SAILPLANE AND GLIDER

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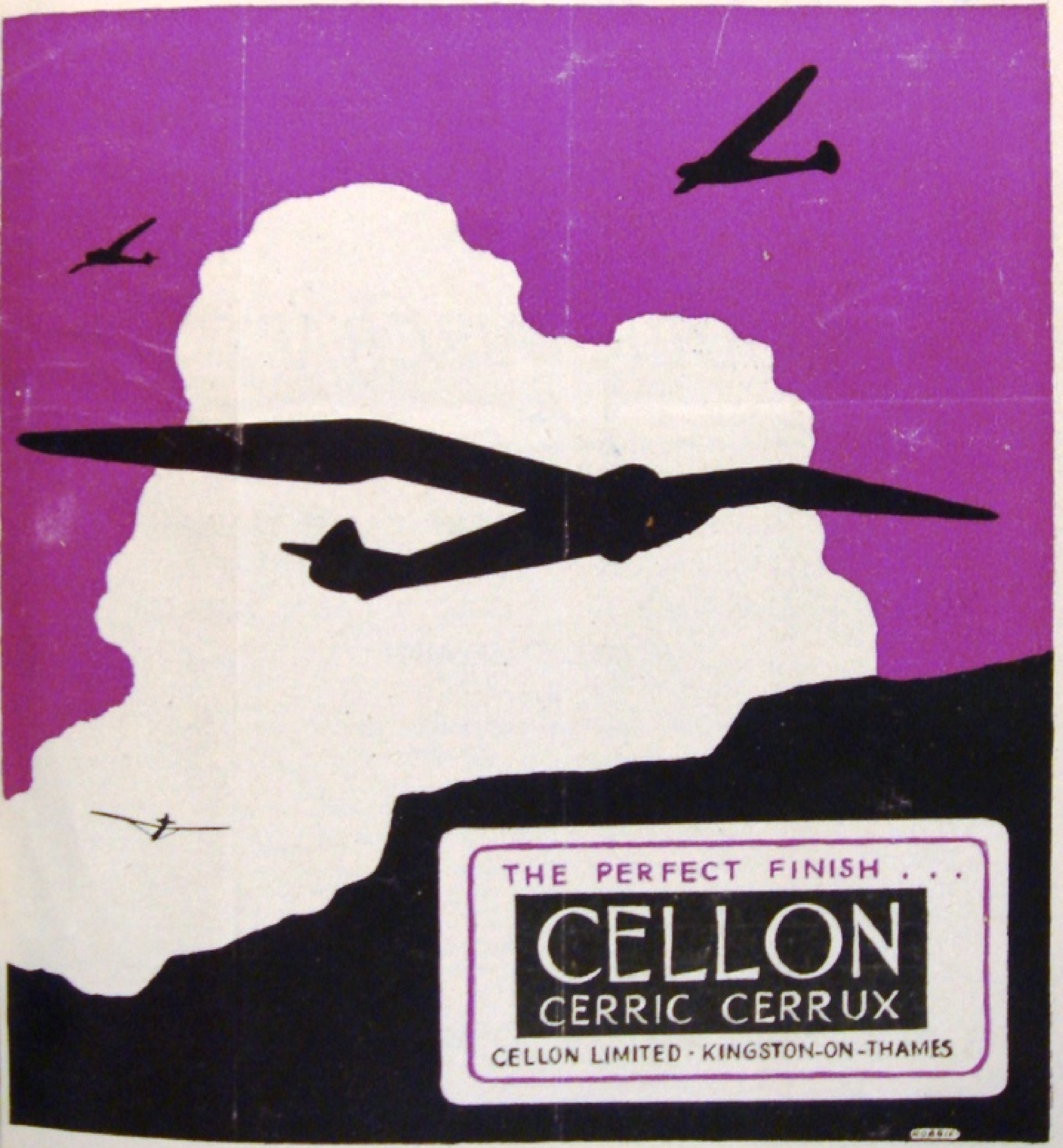
The First Journal devoted to Soaring and Gliding



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The First Journal devoted to Soaring and Gliding

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GLIDERS IN WAR

IT WOULD be difficult to produce another issue of SAILPLANE without mentioning something about the place which Gliders have played in the armed forces of the United Nations in the military operations for the liberation of Europe from the Nazis.

It is a far cry from the innocent Sailplanes of the pre-war years to the Hamilcars of to-day, capable of transporting a small tank or armoured fighting vehicle, or of delivering a platoon of the most efficient fighting men where they can serve a military purpose best. The great delight of Soaring, Sailflying, and Gliding—its silence—and the comparative safety with which one can indulge in a forced landing, have been turned to military account. In silent approach lies tactical surprise, and if to this is added the skill of the well-trained Glider Pilots in landing their craft in small and limited spaces, whatever the surface, without hurting their crews and cargo, it is clear that a new weapon has emerged which can effect the speedy progress of battles in a manner never seen before this war.

Not a few ardent devotees of Soaring and Sailflying before the war, have played a notable part in creating the aircraft and training the pilots as well as other developments of Airborne Forces. But they rather feel that all this is a misuse of the real art of flying. They would rather discuss the formation and behaviour of clouds and their Sailplanes than wing loadings and Centres of Gravity.

With this attitude of mind there will be a great deal of sympathy. May it not be long before their heart's desires in this respect are gratified.

But since Gliding and Soaring have played a not unimportant part in the organisation and training of certain portions of our war machine, it may be pertinent to ask the question as to whether their experience is being fully used.

Pre-war Gliding touches modern military needs at two points—the training of A.T.C. Cadets and Glider Pilots.

The British Gliding Movement had something to do with the formation and training of the Air Defence Cadets—the pre-war precursors of the Air Training Corps. In those days the Air Ministry allowed a greater degree of importance to Gliding and Soaring, as being of value to becoming a power pilot; than is the case to-day, when the ability to land a glider and do simple turns is all that is required. These requirements are essential it is true, but it is surely none the less true that it is hours in the air which count in gaining "Air-sense." If Soaring were to be permitted one day in the A.T.C. we are sure that not only would it stimulate the rate of recruiting for air-crews—which may not be so high after the war—but that the standard of pilot achieved would be higher. It is to be hoped that it is a question of resources and not of understanding which is the cause of the present limitation.

Recently there appeared in these columns an account from German sources of the Final competitions in Germany of the best Hitler Youth Sailplane pilots, who were required to land properly in a very limited and designated area, after a two-minute flight from an aero-tow. The idea has some merit, and it is an odd reflection upon the comparative resources of ourselves and Germany last year that they should be able to carry it out and we can't. Though no one would prefer that we should allow Soaring if it meant such a diversion of resources that it meant losing the war.

Such training would be of immense benefit to pupils who were going on to power flying afterwards, and whether they became Glider Pilots in the Airborne Forces or not.

Again it has been suggested that if Glider Pliots were to begin their training on Primary Gliders and then move on to Intermediates and Sailplanes, not only would the process of weeding-out be quicker and simplified, but the training of those who are suitable would be shortened by several weeks.

To be a power flyer is not necessary, in the opinion of many experienced pilots, if the pilot is only going to control a glider afterwards, and even if it is, the benefits of beginning on Gliders will be felt even by the most "power-minded" airman.

Were these ideas to receive official support the effect on the British Gliding Community would be electric and vital, but on Empire Airmindedness they would not be less powerful.

One sincerely hopes, therefore, that the time is approaching when the whole subject of the relation of motorless flight to future Empire needs may be reconsidered, and more favourably.

POWER SOARER.

By the Late LEWIN B. BARRINGER.

LEWIN B. BARRINGER

THERE has been some feeling among soaring pilots, ourselves not excluded, to discourage the application of light power plants to gliders, or at least to leave such combinations out of the "motorless flight" picture. Several times in the past ten years or more, serious attempts were made, both here and abroad, to solve the light plane design problem with this approach. That these efforts did not succeed was not so much because of the method of approach as the failure to continue development work far enough along these lines.

An example was the Waco experimental motor-glider, built in 1932. Utilizing Waco primary glider wings of 36 foot span on a covered fuselage with the standard primary tail surfaces, this little ship utilized a two cylinder, two-cycle, 20 horsepower Jacobs engine mounted as a pusher. Weight of the complete ship empty was under 250 pounds. This ship took off under its own power and flew very well. On one occasion we reached an altitude of approximately 5,000 feet with it, and flew around for an hour and a half before the one-gallon gasoline supply was exhausted. After the propeller stopped, we continued to fly on weak thermals for half an hour before coming in to land.

THE QUESTION

Now, although we fly them, we are not advocating this magazine or our Society's entering the light airplane field other than by encouraging student airplane pilots to begin their instruction in gliders and advanced glider students to get their instruction in stalls and spins in Class 1 airplanes. Lightplane flying is a logical step that comes between gliding—preliminary soaring and high performance soaring for the all-round heavier-than-air craft pilot. What we are concerning ourselves with, for it begins to look as if it will be a logical step in making soaring practical and popular for the sportsman, is the power soarer.

THE ARGUMENTS

This term of "power soarer" conveys rather a different meaning than "power glider." It refers to a sailplane equipped with an auxiliary engine to facilitate take-offs and transportation to and from soaring sites. If applied in this manner, a small engine will no more make an airplane out of a high performance sailplane than an auxiliary engine makes a speedboat out of a sailing yacht. After all, we use an engine in an auto, winch or airplane tow launching, so why not incorporate a small engine into the sailplane itself, to make it possible to take off and climb to an altitude where thermals can be caught? By doing this we will eliminate a great deal of the trouble of a ground crew as well as the possible danger to other aircraft of using long tow ropes on an airport.

It is quite possible to design a sailplane with the motor down inside the fuselage, completely out of the slipstream, and cooled by louvres, which can be closed by by flaps when soaring, on the sides and bottom of the fuselage. Power could be applied through gearing to a small propeller mounted on a steamlined mast. The propeller could be locked and retracted with the mast into the fuselage.

IN CONTESTS

At a soaring contest it would be an easy matter for the official in charge to limit the gasoline supply to an amount sufficient to reach a certain altitude, such as 1,500 meters, the maximum allowed by the F.A.I. for airplane tows in contest soaring. The engine vibration recorded on the barograph would probably show the exact altitude as well as the time that the pilot shut off his engine and started to use thermal updrafts to carry him aloft, as well as speed him on his way.

Let us look into the not-too-distant future and imagine the ease and convenience of rolling your sailplane out of the hangar by yourself, as it is balanced on its two-wheel landing gear, with wheels set on either side of the skid. Out on the concrete apron you unfold the wings, lock them in position, head the ship into the wind, climb into the cockpit, shut down the hood, and strap yourself in. After a few shots of the primer, you press the self-starter button and the little engine comes to life. Holding the stick back and the brakes on, you warm up for a few minutes.

IN PRACTISE

Taxi-ing out to the end of a runway, you keep out of the way of a landing transport and wait for the green light of the control tower before pushing the throttle forward. Taking off gracefully, you retract your wheels and fly away from the airport toward some likely looking cumulus clouds. At fifteen hundred feet your variometer suddenly jumps from seven feet per minute to twelve. Immediately you start to spiral, as you shut off the ignition switch, apply the propeller brake until it stops in the up and down locked position, and then pull the retracting level. The rate of climb drops back to five feet per minute, but there is now no noise, no vibration, nothing but the silence, the beauty, of soaring flight.

Five hours later and one hundred and eighty miles from home, you run out of thermals. At 1,000 feet you pull up your propeller, start the engine and head for a nearby airport. A few minutes later you circle the field, drop your wheels, pull on the flaps and come in to land. Your sailplane is stored overnight in a hangar and, next day, you fill up your tank and fly home.

THE PROPHECY

We believe that the handwriting is on the wall that small aircraft engines applied as auxiliary units to sailplanes will do much to make soaring a popular sport by making it thoroughly practical for the average, busy individual.

(Acknowledgments to Soaring—U.S. official magazine).

A BREAK-UP IN CLOUD.

THE FLIGHT OF KOROTOV IN THE KAI.4.

Translated from "Samolet" by Alexis Dawydoff.

AT noon, on July 1, 1937, a KAI-4* two-place sailplane took off from the Kazan Aerodrome by airplane tow, piloted by the Soviet master soaring pilot, I. Korotov, and, carrying as passenger Adjamoff, also a soaring pilot and student of the Aviation Technical Institute. Korotov planned to try for altitude, as the conditions for such a flight were very favourable. Big cumulus clouds were everywhere, with the cloud bases at 6,500 feet and practically no wind.

Having taken off and made one circle of the field, Korotov's sailplane hit a strong updraft. He immediately released from the tow plane, although he had no more than 400—500 feet of altitude. The pilot of the tow ship did not notice that the sailplane had released and kept on climbing for some time before discovering it and landing. Korotov's flight was officially observed by the Sports Commisar of the Central Aeroclub of the U.S.S.R.

ENTERED A THUNDERHEAD

Flying over the aerodrome, Korotov soon gained an altitude of 6,500 feet and later climbed to 11,800. At that altitude, he crossed over to a very big formation of cumulus clouds, which were just over the city of Kazan, where he soared for over an hour and a half. Soon the observers saw him turn back and fly towards the airport, where the sailplane seemed to fly to great height. A few minutes later the ship was seen entering an enormous cloud, which had the appearance of a thunderhead. For fifteen minutes the KAI-4 was out of sight. Then the observers saw parts of the ship emerging from the cloud—a wing—parts of the fuselage—and at last, two parachutes, bringing down the pilot and passenger to safety.

23 FEET PER SECOND LIFT

According to the story of Korotov and Adjamoff, as well as the findings of the investigation committee, we have this account of what happened in the cloud. On entering the cloud, the sailplane immediately encountered a very strong upcurrent of 23 Feet Per Second. Rain and hail threatened to tear the fabric off the wing and a blizzard inside the cloud buffeted them unmercifully. At times the wings of the ship were covered with ice. The air inside the cloud was extremely turbulent. As the KAI-4 ascended, the upcurrent seemed to become more narrow. The last few feet that the sailplane spiralled upward, at times one wing was in the upcurrent and the other in the downdraft.

HORIZONTAL FALL?

When the altimeter read 15,100 feet, Korotov decided to try and get out of the cloud, as things were getting too tough. Suddenly the sailplane was hurled violently upward, then started to lose altitude very rapidly in a position which its crew could not determine, as they had lost all orientation. The variometer registered a rate of descent of 33 ft. per second (2,000 ft. per minute). The airspeed indicator needle went up to 150 miles per hour and stuck at the peg. The ball-bank indicator, however, showed a normal attitude of the ship. When all attempts to bring the ship out of the situation proved futile, Korotov neutralized all controls and decided to wait. Due to the rapid descent of the ship, load factors on it were getting higher and higher. The passenger, Adjamoff, who held the barograph in his hands, could not move, because of the pressure exerted on his body by the rapid fall of the ship.

THE BREAK-UP

The next second, Korotov and his passenger heard a sound like an explosion behind them. The tail surfaces, not being able to withstand the terrific load, had broken off. Almost immediatly the fuselage broke in half. Adjamoff was thrown out, as his belt had broken at the same time. Korotov was left hanging on his belt, with part of the fuselage behind him. Unfastening the buckle, he jumped clear and opened his chute after a drop of 1,300 feet. Adjamoff had pulled his ripcord immediately after being tossed out.

Both pilot and passenger landed safely, the only injury being a small scratch on Korotov's face, caused by the enclosure. All instruments except the barograph were soon found, and it was recovered the next day. Only part of the barograph was damaged in the fall, and enough of it was left to enable the officials to determine that Korotov had reached a record altitude of 16,156 feet.

LESSONS

It was thought that the breaking up of the KAI-4 was due to the fact that, after the ship was thrown violently upwards, it went into a dive because of the resultant stall and, as the sailplane was not equipped for instrument flying, its pilot could not determine the ship's position. He probably held it in the dive so that the airspeed of the ship reached 150 to 170 m.p.h. The air was extremely rough, with updrafts and downdrafts of 20 to 35 feet per second, and a sudden change of the angle of attack of the ship imposed a terrific load on the structure and caused it to collapse. This only goes to show that attempts to break altitude records should be made in ships equipped with full blind flying instruments, in the use of which the pilots must be expert. The sailplanes themselves must be built with higher safety factors, although this will mean sacrificing some performance. It may result in two definite types of high performance sailplanes, one for thermal and distance soaring, and the other for altitude and cloud flying.

* An amphibian sailplane of Kazan Aviation Institute. For take-offs from land, the wing tip pontoons are detachable and the keel is reinforced.

AUCKLAND GLIDING CLUB, NEW ZEALAND.

MR. P. T. CHINNERY-BROWN, Instructor to the Auckland Gliding Club, sends the following account of the past history and recent activities of his club:—

From September 1935 to January 1936 we flew at Orakei, a suburb of Auckland. That Christmas a bad storm wrecked our hangar and both our machines, a Zogling with struts and a metal-fuselage Waco primary. We started again in October 1936 with a new Waco and a Dickson with struts, at a field out at Mangene, about 14 miles out of Auckland.

UNOFFICIAL RECORD

We had no flying from March to August 1937, when we got on to another field at Alfriston, about 23 miles out of Auckland. Just before finishing there we totally wrecked our Dickson. A little while before that we put a nacelle on our Waco, which added much to its performance, enabling us to do 18 minutes' slope-soaring one day. This unofficial record has, as far as I know, never yet been beaten in New Zealand.

We again had no flying from March 1938 till November 1940, when we got on to a disused aerodrome owned by the Auckland Aero Club, who, owing to the war, had no machines. We built a Waco with a wooden fuselage, with the wings and trail unit interchangeable with our metal Waco. We smashed up the wooden Waco in a crash just before finishing at this field in May 1942. From this date we have had no flying, and do not see any opportunity of doing so for the duration.

Our best time on this field was 2 mins. 35 secs. from release at 600 feet. All our previous flying had been done by winch, but on this field we used auto-towing. We had three ropes: No. 1 was 100 feet long and used for ground slides and preliminary hops, etc.; No. 2 was 220 feet long and used for gentle turns, speed landings, and "A" certificates; No. 3 was 600 feet long and used for left and right-hand circuits, steep turns, side-slips, approaches and such. Occasionally we joined the three ropes together and would then clock 650 feet on a sensitive altimeter read straight off the dial at release.

RECOGNITION REQUIRED

The public out here in New Zealand are not at all interested in gliding, mainly because, I think, we have not been able to show them anything. But I am sure that, if we could put up a flight of an hour or so, we would be making a start in the right direction for recognition.

Our greatest trouble has been grounds. Our club has only been able to operate at week-ends, usually Sundays, and whenever we have been on a field for a while, we have been kicked off because—here's a laugh—we frighten the cattle!

Our Waco here, nearly new when we bought it, cost us about £75, paid for in dribs and drabs. We have done over 1,000 flights in it while on the aerodrome.

We have been trying hard to get our local Air Training Corps interested, but are gently headed off each time. The A.T.C. have been allocated three Tiger Moths to keep their interest up. What could we not do with that equivalent in money!

RADIO INSTRUCTION

When we were last flying we had a system of control with a third wire or two wires running along the towing cable, complete with pull-out plugs at each end, for the training of beginners. The idea was, we had a radio set in the towing car, complete with microphone; on the glider the pupil had either earphones or a small speaker mounted behind him. This method of giving instructions we found very satisfactory, thus doing away with any yelling or arm signals. When we start again we are going to have a transmitter on the car and a receiving set on the glider and do all instructing by short wave.

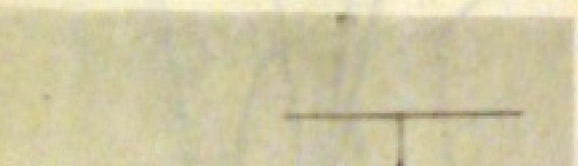
Over the last period of flying we had 60 members, of whom about 45 flew.

Left to Right. P. CHINNERY BROWN, I. M. CHINNERY BROWN, (IN COCKPIT), J. C. HARKNESS, TOM THOMPSON, G. O. H. NICHOLLS, FRANK ANDERSON, AND ANOTHER.

A SIMPLE ALTIMETER.

THIS instrument was designed principally for use with an open Dagling and is fitted between the rudder pedals, where it is in full view of the pilot.

It consists of an aircraft aerial mast which has been modified to house a manometer-type altimeter in the body and, incidentally, carried at the top a cross-wire for indicating the attitude of the machine relative to the horizon. Means for the vertical adjustment f this cross-wire are provided, so hat it can be " set," before take-ff, to suit the eye-level of any articular cadet.



MANOMETER AND RESERVOIR.

The manometer comprises a glass tube open at the top and being connected at the bottom to a small reservoir, the bores of both tube and reservoir being so proportioned that, for a given reduction in external pressure by height, liquid in the tube rises practically the full extent of the differential pressure. A scale to which the tube is attached indicates height, in steps of 50 feet, from ground level to a maximum reading of 400 feet, which represents a total rise of, approximately, 7 inches of liquid.

The small reservoir is connected by means of a rubber tube to an isothermal container (or lagged vessel, of the thermos flask principle) which is fixed behind the pilot's seat, the purpose of which is to add a relatively large air capacity at almost constant temperature, to the air space above the liquid in the small container.

A screw-in needle valve, fitted immediately above the top of the indicator tube, allows connection to be made between both containers and atmosphere and is left open at all times except immediately before, and during flight. Thus, on closing the valve prior to take-off, a quantity of air at ground level conditions is stored in the containers which, being relatively unaffected by changes in temperature over a short period, allows the manometer to indicate a reliable reading of height.

Note.—The above instruments were designed and made by L. A. Lansdown and E. D. Bannister, of the Westland Aircraft Company. This information is for private use only. The instruments cannot be fitted to any glider in use by the A.T.C. They have not been approved by the Department of Technical Developments of the Air Ministry.

EDITORIAL REGRETS

This month's issue of "Sailplane" is later than usual. This is regretted, but the onus lies on present day paper restrictions and not on anything for which the staff are responsible. It is hoped that next month's issue will be ready at the usual time.

THE NEED FOR A PROPERLY DESIGNED TUG AIRCRAFT.

BEFORE the war, aero-towing was a recognised method of taking a sailplane to the height or position in which conditions could be found which enabled it to soar or sailfly.

The machines usually employed were light aircraft of the Tiger Moth type. The connecting cable was fixed to the tug aircraft by a quick release hook at a point underneath the elevators in the tail unit.

To-day all the glider towing we know of is military—by twin and four-engined aircraft.

When the strategic and tactical value of the glider for Airborne Operations was thought out by the Germans, it is odd that they did not devote some time and attention to the creation of an efficient tug aircraft. Without exception all the tug aircraft in use to-day both for Civil (Richard Dupont's "All American Aviation" Glider pickup system) and Military purposes are aircraft designed for other functions, adapted for towing by the mere attachment of the quick release mechanism. Experience has shown two outstanding facts :—

(i) That the tail unit connection (even to the extremity of the longeron) brings with it problems of stability which have to be overcome by manual means.

(ii) That the engines of the tug aircraft, even the modern Dakotas and Lancasters, almost invariably overheat.

PROBLEMS OF STABILITY.

The following are among the problems of stability of the tug-glider combination :—

(*a*) The glider tends to be airborne before the tug. If this is allowed, the effect is to pull up the tail of the tug aircraft and turn the nose of the tug aircraft into the ground.

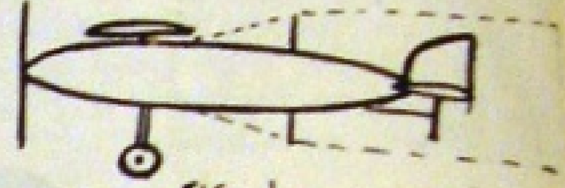
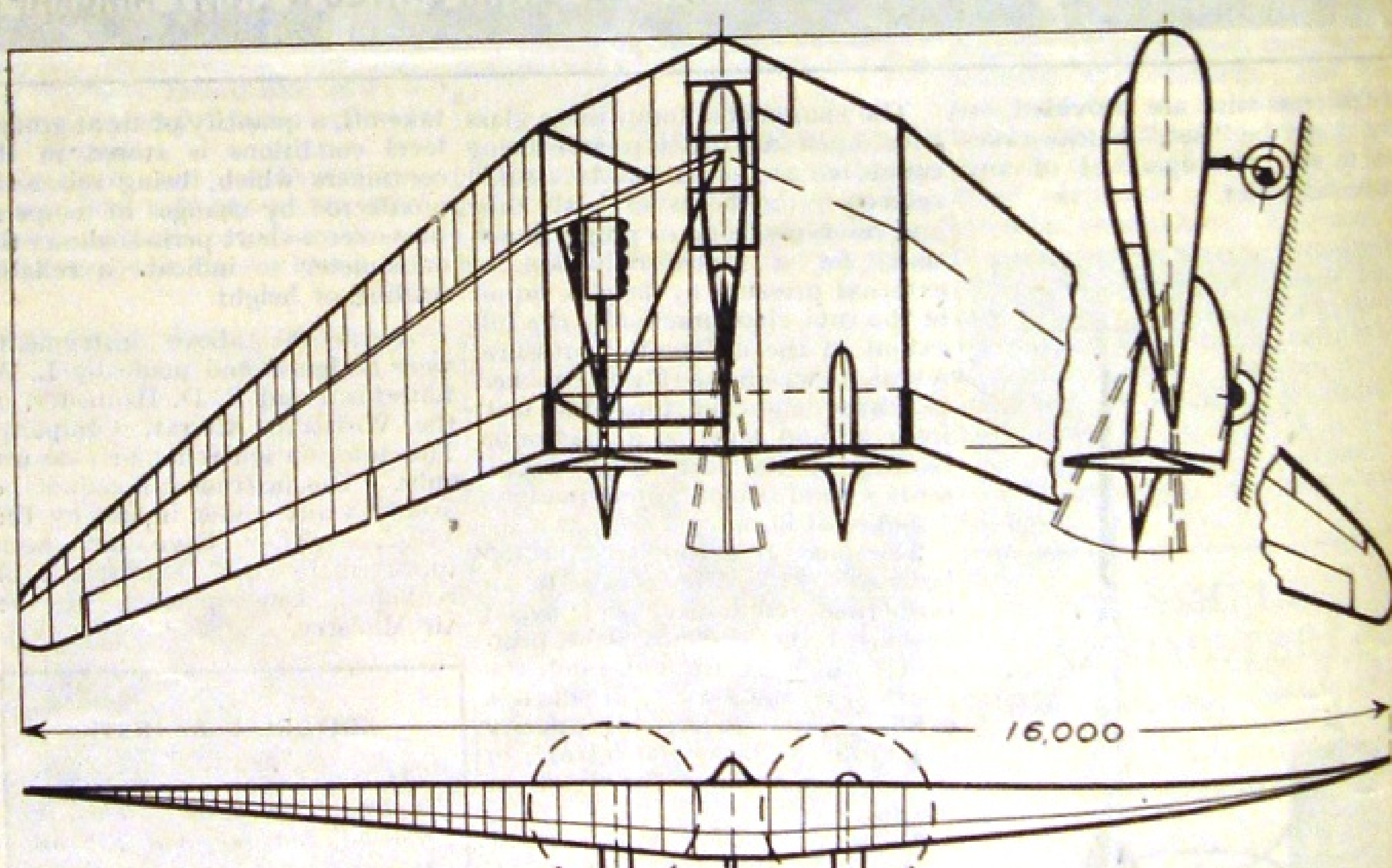


FIG. 1.

(*b*) Once in the air deviations from the stability, *i.e.* rise or fall—of either tug or glider, tends to upset the stability of the other aircraft and has to be corrected by both pilots. This "see-sawing" can be dangerous and is very fatiguing, especially with a short cable.

(*c*) Off-course deviations by either machine have to be corrected similarly.

(*d*) Any slackening of the cable due to the varying speeds has to be corrected by the rudder, *i.e.* moving out of the line of the course.



(FIG. 2)

THE "FLYING WING HORTEN V."

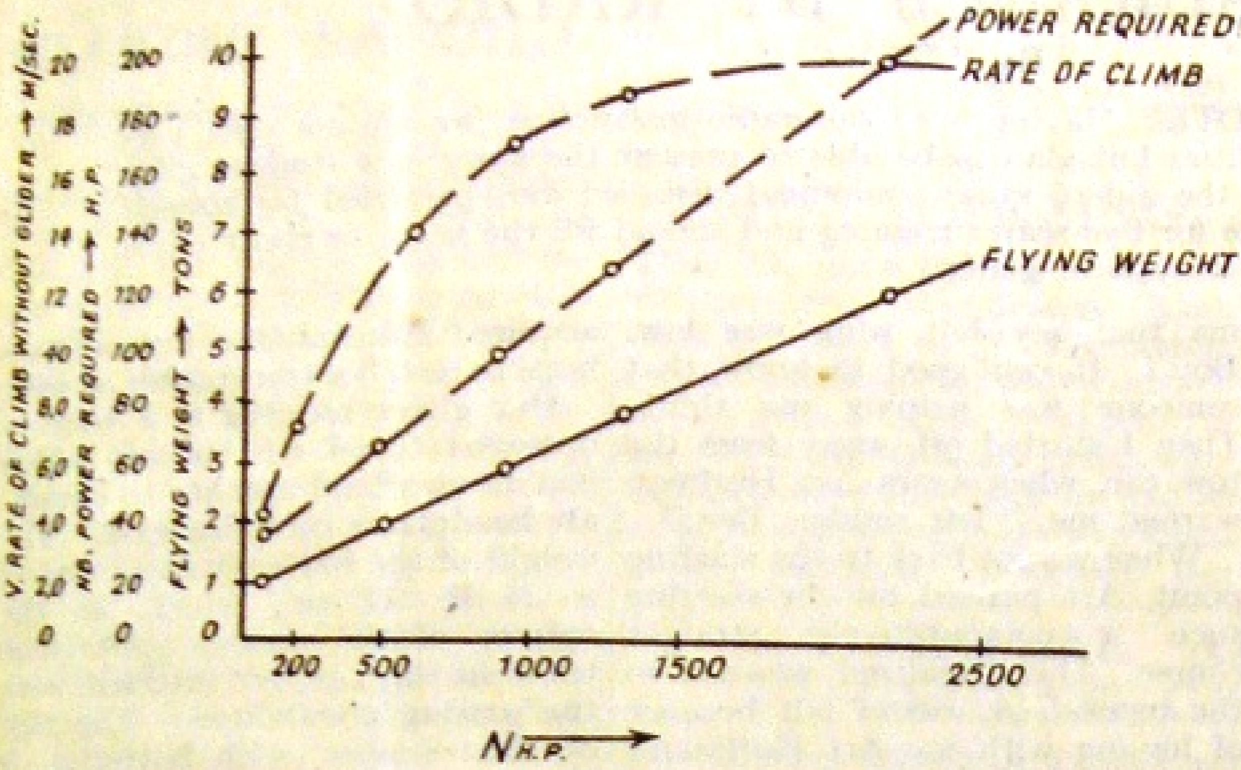


FIG. 3

RELATIONSHIP BETWEEN WEIGHT, RATE OF CLIMB POWER REQUIRED AND POWER AVAILABLE FOR A TUG WITHOUT GLIDER.

All these factors are due to the turning moment about the C.G. of the aircraft of the force applied to the tail.

POINT OF APPLICATION

Clearly, therefore, they can be reduced by placing the point of application as near the C.G. as possible. With normal aircraft this means that the cable, if affixed either on top or beneath the fuselage, would interfere with the tail surfaces. But with a "Tail-less" aircraft—the "Flying Wing" or Pterodactyl—this could not happen.

Alternatively the tow rope could be passed over a fender bar on a normal aircraft, so as to avoid the tail unit altogether (*Fig.* 1).

This method, however, is not foolproof, or not so foolproof as a Pterodactyl would be.

Let us agree that a tail-less aircraft is the type required. What other characteristics must it have to fulfil our requirements?

We have mentioned the tendency of the tug aircraft engines to overheat. Clearly, therefore, they were doing work for which they were not designed. They were possibly overloaded and certainly undercooled.

Let us therefore consider the tug aircraft and its engines as a single aerodynamic unit.

The characteristics of any aircraft may be considered in relation to its task under the following heads:—

(i) Speed.
(ii) Reliability.
(iii) Ease of Maintenance.

AIRCRAFT CHARACTERISTICS

(i) *Speed.* Considering the power unit alone. What speeds do we require for towed aircraft? For take-off something between 50 and 70 m.p.h. is needed. But for level flight speeds up to 200 m.p.h. may be expected. Clearly, therefore, engines which are both powerful and flexible are to be predicated.

(ii) *Reliability.* For this an air-cooled unit is preferable. But since it is necessary to provide against engine failure during take-off, more than one engine is needed, and each must be powerful enough to provide a rate of climb of at least 4—6ft. per second. These considerations seem to indicate that the power unit shall consist of two or more engines of not less than 500 h.p. each.

(iii) *Ease of Maintenance* would be facilitated if the engines were air-cooled. But since the aircraft should be an all-weather model and as little maintenance as possible is required, attention must be paid to the following points:—

(*a*) Ease of starting in cold weather.
(*b*) Hence a robust construction.
(*c*) Flexibility.
(*d*) And an extra blower for cooling, thus prolonging the life of the engine and reducing maintenance.

Considering the aircraft as a combination of power unit and lifting surface we find the following points:—

(i) *Speed.* The efficiency of the airscrew is greater if interference losses are avoided. Therefore a "pusher" type airscrew and power plant-plane combination is necessary. The difference between the speed of the slipstream and that of the aircraft is so great that it is an advantage if the slipstream flows away undisturbed.

(ii) *Reliability.* An all-weather aircraft is clearly desirable—one

(*continued on page* 16).

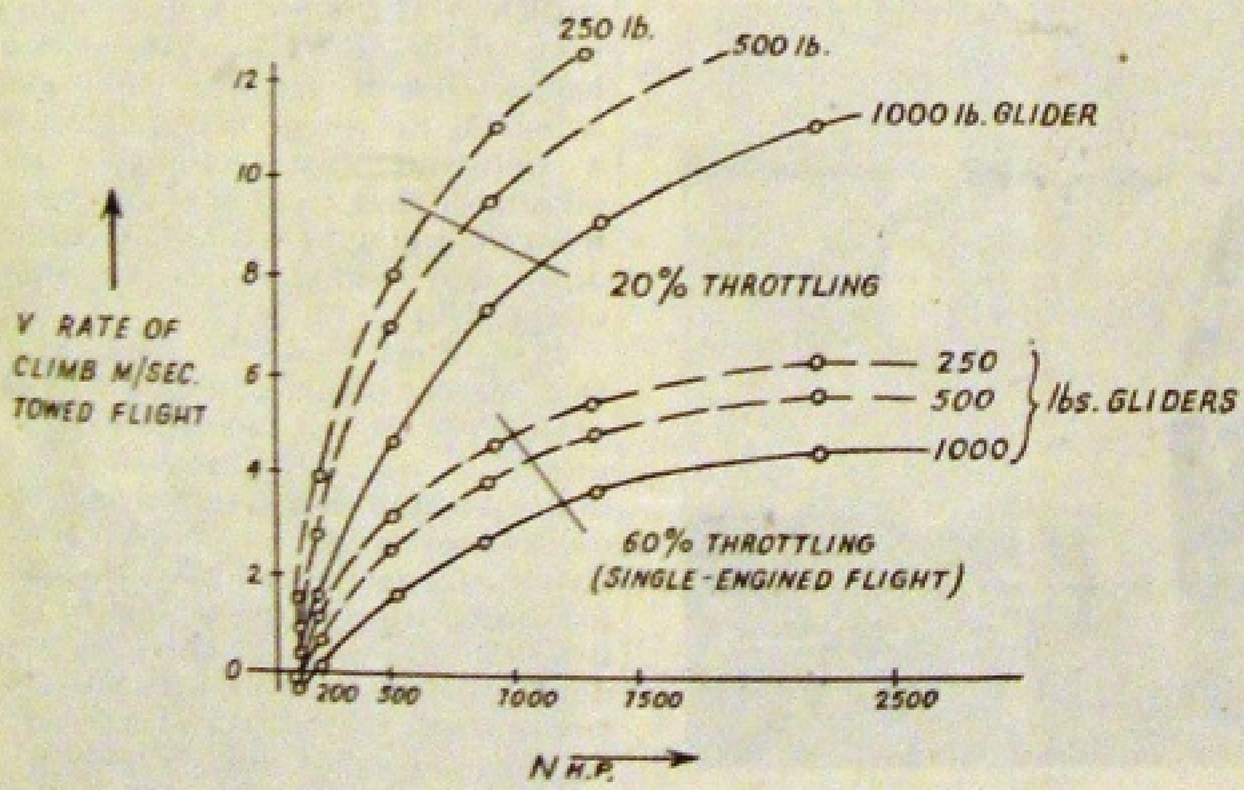


FIG. 4.

RELATIONSHIP BETWEEN RATE OF CLIMB WITH DIFFERENT FLYING WEIGHTS AND ENGINE POWER AVAILABLE FOR TOWED FLIGHT.
(N.B.—Weights shown above should be in Kilograms).

REASSURANCE BY RADIO

By "BEN."

"SOARING" EDITOR'S NOTE: Having tried this radio instruction, we are not only very enthusiastic about its possibilities but glad to be able to present the story of a student pilot, who has learned to fly with the aid of radio equipment installed and perfected by himself. This is the only real substitute for two-seater training and should fill the needs of many clubs, who are unable to obtain that type of glider.

IS there anything more confusing and bewildering than one's first tow across the field? The control stick just won't move, and the rudder pedals seem to need grease. You watch the left wing and the right wing takes advantage of you to go skyward. You watch the right wing and the left wing dips into the ground and round and round you spin. And, to top it all, you're supposed to follow the wig wag instructions from the tow car. Just try! The life of a beginner is hard.

I wanted my instruction to be definite and positive, so I equipped the Airhoppers Gliding and Soaring Club with a 5 meter receiver in time for the Wurtsboro Meet, which started on Oct. 9th. A 5 meter mobile transmitter was installed in the car. Sunday, Oct. 10th, a little before noon, I fastened the safety belt around me, adjusted the volume of the receiver, and was ready for my initial flight instruction. A wave of my hand and the tow car started. I will confess now that I froze to the controls "just a trifle." But Art Hoffman's voice, coming over the ether, cautioned me that my left wing was low. Boy! It was good to know that someone was helping me think. Then I started off, away from the tow car, when again Art Hoffman warned me, "left rudder, Ben."

When we got back to the starting point, Art praised me for steering such a comparatively straight course. This, I realized, was due to the mental security I felt because of having with me Art Hoffman's calm voice, always ready with the right suggestion. By the end of the afternoon, I had made eleven tows. On the last five tows I was permitted to take-off and fly about 5 ft. above the ground.

I attribute the success of this radio equipment to the fact that the receiver in the glider is a factory built, tested job, made by the Radio Transceiver Laboratory of Richmond Hill, New York City. Previous attempts were, I understand, made either with homemade apparatus or with transceivers, the chief fault of which is to detune. We decided that for the present a receiver was sufficient for all purposes of instruction and flight control. Later, when the members have acquired transmitting licenses, we hope to install a transmitter as well.

Our glider receiver is a battery operated tuned r.f. circuit, which has its own loud speaker to eliminate headphone complications. The weight of the batteries and receiver is 24 lb. 11 oz., which, in the opinion of the various pilots who tried the ship, did not interfere with the soaring possibilities. The cost of this receiver, with batteries, is $34.72. With such a receiver in the ship, the average club should be able to get some local radio anateur to co-operate with his mobile transmitter. For as long as the licensed radio amateur is in charge, it is permissible for any person to speak over the microphone. To attempt to operate a transmitter without a license is to invite the severe penalties of the F.C.C.

Let me tell of another incident on this same Oct. 10th, involving the use of radio. One of our newly trained pilots had taken off for a 360. As he glided back to the take-off point, Arthur Ramer observed that he had not lost much altitude and was high enough to make a second 360, thereby losing sufficient altitude to land near the take-off point. This information he was able to give the pilot, who acted on the suggestion and made a beautiful spot landing. He admitted that, without the voice from the radio, he would have come down and landed at the far edge of the field.

It is clear that the confidence that an instructor can give to the novice just at the moment that he needs it, when the bewilderment of his position may create a dangerous moment, is of inestimable value. Even the experienced pilot may be prevented from trying to spin 50 ft. from the ground. There is no doubt that the use of a radio is a tremendous help in creating confidence and safety for the student pilot.

(Acknowledgements to *Soaring*—U.S. official magazine.)

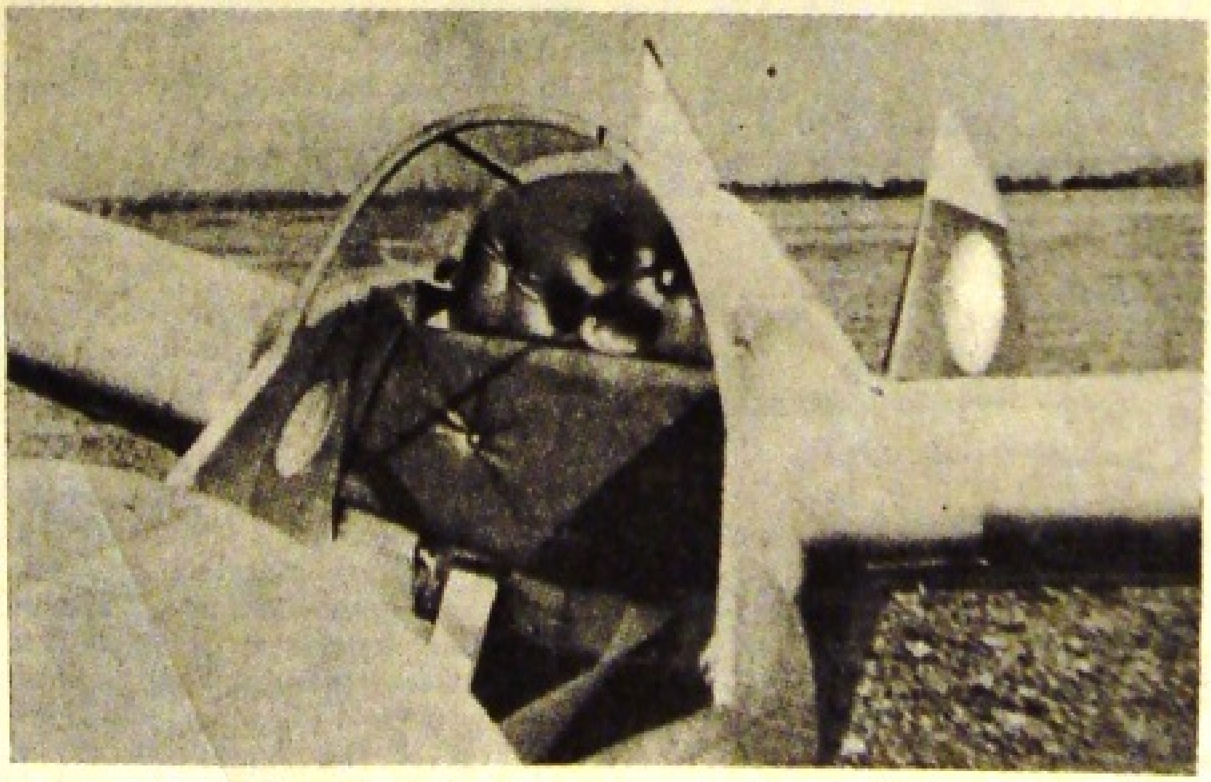


Photo: W. Setz.

MINIMOA WITH RADIO RECEIVER. Antenna above fuselage. Radio back of headrest. Speaker in right wing root.

THE FIRST SOARING RECORD.

WHAT was the first duration record for soaring flight? Neglecting the brief hovering flights of such pioneers as Lilienthal and Chanute, the earliest well-authenticated record is that of 9¾ minutes by Orville Wright in 1911, which headed the list given in the May SAILPLANE. But there is a little-known account of a flight made two years earlier which, if it really occurred, would just have fulfilled the conditions for a " C " certificate.

According to the *Petit Havrais* of September 7, 1909, quoted in the French paper *l' Aero*, which is in turn quoted by *Flight* of November 11, 1911, the flight was made by M. Raymond Hekking at Larcouet, near Havre, in September, 1909. His machine is described as a biplane of 7 metres span with 25 square metres of surface (269 square feet), balanced by movements of the body after the fashion of Lilienthal. The paper states that the pilot, without a motor, rose on this machine to a height of 25 metres and remained stationary for five minutes in a wind of 30 to 32 kilometres an hour (20 m.p.h.).

The wind speed is not impossible, since Chanute's pilots flew similar machines in winds of 30 m.p.h. The 25 metres height is obviously an estimate. But what about the five minutes? Was it accurately timed with a stop watch? Probably we shall never know. A. E. S.

DAVID SELLERS, aged 18 months Nothing like beginning young.

JOHN WAREING.

THERE was a moving ceremony recently at Sutton Bank when the ashes of John Wareing, a most enthusiastic, widely-known and much liked member of the Yorkshire Gliding Club, were scattered over the Bank he had so loved to soar along. He was killed in a " blackout " accident last November, but it was not until the Spring that his relations and friends could come together to perform an act he had wished in his Will.

His home was in the Whalley Valley in Lancashire, but he regularly motored over to Sutton to glide. He was a gay, happy courageous soul, who faced the end as cheerfully as he faced life. He enjoyed life and he wished others to enjoy it too. He left a sum of money to be spent in a dinner to his memory, but this will not be done until after the war. He will be much missed when activities are resumed at Suttou Bank.

ROYAL AERO CLUB GLIDING CERTIFICATES.

THE following Gliding Certificates have been issued by The Royal Aero Club during the past month :—

		Gliding School	Date taken
" A "	*Certificates* (40)		
1785	Amos Binfield	E.103 E.G.S., Honnington	16. 4.44
1786	Arthur George Tillett Shearing	Ditto	10. 4.44
1787	Ronald James Sharp	Ditto	23. 4.44
1788	Geoffrey Ernest Partridge	N.48 E.G.S., Bretford	21. 2.44
1789	Horace Edward Spragg	C.121 E.G.S., Halton	23. 4.44
1790	Frederick Hughes	S.W.81 E.G.S., Yeovil	26. 3.44
1791	Deryck Gordon Hobbs	S.W.81 E.G.S., Yeovil	2. 4.44
1792	John Alexander Crawford	A.T.C., Newtownards, N.I.	15. 4.44
1793	John Bradley	Ditto	15. 4.44
1794	Donald Mackinnon	M.45 E.G.S., Meir	25. 3.44
1795	John Shoolbred Graham	A.T.C., Newtownards	23. 4.44
1796	Victor McNabney	Ditto	26. 3.44
1797	John Stuart Martin	C.123 E.G.S., Bray	15. 4.44
1798	Cedric George Turner	N.E.25 E.G.S., Hedon, Hull	13. 2.44
1799	Arthur Williamson	Ditto	12. 2.44
1800	Geoffrey Greenwood	Ditto	25. 9.43
1801	John Brian Howard	Ditto	13. 2.44
1802	James Kenneth Bailey	Ditto	19. 2.44
1803	Ronald Nalton	Ditto	26. 9.43
1804	William Edley Petch	Ditto	12. 2.44
1805	Francis William Jackson	Ditto	20. 2.44
1806	Colin Dews	Ditto	30. 1.44
1807	Harold Alexander Benton	M.48 E.G.S., Bretford	11. 3.44
1808	Albert Edward Westbrook	L.141 E.G.S., Kidbrooke	29. 3.44
1809	Derek Brooke Bray	N.E.24 E.G.S., Netherthorpe	19.12.43
1810	Charles V. Webb	M.45 E.G.S., Meir	4. 9.43
1811	George Alan McDonald	N.E.26 E.G.S., Greatham	16. 4.44
1812	Allan Simpson Hughes	Ditto	16. 4.44
1813	John Rupert Maurice Jacobs	N.E.24 E.G.S., Netherthorpe	10. 6.43
1814	Thomas Hutchinson Smyth	C.123 E.G.S., Bray	9. 4.44
1815	Ronald Weir Graham	A.T.C., Newtownards	16. 4.44
1816	George Geoffrey Hewitt	N.E.24 E.G.S., Netherthorpe	12.12.43
1817	Harry Johnson	S.W.83 E.G.S., Morton Valence	7. 5.44
1818	Kenneth Edward Pearce	S.W.81 E.G.S., Yeovil	7. 5.44
1819	Raymond John Allwood	C.123 E.G.S., Bray	5. 5.44
1820	Reginald Charles Adaway	Ditto	7. 5.44
1821	Peter Fairhurst Shaw	183 E.G.S., Woodford	14. 5.44
1822	Norman William George Marsh	C.123 E.G.S., Bray	7. 5.44
1823	George Edward Nunn	L.141 E.G.S., Kidbrooke	7. 5.44
1824	Donovan Herbert Clarke	Ditto	26. 3.44
" B "	*Certificates* (5)		
1785	Amos Binfield	E.103 E.G.S., Honnington	16. 4.44
1786	Arthur George Tillett Shearing	Ditto	16. 4.44
1787	Ronald James Sharp	Ditto	23. 4.44
1810	Charles V. Webb	M.45 E.G.S., Meir	1. 4.44
1824	Donovan Herbert Clarke	L.141 E.G.S., Kidbrooke	23. 4.44

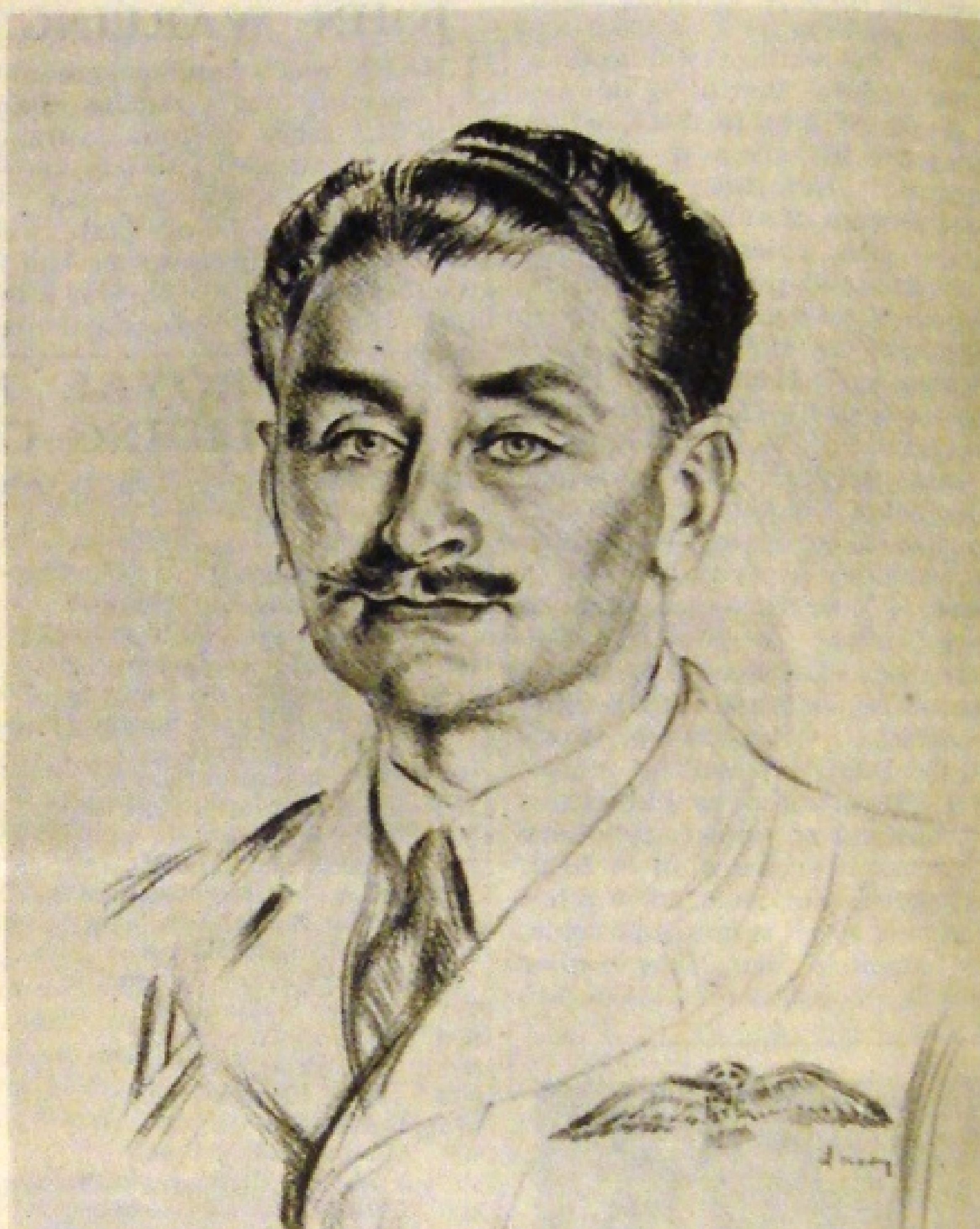
Pioneers of British Gliding—3

GROUP CAPTAIN E. I. MOLE.

(By LT. CDR. R. J. HURREN).

CHANCE acceptance of an invitation to a dinner given by the Royal Aero Club led Group Captain E. I. Mole, R.A.F., to become a founder member of the London Gliding Club and aroused in him a never-flagging interest in powerless flight thereafter.

Whilst stationed at Manston in 1930, Group Captain Mole (then a Flying Officer serving with No. 2 Army Co-operation Squadron under the present Air Commodore H. Probyn, D.S.O., who is now at R.A.F. College, Cranwell, and another glider expert) attended an R.Ae.C. dinner to which a number of German glider experts had been invited. At that period gliding in England was moribund; whilst the Germans, using this innocent sport as a skeleton for military expansion later, were the world's foremost exponents of powerless flight.



GROUP CAPTAIN E. I. MOLE.

L.G.C. FORMED

An outcome of this dinner was the formation of the London Gliding Club, in which Group Captain Mole later obtained Gliding Certificate No. 6.

The new club acquired a Zogling primary glider trainer, and on this machine Mole qualified for his "A" Certificate. Shortly afterwards, in June, 1930, he obtained his soaring Certificate "C" on a Prufling machine owned by the club, at Itford Hill, near Lewes, Sussex.

The fascination of powerless flight made a deep appeal to Group Captain Mole from the time when he crashed in a Parnall Pixie monoplane in 1930. This aircraft, which he purchased for £52. 10s., had lain unused for five years previously, and his elation at acquiring a private aircraft of his own knew no bounds. Enthusiastically he invited a friend for a flight in his midget aircraft; and although the passenger showed some reluctance to take the air when he actually saw the machine, he did in fact fly in it.

But not for long. Taking off with some difficulty, Mole, as pilot, found himself unable to climb above the valley, and after a fruitless search for a way out finally crashed ignominiously on the hillside. This accident, fortunately not in any way serious, derived from the fact that when carrying a passenger the Pixie required to be converted to a biplane—and the vendor had forgotten to warn Mole of this necessary qualification. Thus the aircraft never had enough lift for the weight: it was a marvel it became airborne at all as a monoplane with two up. Crowning insult of the episode was that a farmer charged £1 to remove the wreckage.

DO BIRDS "SIGHT" AIR CURRENTS?

At this time many theories of gliding were held. One, often voiced, was that birds had some means of sighting air currents—some formation of the eye or optic nerve which enabled them to see air movements invisible to human beings. This theory was supported, in part, by Mole's personal experiences of soaring in Egypt where the kite hawks are a familiar sight.

wheeling idly on the up-currents to great heights.

Mole, lent a sailplane by the Egyptian Government, and from the R.A.F. Station at Abu Sueir, close to the Suez Canal, made many interesting flights. He tells a graphic story of joining in with the kite hawks, whose big black eyes could plainly be seen enviously staring at him as he climbed more swiftly than they. One experiment he never took was to make an opposite circuit to the birds; for it is a curious fact that soaring kite hawks almost invariably get in a one-way traffic stream and consternation might well have been caused had Mole elected to do a "wrong circuit" in their midst.

Once, coming in to land at Abu Sueir, Mole struck an up-current over the cook-house, and away he went soaring to 5,000 feet in 13 minutes. (One wonders what height he would have gained had he managed to soar over the native quarter in Alexandria or Cairo!)

LOCAL RECORDS

Many local record flights stand to Group Captain Mole's credit. In June, 1931, he made the first British long-distance aeroplane-towed flight from London to Blackpool, flying a BAC VII and towed by a Cirrus Moth. Incidentally, the Moth pilot forgot to cast off his steel tow wire, and on coming in to land neatly dissected an aircraft on the ground with this novel cheese-cutter.

Two months later he set up a British duration record with a flight of 6 hours 20 minutes at Ditchling Beacon, (near Brighton). He was flying a Professor sailplane belonging to the London Gliding Club, and landed after dark by the aid of motor-car headlamps. This landing must have been quite a feat, since none of the instruments were illuminated and the pilot had to fly entirely by "feel."

At the R.A.F. Pageant at Hendon in 1932, he was one of a glider formation of three, towed by Moths. The formation flew BAC VII's, and the centre pilot was the present Air Commodore Probyn, and the other the then S./Ldr. Williamson.

EXPLORED SUTTON BANK

In July, 1932, Mole went to Sutton Bank, which he was the first British pilot to explore for soaring. He made many flights there in an Airspeed Tern, and set up a British record for altitude—a record of short-lived duration—with 1,450 feet. On his recommendation, the site was adopted and became later famous in gliding circles.

Mole set up a duration record at Dunstable in July, 1932, when he flew a Willow Wren for [illegible] hours 55 minutes. The Wren was hand-made by an R.A.F. Corporal from Hawkinge, and so successful was this basic design that it gave its ancestry to many subsequent developments.

In a Falcon sailplane, Mole established another British duration record at Dunstable in May, 1934, with a flight of 8 hours 20 minutes.

After this he became attracted towards power-driven soaring aircraft—in which, incidentally, he foresees now a wide future. At that time he assisted Kronfeld on a Drone (BAC VII equipped with Douglas motorcycle engine). This aircraft was able to cruise with a consumption of 55 miles to one gallon of petrol. It could take off in 60 yards in near-still air and unstick at 25 m.p.h.

TO EGYPT

These power-driven soaring flights were curtailed by a posting to Egypt, to which he went in October, 1935. There he carried out many soaring flights to explore the thermal currents which rise abundantly from the heated desert. Partly to satisfy the public craving for a thrill, he performed on one occasion 67 loops in succession (April, 1937) in a Wolf sailplane, and in the summer of the next year made 147 consecutive loops in a Hungarian M.22 sailplane at Abu Sueir.

To demonstrate the aerobatic gliding of his glider at a local R.A.F. Display, Mole also performed the feat of an "outside or forward" loop, commonly described as a double-bunt. This involved a complete inverted-flight loop, the speed attained at the bottom of the loop being 100 m.p.h.

On returning to England, Group Captain Mole revived his interest in light aeroplanes. He made the initial test flights in the Luton Major, and in a Tipsy secured third place in the Whitsun, 1939, race at the Isle of Man.

MILITARY GLIDERS

With the advent of war, his considerable experience of gliding was not called upon until after he had served in France in 1939 on Intelligence Duties, then in the Air Ministry Directorate of Servicing and Maintenance, and later on as their representative in Washington. For the past two years, however, he has been in the Directorate of Technical Development, Ministry of Aircraft Production, in charge of the Branch Controlling Military Gliders.

Group Captain Mole couples the qualities of an enthusiastic bird-man with those of a highly qualified engineer. He took his B.Sc. degree with Honours at Birmingham University in 1927 and served for a year as a Scientific Officer at the Royal Aircraft Establishment before transferring to the R.A.F. owing to his keenness on flying. He qualified for the symbol "E" (for engineering) at the R.A.F., Henlow, in 1933, and also qualified at the R.A.F. Staff College course in 1939.

THE STRETCHING ROPE

Group Captain Mole was able to scotch for me two aimible canards. Not long ago there was a story of an aircraft being used experimentally for glider-tug flight. On landing the pilot casually remarked that the fore-and-aft controls seemed to him rather "phoney." According to the story, on check the fuselage was found to have been elongated one foot. This is nonsense in fact since the connecting cable is the "weak link" in the chain, and would have parted had any such state of strain begun to arise.

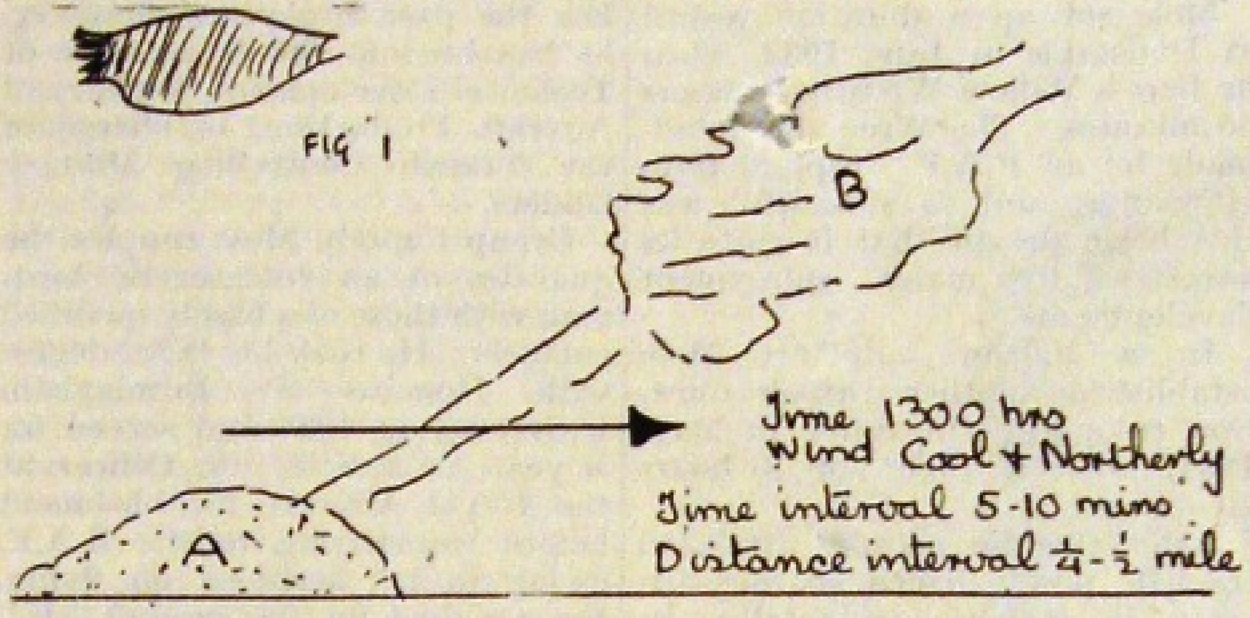
(*Continued on page* 16)

"NOT MUCH LIFT THIS MORNING, IS THERE, CHOLMONDLEY?"

VISIBLE THERMALS.

By MAJOR CYRIL A. KAYE

(Derby and Lancs. Gliding Club).



SINCE I have been in this daft and maddening country (Iraq) one of the things which has preserved my sanity is the observation of the curious results that accrue from that which deprives most people of their ultimate reason, namely heat, heat, and more heat acting upon sand, sand and more sand.

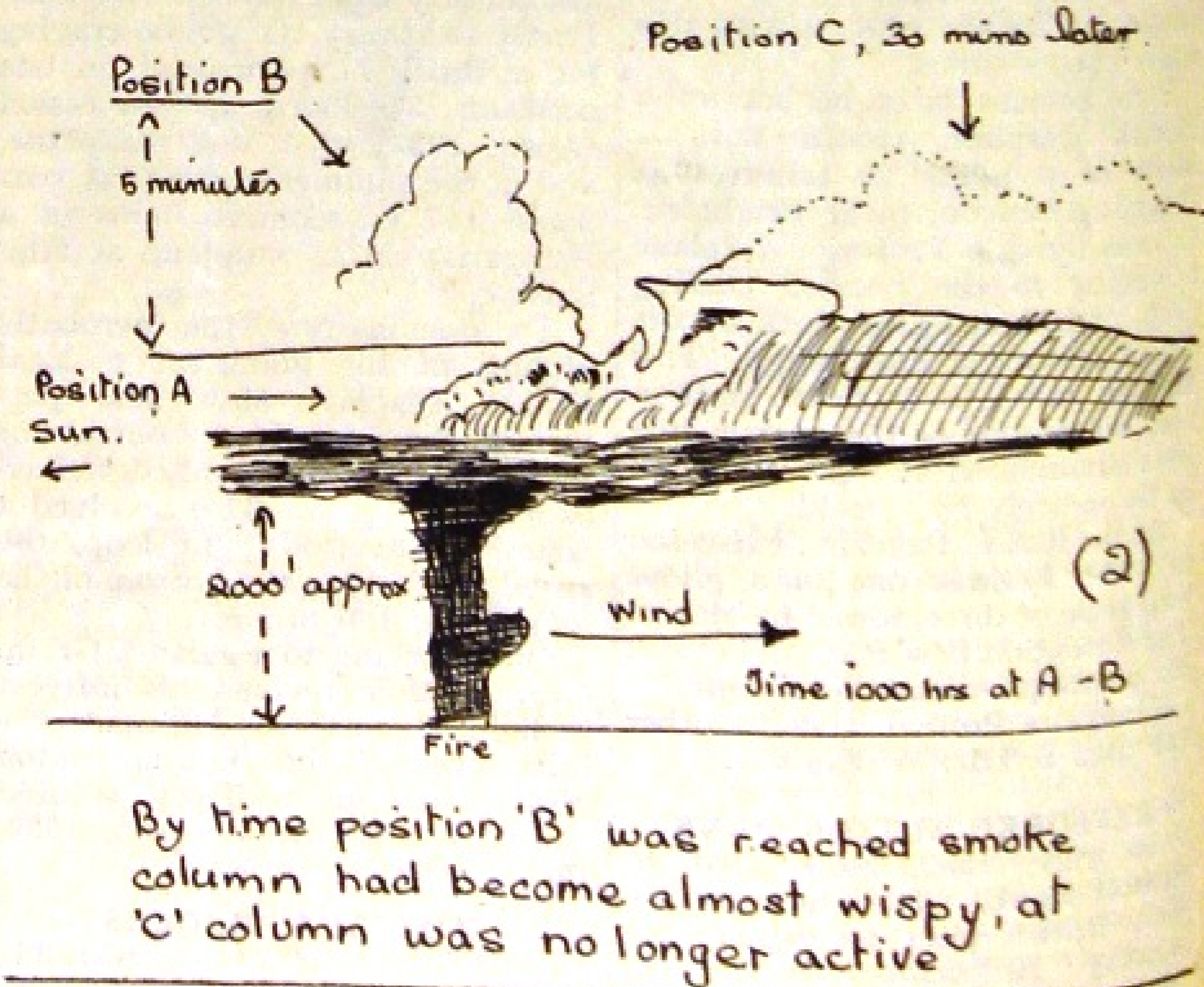
Temperatures of anything above 100°F., in the shade, are no joke, and when they get up to 120°F. in the shade, thay are not the least bit funny, nor are the accompanying temperatures out in the sun which seem to get up to about 180°F. (and wherein no sane man lives very long), but to the would-be and/or one time soarer they do produce two items of interest, nanely the "Thermal Generator" and the "Visible Thermal" so long desired by Silver "C" aspirants in some parts of our green and grassy homeland.

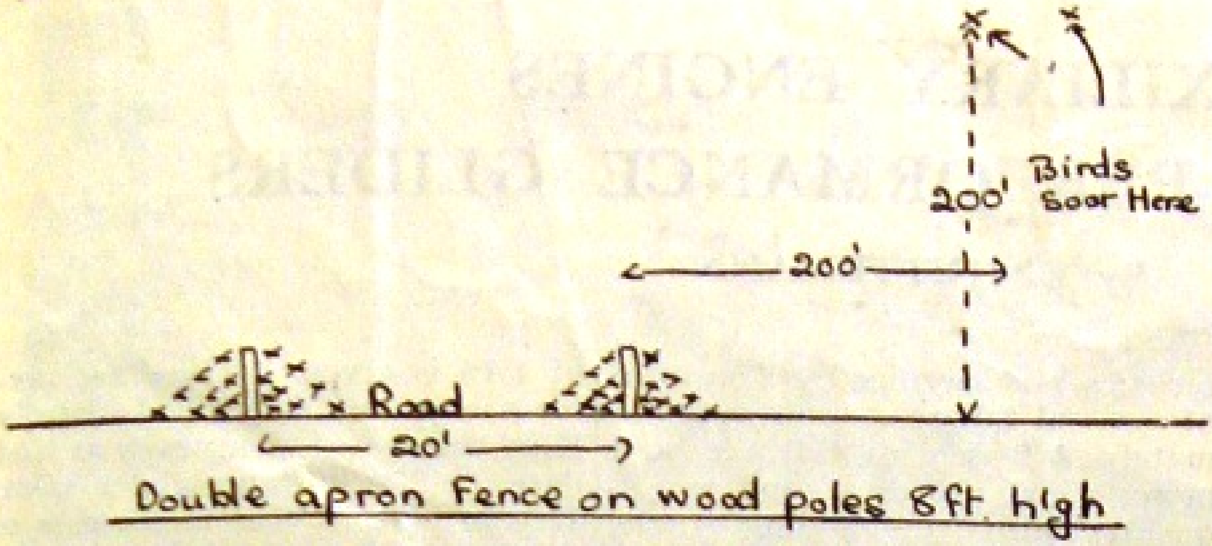
BUBBLE THEORY—

Bearing in mind the lengthy discussions that used to take place at Camphill on and about the bubble theory, I made a sketch the other day (*Fig.* 1) of a development that I saw take place to the lee of a large workshop building, at about one hour after noon, wind about 10 to 12 m.p.h. steady, cool, and northerly, as is common in these parts. There was a commotion (A) over an area, roughly 50 feet diameter, which began with a general melee of dust, pieces of paper, sand, etc., whirling round in the characteristic dust-bowl form which then moved off down wind in the shape of an inverted ice-cream cornet, the point ascending rapidly in a spiral until by the time it was clear of the building. It had the appearance A and B shown in (1). The rotating column was thick with dust and sandy in colour, so that, until "C" condition was reached, it was clearly discernible against the blue sky. At "C," the "ice-cream" cornet broke away from the ground and began to ascend in the shape shown in the right-hand sketch in (1), but rapidly thinning out in density as the column expanded in diameter. The total length "C" seemed to remain about the same as "A" and "B," but the diameter increased about ten times until the column became wispy, and I lost sight of it at about 200′ to 300′ and perhaps 400 yards away. The rotation was constant and seemed to be clockwise looking *up* the axis of the column, but this is a bit tricky to decide upon.

—TO CORNET

Smaller versions of this, up to 10 or 15 feet high, are common, but occasionally when a hot day coincides with a steady cool wind (cool is about 85° !) the big ones go up and the *really* big ones lift dust, paper, petrol cans, etc., over a circular area up to 200′ diameter. Under favourable conditions, the same thing happens at regular intervals from certain "generating" points, although in these instances there is not much density of sand in the column. Any dump of material seems to function more or less in this way, but the thermal-generator *par excellence* appears to be any dump of closely packed cars and vehicles. I spotted this, one day, when I saw a flock of kite-hawks circling madly at about 25′ above a vehicle-dump amongst some buildings and noticed that after they had "caught" the thermal and sailed away to fantastic heights they all solemnly glide and flapped back to the same dump





where they then perched in and on the said vehicles for about ten minutes or so until commotion arose, and a new thermal was set off. Reconnaissance showed this dump was in a slight hollow sheltered from the wind, and the vehicles were closely packed in an area probably 200 yards square, everything being favourable for "bubble" formation until the dome or peak got caught by the wind and was so burst and carried off by the wind. The break-away here was a litte different from the one sketched in (1). The bubble "A" was shallow and dome-shaped, and at the break-away floated off down wind in a cloudy structure "B," turning rapidly into wispy stuff with a dusty cone which disappeared from sight at about 1,500 feet and some thousand yards away. After "B" stage there was no definite form, but a certain dustiness could be seen in the air and, at this stage, any Kitehawks who had caught the bus were circling effortlessly in; I estimate, 100 yard circles.

LUCKY KITEHAWKS

The Kitehawks are birds about as heavy as the ordinary domestic rooster and have a wing span of three to four feet, with wing feathers like a rook. They are adept at all the normal soaring tricks and never waste effort in flapping if soaring will serve. There seemed to be something tricky about catching the bubble on its initial break-away, and those who were successful remained in the ascending column until it dissipated, but the unlucky ones made no effort to pick it up again after having once missed it. If they saw any other hawks in the vicinity, *who were circling*, they they would flap over and join in, but not if any climbing was required. Presumably the down-draught outside the thermal is strong because I noticed plenty of "sink" on those birds trying to get from one to the other and mostly the unlucky ones went straight back to their perches in the vehicle dump and waited for the next. On this particular day they were coming off at about five to ten minute intervals, and one could see two thermals in action at once for part of the time—one thermal almost exhausted at 1,500′ or so, and a new one going up at 50′ or 100′, with birds soaring in each, and perhaps ¼ mile between the two columns.

PURELY GROUND WIND EFFECTS

An interesting thing is that these effects are purely ground-wind effects. The upper air seems absolutely stable and there is nothing but deep blue up above. A cloud of any sort is exceptional, and so I imagine as soon as the accumulated ground-heat is dissipated by each thermal the column just fades out. This appears to take place at about 1,500′ to 2,000′. It is very noticeable that there is no activity of any sort until about 10.00 hrs. (when the sun has been up about 3 hrs.) and after 16.00 hrs. (3 hrs. before sunset).

FIRE FORMED CU-NIM

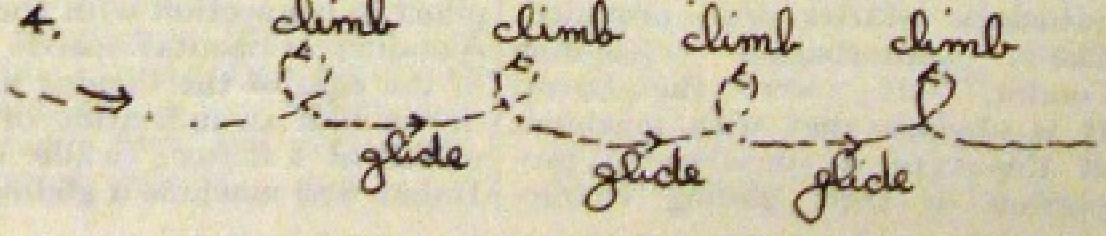
Another interesting thing which I saw the other day was the formation of a cumulo-nimbus type of cloud by a fire. I have seen this illustrated in books in cloud-formation but saw it take place, as follows, and as sketched in *Fig.* 2. Some miles from where I was, a big fire of some sort had set up a dense smoke column, ascending to about 3,000′, and perhaps two or three hundred yards diameter. I couldn't see the source of the fire but I guessed it must have been stores of some kind, for it burned for several hours, and after two or three hours I noticed the characteristic cumulus forming above the fire, roughly as shown in *Fig.* 2 "A." The wind had blown the smoke away to the right except where it was hanging immediately over the fire and directly above the dark smoke column there was a cumulus "cauliflower" forming and expanding rapidly. The sun was shining from the left and illuminating the white cauliflower against the background of blue sky and the lower bulk of dark smoke. This was "A." In five minutes the cumulus "cauliflower" had risen to position "B." 2,000′ at least above "A" and was still very active indeed. Half-an-hour later, when I looked again, the wind had blown the cumulus crest away to the right to position "C," but position "A" was still active, although the fire had died down and the smoke column was wispy and inactive. The whole performance lasted several hours and did not disappear until later in the afternoon. The day was cloudless, and conditions otherwise normal.

All of which seems to show that you *can* generate thermal if only you can apply enough heat in the right place, and you can make them visible if only you have an indicating medium at the same place !

COMBINED THERMAL AND SLOPE

One more queer thing I've seen here, and I can't claim to explain it, is a combination of thermal and "ridge" soaring set up like this (*Fig.* 3). Where I saw this happen, there is a double apron wire fence along either side of a roadway some 20′ wide, and several hundred yards long, lying to the lee of a camp and roughly at right angles to the prevailing wind. Kitehawks soar

FIG 4.



(Continued on page 16)

AUXILIARY ENGINES FOR HIGH-PERFORMANCE GLIDERS

By E. HUTTEMANN

THE publication of the details of the new "C 10" power glider (designed by the Aeronautic Branch at the State Technical College at Chemnitz) in the July 1941 number of the *Sportflieger* will have come as a pleasant surprise to glider enthusiasts. This is a high-performance glider with a 18 h.p. Kröber engine permanently mounted in the wing and a furling airscrew. When the engine is switched off (during gliding) the glider has a gliding angle of 1 to 22 at a forward speed of 50 m.p.h.; and a rate of fall of 33 inches/sec. at 36 m.p.h. Power-driven, its rate of vertical climb is 6ft./sec. After years of experimenting and many differences of opinion the construction of a machine, fully deserving the name of power glider has thus been realised. Unfortunately this simultaneously reopens the question whether the power glider is a poor compromise between power-driven aircraft and an ordinary glider, or whether it actually fills a generally felt want.

PREVIOUS ATTEMPTS

The widespread view that an engine-driven glider only represents a half-way stage, being neither a satisfactory light aeroplane nor an acceptable simple glider, is only based on the by-no-means-happy designs made public hitherto. How did the engine-driven gliders produced between 1934/36 actually originate? Simply by selecting a standard ordinary glider and adding a small engine and airscrew with a few minor alterations. For lack of sufficient space both engine and airscrew were in almost every case mounted outside the wing. The increase in weight and parasitic drag were simply accepted as inevitable. In order to avoid further increasing the weight, no automatic starter was provided. The "Motorbaby," "Motor-Condor," etc., were the result. It is obvious that with machines of this type a considerable proportion of their gliding characteristics was sacrificed. The rates of vertical fall rose from approximately 2 ft./sec. to 4 ft./sec. and more, while the drag, and consequently also the gliding angle, became proportionally unfavourable. The automatic starter having been omitted for reasons of weight, the pilot had no means of switching the engine on or off during flight. Gliding was effected with the engine throttled down (only in upward currents of course in which even a barn door would fly). In other words, the machine was a poor glider and an equally poor light aeroplane of which higher speeds and rates of climb were expected.

CONVERTED GLIDERS

It is understandable that such a hybrid type of power glider encountered much opposition and served to emphasise the great difference between a glider and a power-driven aeroplane. In spite of the fact that other machines were designed (*i.e.* Count Saurma-Jeltsch's machine, the Italian "Canard" SS2, the "Brummer" by Bock of Hamburg, the "Merlin" machine of Alkaflieg at Munich, Lord Sempill's machine which made the London to Berlin flight, and others) which were not based on any known glider design but had been definitely designed as power gliders and been classified as such, all of them failed to show characteristics superior to those of converted gliders. Collecting and comparing all published data of power gliders known so far, we notice one fact which typifies the then existing conception of power glider and supplies a further reason why such machines have fallen into discredit nowadays: *i.e.* in no case in any of these machines do we find data on the gliding angle and the rate of fall (so indispensable to the pilot) in connection with the corresponding horizontal speed. Only in the case of the Condor machine do we find an indication of a rate of fall of 4 ft./sec., while for the Italian SS2 machine a gliding angle of 1.16 is given. These are performances which would hardly have been satisfactory even at that date (1936) for any glider pilot. It is of interest that in the case of all the above machines their range, maximum and cruising speed with engine running, rate of climb, fuel consumption per hour and the fuel tank capacity are given. Even in the case of small engines of 10-20 h.p. these full tank capacities amount to 50 litres (about 23 gals.). Such data, however, are only of interest to aeroplane pilots, and it is feasible to assume that these would hardly be interested in the above type of machines in which the rates of climb and forward speed are so small in comparison with other light aircraft.

"COMPARE WITH LIGHT AIRCRAFT"

The pilot finds no information regarding the possibility of starting or stopping the engine in flight. Furthermore, no effort was made to reduce the drag figures (so important from the pilot's point of view) by cowling the engine and airscrew when gliding. Neither was there any attempt at improving the gliding angle at least to such an extent that the machine might properly be called a power glider. We cannot wonder, therefore, if glider pilots did not consider this type of machine equivalent to their own, and aeroplane pilots were only interested in so far as the machines in question represented a type of light aeroplane, *i.e.* an engine-driven glider. This became clearly apparent at the Rangsdorf power glider trials. It also found expression in later publications and statements. Only one machine showed promise at that time of becoming a proper high performance glider power with auxiliary engine. It was the "Horten III." With its 60 h.p. Hirth engine switched off, it had a gliding angle of 1:20 with an acceptable speed performance and rate of fall of 3 ft./sec. (at a forward speed of 130

THE C 10.

m.p.h. with engine full out at low altitude). The above data were satisfactory in themselves and could certainly have been improved upon. Unfortunately, this ·machine designed by the brothers Horten was only constructed by way of experiment and no attempt was made to obtain a licence.

In spite of the fact that, mainly due to unsatisfactory design, the power glider type in course of time acquired a bad reputation, the appearance of a new progressive design like the C 10 has provided a basis for the decision whether the power glider supplies a much-felt need or whether it is fated to remain an unsatisfactory compromise.

FUNDAMENTALLY A GLIDER

Let us first of all clearly state the fundamental principle that a power glider is a glider, *i.e.* a high-performance glider with an auxiliary engine on a fixed mount inside the wing capable of being started at any time during flight. When the engine is switched off, the power machine must have all characteristics of a high-performance glider. In contrast to its functions in an ordinary aeroplane, its engine is only used for taking-off, the attaining of more favourable upward currents, the crossing of calm areas and emergency approach to a chosen objective.

It follows from the above that the fuel tank of such an auxiliary engine need only be of minimum size. Fuel for one hour's running amply suffices to make from four to six climbs of 3,000 ft. each. The requirement that it must be possible to start up the auxiliary engine at any altitude of flight in the easiest and quickest way, cannot be met, however. If starting the engine from the pilot's cockpit proves unsuccessful, an electric or compressed air starter must be used in spite of the increased weight. Conditions of flight may occur which demand assured starting of the engine within a matter of seconds.

DISAPPEARING ENGINE

The further and final requirement that the power glider must show all characteristics of a high-performance glider when the engine is switched off, renders it imperative to reduce all parasitic drag to a minimum. In other words, when not running, the engine and airscrew must entirely disappear in the fuselage. The particular merit of the designers of the C10 power glider is that they have been the first to attack this problem successfully. They have not only submerged the engine in the wing and introduced the cooling air through guide rings but also efficiently arranged for the airscrew to disappear completely into the airframe when the engine is not needed. The machine in question is therefore actually the first to deserve the name of *power* glider. Its further development is bound to follow, proving in turn that this type of machine is not a compromise but constitutes a completely new development from the engineering and sporting aspects.

WORLD TRAVEL BY SAILPLANE

The power glider is primarily intended for the glider pilot in possession of an official licence. The grest merit of the machine is that it permits landing at a previously chosen place. Regular practice in flying to regular destinations target and cross-country flying, saving towage and a "return" crew leads to a second advantage, *i.e.* the possibility of carrying out flights of several days, either in competitive circuit flight in which the best flying time and lowest fuel consumption are the deciding factors, or in the form of stage flights to distant destinations. Not only the whole country but the entire world thus comes within the reach of the glider pilot at the lowest possible cost. Any country which has interest from the flying aspect wherever it may be can be visited and explored. Unimagined experience can be gained on a large scale. Ideal flying practice in the widest sense can be gained.

No one—and particularly the seniors—will need to fear loss of practice or knowledge gained in training, through lack of time or opportunity.

The further development of the high-performance glider with auxiliary power, may therefore be followed with greatest interest.

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(Translated by J. Helledoren. Acknowledgments to R.T.P.3.)

THE NEED FOR A PROPERLY DESIGNED TUG AIRCRAFT.

(*Continued from Page* 7)

which needs no hangar. An all-metal aircraft of robust build is therefore required, which will in turn reflect on its ease of maintenance.

RANGE

A most important consideration of the combination is its

(iii) *Range.* And it is here that the factors of flexibility has its greatest restrictive force. For flexibility is lost if the load per h.p. exceeds 10 lbs. per h.p. Hence the wing loading must be as light as possible. If the maximum load of fuel is to be carried the minimum weight of crew and winch can be carried. To budget for a greater range than 400 miles would be to carry too much fuel, thus cutting down speed and putting the towed aircraft at too much of a disadvantage as compared with the light aircraft.

Since there is no need for load space, other than that required for the crew of pilot and observer, it is possible to adopt a "Flying Wing" type of tug, whatever the size of the aircraft. Even if it is small the engine and fuel tanks can be housed in the wings (*Fig.* 2).

FLYING WING TUG

Something is known of the performance of this type of aircraft. Before the war the German "Horten V" "Flying Wing" underwent exhaustive tests, from which the graphs shown in *Figs.* 3 and 4 were drawn.

With a wing loading of about 10 lbs. per sq. foot it was found that the weight of the aircraft bore a constant relationship to the h.p. of the engines *Fig.* 3. From this the rate of climb can be calculated, whilst *Fig.* 4 shows the rate of climb with a glider weighing, say, 1,100 lbs.—the equivalent of a two-seater. The same graph shows also what would be the rate of climb were two similar gliders in double tow, using an engine power throttled bacl to 20%. It also shows what would be the speed if an aircraft on one engine were towing a glider train of 3 gliders.

From a study of the relationships between rates of climb in relation to engine power, it is clear that a power of at least 400—500 h.p. is required for constant use.

V. B.

GROUP CAPTAIN E. I. MOLE.

(*Continued from page* 11).

The second concerns a Dakota pilot, also on tug flight. On slipping the glider the pilot is said to have heard "all the rivets ease off, making a creaking noise as they went back to place" Well, it makes a good yarn for a bright officers' mess and a glass of beer, but unfortunately for the tale is quite divorced from fact.

Group Captain Mole made one striking remark. He said that sailplane flight compared with flying in orthodox power-driven aircraft is all the difference between sailing a racing yacht and coming up the Thames in a barge. He also expressed his confidence in the future of soaring as a sport and also in a soaring plane equipped with something like a modified 10 h.p. car engine which could be cheaply produced and confer the advantages of being able to select direction and choice of air-currents. At 38 years of age, Group Captain Mole retains all the enthusiasms of a boy of 12 for flying and he must be graded as one of the many who regard the future of aviation as a star in the ascendant.

VISIBLE THERMALS.

(*Continued from page* 13).

at about 200′—300′ to the lee of this fence, and at about the same height. When conditions are right they cruise up and down exactly as if ridge-soaring in relation to the wire fence, and the whole thing ust looks damn silly although it works. There is nothing in the area which could set up a wave. The ground is flat, and I can only think that the mass of metal wire (there's quite a lot of weight of metal in a double apron fence x 2) heats the air as it flows through (like an electric radiator, so to speak) and gives it a temperature gradient. Again this only happens between 10 and 4.

DYNAMIC SOARING

Interesting, but a bit tantalising. One last thing I've seen, but have not quite worked out, is a kind of dynamic soaring the hawks use when they catch a good fat thermal. Their soaring circle is often a great deal less than the thermal diameter, and they make use of it by flying across the thermal, on the down-wind arc of the circle, to gather surplus speed and then gain height and by a snappy turn and a vertical climb in the upwind arc. They seem to hold this climb until they feel the thermal is leaving them behind, so to speak, and then do a fast run through the mass of the thermal again until it is time to repeat. In relation to the ground I suppose it is like this and the duration of each loop is the time it takes for the thermal column to pass a point on the ground (see *Fig.* 4). I can't be sure, but I have noticed the climb is colossal, and by the action of the tail and wing feathers, one can see the "climb-on-surplus speed" is deliberate.

Well, that's that, and I hope it shows the bug still bites, even though it is more than four years since I had a ride. I hear the old Kite gets an airing now and then, and I hope we manage to keep her out of the hands of the A.T.C., at least until I see her again.

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The Windak suit in use . . No. 4

Letter from a rear gunner

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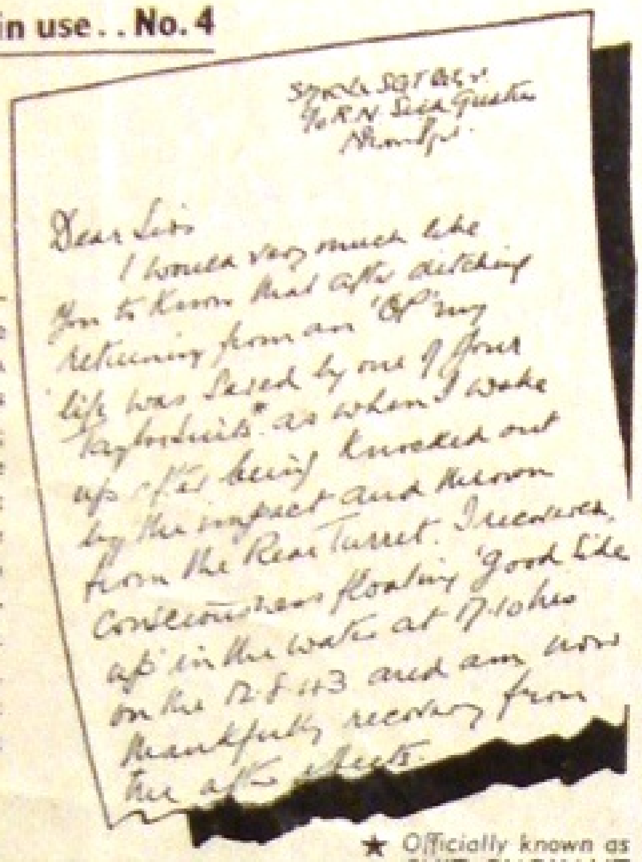

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