SAILPLANE AND GLIDER

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The First Journal devoted to Soaring and Gliding

Sailplane and Glider

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To Kadet or not to Kadet?

BEFORE the outbreak of war, the five leading Gliding Clubs in Great Britain, having survived the heat and turmoil of the day both economically and instructionally, all undertook a considerable amount of "Primary" training, most of which, if not all, was done on "Primary Daglings." This seemed both natural and economical, for this particular machine was specially designed for the job, and possessed attributes not possessed by any other type of machine, which were particularly valuable to the trainee.

When the A.T.C. took up gliding, they had in their own view quite different ends in so doing. They were undoubtedly wise in restricting their activities to straight flights, as much because of the acute shortage of equipment and of the higher crash rate when turns are indulged in, as because of the shortage of qualified instructors. But when they adopted a secondary type of machine to carry out this essentially primary training, in the view of many experienced people, they fell into what is considered a fundamental, expensive and possibly dangerous error.

This does not infer in any way that the "Kadet" machine is not an excellent machine for its job, to wit, secondary training, when the pupil had learnt to gauge air flow and to manage the elementary controls of the machine. In view, however, of the certain amount of controversy which has arisen on this matter, it may be as well to set out clearly the fundamental advantages and reasons why a "Primary" machine is best for primary training. In doing so we are not attacking the A.T.C. Gliding Training Staff or methods. We merely wish to give guidance to the many people who are now taking steps to begin gliding for the first time, some of whom wish to create gliding clubs. It is in our view for the good of Gliding that things should be clearly understood.

The arguments in order of importance are :—

1. A "Primary" is the only machine with a solid keel, yet of light construction, which will withstand the bumps and stalls of primary training over a prolonged training.

2. The flying note of a "Primary" is harsh, strident and obtrusive, and is of sufficient quality to intrude itself upon the most occupied mind of the young pilot. This is the gliding "safety valve" in the early stages which teaches the pupil "air speed" by ear, to be followed later by "air speed" by feel. On any other machine this warning note is of less than 50 per cent. of the intensity and can therefore be easily missed in the early stages of training.

3. The pilot, having no obstruction in front of him, enjoys a full and complete air flow and vision all round him, plus the added advantage of having no fuselage in front of which to hurt himself in case of a diving crash, when even if the safety harness breaks loose he merely takes a toss no worse than a Rugger tackle.

4. The machine is not sensitive on controls, particularly on the rudder, and therefore if and when mistakes in control are made in early training, the results are not too drastic. By comparison a "Kadet" machine is three times as sensitive on rudder control as a "Primary" which greatly adds to early training difficulties.

5. All control movements made by the pupil are completely visible by both the instructor and the other pupils, where only the practised eye of an experienced instructor can check the mistakes in a "Secondary" machine.

6. The upkeep and cost of a "Primary" is less than half that of a "Secondary": repairs are more easily and expeditiously carried out, and its useful life on primary training at least double or treble, possibly quadruple that of a "Kadet. "Some "Primaries" at present in use by the A.T.C. have endured nearly 20,000 launches.

(*Continued on page 15*)

J. C. Neilan.

PIONEERS OF BRITISH GLIDING

No. 12

EARLY in 1933 a stream of letters began to arrive in *The Sailplane* office from Seaham in Co. Durham. They contained news of all the northern Gliding Clubs; photographs of cumulus transformations and of gliding activities for the past two years; original contributions for the paper in prose and verse (not all the latter being published); requests for information about models, wing sections and light-weight sailplanes; and intimate details of an original light sailplane, the "Merlin," which the writer was helping a member of the Newcastle Club to design and build.

ANOTHER VICTIM

There was no mistaking these symptoms; the Gliding Bug, in a particularly virulent form, had claimed another victim. In addition to all this activity, John Neilan spent part of the summer exploring the Pennines, the Lake District and the Yorkshire Wolds in search of soaring sites, in company with W. E. Hick (his co-worker on the "Merlin") and E. T. Addyman of the Harrogate Club. They camped everywhere and took with them Addyman's "Zephyr" light-wind sailplane, which had to be pushed in its trailer by hand, with the help of passing pedestrians, whenever it could not be hitched to a passing car. All he expected in return was a few ground-hops in the "Zephyr."

During the next winter, in reporting further progress on the "Merlin," Neilan revealed himself as a medical student; but that is the last we ever heard of the subject, for Aviation soon got him for good.

HOW TO GET AN "A"

We lost touch with him for a year; then, in March, 1935, he turned up at Sutton Bank as an experienced aeroplane pilot and obtained an "A" gliding certificate by soaring a "Hols" for 40 minutes. In May he made a "C" flight in extraordinary conditions; there was a persistent thermal area over the slope of Sutton Bank which, by drawing in air across the plateau, gave an impression that the soaring was being done over a lee slope where there should have been down-currents.

FATHER AND SON

In July, 1935, being temporarily unemployed, he camped out on Sutton Bank and practised thermal flying, one such flight lasting over 7 hours. He was joined there by Dr. Neilan, senior, who, finding himself with a son who would not follow in father's footsteps, decided to reverse the process and take up gliding. He eventually gained a "C" certificate by soaring a "Hols" to over 600 feet.

Meanwhile, John Neilan, junior, added to the family laurels on July 16, 1935, by soaring a "Professor" sailplane for 13 hours 7 minutes. This was a British duration record, beating the previous one, set up by J. Laver 9 months earlier, by 46 minutes. It remained the British record for over three years till it was exceeded by A. O. Pick with 13 hours 27 minutes. The present record stands at 15 hours 47 minutes.

PRIZES

At the 1935 National Contests, held at Sutton Bank at the end of August, Neilan gained the Distance Prize and the Wakefield Trophy with a flight of 54 miles to Garton, near Withernsea. Such a distance involved much cross-wind flying, since the west wind brought him to the sea at Bridlington and from there he had to work S.S.E. to keep over land. The height reached was over 4,000 feet, so this flight gained him the "Silver C." He was the fifth British pilot to get it, and his International number was 174.

He now obtained a job as commercial pilot in Scotland, based at Aberdeen, and during this period managed to borrow a "Flying Flea." It was alleged to have a ceiling of 500 feet, but by skilful use of cloud currents he coaxed it up to 1,500 feet, according to report.

TAUGHT HIS FATHER

At Easter, 1936, he took part in the Derbyshire and Lancashire Club's inaugural meeting and won a prize for being the first pilot to reach Woodford aerodrome, 15 miles away. During one of his now infrequent visits to Sutton Bank he performed his first sailplane loops in Frank Charles's "Kirby Kite" and tested it for spinning. In "Falcon II" he gave his father dual instruction.

Then, in July, 1936, Neilan left for Northern Ireland to become Lord Londonderry's private pilot, and soaring flights became more infrequent than ever. However, he obtained leave of absence a year later to take part in the International Contest at the Wasserkuppe. By this time his total flying experience amounted to 85 hours on sailplanes and 200 hours in aeroplanes.

J. C. NEILAN

WASSERKUPPE PERFORMANCES

In the final arrangement of the British team, Mrs. Joan Price and John Neilan (pronounced "Nylon" by the Germans) shared the use of a "King Kite," which was a new and unfamiliar type to both of them. Nevertheless he contributed 80 points to the British team's total by flights to Waldorf (25 km.), to Bardorf (40 km.), then 56 km. to Schweinshaupten after having got into and out of a severe spin over the Wasserkuppe (to the discomposure of everyone but himself), and finally 77 km. to Gotha, whose aerodrome he reached with 10 feet to spare.

SEARCHLIGHT PRACTICE

Later, being back in England doing such jobs as flying by night over London to give the seachlights practice, Neilan has a hard task to make his visits to various clubs coincide with a soaring wind. But on May 1, 1938, he managed to fit in a 35-mile flight to Harrogate from an aero-towed start at Kirbymoorside, getting up to 5,300 feet on the way. He contravened a bye-law by landing on "The Stray" near the middle of the town.

WAR ACTIVITIES

When the war began, he started taking daily loads of freight to France. Then he went to the Birmingham area to do Army Co-op. flying for the anti-aircraft people. Next he went to Brough to fly as test pilot for Blackburn Aircraft, Ltd., and while there he had a chance to fly Slingsby's products at Kirbymoorside. This included some cross-country trips in a "Petrel" for the benefit of anti-aircraft spotters in the north of England. Though these were intended to be long glides from a high aero-tow, it goes without saying that they became cross-country soaring flights—possibly the only ones done in England since the war began. There is nothing like keeping one's hand in for the glorious days to come.

A. E. S.

A NOVICE IN A SNOWSTORM

EASTER 1936. My wife, my gliding partner (Capt. Rattray) and I found ourselves as visitors to the first open meeting held by the Lancashire and Derbyshire Club at Camp Hill. We were new to this sort of thing, having done only a few hours' soaring each at Dunstable, but owning a brand new sailplane ("Cambridge II") we felt we must try our luck.

Our good friend, Eustace Thomas, world-famous mountaineer and later a "Silver C," entertained us at his house near Manchester in royal style. Good Friday we drove out to Camp Hill, rigged the machine and did a few circuits. Some of the more experienced men took their trailers to Mam Tor, where the hills face N. and E., which was the wind of the day—but nothing very spectacular occurred. Saturday the wind was from the North, and it being my partner's day we went to the hills on the south side of the Hope Valley, and he flew over an hour, landing back at Camp Hill four miles away.

Sunday was my day, and having decided to try for five hours, Rattray extracted a promise that I would not attempt to leave the area. The E.N.E. wind indicated launching from near Mam Tor, 1,700 feet above sea at the west end of the Hope Valley. This valley is surrounded on three sides by hills 700—900 feet high, the open end facing east—the floor of the valley approximately two miles square.

BLUE SKY THERMAL

After some difficulty in getting the trailer up the steep rough track and through a farm, we rigged in the lee of a stone wall, and I was eventually launched fifth over the 800 feet drop at 13.55 hours. It was very rough at first, but lift was plentiful and I soon rose 1,000 feet above the launch point and found excellent steady lift almost anywhere over the valley—it was one of the most marvellous experiences I've had—clear blue sky, bright warm sun (under the cockpit cover), and the whole panorama of the Peak district spread out beneath to feast my eyes on, it was wonderful—Derwent reservoir, the valley, the hills, beautiful colouring and the ability to wander about at 1,000—1,400 feet, sitting almost stationary anywhere I chose.

RUDE GREETINGS

This went on for over an hour, and I felt I hadn't a care in the world—this was worth all the hard work and money I had spent learning and buying a machine—I even forgot to worry over the fact that having been told by the local pilots that I must be sure to have the only suitable landing field in the valley pointed out to me—here I was 2,000 feet over it and fifty other fields, having forgotten to ask which one. Ten machines all told were launched—five went off across country and five of us remained over the valley at various heights, making rude signs to each other when we approached near enough, indicating that we were having a glorious time.

CLOUD LIFT

Little clouds appeared upwind and came on up the valley. I'd heard about "cloud" lift, and here perhaps was my chance to sample some, so I lightheartedly went out to meet them and thrilled at the slight roughness under them, but couldn't honestly say I climbed a foot (I found afterwards my Collins' variometer was broken). I tried a number of clouds, kidding myself I was getting lift, but they were really too small—about 100—200 feet diameter. Next I saw a really big cloud advancing from the east with its front edge formed like a shelf. As this approached I could see that it stretched for miles each side, but that the main part, the highest part, was coming straight up the valley.

THE REAL LIFT

I had read that there should be good lift under this shelf, but I couldn't find it, altough I was not more than 500 feet below it, then seeing further out what appeared to be a circular curain hanging from the centre like a mushroom stalk with the cloud as the mushroom I went to investigate. Suddenly I was enveloped in snow, which appeared to be rushing straight at my face, but miraculously vanished before I felt it. I remember being quite surprised that the snow didn't stick on cockpit cover and make me blind, amd I remember thinking, "Well, at any rate I am physically comfortable in spite of the cold outside." Before I had time to realise what was happening I felt a giant hand pulling the glider up and up into the cloud—down went the nose, up went the speed, 60, 80, 90 m.p.h., and beyond, right off the dial and still the glider was rising fiercely. Could I sideslip? No,

S./L. E. Furlong in the Gull II.

the controls were almost rigid with the speed—what then ? would the wings stay put—Zander had insisted the machine was very strong and there was a small plate behind my back saying " Max. speed 120 m.p.h." Was I doing 120 ? I just sat there almost standing on the pedals as I was diving so steeply with no sight of anything but driving snow. What would happen next ? What else could I do ?

" WIND UP "

This condition of extreme " wind up " went on for hours, measured by mental time, by watch it was was probably a few seconds—it came to an end suddenly when the ground became faintly visible, indicating that the " core " of the upcurrent was past and that the machine was gaining in its endeavour to lose height. Returning to above the launching point I found it necessary to keep going at 80—90 m.p.h. to prevent being taken up into the cloud again, which by this time had reached the hills—it occurred to me that it would be sensible to go out into the valley to avoid having to fight the excessive lift due to the storm combined with the " hill lift," it also at this time dawned on me that there were four other gliders somewhere—probably doing the same thing as I was, and in that almost zero visibility it wasn't a comforting thought.

100 M.P.H.

However, I went out over the valley and did find the lift easier, but then realised too late that I had completely lost sight of the ground about 800 feet below. There was only one thing to do, go back to the hill and tear up and down until the storm passed. Turning and flying down wind at possibly 100 m.p.h. ground speed, I just glimpsed black objects flashing by under my starboard wing—they were the stout helpers standing in wind and snow on top of the hill trying to see where we had got to and unconsciously forming the only object one could focus on. A vertically banked turn back into wind brought the machine about 200 yards behind the hill brow and 200 feet above it, but in violent and turbulent down draught with nowhere suitable to put down and no possible chance to reach the brow and the upcurrent in front. One way out only seemed possible and that down a deep gully which led round to the front of the hill. This was taken, and fortunately the excess speed still in hand enabled the glider to reach the front of the hill about 400 feet below the top. It didn't take long to reach the top again, in fact it was necessary to rush up and down again very close to the top to avoid losing sight once more of the hill line in the thick snow. After about 15 minutes the storm passed, the snow stopped, the wind dropped, and the valley presented a transformation. When last seen it had been green and brown, now it was sparkling white and peaceful—giving no hint of the turmoil of a few minutes before.

MISSED THE FIELD

It soon became evident that there would not be enough wind to continue my attempt at " 5 hours," so I made out into the valley in preparation to land in the field I thought looked most suitable. After a somewhat hectic approach I missed altogether the field I was aiming at but managed to hop the wall and put down successfully in the next.

When my friends eventually arrived with the trailer I heard their side of the picture. They had watched Richardson go off in expert style before the storm. Bergel and Slazenger had made a dash for Camp Hill, and Baker had put down in a favourable field well up the valley just before the snow started. Liddle got caught in the snow and flying blind had hit the hill, fortunately without hurting himself, although the machine was wrecked.

The watchers on the hill had no idea where I was until the " Cambridge " appeared at speed out of the snow going the wrong way over their heads—my partner in his excitement at my sudden appearance in that predicament yelled " He's mincemeat," which didn't exactly cheer up my wife, who was sitting in the car with him.

I had more " wind up " and more thrills and learnt more in that 2 hours 23 minutes than in any period since the last war, and I wouldn't have missed it for anything.

E. J. FURLONG.

AMERICAN ITEMS

THE Report of the Records Committee of the Soaring Society of America is contained in the November-December issue of " Soaring." The Society is the competent authority in the U.S.A. for the awarding of Soaring and Sailflying Certificates and Badges. Its Headquarters are at Elmira, New York.

During the year ten " B " Certificates were issued, eight of them gained at Elmira.

Of the 22 " C " Certificates awarded in the year, only two were gained at Elmira. Three were gained at an Army Air Base in Sicily, and the same number at an Air Base in England. (Enquiries seem to indicate that these were gained in a W.A.C.O. C.G.4 under cumulus over the Eastern Counties.)

Twenty-nine Palms, California provided three. It is the fabulous place with a 64 ft. thermal, 365 days in the year, from 10 a.m. to tea-time. Golden " C's " are said to be guaranteed in one day, the lift extending to 14,000 ft. and the last leg consists of the 100-mile glide to Los Angeles. A recent visitor to SAILPLANE Office was Flight-Officer Cole, who hopes to be C.F I. at a post-war Soarngi School there.

SILVER " C's "

There were two Silver " C " Pilots in U.S.A. last year : Herman J. Stiglmeir and James A. Simpson, President of the Soaring Association of Canada.

A new " Gliderport " was opened on Nov. 25th-26th by the Philadelphia Glider Council at Silverdale, Pennsylvania. Retrieving was by one-horse power quadruped.

In a discussion on Thermals and Helicopters, Edward A. Quartermain states that thermals have a vertical velocity of 4—10 ft. per second, and that one would expect to find the diameter of such swirling currents to be of the order of about 90 to 125 ft. He then makes the somewhat surprising statement that " looking from above toward the earth these swirling thermals turn (in the northern hemisphere) in a counter clockwise direction, at about 60 to 90 r.p.m.

(Continued on Page 17)

ACE SOARER

OBSERVATIONS ON THE FLIGHT OF THE FULMAR PETREL

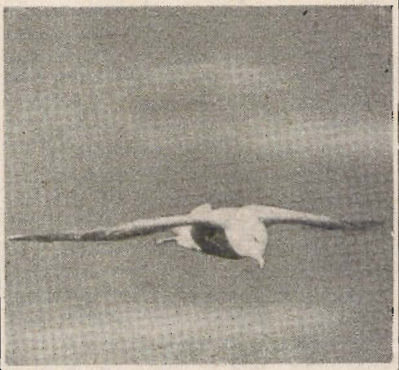
THE Fulmar Petrel is the most accomplished slope soarer that I have ever seen, beside whom Herring, Lesser Black-backed and even Kittywake gulls appear as clumsy as an open Dagling "Primary" trying to compete with a high-performance sailplane.

They usually hold their wings stiffer than a gull without the rake-forward and sweep-back of the wings, relying for fore and aft stability on a very highly developed tail. The tail muscles are extraordinarily strong and well developed capable of warping the tail up on one side and down on the other and at the same time twisting the whole assembly and thus putting on bank without using aileron control. The ensuing turn is then flown with the tail horizontal to the horizon and very slightly depressed. To come out the tail is warped up and down on opposite sides and twisted back to normal in relation to its body, thus leveling the petrel. The elevator force in this method of steep turn is supplied by shifting the Centre of Pressure forwards achieved by stretching the wings forwards. It also uses the more orthodox method of applying negative incidence on the inside wing to put on bank, twisting its tail into a nearly vertical plane to the horizon and pulling it back (warping it up).

No doubt they use many other combinations of controls for turning but to observe these requires several observers at the same time—I only had my own eyes, camera and binoculars.

FLYING TECHNIQUE

When slow-flying the arm of the wing is highly supinated (held at high incidence), the hand sometimes appears to be pronated but is always at a much smaller angle of incidence than the arm, the tail-plane is pulled back and curved and the Centre of Pressure is continuously adjusted by tiny but rapid oscillations of the wing tips backwards and forwards. Slots are occasionally opened and the legs are lowered giving full flap, which is, however, continuously regulated and often used as a rudder. They delight in hovering a foot or two above their brooding mates in this form of "parachute" soaring.



'Fulmar Petrel.'

'Parachute' Soaring.

Lapwing in High Speed Stall.

One of the photographs shows a fulmar "parachute" soaring 6 ft. away in order to have a good look at the photographer.

SOARING ENTHUSIASTS

They are soaring enthusiasts, occasionally they soar very high but mostly they fly very fast along and below the cliff top because it is much more interesting.

I have often observed them at an aerial switchback game played in an inlet, bay or miniature fjord in the cliffs, one of whose sides would be facing roughly into a very strong wind—the other cliffside of the inlet in the lee of the wind giving very strong and turbulent down draughts. Their flight path would usually follow an egg-shaped rather than an elliptic course whose plane is steeply inclined to the horizon. Starting at the top, close to the cliff right inside the indentation, they would fly into the down-current along the lee cliff—accelerating as if they were rocket-propelled and quickly reaching sea-level at the foot of the promontory forming the lee cliff of the miniature fjord. (The height of these cliffs was just over 200 feet.) At the bottom a wide turn towards the windward cliff face and an orthodox but remarkably rapid bit of slope soaring to the top of the cliff till the end of the inlet was reached again. Then the same cycle would be repeated.

FULMAR PETRELS ONLY

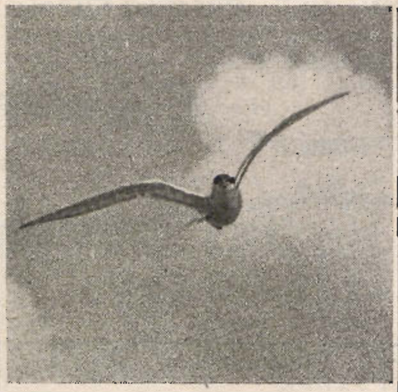
One day when there was a 30—45 m.p.h. wind blowing off-shore (off-cliff) I went to the cliffs for some sheltered rock climbing and not to observe birds, as I expected to find all the cliff birds grounded. To my amazement the Fulmar petrels alone were all soaring very close to the cliff face, if anything with more than the usual fervour and without a wing beat. Their control and manoeuvrability were such that they could fly in the up eddies formed at the cliff face as the air cascaded down the cliffs. On this occasion some again played the switchback game by flying away from the cliff into the down-draught, accellerating greatly and then turning back to the cliff face and gaining height extremely rapidly in the up eddy.

These forays into the down-draughts were not accidents, they were intentional. For whenever a petrel played switchback it would continue for some time, doing ten or fifteen circuits, then revert to normal level, soaring close to the cliff face in the up eddy and when tiring of this revert to the switch-back. At the same instant there were always several Fulmars switch-backing and others purely slope or eddy soaring and avoiding down-current.

STALLED TURNS

Another popular manoeuvre was the stalled-turn executed with hair-breadth precision. They would fly with the wind straight towards the cliff face, pull up sharply and climb vertically, stall turn within one foot of the cliff face and then fly away again. This was done most often above the head of a brooding Fulmar.

The Fulmar petrel is one of the most fascinating birds for sailplane pilots to watch—it is very nearly a purist, it is the master of slope soaring, from whose technique and control a lot can be learned (I hope). The aerial switchback is also very intriguing.



Arctic Tern.

GREEN PLOVER

There is one photograph of a Green Plover caught in a high-speed stall. I was standing in front of its nest containing four newly-hatched chicks which I had photographed while the mother kept making passes at me flying at eye-level and cross-wind. The attacks were pressed home quite well, the pull up was usually only two to three feet from my head. On this occasion I jerked the camera as my aim was faulty. The plover must have thought that I was going to throw something at it, for it pulled the " stick " back too sharply and as a result flicked over on to its back in a high-speed stall, loosing two feathers in the process—these can be seen just in front of its beak. Note the way in which the legs have dropped down and the body and wings are being twisted rouud its head.

ARCTIC TERN

The other picture is of a head on attack by an Arctic Tern, remarkable for its beautiful lines and highly-tepered wings—" Vogues " idea of a gull must be something like this. Unfortunately it does not believe in soaring ; I suppose it is temperamentally unsuitable and that its metabolic rate is too high. But as a power flier its manoeuvrability and fighter tactics against pestrels, peregrine falcons and human intruders are of great military interest, as they sometimes stage highly co-ordinated squadron attacks, and I have witnessed one air operation against a fully-grown pregrine falcon in which several squadrons took part, totalling about one hundred to a hundred and fifty Arctic Terns, the organ-ization and co-ordination of the attack, was magnificent.

O. W. N.

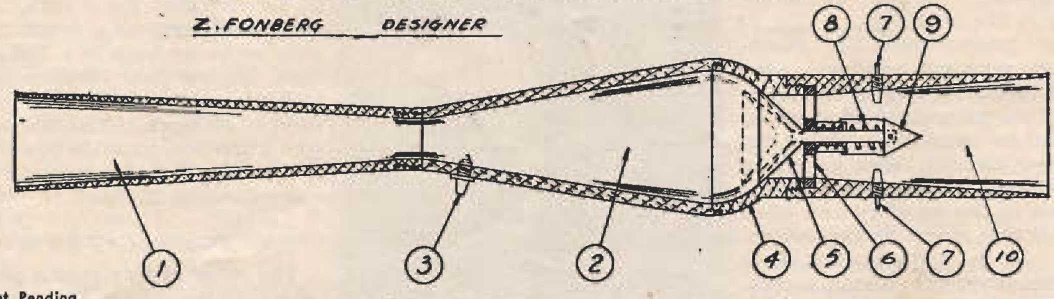
Australian Gliding Association

SOUTH AUSTRALIA

Some further information on the *break up of the " Kite I "* at Waikerie is set out in a letter dated 27/11/44 from Mr. E. R. Barratt, Instructor of Waikerie Gliding Club. He states :—" You asked me what were those ' two flashes of yellow ' I mentioned in my previous letter—I had forgotten that this was not mentioned in the report. We thought that what I had thought I had seen (and at the time I could hardly believe I had seen) had no bearing on the report ; but it naturally had a bearing on our search. From where he had cast off at 3.20 p.m., Ken Riebe had circled unbrokenly in one thermal up to a little under his height when last seen at 4.15 p.m. I then noticed him straighten out and fly back S.S.W. for about a minute. Then even at that distance I noticed him fly into something pretty good, in which he immediately began circling and each circle he was going up appreciably on the cloud background. Just at this point I noticed some considerable undulations in his circles. These must have been considerable to be so noticeable at the distance he was away, as I could only see the machine while it had a cloud background. I said to two of the younger members standing near : ' He's struck something pretty tough there." At this moment the machine flew out of the cloud background and I lost sight of it. I glanced at my watch and it was 4.35 p.m., and I walked into the hangar to see how the boys were getting on with the tyre pumping. About—and this is why we did not include this in the report—I can only say about 5 minutes later I walked out again and that was when I saw a flash of yellow to the East and one slightly West of where I last saw the machine but considerably lower. For a second I thought it was the machine, but when I saw the two so far apart I concluded my eyes were playing me tricks. (Which would not be surprising after watching the sky so long.) I spent the next 15 minutes fruitlessly hunting the sky everywhere, and then those two flashes of yellow began to worry me just a little. By the time we had traversed the Renmark Road to away behind Lake Bonny at Barmera with no sign of Ken, I began to worry more, and I took Rex Coats aside and told him what I thought I had seen. I said—' If we hear nothing of Ken by to-morrow mid-day we must take it as a possibility that the machine broke up in the air and we will need to look straight North of the drome.' This supposition we acted upon when the plane search began next day. Two ' Oxfords ' came up and Rex Coats went up in one and I went up in the other. We first did two 15-mile beats out and back of the drome, and although we must have flown over the machine did not see it. Mr. J. W. S. Taylor found the machine the next day almost by

(*Continued on page* 17)

UNIFLOW JET PROPULSION ENGINE



Patent Pending

Specification		General Data		Remarks
No	NAME	LENGTH	21 1/4"	WITHOUT MOLÉ NOZZLE
1	OUTPUT NOZZLE	MAXIMUM DIAMETER	3 5/8"	
2	COMBUSTION CHAMBER	OUTPUT NOZZLE MAXIMUM DIA.	2 1/8"	
3	SPARK PLUG	INTAKE NOZZLE MAXIMUM DIA.	2 3/8"	
4	HEAD	WEIGHT	9 lb	MADE FROM ALUM. ALLOY
5	INTAKE VALVE	MAXIMUM REACTIVE FORCE	15 lb	
6	GUIDE	MAX. REACTIVE FORCE WITH MOLÉ NOZZLE	22 lb	MOLÉ NOZZLE NOT SHOWN
7	FUEL INJECTION NOZZLE	THEORITICAL POWER	28 H.P.	GASOLINE
8	VALVE SPRING	INTERNAL EFFICIENCY	24 %	
9	COVER	MAX. EXTERNAL EFFICIENCY	92 %	
10	INTAKE NOZZLE	FUEL CONSUMPTION PER HOUR	2 1/2 GAL.	LOW OCTANE GASOLINE

Applying Jet-propulsion to Gliders

By ZBIGNIEW ZRZYWOBLOCKI * **

REACTION-propulsion depends on the principle, to every action there is an equal contrary reaction. The recent application of this principle in aviation called jet propulsion uses a flow of gases. If the exhaust gases flow from the nozzle directly into space, the reactive force is equal to the product of the mass of gases in 1 sec. times the velocity of the flowing gases.

TWO TYPES

Jet-propulsion may be divided into 2 types, depending on the fuel used :

(*a*) Rocket-propulsion in which the fuel carries its own supply of oxygen or air, for example black powder.

(*b*) Jet-propulsion in which the fuel needs an external supply of oxygen or air, for example gasoline, heavy oils, petrol, etc.

The main advantages of powder-rockets are their simplicity of design and operation. The charge may be ignited by a small battery. There are 3 great disadvantages :

(*a*) Serious difficulties in the manufacture of big powder rockets with the attendant danger of explosion during manufacture.

(*b*) The possibility of explosion of the rocket in flight.

(*c*) Lack of control of charge after it is ignited.

Though jet-propulsion has none of the disadvantages of powder rockets, its disadvantages are as follows :—

(*a*) Necessity of designing special jet-motor.

(*b*) Additional weight of this motor.

In both types of reaction-propulsion, two coefficients of efficiency are of importance :

(*a*) Coefficient of internal efficiency which depends on the losses inside the combustion chamber and inside the nozzle.

(*b*) Coefficient of external efficiency which depends on the ratio of velocity of flight to the velocity of exhaust gases.

HIGH THERMAL EFFICIENCY

The value of the internal coefficient is better than the coefficient of internal efficiency of combustion engines, since the construction in the first case is much simpler. The tests of Oberth, Goddard, Sanger and others, proved that the coefficient for reaction-propulsion may reach the value of 0.7 or better. The coefficient of external efficiency reaches its optimum value when the velocity of flight is close to the velocity of exhaust gases. Consequently, in the case of gliders, one must be prepared beforehand for a low value of this coefficient and for a low over-all efficiency of reaction-propulsion when applied to gliders. Nevertheless, the simplicity of reaction propulsion as compared with a propeller engine unit is so great, that already 16 years ago, there were tests of the application of this type of propulsion to gliders.

ON GLIDERS FIRST

It is enough to mention that the first flight in history of an airplane with reaction-propulsion was performed by a gliding society. Namely, the first rocket flight was performed by the Rhon-Rossitten Gesellschaft on June 11, 1928. The test was performed with models. Very soon after these tests, the first successful powder rocket flight was performed with a glider designed by Dr. Lippisch. During one of the succeeding flights, there was an explosion of the powder rocket in the air, causing serious damage to the glider. After that, the Rhon-Rossitten stopped the tests. In 1929, the Gliding Society in Breslau built a model of five feet span, driven by powder-rockets, which performed some successful flights. In 1931, the Italian Company, Cattane, Pierro, Magni, built a powder rocket glider of eighty-eight feet long span. In 1935, the idea of applying reaction propulsion to gliders was again undertaken by the Gliding Institute attached to the Lwow Institute of Technology. There were published for the first time in the world the calculations for take-off with powder-rockets by the author. Some tests were performed with models but lack of money did not permit the author to run comprehensive tests.

ADVANTAGES TO GLIDING

It might be of interest to discuss what advantages gliding can gain from rocket or jet-propulsion. The tests of the Rhon-Rossitten Gesselschaft were performed with the aim of the elimination of shock cord launching. In general, reaction-propulsion might be applied to the following conditions of flight :—

(*a*) Take-off from a level hilltop. No gain in altitude required.

(*b*) Take-off from flat ground with a requirement that altitude must be gained.

(*c*) Horizontal flight.

The purpose of applying reaction propulsion in the cases (*a*) and (*b*) will be the elimination of external take-off devices, and to gain whatever altitude is needed.

Case (*c*) may occur in a thermal flight when the pilot wants to pass from thermal to thermal. The location of rockets inside the glider will depend upon the construction.

TABLE I—LAND GLIDERS

Wt. of Glider lbs.	Flight Condition	Under Carriage	Friction Coefficient	Propulsion	Reactive Force in lbs.	Length of the Rocket inches	Diameter of the Rocket inches	Wt. of the powder lbs.	Distance of take-off or flight in ft.	Gain or loss in Altitude ft.	Time sec.
435	Take off from a level	skid	0.2	Rocket	131	14.6	5.9	19.6	168	...	10
435	ditto	wheel	0.07	Rocket	72	14.8	4.4	11.8	303	...	16
435	Take off from a hilltop with 10° slope	skid	0.2	Rocket	50	15.1	3.9	8.8	165	...	10
593	Take off from a level hilltop	skid	0.2	7 H.P. Eng.	Take off impossible						
593	ditto	skid	0.2	7 H.P. Eng. with a Rocket	102	22.3	5.2	24.1	300	...	20
593	ditto	wheel	0.07	7 H.P. Eng.	Take off impossible						
593	ditto	wheel	0.07	7 H.P. Eng. with a Rocket	31	26.0	2.9	8.0	735	...	32
593	ditto	wheel	0.07	9 H.P. Eng.	..	...	..	...	1,689	...	46
593	ditto	wheel	0.07	9 H.P. Eng. with a Rocket	23	18.5	2.5	4.8	696	...	21
435	Climb after takeoff	...	...	Rocket	83	152.5	4.7	159.5	13,440	1,650	314
593	ditto	...	...	7 H.P. Eng. with a Rocket	102	93.5	5.2	120.0	9,180	1,650	192
593	ditto	...	...	9 H.P. Eng. with a Rocket	85	93.5	4.8	100.0	9,180	1,650	192
435	Level flight	...	...	Rocket	26	33.0	2.6	10.7	3,270	...	61.5
593	ditto	...	...	7 H.P. Eng.	..	...	..	...	3,270	...	44.4
593	ditto	...	...	7 H.P. Eng. with a Rocket	66	16.3	4.2	13.4	3,270	...	33.3
593	ditto	...	...	9 H.P. Eng.	..	...	..	...	3,270	...	40.0
593	ditto	...	...	9 H.P. Eng. with a Rocket	48	16.3	3.5	9.3	3,300	...	33.9
435	Glide	...	...	Own weight	..	...	..	...	3,300	—210	67.8
435	Glide	...	...	Rocket	15	33.1	2.0	6.3	3,300	—105	67.0

TABLE II—SEA GLIDERS

Flight Condition	With or without Rocket	Take-off ft.	Time Sec.	Percentage of Distance	Percentage of Time	Number of Rockets		Wt. of Rocket lbs.	Number of Rockets		Reactive force of Rocket lbs.
Seaplane towing a sea-glider	Without	1,296	34	100	100	..	×	..	..	×	..
Ditto	Rockets in seaplane or sea-glider	792	21	61	62	2	×	8.7	2	×	55
Ditto	Rockets in seaplane and in sea-glider	396	10	30	29	8	×	4.1	8	×	55
300 H.P. motorboat and two-place sea-glider of 750 lbs.	Without	1,401	40	100	100	..		..	..		..
Ditto	Rockets in sea glider	624	18	45	45	2	×	7.3	2	×	55

Powder-rockets may be easily located in the rear part of the fuselage, behind a fire wall in a special chamber. Also, the wing may be a good location for them. The same location may be used for the combustion chamber in case of jet-propulsion. The gasoline tanks may be put inside the wings or the fuselage. It is difficult to answer the question of whether to use rockets or substitute jet-propulsion. Powder rockets may be simpler to install and operate, but there is no control after the charge is ignited. After the charge is spent, there is hardly any weight left.

ELABORATE J.P. INSTALLATION

Jet-propulsion calls for a more elaborate installation and is more difficult to operate, but the motor can be controlled. When the fuel is exhausted, there is still the additional weight of the combustion chamber.

Some Russion authors maintain that powder rockets will not find application in those cases in which a long time of operation is necessary, but may find application in cases in which a short time of operation is required as in take-off. In order to have some idea about the weight of fuel needed in each of the cases, mentioned above, the results of the calculation of the size and weight of powder rockets are given. The odd numerical values result from converting the original calculations which were in the metric system. Table I refers to land and powdered gliders, Table II to sea and powdered gliders. Black powder was used as the propulsion material. On an average from every square inch cross-section of the powder rocket, a force of 7 lbs. may be obtained.

WEIGHT COMPARISONS

It is unnecessary to calculate the weight of gasoline for jet-propulsion. The gasoline mixture is very similar in heat content and the velocity of gases as the black powder. Therefore, the masses of exhaust gases in both cases will be equal. The fuel-air by weight for gasoline mixture is equal to 1:13 to 1:18. Consequently, multiplication of the tabulated weights of the black powder in the various cases by this ratio, will give a close approximation of the weight of gasoline in corresponding cases. The question is whether this saving in the weight of fuel may be nullified by the weight of the jet motor and the gasoline tanks. It is apparent that in those cases where the weight of the powder is great, it would be advantageous to use gasoline, since the weight of the jet motor is very small. Dr. Sanger built some models of jet motor, each weighing not more than 1 pound and giving up to 66 lbs. of measured thrust, when petroleum gas, oil and pure oxygen were used. The limitations of this paper do not permit dis-

(*Continued on page* 17)

(*Continued from last month*)

SOARING METEOROLOGY

IN

CONVECTION CURRENTS

BY

J. A. SIMPSON
President, Soaring Association of Canada

IV—CONVECTION CURRENTS

THE ever-increasing gliding performance records may be traced to three distinct developments. First, the aerodynamic improvements to the aircraft themselves; second, improved skill of the glider pilots, and finally greater knowledge and use of atmospheric possibilities.

There have been no basic changes in glider design, but only minor aerodynamic improvements, since the development of the " Blaue Maus " and " Vampur " in 1922, and piloting technique has changed little since 1932, but the benefits of meteorological knowledge have only recently been explored, and it is along these lines that we must look for ever better performance in the future.

Meteorological research pointed the way to " thermal " gliding and thus made possible soaring flights over the plains, which brought in its wake the necessary auxiliaries, airplane and winch launching.

KEGEL BEGAN IT

It was in 1926 that convection current soaring was first carried out, during Kegel's remarkable thunderstorm flight, and this resulted in great interest in thunderstorm and line squall soaring. Insolation thermals were first used in the cloud flights of 1930 and 1931, and in the " dry thermal " flight in 1932. Wind thermals were first utilised at the international competitions of 1934 and ocean thermals were explored during the South American expedition of the same year. It was also at about this time that evening thermals were discovered. Height thermals, which were described in the last section in Atmospheric Instability, have not been used for prolonged soaring flights as yet, but offer great hope for the future.

To understand the reasons for thermal action we must study the physical principles of convective motion in the atmosphere. Except for local superheating, thermal movements require a labile atmosphere, *i.e.* a vertical temperature gradient greater than the adiabatic. (See section III.) This instability may be due to the daily solar insolation, that is heating of the lower air strata by the sun, or it may be caused by cooling at greater heights, due to radiation or the advection of cold air. The instability may also be due to the arrival of warm moist air masses, when the thermal energy stored up in southern latitudes may be released in our parts as thermal currents.

Under conditions of atmospheric instability the convective action may be started or triggered in any one of a number of ways.

INSOLATION THERMALS

Thunderstorm and line squall soaring will be discussed in the next section on fronts. Insolation thermals are familiar to every glider pilot, and will be described first.

The insolation thermal is the result of the overheating of the lower air strata, and is therefore markedly affected by local ground conditions. Light coloured, dry areas such as sand, grain fields, towns, etc., reflect the sun's heat to the overlying air, which becomes much warmer than the air around it. When a temperature difference of several degrees is developed the lighter, warm air is pushed up as

A Layer of Stable Cold Air Above Condensation Level.

a huge bubble or balloon by the surrounding cooler and denser air, which flows in to fill up the space. Most soaring flights are made in thermals of this type. If the air in the thermal bubble is moist enough to cool to its dew point before its upward climb is stopped by an inversion, the moisture will condense to form a cumulus cloud, which then forms an excellent indicator to the sailplane pilot of where lift may be found. If the air is too dry to form clouds the thermal can only be located by sensitive rate of climb, instruments in the sailplane, although its start may often be observed as the inflowing cool air blows flags, smoke and grass radially inwards towards the centre.

The sailplane circling in a thermal is constantly sinking down through it, and indeed can only go up if the thermal rises faster than the glider sinks. Due to the bubble nature of these thermals the glider eventually sinks to the bottom of the rising air, and must then search for another bubble.

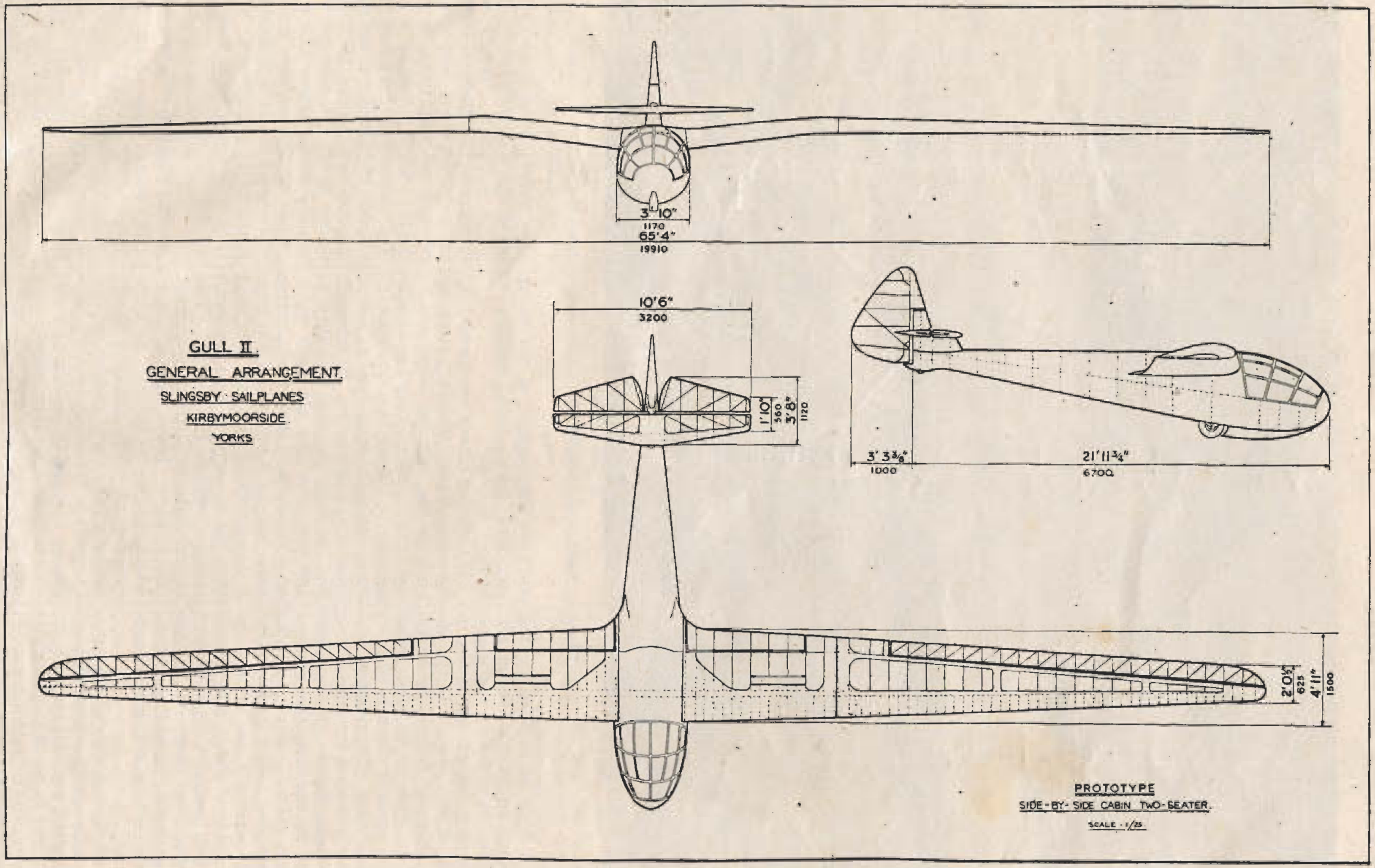
If cumulus clouds are formed by thermals, they remain active as long as the thermal continues to rise, and then they gradually dissolve. During the formation of these clouds a great deal of latent heat of condensation is released, and as long as the humidity is 100 per cent. the air cools much more slowly than the dry adiabative lapse rate of 5.4°F. per 1,000 feet, in fact at about half that rate, and thus the up-currents are very much stronger within the cloud. This in turn induces a strong up-current immediately below cloud base, which accounts for the fact inexperienced pilots climbing slowly beneath a cloud suddenly find themselves drawn up into it. The strong up-currents within cumulus clouds cause the air to become very turbulent, and it is not safe to fly into these conditions in secondary type gliders, even if the pilot has blind flying experience.

The frequency, strength, size and distribution of thermal currents is of great interest, and some important investigations have been made. (See reference 1 and 5.) The instability necessary for insolation thermals does not as a rule develop until about 10.00 a.m. on sunny days, and thermal activity usually ceases before 6.00 p.m. If clouds are formed they are usually in evidence in the late morning and again in the afternoon, although they sometimes form and dissolve all day.

"CATCHING" A THERMAL

It takes some time for the temperature difference necessary to start a thermal to build up, and on calm days they will break away from any particular place at intervals of from fifteen to twenty minutes. Thus by careful timing it is possible to establish the cycle

(*Continued on page 15*)



The Famous "Gull II."

SLINGSBY "GULL II"

TUCKED away in a hangar on an aerodrome somewhere in the North sits a high-performance sailplane gathering dust but otherwise well preserved. This machine, a prototype, represents a very high level of achievement in sailplane design, and superb craftsmanship.

The designer, who spent many months of labour creating this machine, is prevented by reasons obscure from carrying out the flying tests to enable him to check his performance figures and acquire valuable data for the future development of motorless aircraft.

The full story is one of interest. In 1938-39 Mr. F. N. Slingsby designed and constructed the "Gull II" high-performance cabin type sailplane. The work was completed and ready for tests in October 1939 when all civil flying was barred for security reasons.

The designer's object was to provide side by side dual control high-performance type suitable for instruction in cross-country flying, and so step up the number of Silver "C" pilots in Great Britain. The essential characteristics for such a machine were, low sinking speed over a wide speed range; the best flying speed about 45 m.p.h. with stall at say 38 m.p.h.; and an aero-towing speed of 85-90 m.p.h.

The problem was not an easy one; control at lower speeds suggests decrease of incidence to the tips—a disadvantage for higher gliding speeds. Therefore a minimum of wing twist was used and full flaps were provided for improving lateral control at the lower speeds. The intention was to use these flaps for circling in thermal currents.

Lift spoilers of generous area were included and are very effective.

Particular attention has been given to visibility and the view from the cockpit is remarkably good.

An opportunity occurred for the firm to do two test circuits with the "Gull II." The machine was then requisitioned for A.T.C. use. The A.T.C. have used the machine for demonstration circuits—it is unsuitable for A.T.C. training, of course.

Last year the designer was given permission to make two soaring flights at Sutton Bank, but further test flights were not permitted, and apart from showing its excellent soaring qualities, speed range, and low sinking speed on the two flights at Sutton Bank, we are denied the valuable data which can only be obtained from flight tests by a qualified test pilot.

The design information is as follows:—

Weights.	*lbs.*	
Fuselage	250	
Tailplane & Elevator ..	22	
Rudder	7	
	279	279
Centre Section	196	
Extensions (Two) ..	176	
	372	372
Tare weight ..		651 lbs.
Pilots		360
All up weight ..		1011 lbs.

Performance (Estimated).

Best gliding angle, 1:29.5 at 47 m.p.h.
Min. sinking speed, 2' 3½"/sec.
Stalling speed, 35 m.p.h.

General Dimensions.

Span	65.8 feet.
Mean chord	3.5 "
Wing area	234 sq. feet.
Aspect Ratio	18.5

Stressing Cases:

Case.	*Factor.*	*Items covered.*
C.P. Forward	8	All (covered by upgust).
C.P. Back	6	All (aileron otherwise covered by 1 and 3).
Dive 180 m.p.h.	1.5	Wing torsional nose box, main ribs and spar attachments.
Dive 200 m.p.h.	1.5	Tailplane and attachment to fuselage
Landing on wing 110 lbs. horizontally on tip	1.0	Wing drag bracing.
Upgust 25 ft./sec. at 2 VS. (88 m.p.h.)	1.5	Main wing spar. Lift bracing. Attachment of wing to fuselage. Pilots seat, etc.
Downgust 25 ft./sec. at 2VS. ..	1.5	Covered by upgust.
Dive 60 m.p.h.	2.0	Flaps and Flap Controls.
Control system	1.33	75 lbs. sideways on stick. 75 lbs. fore and aft on stick.
Rudder Controls	1.33	180 lbs. on both pedals.
Dive 140 m.p.h. with full aileron	1.5	Covered by dive case 3.

Slingsby's Welding Shop.

CRASHES

The following is an extract from a report on accidents during glider training of Swedish Pilots during the years 1941-43.

DURING the year 1941-42, 21,913 glider launches were made, 35 of which resulted in crashes, giving a crash percentage of .016 per cent.

During the same period 4,092 sailplane launches were made, resulting in 22 crashes; a crash percentage of .54 per cent.

Although these crashes did not give rise to any fatal injury to the pilot, they represented an undesirable waste of time and money, and the level was considered so high that it should be possible to effect some improvement.

It was decided to introduce some system of "crash reports" in the hope that reduction might be effected. These reports were circulated to all Gliding Schools in the following form :—

CRASH REPORT

Club : Skaane Aero.
Date : 22.8.42.
Site : Bulltofta.
Type of flight : "C" Schooling, lorry launch.
Wind and weather : 2m./sec. clear.
Previous experience : 25 "A," 31 "B," 8 "C" launches.
Personal damage : Two vertebrae broken, and slight cut on the head.
Cause of accident : Pilot's error.
Description of accident : Steep turn at low altitude, during which the sailplane spun and crashed
Pilot's reflections : Pupil affirms that speedometre showed 40 m.p.h., during the whole of the turn, though he thought his speed was a little low, but relied more on the speedometre than himself. He later believed that the speedometre had temporarily jammed.
Suitable means to prevent repetition : Impress on the pupil the importance of adequate speed, especially at low altitudes, and not to rely on instruments alone. Prohibit flying for the pupils who turn without permission.
Cost of repairs : 5,000 Kronors.

During the year in which this system was in force the crash percentage fell to .012 per cent. for gliders and .53 per cent. for sailplanes. A study of a few specimen reports might be of interest, and are given below. They go to prove how repetitive are the causes of crashes, as they are all of a type with which we are familiar, there seems to be no doubt that the introduction of a similar system in this country, would effect a definite improvement.

FLY SAFE

A glider was given a poor launch over the slope, on the return leg the pilot found that he was too low to get over the ridge if he continued his present glide, so he eased the stick back in the hope of climbing over the ridge, this he failed to do. He stalled and crashed into the edge of the slope. It was advised that pilots should never try to squeeze more out of a flight than was amply safe, he should have landed at the bottom of the slope.

Another accident was when a pilot was launched for an 180 degree turn, in the initial climb he did not gain sufficient height, but still tried to complete the turn. As he had not flown for some time, he misjudged, the wing tip hit the ground and the glider crashed. It was suggested that in future when pilots had not flown for some time, they should be treated with much greater care.

GROUND CRASHES

Against popular belief, not all the crashes were made by pilots in the air, many were caused by bad handling on the ground. For example, a glider having just landed was parked on the edge of the landing ground until time was available later on to put it away. Another pilot when coming in to land, lost more height than was anticipated and crashed into the parked glider.

Most of the accidents were caused in the beginning stages of training. One pupil was warned not to land away from the winch, or make a cross wind landing. During the flight, however, he lost control and crashed one wing low, cross-wind. Flying instructors are advised to pay utmost attention to weather conditions, and to take no risks with a pupil at such an early stage.

Although the errors at first seem quite simple, the reports show that it is on the simple points that pupils fail, and therefore if the common mistakes are known, the instructors might have some indication as to the safety, or otherwise, of a flight.

With acknowledgements to the Royal Swedish Soaring Club.

To Kadet or not to Kadet?

(Continued from page 1)

7. Full and healthy reactions cannot be acquired in the early stages permanently and completely on any known machine at present other than a "Primary," for the above-mentioned reasons, particularly No. 2.

8. A "Primary" is of no interest whatsoever to any skilled sailplane or power pilot ; in fact it is of no use to anyone other than a pupil in the early stages of learning to fly.

To sum up, it would appear that "Dagling Primary" will do three or four times the work in the early training of pupils with less than half the cost of a "Secondary." It will do it better and more safely, and will have imparted fundamentals of pilotage to the pilot which no "Secondary" can as efficiently and properly impart save to the very keenest and brightest of pupils. And this is true whether the aim is to create ultimate power pilots for those more skilled explorers of the air-Soaring Pilots.

SOARING METEOROLOGY

(Continued from page 11)

which is being followed, and launch the glider at the appropriate time to enable it to catch the lift over a favourable field.

As the earth forms a boundary, a thermal will not develop a strong vertical velocity until it has reached some height. Under normal conditions it is not possible to make contact with the up-current below four hundred feet, and from one thousand feet it is very much easier. This is about the limit of normal winch launching. As it is very easy to catch thermals from a start at two or three thousand feet on good days, aero-towing is often resorted to.

Letters to the Editor

247, Birstall Street,
Leicester.
14th February, 1945.

DEAR SIR,

I have read with interest the correspondence published on Mr. Warring's article entitled " Thermal Flying : A Note for Newcomers," and would like the opportunity of making one or two comments.

The main point of the controversy would seem to be whether or not a machine in a thermal has a natural tendency to circle. From model experience, I can substantiate Mr. Warring's statement that all models in a thermal show a definite tendency to circle, and this theory would seem to disagree with full-size sailplane experience. The fundamental reason why the sailplane tends to turn away from the thermal lies in the fact that the whole of the machine is not within the thermal, that is to say, that only a part of the wing is actually in the thermal, and this part of the wing tip has an increased angle of attack due to the upward movement of the air, and so increases the lift coefficient. This results in a bank away from the thermal.

Now due to the small wing span of a model as compared with a full-size machine, the difference in angle of attack between wing tips would not be nearly so pronounced as that of a full-size machine. Therefore, it would seem that a model would fly more easily into a thermal than the sailplane, and once it is within the thermal, the model does definitely circle, and I maintain that if the sailplane is within the thermal this would also circle, but I believe your correspondents are thinking of a machine that is only partly in the thermal, and this causes the tendency to turn away from the thermal.

Another point to be borne in mind is that if the difference of angle of attack on the model wings is sufficient to cause it to turn away from the thermal, then the modellers on the ground below have no indication that the model is in the vicinity of the thermal, and therefore models on numbers of occasions may have turned away from the thermal without the modeller having any knowledge that the thermal was present.

It appears to me then that both Messrs. Furlong and Neilan are correct when a machine is only partly in a thermal, also Mr. Warring is correct when the complete machine is within the thermal.

Yours faithfully,
D. J. DAWSON.

No.1 E.F.T.S., R.A.F.,
S.E. Asia Air Forces.
29th March, 1945.

DEAR SIR,

We now have two propositions, very ably expounded by Messrs. Hiscox (Jan.) and Rice (Feb.) on the effect of wind velocity gradient on up and down-wind flight, namely (*a*) that in level up-wind flight near the ground an aircraft receives gratuitous lift from the velocity gradient, and (*b*) in descending up-wind flight near the ground an aircraft loses lift owing to the decrease in speed of the opposing air flow. The latter effect is often very marked in the case of light aircraft making a steep gliding approach and, it is submitted, in such cases considerably exceeds the effect of (*a*).

I have a third proposition to make. When there is sufficient wind to cause an appreciable velocity gradient it is often gusty. It is, I think, common experience that the onset of a gust is more marked than its dying down. In support of this one can quote the weather-cocking tendency of a glider hill-soaring obliquely across wind : the onset of each gust swings the glider round further into wind. I have also noticed a tendency to stall on the down-wind part of steep circles over a hill-side, which could be caused by bad flying, velocity gradient, or being overtaken by a gust. The proposition therefore is that (*c*) an aircraft flying down-wind in gusty air is in danger of being " overtaken " by any gust and is therefore more liable to a sudden stall than an aircraft flying up-wind.

Yours faithfully,
R. E. PEARS (Capt.)

36, Heathdene Road,
Wallington, Surrey.
20th Februery, 1945.

DEAR SIR,

I have flown in a sailplane—in a thermal—with Mr. Furlong. On the

DAYS THAT ARE GONE

JET-PROPULSION. (*Continued from page* 10)

cussion of all details of jet motors.

But one can assume that the problems of the jet motor, and the construction of the combustion chamber and the nozzle are capable of practical solution, that it will be possible to build for gliding purposes, jet motors of a few pounds of weight.

PROBLEMS

Some words should be devoted to the problem of the improvement of the coefficient of external efficiency for use in gliders and in aviation generally. Two ways are indicated :

(*a*) To decrease the velocity of the outflowing gases. The chemist could be of help in developing a slow burning gasoline with the attendant decrease in the velocity of the gases and with a possible increase in the mass because of the added chemicals.

(*b*) To increase the mass of the outflowing gases by sucking in air from the outside. A multiple Melot's nozzle can be used for this purpose. Although some tests of the multiple Melot's nozzle were performed (Dr. Kort, N.A.C.A., etc.) the question has not been answered whether Melot's nozzle may be of advantage or not. Prof. Prandtl in one of his papers stated that the efficiency of Melot's nozzle may be low, because of the mixing of two gases having such highly different velocities causes a great loss in energy. The problem demands more tests, particularly tests of this nozzle in a wind-tunnel.

Following are conclusions for gliders with skids :

(1) About 24 lbs. of black powder or 1.5 lbs. of gasoline are needed to assist the take-off of a 600 lb. powered glider.

(2) For the take-off of a 440 lb. on an inclined hilltop, about 9 lbs. of black powder or 0.56 lbs. of gasoline are needed.

(3) For this same glider on a level hilltop, the take-off will require 20 lbs. of black powder or 1.25 lbs. of gasoline.

(4) After take-off, for a gain of altitude of 1,650 ft. for this 440 lb. glider, 160 lbs. of black power or 10 lbs. of gasoline are needed.

(5) For horizontal flight from thermal to thermal, a 440 lb. glider will travel a distance of 3,270 ft. with a charge of 10½ lbs. of black powder or 0.66 lbs. of gasoline.

(6) To cut the sinking speed in half while in free flight, a 440 lb. glider will require 6 lbs. of black powder or 0.39 lbs. of gasoline.

(7) Rocket or jet-propulsion is of material assistance in the launching of water gliders.

(8) The use of rocket or jet-propulsion blends in very well with the streamline shape of a glider and will not spoil its aerodynamic characteristics.

Research and testing are necessary to improve the coefficient of external efficiency.

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* Fellow in Aeronautical Engineering and Instructor at the Polytechnic Institute of Brooklyn.

**Presented at the Motorless Flight Conference of the Soaring Society of America, at the Polytechnic Institute of Brooklyn, on Aug. 5 and 6, 1944.

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occasion in question a disturbance occurred which tended to lift the left wing, this Mr. Furlong corrected, and further depressing the wing turned the machine in this direction, to the left.

On another occasion, flying alone, I experienced a similar disturbance also under the left wing, which duly rose and away I went round to the right. I straightened it up a little later.

Now according to Mr. Warring it seems only fair that Mr. Furlong should have gone down and I should have gone up, and Mr. Furlong should now be trying to fly like a fly—unfortunately the opposite is still the case.

Touching the behaviour of models, I think a reasonably simple explanation is available. The model is flying in a vortex which is comparatively powerful relative to the weight and speed of the model and behaves as one would expect if one studies the bath-water going out in place of ping-pong balls at the local fun fair. If Mr. Warring loads one of his models and shoots it through a vortex at about 30 m.p.h. he will, I think, find its behaviour quite different.

With a sailplane the vortex component of the thermal is comparatively unimportant and the sailplane is influenced by the air on the thermal side rising faster than on the off side and being appreciable compared with the normal rate of sink.

Lastly, on the question of banking for any given rate of turn, there is only one angle of bank which will conduct a normal flying machine round a given circle without reducing its efficiency below the optium—its value is easily calculable with elementary mathematics used in the design of banking on railway curves, design of engine governors, etc., and Mr. Furlong is to be thanked for keeping it to the fore in the face of the periodic epidemics of wild theories offered without any solid basis.

Yours faithfully,

D. Clarke.

AMERICAN ITEMS

(*Continued from page* 5)

A thermal 90 ft. in diameter would have a circumference of 283 ft. Sixty r.p.m. gives one r.p.s., or 283 ft./sec. in this case. As 88 ft./sec. = 60 r.p.m., this would give the speed of the thermal at about 200 m.p.h., which does not seem feasible. Has anyone ever measured the rotary speed of any thermal ? We should like to hear

AUSTRALIAN GLIDER ASSOC.

(*Continued from page* 7)

accident, as he was going out to his back water tank—he picked up a little piece of rib on the track and he then began searching and found pieces strewn all over the scrub. He made a smoke which we in the planes picked up after taking off next morning. The rest you already know. The instrument panel was evidently knocked out of the cover early in the break-up, as it was found intact except for the bubble level sticking up in the sand about 200 yards from the main wreckage. The other instruments were O.K. The left wing tip was not found.—I think it would most likely have been found about a mile east of the machine, as it was most likely the ' flash of yellow ' I saw east. When we went to search the area for it we found that the fire (see circular 32) had passed over that part and so the wing tip was never found. The machine crashed approximately 12 miles in a direct line from the drome, and the machine when last seen was at about an angle of 14 degrees, which gives it an approximate height of 14,000 feet. Cloud base that day was at that time I should say 15,000 feet. At the time of making out that report I did not think that Ken could have reached cloud base, but since making a check of time lapsed with the other boys watching it, it seems possible that he did reach cloud base and was possibly diving steeply to get out of it when the rough stuff on the edge turned the machine on its back. (We are sure that the wings collapsed while in an inverted position.) The clouds that day would, I think, be very rough, because ground thermals had broken up a 10/10 high blanket of alto-cumulus in the morning and pushed the base up from 10 to 15 thousand feet and they were thin and flat. The lesson the Clubs can learn from this unfortunate record attempt, and especially the Clubs operating in the drier inland, is that dry thermals should be treated with as much respect as thunderstorm and cloud currents. Not only should a parachute be carried but oxygen should be carried and if possible an enclosed cockpit used or else very warm clothing used, as on these good thermal days very great drops in temperature are encountered at altitudes over 4,000 feet. As I found on my 13 hour flight last year, I was shivering from head to foot in spite of the fact that it was around 100 degrees Fah. on the ground. I think oxygen lack was a contributing cause, if not the main one, as I know Ken Riebe was particularly tired that day, as he had had to do most of the work on their property for some time. Ken, as far as the military was concerned, was A.2—that brings us to another point—should glider pilots intending to take up high altitude thermal soaring have some sort of a medical check ? "

NEW SOUTH WALES

SYDNEY METROPOLITAN GLIDING CLUB

Honorary Secretary is Cecil Hughes, 46, Glenfarne Street, Bexley, N.S.W. Equipment is housed at Matraville ("Montana," Daunt Avenue).

Membership is at present 15 pilots and 2 associate members. Pilot membership is not to be increased beyond 15 at present, and those wishing to fly have to join as associates until vacancies occur. The new winch is complete except for traversing gear and rollers. A "Harley Davidson" motor cycle has been purchased for cable retrieving and the Club is hopeful of obtaining a 30-cwt. Chev. truck to mount winch on and to use for towing trailer. Details of flying in "Falcon" two-seater at Matraville are as follows:

All Winch Launchings.

11/11/44 ..	3 flights		20 mins.
12/11/44 ..	15 ,,		57 ,,
18/11/44 ..	5 ,,		19 ,,
19/11/44 ..	12 ,,		49½ ,,
2/12/44 ..	14 ,,		42½ ,,
3/12/44 ..	13 ,,	1 hr.	6 ,,
Total ..	62 ,,	4 hrs.	14 mins.

(Time in air).

Pilots were J. Munn and M. Waghorn, and trainees S. Button, K. Caunt, C. Hughes, R. Costick, Mrs. S. Newbigin, B. Rees, R. Boon, E. Marden, A. Cartwright, S. Taberlet, M. Rees, A. Tickner.

Best height obtained was 1,250 feet on winch for a duration of 12 minutes (J. Munn and K. Caunt) on 11/11/44.

A flight of 12 minutes' duration was made by M. Waghorn and K. Caunt on 12/11/44 (circling in light thermal max. height 950 feet).

Cecil Hughes, S. Britton and R. Costick are ready to go solo.

SYDNEY SOARING CLUB

Slope Soaring at Kiama. "Kite II" was taken down in trailer behind Dodge winch car by Jack Watt and Mervyn Waghorn on Friday night 23/12/44. (Kiama is 76 miles by road, approximately south of Sydney and on the coast.) The expected southerly wind did not blow—only a very dusty and strong westerly all day Saturday and a steady north-easter on Sunday (24/12/44). Except for an occasional "super duper" day this site usually involves a fairly short beat, somewhat bumpy conditions and not much more than 500 feet above the hill, which is 600 feet above the sea. Owing to the N.E. site being difficult for shock cord launching the winch was used for launching, although it was only possible to use half the cable length. The following are details of flights made :—

Martin Warner ..		36 mins.
Harry Ryan		15 ,,
Len Schultz ..		8 ,,
Mervyn Waghorn ..		35 ,,
Jack Watt		12 ,,
Steve Newbigin ..	1 hr.	3 ,,
Doc. Heydon ..		9 ,,
Frank Whitlock ..		not timed.

Total—8 flights for 2 hours 58 mins. in the air.

Started at 12.10 p.m. (800 feet above the hill). Took off at 2.30 p.m.

On the last flight the pilot went out past the lift, thereby striking the down-current from another hill, and to avoid going to the bottom made a downwind landing amid down-currents near the end of the bowl and damaged the main skid member of the fuselage. It was decided that the job could not be repaired on the spot, so the remaining two days of the holiday were spent by some of the members in surfing and just camping.

VICTORIA

1944 GLIDING HOLIDAY MEEING AT GEELONG

This meeting was held at the Belmont Common Aerodrome, 47 miles from Melbourne (by road), where hangarage and messing facilities were made available by Percy Pratt of the Geelong Gliding School. The flying ground has a runway of approximately one mile in north and south direction, and is in excellent condition for car towing.

The Gliding Club of Victoria's party assembled at Footscray on Saturday, 23/12/44. "Grunau Baby II" Sailplane in enclosed trailer towed by Harry Bartram's car (Dodge). "Merlin" two-seater and "Utility" on big open trailer towed by Jack Hearn's Dodge car (loaned by N. Hyde). "H.17" Sailplane on small open trailer towed by Ron Roberts' Standard car. Dodge towing car (not registered) towed by R. Duckworth's Dodge utility truck. 16 members and camp equipment, supplies, etc., were also loaded on to the various units, and the party left Footscray at 4 p.m. and arrived at Geelong at 7 p.m. after severe buffeting in strong westerly side wind, but without mishap.

The Victorian Motorless Flight Group's White "Kestrel" (Iggulden Bros.) on open trailer, "Golden Eagle" (H. G. Richardson) enclosed trailer, and winch 27 h.p. Hudson (chain drive) arrived later in the evening (about 11 p.m.). In the dark H. G. Richardson fell over Percy Pratt's Red "Kestrel" elevator, damaging the fuselage mounting, and this was fixed up the next day, the damage not being as severe as it sounded.

The majority of the days were bad for gliding owing to west winds, which, besides being generally poor for "thermal" soaring, were unsatisfactory for launching; the drome being narrow east and west. Flying was carried out on 8 days—24/12/44 to 31/12/44 inclusive, and the total crashery for the meeting was nil.

The following is a resume of flying done by each group in each machine :—

The Gliding Club of Victoria (all car towed launchings).			
" Grunau Baby II "	.. 46	7 hrs.	23 mins. 45 secs.
" Merlin " 2-seater	.. 67	3 ,,	55 ,, 55 ,,
" Utility " (U.T.I.)	.. *23		43 ,, 5 ,,
" H.17 " (Davies & Bartram)	.. 15		52 ,, 45 ,,
Total ..	.. 151	12 hrs.	55 mins. 30 secs.
* Includes 6 flights not timed.			
Victorian Motorless Flight Group (winch launchings).			
White " Keatrel " (Iggulden Bros.)	.. 26	1 hr.	36 mins. 30 secs.
" Golden Eagle " (H. G. Richardson)	.. 7	1 ,,	35 ,, 30 ,,
2-seater (Pratt)	.. 45	1 ,,	52 ,, 30 ,,
Total ..	.. 78	5 hrs.	4 mins. 30 secs.
Geelong Gliding School (P. J. Pratt).			
Red " Kestrel "	.. 19	2 hrs.	32 mins. 0 secs.
2-seater (Pratt)	.. 8		20 ,,
Total ..	.. 27	2 hrs.	52 mins.

DETAILS OF FLYING IN EACH MACHINE

The Gliding Club of Victoria.

" Grunau Baby II " Sailplane. Flown by R. Roberts, R. Duckworth, K. Davies, N. Hyde, H. Bartram and J. Hearn.

25/12/44. R. Duckworth 15 m. car tow to 900. Got to 1,200 ft.

Note this.—On two flights on this day the elevator control of " Grunau " became intermittently jammed owing to slackness in cables, allowing a turnbuckle to catch up against side of bulkhead.

26/12/44. H. Bartram 10m. 30s. tow to 1,200 ft. (latter part of flight in heavy rain).

28/12/44. K. Davies, 10m. H. Bartram, 20m. tow to 900 ft. got to 1,400 ft. H. Bartram, 1hr. 18m., tow to 800 ft. got to 5,300 ft. ; temperature 85 degrees Fah. on ground, 47 degrees Fah. at 5,300 ft. Tour of district about 7 miles away at furthest (about 2 miles past Ford works at Corio). This was the *best climb above point of release* (4,500 ft.) for the Meeting.

29/12/44. J. Hearn, 23m., 1,200 on launch got to 2,400 ft. J. Hearn, 12m. ; R. Roberts, 11m. 30s. ; K. Davies, 10m. ; R. Roberts 11m. ; J. Hearn, 9½m. Looped 6 times in one flight by N. Hyde (18 times altogether during the Meeting).

30/12/44. R. Roberts, 30m. 30s. Tow to 600 ft. got to 2,800 ft., had to leave thermal owing to strong wind getting him too far from drome.

" Merlin " 2-seater. Flown by N. Hyde, R. Roberts. *Trainees* : K. Chamberlin, G. Nixon, D. Doolan, Mrs. G. Roberts, J. Titterington, K. Ellis, R. Dowling, L. Dowling and R. Pollard. *Passengers* : Don Stewart, Lionel Pitt, R. Brannagan and Eddie Smith. *24/12/44.* *Best height*, 1,020 ft., G. Nixon and N. Hyde. *Best duration*, 5½m., Mrs. G. Roberts and N. Hyde on *26/12/44.*

" H.27." Flown by K. Davies, H. Bartram, N. Hyde, J. Hearn, R. Roberts and R. Duckworth. *Best duration*, 5½m., by H. Bartram on *26/12/44.* *Best height*, 1,200 ft. on tow, J. Hearn, *26/12/44.*

" U.T.I." Flown by R. Dowling, R. Pollard, B. Hearn (Straights), L. Dowling (Circuits), also K. Davies, R. Roberts, R. Duckworth, N. Hyde and H. Bartram. *Best duration*, 4m. 15s. by N. Hyde on *28/12/44.* This machine was looped once by N. Hyde on *29/12/44*

Victorian Motorless Flight Group.

" Golden Eagle " (H. G. Richardson).

29/12/44. W. Iggulden winched to 800 ft. got to 2,900 ft., 22m. Jack Iggulden winched to 1,200 ft. got to 5,400 ft., 40m. This was the *best height obtained* at the Meeting.

White " Kestrel " (Iggulden Bros.).

29/12/44. W. Iggulden launched to 900 ft. got to 3,000 ft., 12m.

Geelong Gliding School (P. Pratt).

Red " Kestrel." *29/12/44.* Percy Pratt, 36m., estimated height 3,500 ft., 18m., estimated height, 2,000 ft. (no instruments).

Gliding films were screened in the evening on 30/12/44 and 31/1 the evenings on 30/12/44 and 31/12/44. " Flight without Power" —the art in Australia, 1,000 ft. (silent) by R. Duckworth, L. Muir and N. Hyde (activities since 1936). Gliding in Germany (1929), entitled " The Art of Aerial Gliding," by Agfa Co. (400 ft.).

CLUB ANNOUNCEMENTS

LEICESTER GLIDING CLUB

May 11th. Talk by Sir Frederick Handley Page, College of Art, at 7 p.m. An aerodynamic course with wind-stream models is being instituted, also a construction group. Those interested should get details from the Secretary, who will also supply details of the visits, etc., arranged for the summer, Leicester Gliding Club, Park Road. Blaby, Leicester.

THE MIDLAND GLIDING CLUB LIMITED

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

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

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

LIVERPOOL AND DISTRICT

There exists in Liverpool the nucleus of a live Gliding Club if someone with experience can be found to give it a lead. Some sixty youths, of fifteen and upwards, are anxious to begin. If anyone is interested in volunteering for this commendable job, would they please write to the Editor ?

SOARING

Your Emblem

Have you earned a gliding or soaring certificate? Then you have something which very few people in the country, and even in the world, possess.

The A  **GLIDING BADGE**

The B  **GLIDING BADGE**

The C  **SOARING BADGE**

Silver C  **and Golden C**

SOARING BADGES

The A, B, C, Silver C and Golden C badge you received is different from the usual emblem you see people wearing. In most cases the buttons in people's lapels signify that their subscriptions are paid up. In your case it means more than payment of dues. It means you've done something. It means that, without a motor, you are striving to outdo the flight of birds. Wear your badge—and wear it proudly!

ROYAL AERO CLUB GLIDING CERTIFICATES

" *A* " *Certificates* (46)		*Gliding School*	*Date taken*
2380	Gordon Raymond Gardner	S.W.83, Moreton Valence	4. 2.45
2381	John Michall Siggins	W.65 E.G.S., Cardiff	18. 2.45
2382	Allan Jerams	N.W.187 E.G.S., Stretton	11. 2.45
2383	Richard Sneddon...	S.4 E.G.S., Abbotsinch	4. 2.45
2384	Dugald Macdougall	Ditto	4. 2.45
2385	Latimer Laurence Tuke	Ditto	4. 2.45
2386	James Derek Locke Ross	203 E.G.S., Newtownards	17. 2.45
2387	Allen Henry Mosdell	S.W.83 E.G.S., Moreton Valence	21. 1.45
2388	John Patrick O'Loughlin	L.145 E.G.S., Colchester	25. 2.45
2389	Stewart Alfred Maxwell	M.43 E.G.S., Walsall	7.10.44
2390	Gordon Alexander Wellum	184 E.G.S., Woodford	17. 9.44
2391	Edward Thornton (G/C)	C.121 E.G.S., Halton ...	23. 4.44
2392	Denis William Jones	S.W.92 E.G.S., Yate ...	18. 2.45
2393	Sidney Elliott	N.E. 30 E.G.S., Sherburn-in-Elmet	3. 3.45
2394	Derick Charles Smith	S.E.166 E.G.S., Ashford	4. 3.45
2395	Thomas Andrew Blair Bond	203 E.G.S., Newtownards	17. 2.45
2396	George Herbert Cain	N.W. 184 E.G.S., Woodford	11. 3.45
2397	Alexander Frederick Barge	C.129 E.G.S., Waltham Cross	3.12.44
2398	Albert Oscar Hone	Ditto	12.11.44
2399	Raymond Herbert Oliver John Green	L.148 E.G.S., Southend	31.12.44
2400	Alan Dobson	Ditto	21. 1.45
2401	Robert John Nichols	Ditto	18. 2.45
2402	Graham John Stephenson	Ditto	18. 2.45
2403	Kenneth Charles Bray	S.W.89 E.G.S., Christchurch	4. 3.45
2404	Brian Henderson Fantom	M.44 E.G.S., Rearsby...	23. 7.44
2405	Eric Cudini	N.E.30 E.G.S., Sherburn	2. 2.45
2406	Alan Ridley Baty	N.E.27 E.G.S., Woolsington ...	3. 9.44
2407	Leslie Hesketh	N.W.186 E.G.S., Speke	11. 3.45
2408	Wilfred John Lancaster	S.E.166 E.G.S., Ashford	10. 3.45
2409	Ernest Archibald Norman	L.148 E.G.S., Southend	24. 2.45
2410	Arthur Richard Barber	Ditto	24. 2.45
2411	Francis James John Kevin Johnston	Ditto	24. 2.45
2412	Brian Sperrin Francis	Ditto	21. 1.45
2413	John Lancaster Cox	Ditto	28. 1.45
2414	Ian Campbell	Ditto	21. 1.45
2415	Ronald James Bunn	Ditto	18. 2.45
2416	Kenneth Ivor Darby	Ditto	11. 2.45
2417	Ernest Henry Patrick Cottee	Ditto	18. 2.45
2418	John Basil Walden	Ditto	24. 2.45
2419	David Ernest Roberts	Ditto	24. 2.45
2420	David Basil Gurton	Ditto	28. 1.45
2421	Gordon Kenneth Williams	S.W.83 E.G.S., Moreton Valence	11 3.45.
2422	Thomas Reginal Young	N.E.26 E.G.S., Greatham	7. 3.45
2423	Ronald Herbert George Ruffle	L.145 E.G.S., Colchester	18. 3.45
2424	Francis Sydney Jackson	N.W.186 E.G.S., Speke	11. 3.45
2425	Cyril Coleman	Ditto	23. 7.44
" *B* " *Certificates* (6)			
2390	Gordon Alexander Wellum	N.W.184 E.G.S., Woodford ...	18. 2.45
2391	Group Captain Edward Thornton	C.121 E.G.S., Halton ...	30. 7.44
2393	Sidney Elliott	N.E.30 E.G.S., Sherburn-in-Elmet ...	7. 3.45
2405	Eric Cudini	Ditto	4. 3.45
2422	Thomas Reginald Young	N.E.26 E.G.S., Greatham	11. 3.45
2425	Cyril Coleman	N.W.186 E.G.S., Speke	18. 3.45
" *C* " *Certificate* (1)			
2391	Group Captain Edward Thornton	C.121 E.G.S., Halton ...	27. 8.44

Five shillings per copy offered for back issues of SAILPLANE, March 1944; 4 copies wanted, May (1), July (2), November (1).—Send to Box 2, SAILPLANE.

MISSING LANTERN SLIDES

Towards the end of 1943 F./Lt. D. F. Greig lent some 60—70 coloured lantern slides to S./Lt. "Duggie" Dewey, of the Royal Aircraft Establishment, Farnborough. Shortly afterwards S./Lt. Dewey was killed and the slides were not returned nor could they be found. If any reader ever sees them or knows where they are would he please inform SAILPLANE Office? Some day they will be found, and whenever they are shown someone will be sure to recognise them. So will readers of SAILPLANE please keep a sharp lookout.

S./Lt. Dewey will be remembered as a Silver "C" member of the Cambridge University Air Squadron, and the owner of the "H.17." He was awarded the A.F.C. for meritorious flying and lost his life in testing a Jet-propelled Aircraft.