' Rhon ' is not the fulfilment of their aims. They have commenced construction on the Australian-designed ' Falcon ' two-seater, and if their previous effort is an example of their energy, it should not be long before the ' Falcon ' is taking advantage of the excellent soaring conditions in the area.

(Reprinted from " Glidabout," journal of the Gliding Club of W.A.)



The above photograph of Sea Gulls was taken by Mr. F. N. Slingsby

N.S.W. Group Buys 'Kangaroo'

Schneider Ltd. to Build More Two-Seaters

A GROUP of pilots at Boggabri, in New South Wales, has bought the ' Kangaroo ' two-seater which was recently built by Edmund Schneider Ltd., for John Wotherspoon.

The group consists of five power pilots who began gliding last year in a utility glider which they bought from the Gliding Club of Victoria.

Boggabri is 320 miles almost due north of Sydney, and has a population of about 1,200. It is on the edge of the wheat producing plains of N.S.W., which have been proved first-class for long distance soaring.

Members of the group took delivery of the ' Kangaroo ' in Adelaide on March 16. During the 1,000 miles drive back to Boggabri the sailplane was used to give exhibition flights at Nuriootpa, in South Australia, and Dubbo, in N.S.W.

The Barossa Valley Gliding Club, which was formed recently at Nuriootpa, has placed an order with Edmund Schneider Ltd. for a club two-seater utility glider. Another two-seater utility is being built for the Renmark Gliding Club in South Australia.

Having sold the prototype ' Kangaroo,' John Wotherspoon has ordered another as a replacement.

'Australian Gliding.'

The Air Force Gliding Club at the Aeroporto dell' Urbe, under the command of Major Mantelli has received the first five ' Canguro ' sailplanes from the Societa Ambrosini.

During its tow from Rieti to Rome of a ' Canguro ' sailplane, Major Mantelli cut free at 2,000 metres over Monterotondo and stayed up for 8 hrs. 35 mins., landing on the aerodrome of Guidonia.

The flight was made in poor atmospheric conditions and serves as an interesting study of local thermals. It is also the longest post-war flight and so gained the national record for duration for single-seaters.

From ' ALI.'

Two Place Out and Return Record

By Ric New

AFTER listening to the met. forecast and deciding that a short out and return flight should be possible, I asked Geoff Higginson to come along as a passenger in the ' Laister Kauffman ' so that we could attempt to better the existing two place height record of 6,500 feet and also establish other official two place records.

I chose an out and return because I had flown for five hours the previous day and felt that a short flight on a soft seat without retrieving would be reasonably restful.

Geoff came to Dowerin to crew for me, and a wonderful job he did with the assistance of my wife. This retrieving team inspired a lot of confidence because I knew that they would always be close behind me at all times and a great deal, if not most, of the credit for any good flight should go to the crew.

This is particularly so when the pilot only has to walk up to the glider and everything is ready for him to start.

We were towed off by Cyril Flood and the ' Tiger Moth ' at 1 p.m. The thermals were quite weak and after 45 minutes we were still over the field, though at 7,000 feet.

I was not too confident that we would ever get away from the field, but decided that we must push on even if we only landed a few miles away.

We set off against a fair headwind towards our declared turning point, Wongan Hills.

The ' L.K. ' with two aboard really does go, and the only anxious moment on the trip occurred when we were down to about 2,000 feet in heavy cloud shadow and it appeared as if we would be walking home.

Once again the excellent gliding angle of the ' L.K. ' helped, and I steered towards some patches of sunshine on the ground.

Sure enough, weak lift was found and I circled this feverishly until we were back at 5,000 feet.

I then took a few breaths and spoke to Geoff who told me that he had already picked out a field to land in. (Very handy having a passenger).

We then made a short glide to Wongan, took two pictures and started back for Dowerin. Soon after this we were at 9,000 feet with a good following wind. Cloud base was at about 12,000 feet so we just loitered along with Geoff on the rudder and myself on the stick.

This certainly was a pleasant ride. As we detoured a couple of clouds that were shedding rain I said to Geoff that it might cool the ground. How wrong I was, for when we landed it was difficult to imagine that rain had been seen.

At times on the home run we were doing 55 m.p.h. and climbing at 8 feet per second in straight flight.

We arrived back at Dowerin at 5,000 feet and had to circle in some red air to get down.

The distance flown altogether was 65 miles, and we reached a maximum of 10,500 feet, thus setting two new Australian records. All in all, it was a very pleasant flight, and one which again justifies my confidence in the ' Laister Kauffman.'

'*Australian Gliding.*'

N.S.W.G.A. TROPHIES

At its meeting in March, the N.S.W. Gliding Association made the following awards for the year ending 31st January, 1953.

The Stamina Trophy, for the longest distance flight, to Bob Krick, of the Hinkler Soaring Club, for his flight of 220 miles from Narromine to The Rock.

The Fairey Trophy, for the greatest gain in height, to Fred Hoinville, of the Hinkler Soaring Club, for his climb of 13,600 feet.

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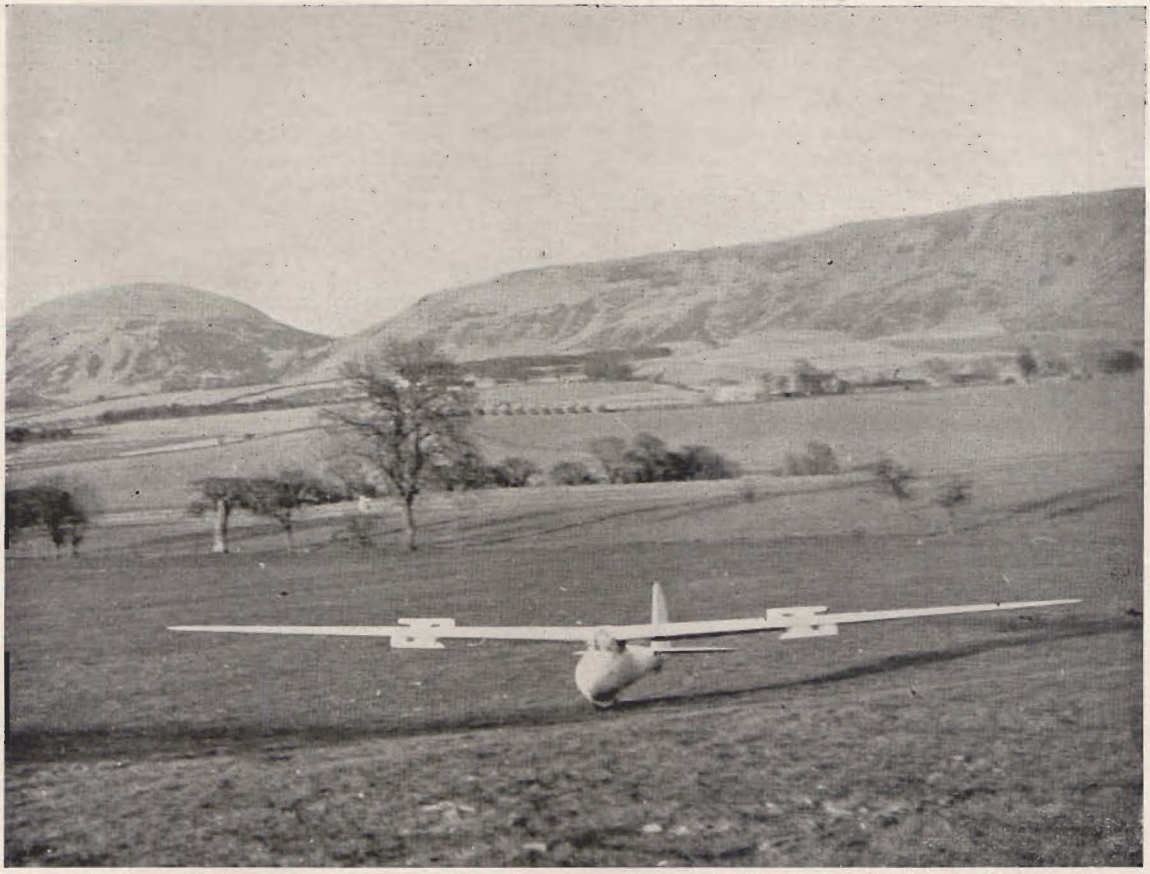
★ Summer Gliding Courses will be held as follows :—

June 20th—28th, July 4th—12th, August 15th—23rd, August 29th—September 6th.

Inclusive fee for each course of 9 days with accommodation, 4 meals per day and all flying, £15.

Full particulars from :—S. H. JONES, 82 Ravenhurst Road, Harborne, Birmingham, 17.

SLOPE SOARING AT BISHOPHILL



Tom Davidson, C.F.I., of The Scottish Gliding Union, landing the Club ' Olympia ' after six hours' slope soaring over Bishophill, seen in the background.

Pye Equipment at Farnborough Exhibition

At Farnborough last week Pye Limited showed a range of wireless equipment varying from their latest Walkie-phone—notable for its light weight (only 10 lbs.)—to the highly intricate multi-channel radio link equipment, designed for using radio as a telephone trunk line. A feature of the latter was its actual link between the exhibition and the Ministry of Supply headquarters in London, more than 30 miles away. Any visitors from the N.A.T.O. countries could telephone from one of the two call-boxes and be immediately put through by the Ministry of Supply to anyone on a Government internal line in London.

Other items shown included part of an instrument landing system, various components, and the Army Wireless Set 62. An outside display showed the installation of radio equipment in a fire-fighting vehicle and on an airfield tractor.

' Pelican ' Two-Seater is Test Flown

The Waikerie Gliding Club in South Australia test flew the ' Pelican ' two-seater on February 22.

The ' Pelican ' is a 54 feet span, side-by-side machine, and was designed and built by members of the club.

The empty weight is 500 lbs. and it has a pod and boom type fuselage and cantilever wings.

Waikerie Gliding Club secretary, Bob Rowe, says : ' The performance is superior to our estimates.

' We have made a good comparison with our ' Olympia.' The ' Olympia ' had a slight edge during climbs in thermals, also in the speed range between 40 and 50 m.p.h. From 50 to 55 m.p.h. the gliding angles of the two machines were the same, but above 55 m.p.h. the ' Pelican ' was the better.

' The unaccustomed side-by-side seating causes the pilot to make skidding turns unless an eye is kept on the turn and bank indicator. This, however, will be remedied once we get used to the machine.

' Finally, we find the shoulder releases—supplied by Edmund Schneider Ltd.—to be very good. They allow full control of the aircraft throughout the whole launch with very little movement of the controls.'

'Australian Gliding.'

FROM *SAILPLANE* OCTOBER 23, 1931

AEROPLANE TOWING

By FRITZ STAMER

IN September, the Wasserkuppe Flying School held, under my direction, the first course of instruction in aeroplane-towed flying at Griesheim Aerodrome, near Darmstadt. It was a six-day course. The aeroplane ' Flamingo ' with a Siemens SH12 engine was used for towing, and the sailplanes towed were the ' Falke ' and the ' Professor.' The ' Flamingo ' was piloted by Herr Riedel, who was indefatigable. The Griesheim camp provided accommodation and excellent catering for the pupils.

Sixteen men in all took part in the course, of which 8 were pilots of power-driven aircraft, and 8 pilots of sailplanes only and holders of the ' C ' Certificate. In spite of the rather bad weather, flying was carried out every day, although the machines often dripped with rain, and often disappeared into the clouds at altitude of only a thousand feet or so.

I may say at the start, that hardly any difference could be distinguished between the performance of gliders who were also pilots of power-driven aircraft and those who were simply gliders ; the latter found themselves just as much at ease at a height of 3,000 feet as the pilots of power-driven machines who are accustomed to such altitudes. During the course each pupil carried out, on an average, 8 flights, in which the towing lasted 10—15 mins. and the glide 20—30 mins., so that the total duration of flight for each pupil was about 4—5 hours.

This course showed how important it is that ' C ' tests should be made on aircraft such as the ' Falke,' ' Prufling,' ' Mayer I,' etc., and not with aircraft such as ' Hols der Teufel ' and the like, if the ' C ' test is to be of any value as preliminary instruction. It should not be forgotten that, before taking part in the towed-flight course, the pupil must accustom himself to very exact action of the controls, as the aircraft towed by a power-driven aircraft always exceeds its normal speed, so that the action of the controls is considerably stronger.

When, for any reason, the aeroplane has to cast loose, it is the duty of the pilot of the sailplane also to cast loose at once. Only when the sailplane is flying at a high altitude over villages, electric power cables, or the like, can the rope be carried along and dropped on uninhabited ground. As the sailplane flies slowly, the tow-rope, which is 120 m. long (about 400 ft.), hangs down almost vertically, and catches in bushes, trees, hedges, and the like. This would lead to a bad crash. Therefore, throw away the rope as soon as possible. It can easily be forgotten as it cannot be seen from the cockpit. It is much more serious to have a crash than to lose a rope.

A number of flags should be attached to the tow-rope, which makes it easier to be seen during the flight, and easier to find when cast off. Normally the sailplane casts the tow-rope loose, and the towing 'plane returns it to the starting place where it is dropped. Every aeroplane is not suitable for towing, and every sailplane is not suitable for trailing. It is best to take part in a course of instruction for towed flight in order to obtain reliable information regarding all these questions and the practice of towed flight.

The next course of instruction in towed flight is to take place from Nov. 3 to Nov. 10, 1931, at Griesheim, near Darmstadt. Anyone wishing to take part in this course and who is not already known to the directors of the Wasserkuppe Flying School, should enclose his flying certificate with the application, showing clearly what previous training he has had. All applicants must have passed the ' C ' test. If the applicant has not had sufficient preliminary training, he will, naturally, not be accepted.

During the course more than 100 flights were made at Griesheim, but no machines were damaged and none of the pupils were injured. It was clearly proved that towed flight can be learnt, but instruction is necessary, as difficulties often arise which can be overcome only by making use of the rich experience already collected by the Forschungs-Institut and by the school of the Rhon-Rossitten Gesellschaft.

At first towing was only carried out during calm periods, but afterwards in strong winds, gusty weather, strong vertical air-currents, and through small clouds. (It is foolishness to attempt towing through thick clouds ; this should always be avoided). Then sharp curves were flown, and at a high speed. All the pupils who held licences for power-driven aircraft were taken up in the ' Flamingo ' to give them an idea of what the pilot had to do when towing. Some of the other pupils were also taken up in the ' Flamingo ' as in order that both pilots should be able to work well together it seemed important that the pilot of the glider should know the possibilities open to the pilot of the towing machine.

In accordance with the approved method of gliding and soaring instruction which stress the importance of the development of ' air-sense,' no instruments were fitted in the trailer ' Falke ' which was first used, and not until several flights had been carried out was an altimeter fitted to check the flight. In the ' Professor ' which was used towards the end of the course an air-speed indicator, a variometer, and an altimeter were fitted. The ' Professor ' also carried a parachute.

RULES

A number of fundamental rules were drawn up, namely :—

Always pay attention to the towing rope ; it is easier to prevent it becoming slack than to put it right afterwards.

Always keep 30—40 ft. above the power-machine ; if you fly on the same level you will be in its slip-stream and will draw its tail downwards.

Do not get too high above the towing machine (not more than 60—100 ft.), as the glider then begins

to carry the towing machine and can be overstressed.

When the tow-rope becomes slack, traction is reduced, and, as the speed is also reduced, one feels that one should turn the nose of the glider downwards. The nose should, however, be turned gently upwards, as otherwise the tow-rope remains slack. If the towing aeroplane flies round a curve, try to fly round the same radius. If you make a sharper turn, the distance is shorter and rope becomes slack, whereas if you fly with a big radius you fly further, and therefore faster, thus you rise.

In this manner it is possible to correct the altitude in relation to the towing aeroplane. One may fly behind it, above it to the left or to the right, and can tell by the tube to which the towing cable is attached on the towing machine how far to the side one may go. If one rises too high above the aeroplane, it is no good to turn the nose of the glider downwards as this will only cause the rope to become slack ; one should fly carefully to the right or to the left and back in order to increase the distance in comparison with that of the towing 'plane.

In starting, on leaving the ground the flight path of the glider should be so inclined that the desired height above the aeroplane is immediately attained, so that a normal flight position may be assumed, thus making it easier for the towing machine to rise. This height must be attained at once as, after leaving the ground, the aeroplane climbs fairly quickly.

When the tow-rope is released from the sailplane the speed is at once reduced, and the nose of the sailplane inclines downwards. But as when being towed the speed of the sailplane is in excess of its normal speed, this reduction of speed is quite normal, and it is not necessary to incline the nose of the sailplane downwards.

THE GOVERNMENT AND GLIDING

The Aeronautical Research Committee acts in an advisory capacity to the Secretary of State for Air. It also co-ordinates all the aeronautical research work done in this country. Once a year it issues a report, in which it not only describes what has been done but suggests future lines of development.

An appreciable part of the current report is devoted to Gliding and though the present financial situation renders financial support from the Government unlikely at the present juncture, there is plenty of ground for optimism in the report. Clubs which are interested in scientific investigation should see whether they cannot organise themselves that when the time comes they are in a position to co-operate with the Committee.

WHAT THE REPORT SAYS

' The Gliding Movement has been brought to the attention of the Committee, and in their discussion of its bearing on research they have had the cordial co-operation of Mr. G. M. B. Dobson, Mr. Gordon England (the Chairman of The British Gliding Association), the Master of Sempill, Sir Gilbert Walker and Herr Lippisch (Director of the Research Section of the Rhon-Rossitten Gesellschaft on the Wasserkuppe).

' In Germany, flights in gliders have been made, in certain types of weather, for distances of over 100 miles, and from a hillock only 100 feet high a sailplane has been taken to a height of 2,500 feet. In this country, in attempts to make ascents from level ground, experiments have been commenced using motor-cars to give the velocity required to raise the glider to a height above the ground at which it can take advantage of up and down currents and so gain further height.

' Very high performance types of sailplane, with a drag/lift ratio as low as 1 in 20 or less, have been designed in Germany, and there appears to be some promise with this type of aircraft for increasing knowledge both of the aerodynamic properties of aeroplanes and of the movements and strengths of air currents. The Committee are of the opinion that any scientific advances to be gained from gliders in this country require prior successful development of the art of gliding. They are aware of the official encouragement which has been given by the Air Ministry to Light Aeroplane Clubs, and they have recommended a limited financial support of Gliding Clubs. Assistance for scientific purposes would best be given to a Club specially well suited to develop the art on scientific lines and prepared or willing to make an effort in this direction. If this were done the Committee would keep in touch with such a Club and be prepared to help it by advice so far as they were able, so as to be in a position to take advantage of any opportunities that might present themselves for scientific development.'

FRANCE

Information about French gliding courses for foreigners can be obtained from the Secretariat Generale a l'Aviation Civile et Commerciale, Service de l'Aviation Legere et Sportive, 24 Boulevard Victor, Paris, XVme. These courses will take place at several centres and will provide free accommodation. Food will cost approximately 400 francs a day and flying will be charged probably at a daily flat rate.

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SOUTHDOWN CLUB COURSES

★ Southdown Gliding Club are holding a Gliding Camp, open to non-members, at FRISTON from AUGUST 15 to 22.

The course will be limited to pilots of 'B' standard and above. Cost £12.

Write—Course Sec.: A. R. C. LENNARD, 48, Arthurdon Road, London, S.E.4

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(Issued under delegation by the B.G.A.) **APRIL, 1953**

CERTIFICATES 'A' .. 126 (16082-16207)
'B' .. 138
'C' .. 23
Silver 'C' 8
Gold 'C' 1
Goal Diamond 1

'B' CERTIFICATES

No.	*Name.*	*A.T.C. School or Gliding Club.*	*Date taken*
11544	M. L. Banks	R.A.F. Halton	8. 3.53
11877	R. Langridge	Surrey G.C.	18. 3.53
13888	P. S. Robson	No. 31 G.S.	3. 4.53
13906	P. E. Bull	No. 89 G.S.	28. 7.52
14305	D. E. Lynch	No. 68 G.S.	15. 3.53
14322	T. M. Rae	No. 1 G.S.	16.11.52
14434	E. A. Turner	No. 1 G.S.	19. 4.53
14691	R. A. Rowe	No. 42 G.S.	19. 4.53
14876	J. L. Iles	No. 42 G.S.	8. 3.53
15102	A. O. McCrone	No. 7 G.S.	8. 3.53
15103	J. D. D. Haig	No. 7 G.S.	15. 3.53
15105	W. W. G. Neilson	No. 7 G.S.	22. 3.53
15378	B. Carter	No. 102 G.S.	19. 4.53
15839	R. Kerr	Scottish G.U.	19. 4.53
15984	T. Roche	Coventry G.C.	5. 4.53
15990	J. J. Joss	Coventry G.C.	4. 4.53
16082	C. G. Hingley	No. 125 G.S.	22. 3.53
16083	C. J. S. Holden	No. 126 G.S.	22. 3.53
16084	R. B. Stratton	No. 89 G.S.	8. 3.53
16085	R. Dunthorne	No. 122 G.S.	22. 3.53
16086	D. C. Hodder	No. 89 G.S.	21. 3.53
16087	J. A. Lee-Evans	R.A.F. G.S.A. W. Area Club	20. 7.52
16088	J. A. Goody	No. 188 G.S.	8. 3.53
16089	E. J. Bates	No. 161 G.S.	15. 3.53
16090	G. T. P. Humphreys	Midland G.C.	12. 9.52
16091	J. W. Hoskins	H.C.G.I.S.	25. 2.53
16092	G. J. Smith	No. 49 G.S.	26.10.52
16093	C. A. Adkin	No. 49 G.S.	23.11.52
16094	F. L. Catterall	No. 49 G.S.	16.11.52
16095	R. A. Coulthard	No. 89 G.S.	7. 3.53
16096	W. F. Hayward	No. 92 G.S.	8. 3.53
16097	J. M. Warner	No. 188 G.S.	15. 3.53
16098	S. M. Fraser	No. 7 G.S.	22. 3.53
16099	J. Hall	No. 1 G.S.	5. 4.53
16100	R. A. Jeffreys	R.A.F. Detling	27. 3.53
16101	F. R. Stace	No. 168 G.S.	1. 2.53
16102	D. Anderson	H.C.G.I.S.	27. 3.53
16103	J. R. Alderton	Cambridge U.G.C.	24. 3.53
16105	R. T. Littlewood	No. 82 G.S.	8. 3.53
16106	R. M. S. Murray	No. 1 G.S.	5. 4.53
16107	F. K. Birch	No. 45 G.S.	8. 3.53
16108	P. J. Boneil	No. 45 G.S.	20. 3.53
16109	J. A. Edwards	No. 45 G.S.	20. 3.53
16110	A. D. Bridger	No. 166 G.S.	15. 3.53
16111	E. R. Kessell	No. 82 G.S.	8. 3.53
16112	R. P. Kharegat	No. 126 G.S.	4. 4.53
16113	J. B. Shaw	No. 23 G.S.	8. 3.53
16114	C. R. Webb	No. 89 G.S.	15. 2.53
16115	F. C. Anderson	Bristol G.C.	20. 8.52
16116	A. L. Tebbit	Bristol G.C.	4. 9.53
16117	J. A. Nowell	No. 188 G.S.	15. 3.53
16118	F. J. Staff	H.C.G.I.S.	27. 3.53
16119	O. Buneman	Cambridge U.G.C.	20. 1.52
16120	D. W. Gau	No. 126 G.S.	6. 4.53
16121	G. Haigh	No. 45 G.S.	8. 3.53
16122	M. H. Varley	H.C.G.I.S.	27. 3.53
16123	P. F. Wilkins	No. 126 G.S.	6. 4.53
16124	N. M. Williams	No. 68 G.S.	15. 3.53
16125	R. C. Cobbold	No. 104 G.S.	1. 3.53
16127	B. E. Makins	No. 168 G.S.	10. 4.53
16128	B. D. Morgan	No. 168 G.S.	11. 4.53
16129	D. M. Burrill	No. 31 G.S.	12. 4.53
16130	N. G. Gould	No. 104 G.S.	6. 4.53
16131	Sheila R. Gregg	Coventry G.C.	7. 4.53
16132	A. D. Hearmon	No. 168 G.S.	10. 4.53
16133	G. Howe	No. 23 G.S.	12. 4.53
16134	M. W. B. May	No. 168 G.S.	21.12.52
16135	A. G. Morley	No. 168 G.S.	10. 4.53
16136	B. J. Wholey	No. 168 G.S.	10. 4.53
16137	I. G. Jack	No. 1 G.S.	5. 4.53
16138	J. E. Bratton	No. 122 G.S.	10. 4.53
16139	I. Currie	No. 122 G.S.	8. 4.53
16140	J. Coffey	No. 23 G.S.	8. 3.53
16141	F. L. Gardner	No. 122 G.S.	10. 4.53
16142	P. E. Secker	No. 122 G.S.	7. 4.53
16144	M. C. Brown	No. 23 G.S.	4. 4.53
16145	B. J. Couchman	No. 168 G.S.	10. 4.53
16146	C. Simpson	No. 23 G.S.	5. 4.53
16147	J. S. Stewart	No. 31 G.S.	12. 4.53
16148	A. L. Sturgess	No. 168 G.S.	10. 4.53
16150	K. R. Stoker	No. 2 G.S.	25. 3.53
16151	D. M. Higgs	No. 166 G.S.	11. 4.53
16152	S. W. C. Blake	No. 168 G.S.	10. 4.53

(*Continued on page* 24)

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16153	C. F. Scar	No. 168 G.S.	10. 4.53
16154	G. M. Robson	No. 23 G.S.	10. 4.53
16155	A. C. Dodman	H.C.G.I.S.	15. 4.53
16156	R. E. Horn	H.C.G.I.S.	16. 4.53
16157	W. V. Mason	No. 186 G.S.	12. 4.53
16158	G. Stead	No. 23 G.S.	12. 4.53
16159	P. G. Stokes	No. 168 G.S.	10. 4.53
16160	G. E. Jenkins	No. 92 G.S.	22. 3.53
16161	J. G. Wright	Yorkshire G.C.	13. 4.53
16162	J. E. Yates	No. 122 G.S.	10. 4.53
16163	T. E. Dalton	Coventry G.C.	8. 3.53
16164	K. Kelly	No. 24 G.S.	8. 3.53
16165	J. G. Nowell	H.C.G.I.S.	16. 4.53
16166	D. F. Bradford	No. 126 G.S.	18. 4.53
16167	H. T. W. Byne	No. 126 G.S.	19. 4.53
16168	B. Cook	H.C.G.I.S.	17. 4.53
16169	W. T. Johnson	No. 186 G.S.	19. 4.53
16170	M. G. Mealing	No. 104 G.S.	19. 4.53
16171	L. H. W. Post	No. 89 G.S.	17. 4.53
16172	F. Eyles	Surrey G.C.	16. 4.53
16173	B. Webb	No. 183 G.S.	8. 3.53
16174	S. J. Bunce	No. 89 G.S.	19. 4.53
16175	G. M. D. Elson	Derbyshire & Lancashire	22. 3.53
16176	M. Brinsford	No. 89 G.S.	18. 4.53
16177	A. G. Fox	No. 89 G.S.	17. 4.53
16178	W. J. Scott	No. 104 G.S.	6. 4.53
16179	B. S. Whitaker	Moonrakers G.C.	19. 4.53
16180	L. Stanley	Shorts G.C.	27. 6.52
16181	B. J. Beck	Moonrakers G.C.	19. 4.53
16182	B. Mullen	No. 31 G.S.	7. 3.53
16183	D. T. Plummer	No. 168 G.S.	10. 4.53
16184	G. E. Caruana	Luneburg G.C.	19.10.52
16185	L. Ivey	H.Q. 2nd T.A.F. G.C.	3. 4.53
16186	H. Mahood	No. 203 G.S.	22. 3.53
16187	L. G. Nixon	No. 188 G.S.	12. 4.53
16188	D. A. Cozens	No. 166 G.S.	29. 6.52
16189	D. A. J. Lauder	No. 89 G.S.	7. 4.53
16190	P. Burt	No. 31 G.S.	25. 4.53
16191	M. D. Bylo	No. 122 G.S.	15. 2.53
16192	N. Callaway	No. 123 G.S.	26. 4.53
16193	J. W. Kendall	No. 141 G.S.	25. 4.53
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