RECOGNITION AIR TRAINING CORPS GAZETTE CALENDAR

FEBRUARY 1943

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

KEY

1. Bell Airacobra.
2. Fairey Seafox.
3. Gloster Gladiator.
4. Fiat C.R. 42 Freccia.
5. Heinkel 115.
6. Handley Page Harrow.
7. Heinkel He. 111K5a.
8. Focke-Wulf Fw. 187 Zerstorer.
9. Avro Manchester.
10. Hawker Hind.
11. Airspeed Oxford.
12. Fairey Albacore.
13. Dornier 17.
14. Douglas Boston 1.
15. Curtiss Kittyhawk 1
16. Henschel Hs. 126.
17. Fairey Battle.
18. Fiat C.R. 32.
19. Focke-Wulf Fw. 200K Kurier.
20. Hawker Hurricane IIc.
21. Fiat G. 50 Falcho.
22. DB-3.
23. Fieseler Storch.
24. Consolidated Liberator.
25. Fiat B.R. 20 Cigogna.
26. Hawker Henley.
27. Bristol Beaufighter.
28. Consolidated Catalina.

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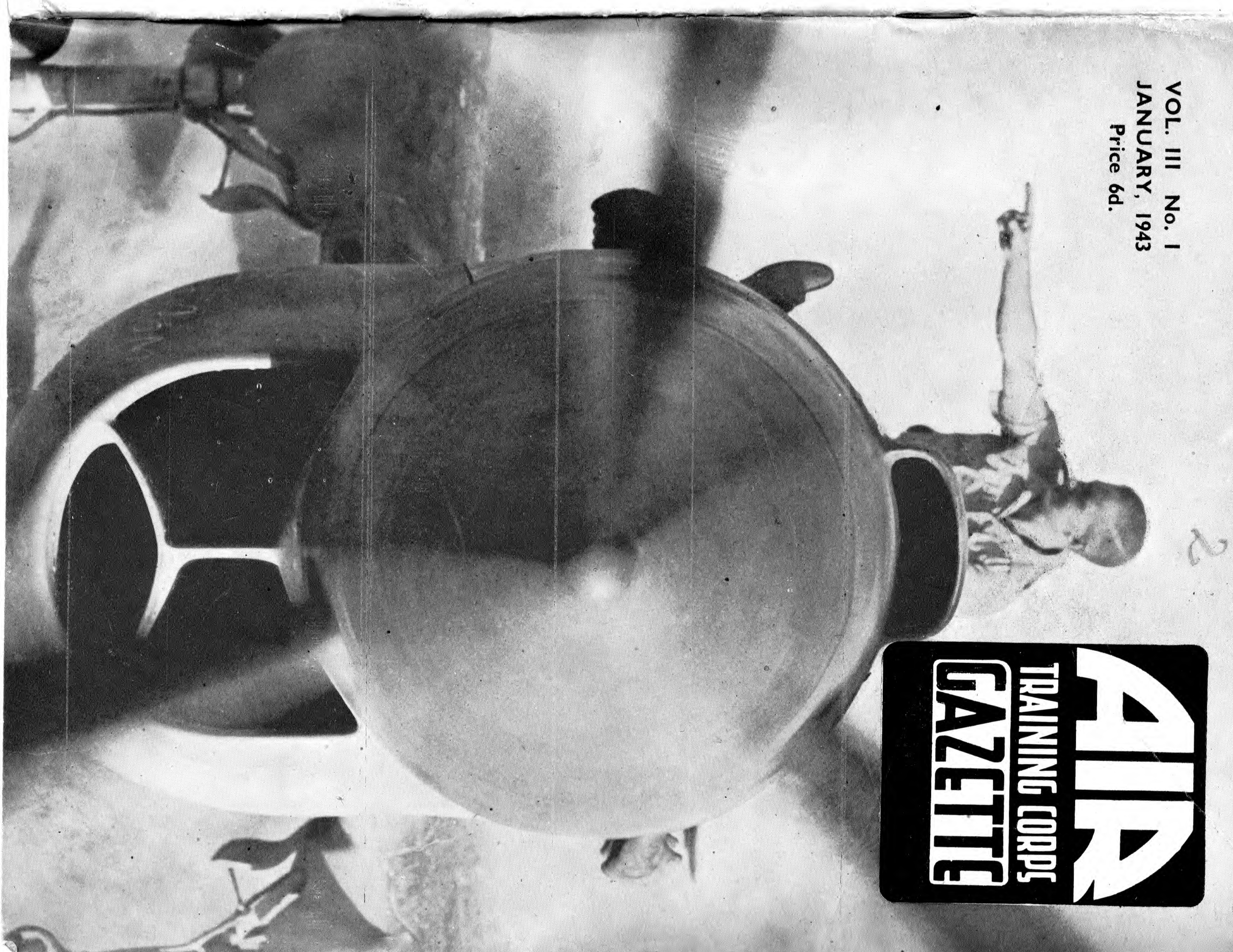
AIR TRAINING CORPS GAZETTE



The new Spitfire has radiators under both wings and a four-bladed airscrew to absorb the extra power of the new Merlin LXI engine. Cockpit cover, leading edge of wing, and nose have been slightly modified. Armament in the machine illustrated is 2 cannon and 4 machine-guns, with stubs for extra cannon.

SPITFIRE VARIATIONS

The Seafire, below, is a modification of an earlier Spitfire fitted with deck arrester hooks for carrier operation. This one is also fitted with a tropical air-intake filter. Seafire's should have a good effect on Naval operations.

A Happy New Year

YES, I really mean to put the emphasis on the word "happy."

Since the reorganisation my sole work has been to see units of the Air Training Corps at training, and I am impressed at the grimness with which the training is carried out.

Naturally, we have to train seriously, because we are a Corps on whom the R.A.F. largely relies to meet its requirements in personnel, but I do feel that we might be a bit more light-hearted in our approach.

Training in the Corps is not, or should not be, a process of cramming for one examination after another. In most cases we should be content to get to a solid 100 per cent. proficiency standard, and we should be able to arrive at that standard with many pleasant deviations on the road.

"On the road" conjures up a picture of outdoor work, and I do hope that in the New Year all squadrons will take the opportunity to do as much outdoor training as possible. Map reading, navigation, aircraft recognition, star identification, signalling — even calculations —can be done in many cases out of doors, and during the winter months when out-of-doors work is less attractive we can surely make the indoor training brighter and livelier than it is to-day.

It will not be a happy New Year in the sense in which I use the wish unless we do brighten our approach to training. We are in danger of becoming rather dull sticks.

AIR COMMODORE
INSPECTOR, AIR TRAINING CORPS

Vol. III No. 1 JANUARY 1943

AIR TRAINING CORPS GAZETTE

Edited by Leonard Taylor

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A Bomb on Every Lecture

I SEND on behalf of the Air Ministry New Year greetings to the Corps and my thanks to all those who have worked so steadfastly at their various duties throughout 1942.

On behalf of the Corps I also send greetings and good wishes to all those who during 1942 have left the Corps to join the Services and are now undergoing their training in preparation for meeting the enemy. We can look back on a year of great achievement. But as well as looking back, the beginning of another year provides us with the opportunity to look forward.

In the late spring and early summer there is going to be a great National Savings Campaign called "Wings for Victory," in which the Air Training Corps will play its part. It is the title "Wings for Victory" that provides the target for us for the forthcoming year.

If we are to get victory we must deserve it. If cadets are to get their wings they must be of the quality that deserves to wear wings. Wings and victory are synonymous, for only by being in possession of overwhelming air power, over land and over sea, and with the enemy driven from the skies, can we expect to secure victory in a reasonably quick time.

What are some of the qualities required in both our aircrews and our ground crews to ensure complete and absolute victory in the air? Courage and determination, self-confidence and initiative; together with a thorough technical knowledge of the work to be done, provide a solid foundation that every airman ought to possess. This foundation the Air Training Corps can do much to develop.

The Air Training Corps is now well placed during 1943 to give greater attention to the development of individual initiative. The Corps is now well equipped and organised. Officers and instructors are becoming increasingly experienced in their work. The majority of squadrons have a good nucleus of first-class N.C.O.s and proficient cadets.

Here, then, is a golden opportunity to give cadets who are proficient opportunities to develop their powers of leadership and self-expression. I hope that officers and instructors will so arrange the work in their squadrons that opportunities for lecturing, leadership and initiative will be given to an increasing degree to the cadets themselves. For cadets to teach and lecture each other provides just that opportunity for clarity of thought and self-expression, as well as a development of confidence, which all who have to man or attend to aircraft ought to possess.

Things happen suddenly in the air, so for aircrews quick thinking is essential. To repair aircraft in out-of-the-way places, which, as operations become more mobile, will become increasingly frequent, often means improvisation. Whether in the air or on the ground, success comes to those with initiative. Initiative grows with opportunities for practice. It is the duty of the Air Training Corps to give their cadets as much practice as possible in developing initiative and quick thinking.

During the coming months many opportunities will arise continually to test the self-reliance and initiative of cadets if the effort is made. I hope that not only will commanding officers of squadrons and their officers and instructors create as many opportunities as possible for the development of the various qualities required by our cadets which I have described above, but that also cadets themselves will continually be thinking of ways in which they can become more alert in mind and quicker in perception of the task to be done.

The dullest lecture becomes lively if in the middle of it a bomb drops a few yards away. Every lecture should have at least one bomb dropped, which will test the quickness and initiative of cadets in something quite different from the subject being taught or the training being done.

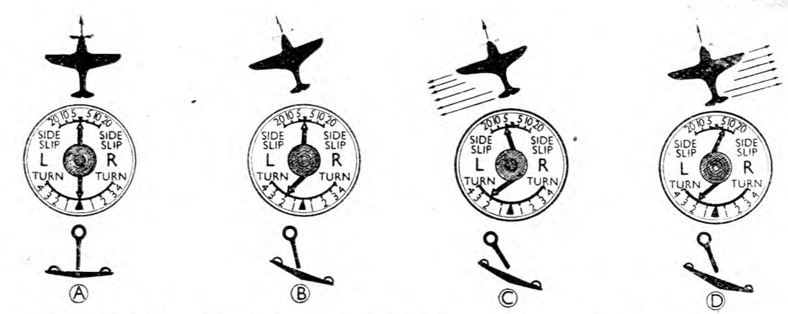
Send in your bombs to the *A.T.C. Gazette*, so that others can practise as well.

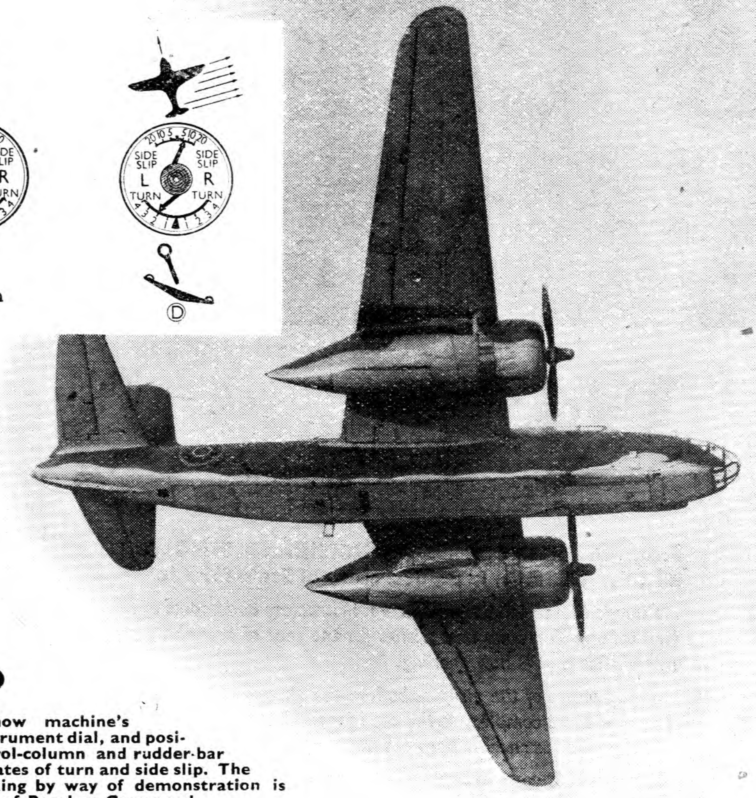
Let 1943 be a record bombing year for the A.T.C.

W. W. Wakefield

DIRECTOR, AIR TRAINING CORPS

Air Chief Marshal Sir Sholto Douglas, K.C.B., M.C., D.F.C., with Captain Harold Balfour, M.C., M.P., during a visit to the Eastern Command gliding school. Flight Lieutenant Burge, Officer Commanding the School, is seen on the right.





RATE OF TURN AND SIDE-SLIP INDICATOR

by ASTRO

Diagrams show machine's position, instrument dial, and position of control-column and rudder-bar for various rates of turn and side slip. The aircraft banking by way of demonstration is a Boston III of Bomber Command.

THE largest instrument and number six on the panel is familiarly known as the Turn and Bank Indicator, but it *does not indicate a bank*. That is the function of the Artificial Horizon Indicator. The function of the Rate of Turn Indicator is to indicate the rate of any turn made either to right or left, and whether that turn has the correct amount of bank to prevent side slip. If not, it will indicate the amount of side slip, but not the amount of bank. The term "Turn and Bank" is therefore misleading. The real name of the instrument is the "Rate of Turn and Side Slip Indicator," and it is one of the oldest and one of the most important flying instruments.

Lessons from the Ground

Everyone who has ridden a bicycle soon learns that the rate of a turn is a most important factor if he is to negotiate a bend successfully. As there are no walls in the air to bump into if a turn is done too quickly, and no road surface to skid on, one is apt to imagine that an aeroplane cannot skid. Yet it is as easy to skid an aeroplane in a turn as it is to skid a car or bicycle round a bend. At Brooklands Racing Track the bends are steeply banked, so that cars can negotiate them at high speeds. The bank is so steep that a man cannot walk up it unaided, and yet cars have shot over the top because their rate of turn was too high for the bank. On the other hand, if a racing car should have a fairly low rate of turn on the bend, it would slip down the bank.

This analogy is not perfect. A better one is the roulette wheel and ball.

Judging in the Air

It must be clear from this that in flight, owing to the lack of "feel" in the cockpit, the amount of bank (or inclination of the wings to the horizontal) must be impossible to judge, and yet if an aeroplane is turning fast and banks too little it will skid outwards, and if it is turning slowly and banks too much it will skid inwards, just as any other vehicle. The only way to determine whether an aeroplane is correctly banked or not, for any rate of turn, is to have some means of indicating this skid or side slip.

The Rate of Turn Indicator not only shows this, but, by simple pointer movements, whether the aeroplane has the right amount of "bank" for any rate of turn. To prevent an aeroplane skidding while turning, the wings are inclined towards the centre of the turn; the amount of this being read directly on the Artificial Horizon Indicator and indirectly on the Rate of Turn Indicator in the form of side slip.

Diagram A shows the reading of the Turn Indicator for level flight. The upper (side slip) pointer and the lower (turn) pointer are both at zero, while the rudder bar and control column are also central. B shows the same aeroplane doing a fairly fast turn; the amount of bank required for the particular rate of turn, shown at the bottom dial, is not indicated, but as the top pointer is at zero, bank must be correct, as there is no side slip. The indicator is therefore reading a correctly banked number two turn. C shows the same rate of turn with too much bank. Like the car at Brooklands, the aeroplane is too steeply banked for the rate of turn, and is therefore slipping inwards towards the centre of the turn, as shown by the arrows. If this bank is excessive, it will cause loss of control or of tactical advantage during combat. To correct this, the banking angle is either reduced by the ailerons or the speed of the turn is increased. This requires much skill and practice, and is part of the art of flying. D shows the same rate of turn with too little bank and the aeroplane skidding outwards; it is the same as the motor cyclist going round the bend too fast and not leaning over far enough to counteract the skidding tendency. It is the same thing which caused the driver to shoot over the top of the bank at Brooklands. It is equally a disadvantage in aerial combat.

How They Work

The Rate of Turn and Side Slip Indicator is actually two separate instruments in one. The bottom or turn pointer is operated by the inertia of a gyroscope. The top or side-slip pointer is a pendulum and is acted on by two forces—gravity and centrifugal force. In a correctly banked turn, the resultant of the components of these two forces is zero, and is indicated by the side-slip pointer remaining at zero. At C the force of gravity is the greater, and so the pendulum swings inwards; at D the centrifugal force is the greater, and so the pendulum swings outwards. The side slip indicator will also show if the aircraft is flying one wing low in straight flight, by seeming to move towards the low wing.

With practice the correct bank for any rate of turn becomes almost a reflex reaction to the indication of the Rate of Turn and Side Slip Indicator.

BOOKS ON INSTRUMENTS

The Observers Book on Aircraft Instruments. W. J. D. Allan. Allen & Unwin. 2/6.

Aircraft Instruments. J. Riley. N.A.G. Press. 1/6.


1943 New Year Greetings 1943

From the Air Council

From the RT. HON. SIR ARCHIBALD SINCLAIR, BT., K.T., C.M.G., M.P., Secretary of State for Air.

I should like to send to all officers, instructors and cadets of the Air Training Corps my best wishes for the year of new and great possibilities that is now opening.

As the duties of the airman, both in the air and on the ground, grow ever more complex, so the need for full and diligent training as the one key to success becomes more pressing.

In the A.T.C. you are laying a great foundation for the responsibilities that you will be called upon to discharge in the R.A.F.

Work hard, train hard, in 1943. You have the spirit and the skill. The goal your efforts will achieve becomes steadily more apparent.

★

From AIR CHIEF MARSHAL SIR CHARLES F. A. PORTAL, G.C.B., D.S.O., M.C., Chief of the Air Staff.

I send warmest greetings for the New Year to all officers, instructors and cadets of the Air Training Corps.

The R.A.F. is already feeling the benefits of the training which the A.T.C. gives its members. I hear excellent accounts of the way in which former cadets are acquitting themselves in the training schools and in active operations.

I congratulate you on an excellent year's work, and I am confident that you will show the same enthusiasm and efficiency in 1943.

★

From AIR MARSHAL A. G. R. GARROD, C.B., O.B.E., M.C., D.F.C., Air Member for Training.

In sending my warmest New Year greetings to all ranks of the Air Training Corps, I want to emphasise the importance of the highest possible standard of individual efficiency. This is one of the things that makes service in the Royal Air Force so absorbing; there is always something fresh to learn and the more thoroughly you have mastered your job the more completely will you prevail over the enemy when you meet him. You have the great satisfaction of knowing that it all depends on you.

Equally important is the team spirit. All your efforts are made as a member of the Service to which you belong.

So let your New Year resolution be that you will strive your utmost to increase your own efficiency in order that you may raise still higher the standard of the Air Training Corps and later of the Royal Air Force.

★

From the Commandants

From GROUP CAPT. THE DUKE OF HAMILTON AND BRANDON, P.C., A.F.C., Commandant for Scotland

Scotland greets all A.T.C. cadets, past and present. Wherever you are we wish you a very 'guid New Year. Your achievements are our reward.

★

From AIR COMMODORE THE MOST HON. THE MARQUESS OF LONDONDERRY, K.G., P.C., M.V.O., Commandant for Northern Ireland.

1943 opens for the A.T.C. with very bright prospects. The progress which has been made has been due in the main to the enthusiasm by which this great movement has been supported by the cadets themselves showing everywhere a real determination to make themselves efficient aircrew members.

The R.A.F., whose splendid record is on everybody's lips, have need of reinforcements from the A.T.C. to carry on the splendid work which has been responsible for maintaining the British Empire, at one time alone and unaided, as the bulwark against the Nazi doctrine of world domination.

I send the A.T.C. my greetings for the New Year.

From GROUP CAPT. G. B. BAILEY, D.F.C., Commandant for Wales.

Officers and cadets—greetings and good wishes for 1943. Best thanks for past efforts and co-operation. The future will bring its own reward if we merit it.

★

From AIR CHIEF MARSHAL SIR W. G. S. MITCHELL, K.C.B., C.B.E., D.S.O., M.C., A.F.C., Commandant for London.

Now is the time to put on that extra sprint in training. The R.A.F. is relying on you. Best wishes to everyone in London Command, past and present, wherever you are.

★

From AIR COMMODORE SYDNEY W. SMITH, O.B.E., Commandant for North East.

We send warmest greetings and best wishes for the New Year to all readers of the Air Training Corps Gazette.

★

From AIR COMMODORE W. J. Y. GUILFOYLE, O.B.E., M.C., Commandant for North West.

Good luck and every happiness for the New Year to all ranks. The many new squadrons now being formed in the North West greatly encourage us and show that our youth has the right spirit.

★

From GROUP CAPT. J. A. C. WRIGHT, A.F.C., T.D., D.L., M.P., Commandant for Midlands.

As the Air Training Corps approaches the end of its second year, the original cadets are now passing into the Royal Air Force in an ever-growing number. Our task in the coming year is to replace these pioneers, and to train their successors so that the already proved worth of the Corps becomes its established tradition.

From GROUP CAPT. T. W. C. CARTHEW, D.S.O., K.C., Commandant for Central Command.

Greetings and sincere thanks to all who have helped the A.T.C. in my Command during 1942. I am grateful to all ranks of the R.A.F. for their co-operation.

Many new problems have arisen, but, in the main have been successfully overcome; and I think we are entitled to paraphrase the famous sentence and say "we are going forward together."

★

From GROUP CAPT. C. F. GORDON, O.B.E., M.C., D.F.C., Commandant for South East.

The record of my Command in 1942 has been one of steady and happy progress. Officers, cadets, A.T.C. instructors and committeemen have combined in their efforts to make the Show go. To all our friends and helpers, whether in uniform or not, I wish the best of luck in 1943.

★

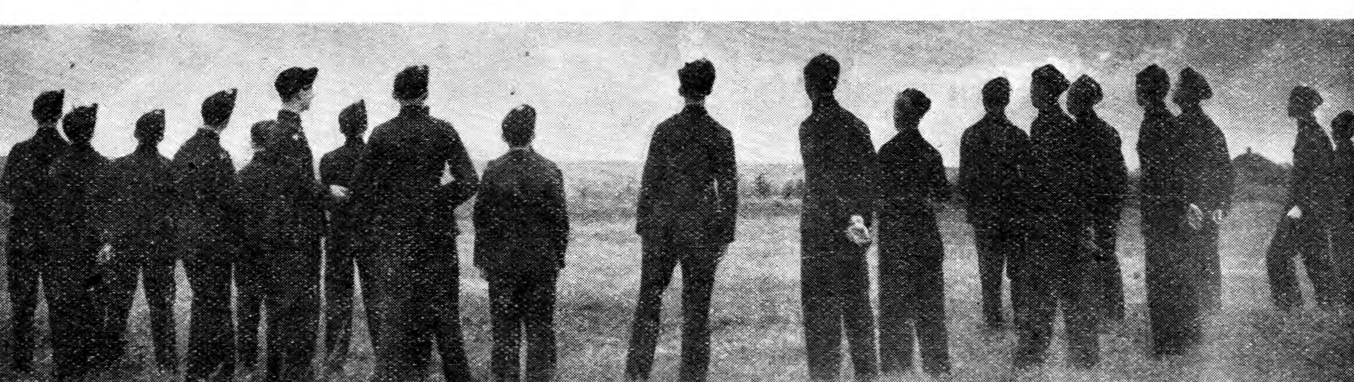
From AIR COMMODORE H. P. SMYTH-OSBOURNE C.M.G., D.L., Commandant for South West.

Very best wishes to all officers, cadets, instructors and committee members of the A.T.C., especially those in the South West Command. Good progress was made in 1942, but we must go forward to achieve even better things in 1943 for the good of the Corps and the R.A.F., thus helping to speed the day of victory.

★

From AIR MARSHAL SIR P. H. L. PLAYFAIR, K.B.E., C.B., C.V.O., M.C., Commandant for East.

Good luck to all members of the Air Training Corps in 1943. I feel sure that great things lie ahead.




FLYING OVER THE MEDITERRANEAN

CAPTAIN NORMAN MACMILLAN *says "the pilot who has never known the Mediterranean has not fully graduated in his flying education."*

TAKE a map of Europe, and you will find that the German hordes look out on the Bay of Biscay, the English Channel, the North Sea, the Norwegian Sea, the Arctic Ocean, the Barents Sea, almost upon the White Sea, on Lake Ladoga, the Sea of Azov, the Black Sea, and the Mediterranean with its numerous subsidiary basins. From the Barents Sea to Rostov on the Sea of Azov, from the Black Sea to the Aegean Sea behind Turkey, from the Mediterranean to the Atlantic across France, the Germans man (in straight lines) 2,000 overland miles. The coast which they must defend, even when measured along straight lines crossing the mouths of the Tyrrhenian and Ligurian Seas and other indentations, measures three times as many miles. Apart from the small neutral territorial strips along the Pyrenees and the frontier of Turkey, the land front is held by Russia. Britain and America hold an aquatic front; the operations in Africa were designed to eliminate a salient in that front. When Hitler's armies lose all hold in Africa, the aquatic front will be complete. Possession of the North African coastline from Algeria to Syria will give Britain and America the salient needed to turn the aquatic war into a territorial war. Thorough knowledge of the geography of the Mediterranean is therefore a matter of great importance to all aircrews and prospective aircrews.

The Middle Sea

The word "Mediterranean" is of late Roman origin. It means "sea in the middle of the land." The Germans call it the *Mittelsee*. Its shoreline measures 14,000 miles. Its waters lap the three continents of Europe, Africa and Asia, and are almost tideless, a factor of great importance in seaplane operation, for it means that launching is equally easy all round the clock.

From the air point of view the Mediterranean may be divided into three basins, the outer basin lying west of Sicily, the central basin west of Crete. Most of the Mediterranean islands are in enemy hands; exceptions are Cyprus and Malta held by Britain, and the Balearics held by Spain.

Geographically the Mediterranean Sea begins at 6 degrees west longitude, where the bar which marks the entrance runs from Cape Trafalgar to Cape Spartel, a distance of 27½ miles. This bar is 650 feet deep, but it is high enough to cut off the deep and cold waters of the Atlantic, and this is responsible to a great extent for the characteristic climate of the greatest inland sea, whose deepest point, in the Ionian Sea, sounds to a depth of 14,500 feet. What have sea depths to do with flying, you may ask. We say that aircraft have a ceiling. We may equally say that submarines have a floor, below which they may not safely pass. The depth of water, therefore, plays a considerable part in the operations of submarines. The tale of the submarine in this war is not yet told, but in the last war submarines often escaped detection and destruction by submerging and sitting motionless upon a sandy sea-bed, until the searching craft went upon their way. But the Mediterranean is not kind to submarines. Its clear waters are favourable to search from the air, its depths make the anti-submarine bomb a missile to be feared.

The eastern end of the Mediterranean lies on longitude 36 degrees east, with the end of the Gulf of Alexandretta jutting 10 minutes farther east.

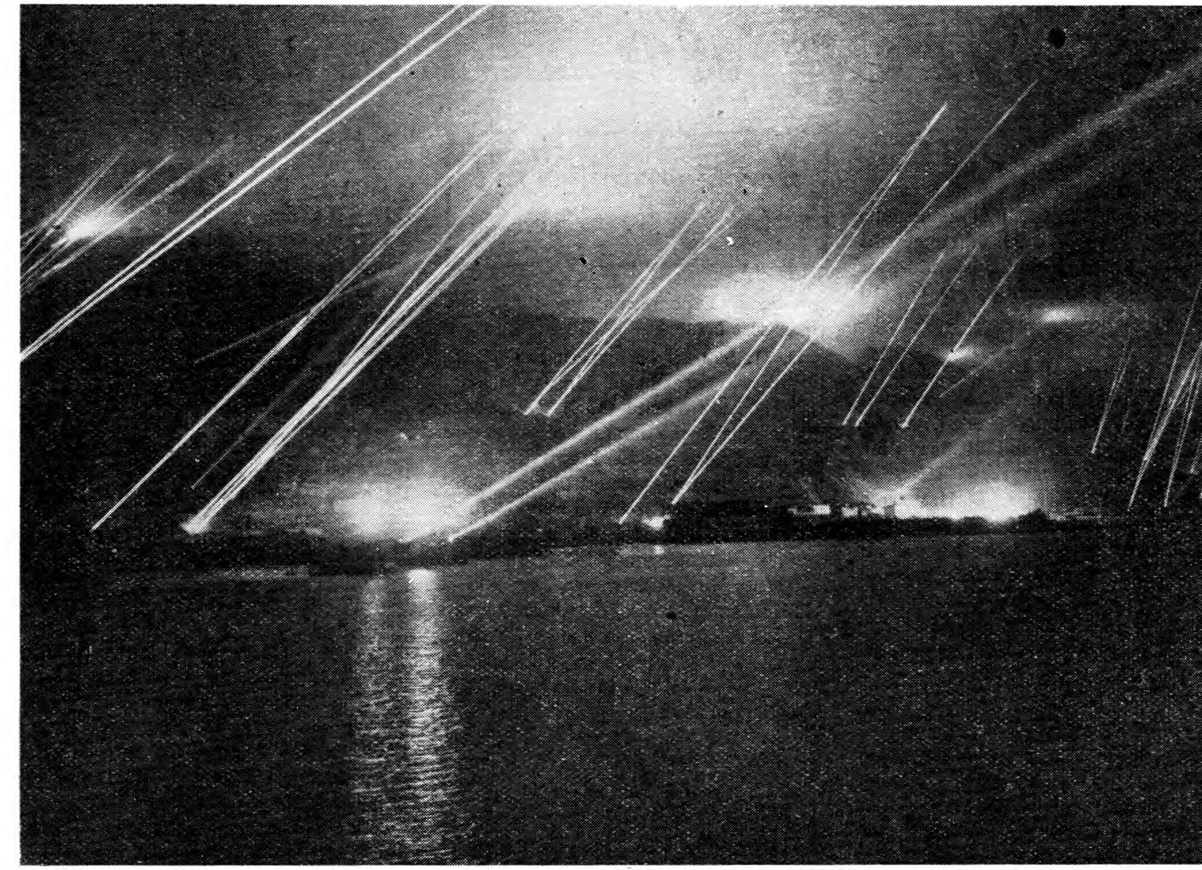
The length of the Mediterranean is approximately 2,100 miles, and its area is roughly a million square miles.

The central basin is the widest, reaching from 30½ degrees north latitude at El Agheila to 45½ degrees north latitude at the head of the Adriatic—a straight-line distance of 1,036 miles.

Italy and Sicily, Greece and Crete stretch like two broken bridges across the Mediterranean. The breaks are shorter between Italy, Sicily and Tunisia; and here again, at about the same depth as at the western entrance, is another bar, part of the broken bridge. The shortness of the missing span makes Tunisia again to-day the most important strategic point upon the North African coastline, just as it was in the time of Carthage. There are the best harbours on the whole south coast between Gibraltar Strait and Alexandria. This key-point of the central south Mediterranean is close enough to Sicily to enable a short-range fighter screen to operate over Italian territory.

Bomber attack has proved again and again to be essential to the success of current surface-force mobility. And, so far, no weapon has ousted the short-range fighter for day defence against bomber attack. When bombers are opposed by short-range fighters they require short-range fighters as escorts to clear the sky for them. The only exception has been the sub-stratosphere bomber, which, suitable for operations against fixed targets such as ports, factories, railway centres, aerodromes, is not readily applicable to bomber attacks against mobile ground forces; against the latter the low-flying fighter-bomber, the dive bomber and the medium bomber have been more effectively used. The low-flying fighter-bomber, the dive bomber and the medium bomber are ordinarily short-range aircraft. This emphasises the importance of geographical planning in relation to the strategy of surface attacks.

The Mediterranean.



A British official photograph of Gibraltar at night, with many searchlights piercing the sky above the Rock.

Ranges

What is the limit of oversea attack against a strongly defended coastline? The landings in Algeria and Morocco are not a true guide, for the French were not enemies, like the Axis forces, and they were previously promised the complete restoration of the greatness of France.

You remember the Dieppe raid? The over-water distance there was 65 miles. Ninety miles separate Sicily and 120 miles Sardinia from Tunisia. Fighter defence must meet fighter escort at these ranges. Undoubtedly air fighting, bombing and counter bombing in this zone can be severe.

What is the Mediterranean like as a flying area? Well, the answer is, variable. The climate ranges from hot, dry and dusty to cold and wet. Even in midsummer it can be cold in the desert at three o'clock in the morning. I have had to get up and run about to get warm after sleeping out under my aircraft in the desert in midsummer.

Several abnormal winds blow within the Mediterranean area. The khamsin is a hot south or south-east Egyptian wind which blows for about 50 days in March, April and May; its name comes from the Arabic *khamsun*, meaning fifty. There is the simoon (called by the Italians the sirocco when it reaches Italy), a hot, dry and dusty narrow-track wind that blows out of the desert, but which may bring rain to Italy in winter. There is the mistral, the peculiar wind that rises in the Alps and which blows down the funnel of the Rhône Valley at an almost constant speed of between 40 and 60 miles an hour; it blows in periods of three days: if it passes the third day it lasts for six, and if it passes the sixth it persists for nine. I have known it laden with centipedes and other insects in the area of the Bouches du Rhône. There is the cold, winter gregale (or Greek wind) of Malta.

There are high mountains in the Mediterranean area. The Sierra Nevada of Spain towers to a peak of 11,420 feet 23 miles from the coast; only the Alps rise higher in all Europe. The coasts of Morocco, Algeria and Tunisia are rock-bound and forbidding; inland rise bleak mountain ranges; the harbours at Oran and Algiers are artificial. Pantellaria Island rises to 2,743 feet. Calabria, the toe of Italy, boasts the Aspromonte, 6,420 feet above sea-level, but it is an 18,000-ft. mountain when measured from the sea-bed. Greece is a mountainous country, and one of the bumpiest regions of the world in summer; but there is no sight more glorious from the air than the rock-walled Gulf of Corinth, a colour marvel of blue, green, violet and purple under an azure sky when the sun is high. But it is not always possible to admire beautiful scenery from the air. Capt. A. S. Wilcockson, the civil master pilot, told me that once he passed over Corsica at about 15,000 feet, thinking he was in calm air, for he was far above the highest point of the island, Monte Cinto's 8,880-feet summit, when he met a bump that shot him upward almost out of control for 1,500 feet. Over Vesuvius I have been rocked and bumped severely. On one occasion a seaplane was caught in the down-draught from the cliff-face of Gibraltar, whose highest point is 1,396 feet, and forced into the sea. Such an occurrence is rare. Usually geostrophic winds are cushioned close to the surface, so that there is room to level out and recover from the worst of them. But flying in the Mediterranean holds surprises which add to air experience. Indeed, the pilot who has never known the Mediterranean, with its vagaries of winds and thermal currents, warmth, wet, drought, dust, cold, insects, flat lands and mountains, has not fully graduated in his flying education.

Geoffrey de Havilland

Aerobiographies VII
by C. G. GREY

FEW men in British aviation deserve the nation's thanks so well as does Captain Geoffrey de Havilland. Yet he is so retiring by nature that he is little known as an individual, although the D.H. series of aeroplanes have world-wide fame. All his friends call him D. H., just as all Sir Alliott Roe's friends call him A. V.

D. H. was a real engineer before he took to aviating. He began experimenting in 1908 near Newbury (Berks), with a home-made biplane, and it flew. His chief collaborator was F. T. Hearle, a director of de Havilland's. D. H. was one of the first aeronautical engineers to be employed at the Royal Aircraft Factory at Farnborough, which just before had been the Army Balloon Factory. It is now the Royal Aircraft Establishment—the name was changed to prevent confusion of the initials with the Royal Air Force.

The Experimentals

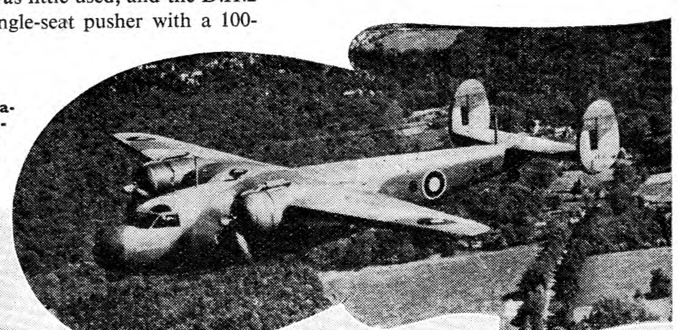
At The Factory, as it was always called, he designed and supervised the building of the B.E. series of biplanes. B.E. stood for Bleriot Experimental, because they had tractor screws—The Factory's other type was called the F.E., which stood for Farman Experimental, because they were pushers. Later, officially, B.E. stood for British Experimental and F.E. for Fighter Experimental—a clever get-out, which was confirmed by calling the next series S.E. for Scout Experimental, as they were single-seat fighters.

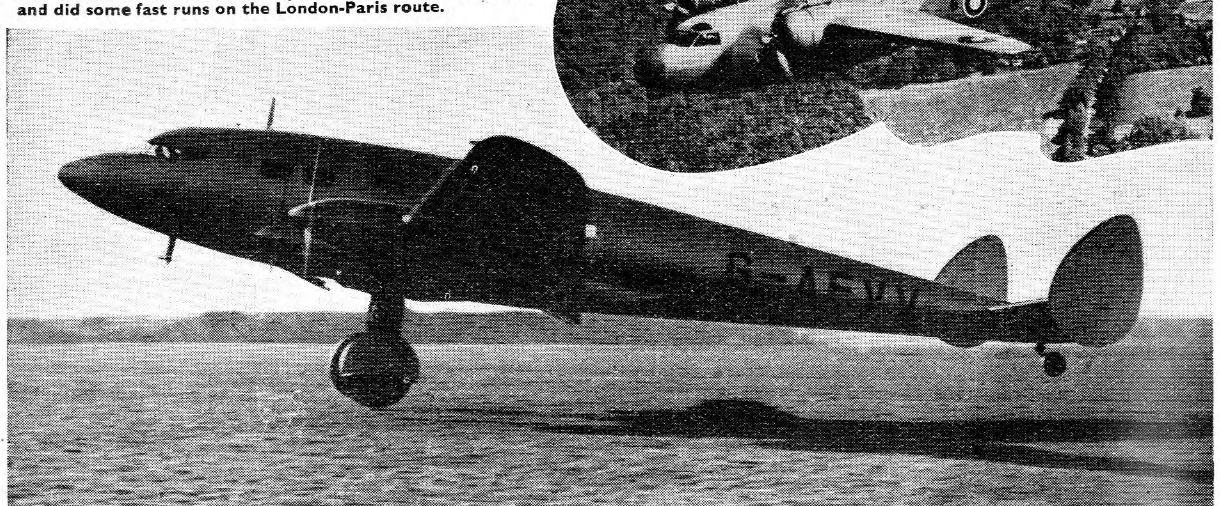
D. H. flew all his experimental B.E.s himself without damage. Most were good. In 1912 he produced the B.E.2c., which (flying outside the contest because it was a Government product) beat all other makes in the International Military Aeroplane Competition on Salisbury Plain in that year. The B.E.2c was certainly the world's best flying-machine of the time, but it was useless as a warplane, and in 1915 so many were shot down by the German Fokker fighters that they became known as Fokker Fodder. They should never have been kept in service after the beginning of 1915.

First of the Series

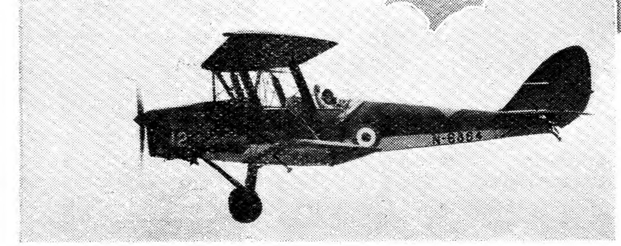
But in 1914, before war began, D. H. had joined Mr. George Holt-Thomas at the Aircraft Manufacturing Co., Ltd., at Hendon, and there the historic series of D.H. aeroplanes began. The D.H.1 was a pusher two-seat biplane with a gun in the nose; it was little used, and the D.H.2 was a little single-seat pusher with a 100-h.p. Monosoupape Gnome rotary — a wonderfully nimble little craft, well able to tackle the Fokkers, but out of date by 1917. His first great success was the D.H.4, a splendid-looking tractor biplane with a Rolls-Royce Eagle, a synchronised gun in front, and a Scarff ring, with twin Lewis guns behind. Another good 'un was the D.H. 9, which went into action first at Easter 1917. It was a smaller and lighter machine with an even better performance on a 200-h.p. B.H.P. engine designed by Captain Halford, R.F.C., later to design the Gipsy engines for D. H. D. H. also designed some twin-engine bombers, but they were not built in quantities.

After the war the Aircraft Manufacturing Co., Ltd., was bought by the Daimler-B.S.A. group, and when the slump came in 1920 it was shut down. D. H. and his faithful colleagues C. C. Walker, F. T. Hearle, F. N. St. Barbe and others, backed by Mr. Holt-Thomas again, started up the de Havilland Aircraft Co., Ltd., at Stag Lane, near Edgware, to build air-liners chiefly. Soon afterwards they were joined by Alan Butler, a rich young man who spent his money on doing things instead of playing about. And he helped the young firm to expand mightily.





The Flamingo (top), now used by the R.A.F. for communications, was designed before the war for use as a medium-sized air liner, and was ordered by Jersey Airways. One of the best streamlined of aeroplanes, the Albatross (below) was in use before the war by British Oversea Airways, and did some fast runs on the London-Paris route.



Captain Geoffrey de Havilland with his colleagues. Reading from left to right: F. T. Hearle, now Managing Director; W. E. Nixon, Secretary for 22 years; Captain Geoffrey de Havilland, Technical Director; C. C. Walker, Chief Engineer; F. E. N. St. Barbe, Business Director.

The Comet (above), winner of the England-Australia Race in 1934, bears some resemblance to the new de Havilland Mosquito. (*Flight Photo.*)

Left: The Tiger Moth.

Birth of the Moth

As the result of a gliding competition at Ilford Hill, near Lewes, in 1922, which was followed in 1923 and 1924 by competitions for light aeroplanes—organised by Air Marshal Sir Geoffrey Salmond, Air Member for Supply and Research at the Air Ministry—the D.H. Co. started to make light aeroplanes. The result was the world-famous D.H. Moth—so called because D.H. himself is a fervent lepidopterist, as a collector of moths is called.

Some years later the Moth became the R.A.F.'s standard trainer. It was followed by a stream of relations—the Puss Moth, the Leopard Moth, the Giant Moth, the Hawk Moth, the Fox Moth, the Tiger Moth, still the standard trainer, the Hornet Moth and the Moth Minor—everything except the Clothes Moth, I think. Also, there were the D.H. transport machines—the three-motor Hercules, the two-motor Dragon and Rapide and the four-motor D.H. 86. And, believe me, Geoffrey de Havilland, by no means a young man, flew every one of them. Furthermore, he won the King's Cup Race in 1933, about the most popular winner ever of that classic event.

Great Achievements

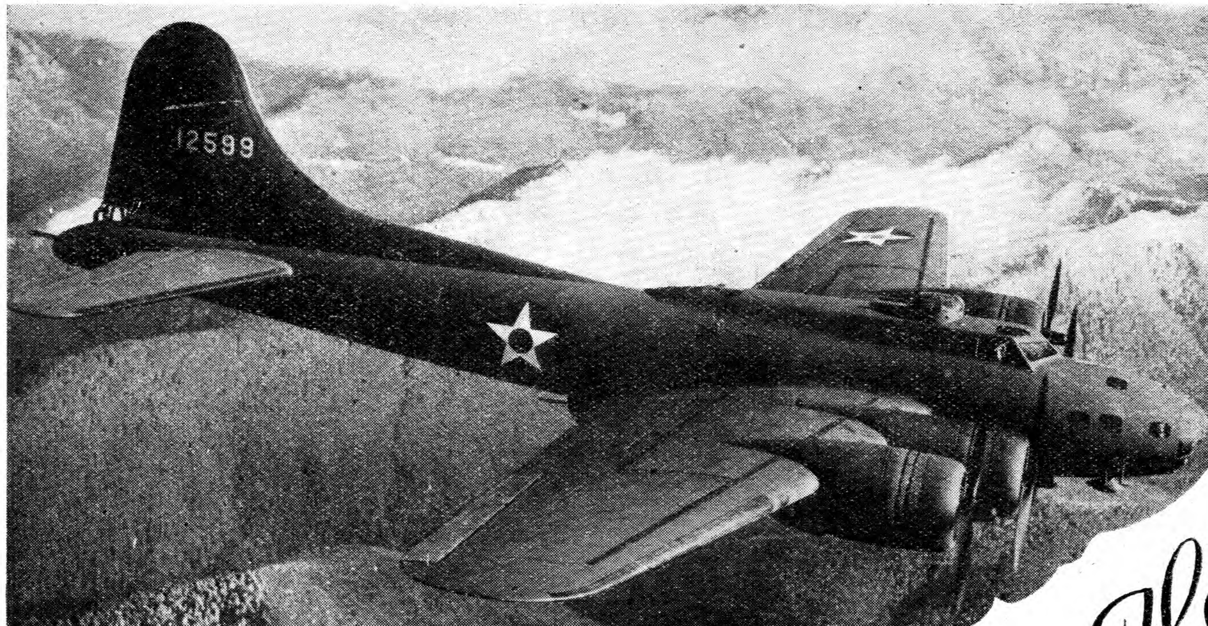
But perhaps the greatest achievement of the D.H. Co., because of its results, was the design (by Mr. Hagg) and building of the D.H. Comet, two-motor monoplane, in which Charles Scott and Tom Black won the MacRobertson Race to Australia, in 1934, flying from Mildenhall (Suffolk) to Melbourne in two and a half days. I wrote at the time that here we had the world's finest mailplane and perhaps the finest high-speed bomber. And to-day we have the D.H. Mosquito—the firm's first aircraft used in air operations since the D.H.10 in the War 1914-18.

I believe that I am right in saying that the Mosquito is one of the fastest aircraft of to-day, and one of the deadliest as a reconnaissance-bomber. It is a fitting achievement of D. H. and his loyal team

POTTED BIOGRAPHY

Captain Geoffrey de Havilland, F.R.Ae.S., Technical Director, de Havilland Co., born Woburn, Bucks, 27th July, 1882; educated St. Edmunds, Oxford, Crystal Palace School of Engineering. Built his first aeroplanes and other experimental machines 1908-11; formed the de Havilland Aircraft Co. 1920; designer and producer of light aeroplanes, including the Tiger Moth, D.H. 86, Albatross, Flamingo, Mosquito.

The FORTRESS



The Fortress is being manufactured in quantity by the Douglas Aircraft Co. and the Vega Aircraft Co. as well as by the Boeing Aircraft Co.

THE original Fortress I is an old aeroplane in comparison with our Lancasters or Stirlings. Its successor, the Fortress II, has several modifications, chiefly in the fairing of the fin into the fuselage and the increased armament. The blisters on either side of the Fortress I have gone, and are now replaced by sliding panels, behind which is a .5-in. machine-gun, universally mounted. The Fortress II carries 13 machine-guns, and must be a formidable opponent even in combat with the Fw. 190, formations of which have been routed by Fortresses on several occasions recently. The machine-guns are disposed about the fuselage, so that it bristles with them. All the guns are .5-in. calibre, except the nose size, which is .3 in.

Many may wonder why the Fortress II has a larger fin area. It is probably that the Fortress I suffered slightly from instability, which the increased fin area has remedied.

Stowing the Bombs

Bombs are stowed in the fuselage sides, leaving only a narrow catwalk between the bomb compartments. This method makes it difficult for the crew to communicate with each other physically. The bomb bays are half-way along the fuselage, between the cockpit and the radio and mid-gun compartments. The bomb doors are electrically operated by motor-driven screws. The normal bomb-load is generally about 5,000 lb., depending on the height from which the aircraft is to operate.

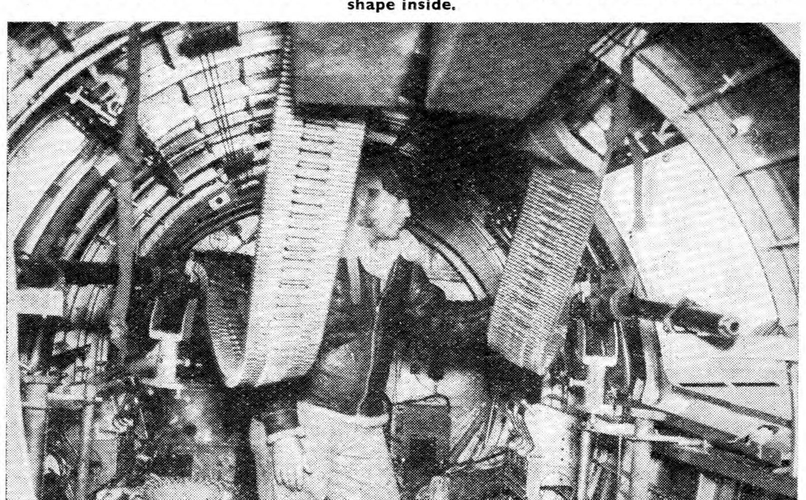
The undercarriage is retracted by reversible electric motors, and the flaps are also electrically operated.

Cockpit Layout

One of the most noticeable features of the Fortress is the neat layout of the cockpit. Dual control is fitted, and there is a separate flying-instrument panel for each pilot with the engine-instrument panel between. The automatic-pilot control is on the left in front of the captain. The compass is mounted on a separate panel above the windshield, with a clock and outside-temperature thermometer. The layout of the instrument panel is strikingly neat and compact, and, with the engine and airscrew controls, the entire cockpit layout has the appearance of a super cinema organ. There is even an ash-tray. The tail-wheel lock is fitted centrally, so that either pilot can operate it.

From inside the fuselage the cylindrical shape is most noticeable, and when you look aft the tapering stringers and formers give you the feeling that you are looking inside a submarine.

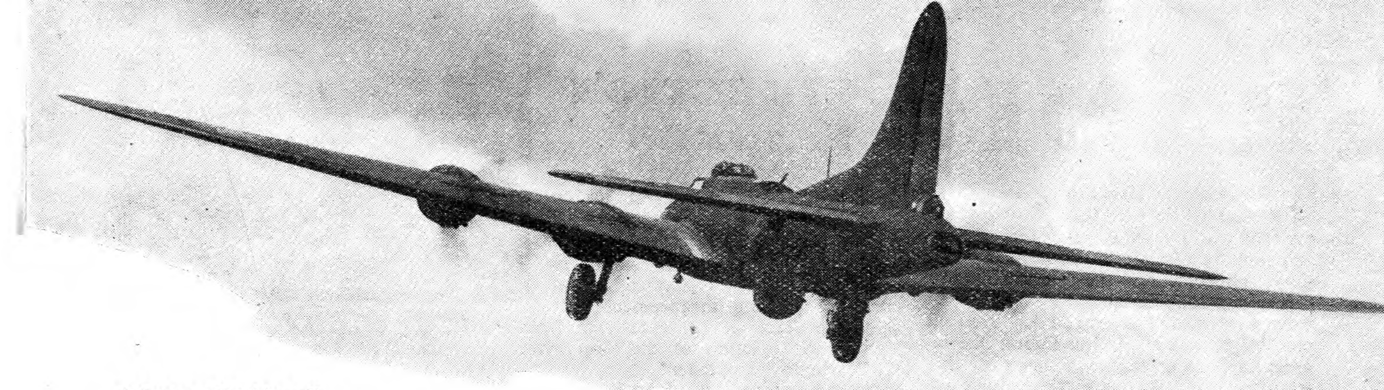
Interior view of a Fortress II, showing the 0.5-in. beam guns, which are fed from ammunition belts stored in drums overhead. The fuselage maintains its cylindrical shape inside.



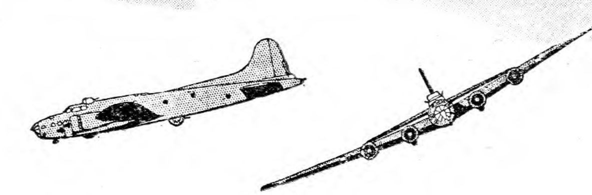
Designed for the Stratosphere

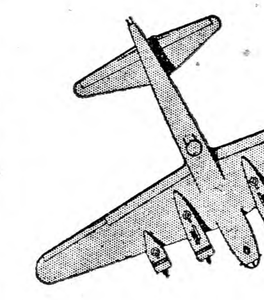
The Fortress is noticeably designed for high flying. Oxygen containers seem to be fitted into every conceivable place. In all, there are more than a dozen large-capacity oxygen containers.

The air-conditioning system is controllable from the cockpit, and hot air or cold air can be passed into the fuselage at will. The boilers are fitted to the port inboard engine, and the flow of hot air is continuous. When hot air is not required, it is spilled overboard. The air duct runs from the rear gun compartment to the front gunner's compartment. Hot or cold air-flow can be diverted to each part of the fuselage where needed.



A Fortress II taking off from a British airfield.





The Turbo-Superchargers

The four exhaust-driven superchargers are among the most outstanding features of the Fortress. These give the aircraft a ceiling up to 30,000 feet. In a turbo-supercharger the usually wasted power of the expanding exhaust gases is directed on to a bladed fan (or turbine) through a series of fixed vanes. The expanding exhaust gases striking the blades of the turbine turn it at a rapid rate. This is translated by a shaft to the supercharger, so driving the supercharger impellers, which pump air to the carburettor. The greatest advantage of an exhaust-driven supercharger over the ordinary engine-driven type is that as the atmospheric pressure decreases the difference in pressure between that inside the engine cylinders and that of the atmosphere becomes greater, so increasing the propulsive effect of the exhaust gases as they pass through the turbines. The turbo-superchargers on the Fortress I are fitted underneath each engine nacelle.

The dinghies, or, as the Americans call them, the life-rafts, are stowed just behind the cockpit enclosure. The emergency escape facilities are good. The front gunner and bomb aimer have a special escape hatch below the fuselage. The co-pilot can escape through the astro hatch, which can be jettisoned. The pilot and radio operators dive through the open bomb doors, and the rear gunners have a detachable door in the side of the fuselage.

Boeing Fortresses are being manufactured in large quantities by the Boeing Aircraft Co.; also, by special licence, quantities of them are being produced in the factories of the Douglas Aircraft Co., and of the Vega Aircraft Co., which is a subsidiary of Lockheed. They have been reaching Great Britain in increasing numbers, and have already taken part in some notable operations both in Europe and the Pacific.

One of the most notable of these operations took place on September 7th, 1942, after a raid on Rotterdam. On the return journey enemy fighters attacked one formation of Fortresses and damaged one machine. The damaged machine fired back and shot down several of the fighters. Altogether the bombers shot down twelve of the enemy fighters, and all of them returned to their bases.

On other occasions enemy fighters have been seen weaving vapour trails high in the sky while vainly searching for the Fortresses.

American ground staff bombing up a Fortress II, with bombs that are also from the U.S.A., for a trip to Occupied Europe. The Fortress bomb bay is fairly far back in the fuselage, and the doors are electrically operated.

RADIO DIRECTION FINDERS

by MAX CHARLES

THE vast wireless direction-finding system which has been built up all over the world to assist navigators in civil and military aircraft is based on a very simple phenomenon—the directional properties of a loop aerial.

Anyone who has owned or used a portable broadcast receiver knows that in order to hear a station satisfactorily the set must be rotated until the volume of the programme is at its loudest, and that if the set is turned too far the volume gradually decreases until the programme is inaudible.

This is due to the fact that the aerial of a portable receiver, instead of being suspended from a mast outside the house, is wound round the inside of the case in the form of a large flat coil, three or four inches wide and about a foot square.

Such an aerial is called a loop or frame aerial, and whether it is circular or square, as in a portable receiver, the strength of the signals it receives are greatest when the plane of the aerial is in line with the direction of the transmitting station, and least when it is at right angles.

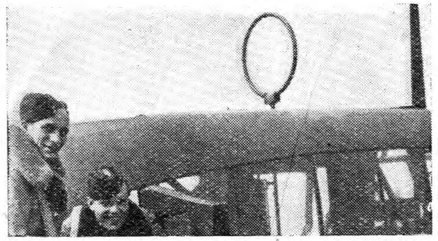
By rotating the set it is possible to get a rough idea of the direction of the station, and radio engineers have made use of this fact in designing direction-finding apparatus for aircraft and ground stations.

Control of the Loop

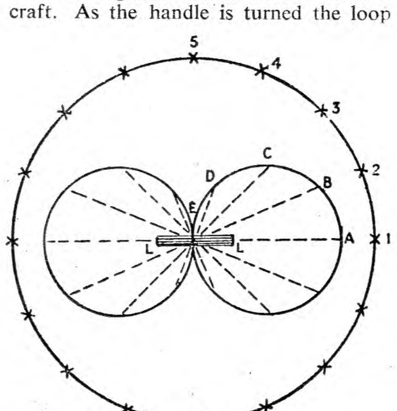
An aircraft loop aerial is pivoted on top of the fuselage and connected by a shaft to a geared handle inside the aircraft. As the handle is turned the loop rotates on a vertical axis, and the bearing of the transmitting station is read from a scale calibrated in degrees. A locking arrangement prevents the force of the slipstream from altering the position of the loop while the bearing is being taken.

In older aircraft the loop is exposed, but in the latest types it is enclosed in a streamlined fairing shaped like an egg.

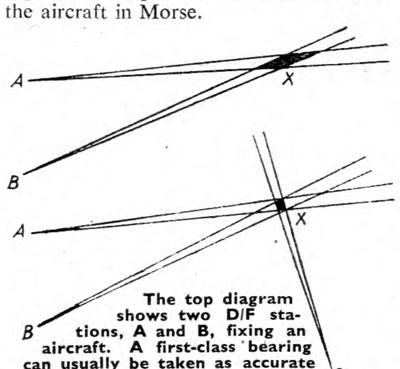
Provided both aircraft and ground station are equipped with direction-finding apparatus, each can take bearings from the other's signals, but as it is easier to operate a loop on the ground than in the air, the ground operator takes the bearings whenever possible and sends them to the aircraft in Morse.



This old-type loop aerial on an Avro Anson is operated from inside the aircraft and locked into position against the slipstream.



A Cosine Polar Diagram, so called because the signal strength varies as the cosine of the angle between the incoming wave and the plane of the loop. The loop is in the centre (LL), receiving signals from a series of equi-distant transmitters. The strength of the signals received is shown by the distance from the centre of the loop to the different points on the two smaller circles. No signals will be received from Transmitter 5 as the loop is at right angles to the incoming signals. The strengths for the other transmitters are shown by the dotted lines B C and D; A, representing signals from No. 1 Transmitter, being greatest. *(From "Radio Navigation," W. J. D. Allan.)*



The top diagram shows two D/F stations, A and B, fixing an aircraft. A first-class bearing can usually be taken as accurate within ±1°, so that the bearings are represented by two straight lines making an angle of 2°. The position of the aircraft is defined therefore by the small shaded quadrilateral. The addition of a third bearing, as shown in the lower diagram, from a third station C, increases the accuracy by reducing the area of doubt. *(From "D/F Handbook for Wireless Operators," W. E. Crook).*

For obvious reasons aircraft on operational flights maintain W.T. silence except in emergencies, and navigate by use of the D/F loop on the aircraft as far as possible.

Applying Direction Finding

There are three ways in which ground stations can do direction finding for aircraft. The wireless operator can obtain a directional bearing to assist the navigator, or a "homing course" which will lead the pilot straight to the aerodrome, or a "radio fix" which gives the aircraft's exact position.

A directional bearing is the geographical bearing in degrees of the aircraft from the ground station, and the navigator uses it to set a course or check his own calculations. A homing course is the ground station's bearing from the aircraft—the reciprocal of a directional bearing—and if the pilot steers on that course he will, after making allowance for drift, eventually arrive directly over the aerodrome.

Any ground station equipped with direction-finding apparatus will provide bearings or homing courses, but radio fixes can only be obtained from certain stations which specialise in this service.

These stations work together in groups of three, one of which acts as control and communicates with the aircraft. All three listen for the aircraft's signals and take bearings on them. As the three stations are situated some distance from each other, the bearings they obtain will differ slightly. The two sub-stations telephone their bearings by landline to the control station, where an officer plots them on a map, and the point where the three bearings cross is the position of the aircraft. This is sent to the air operator by wireless telegraphy.

In bad flying weather a combination of direction finding and radio telephony enables a pilot to land at an aerodrome which he cannot see even when directly overhead.

The ground station takes a bearing on the aircraft's signals and then sends to the air operator by wireless telegraphy a course for the pilot to steer to reach the aerodrome.

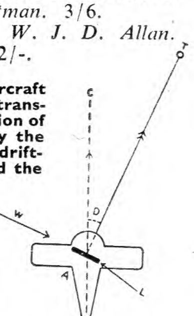
In war-time special steps have to be taken to ensure that enemy ground stations and aircraft do not masquerade as friendly ones, and operators have to be absolutely sure of the identity of a station before communicating with it.

The wireless operator of a bomber returning from a raid on Germany was trying to obtain a homing course from an R.A.F. ground station when another station interrupted and gave him a course to steer. He was suspicious of its identity and ignored its course—and it was lucky he did. The course given led straight back to Germany.

BOOKS ON THE SUBJECT

D.F. Handbook for Wireless Operators. W. E. Crook. *Pitman.* 3/6.

Radio Navigation. W. J. D. *Allan.* Allen & Unwin. 2/-.



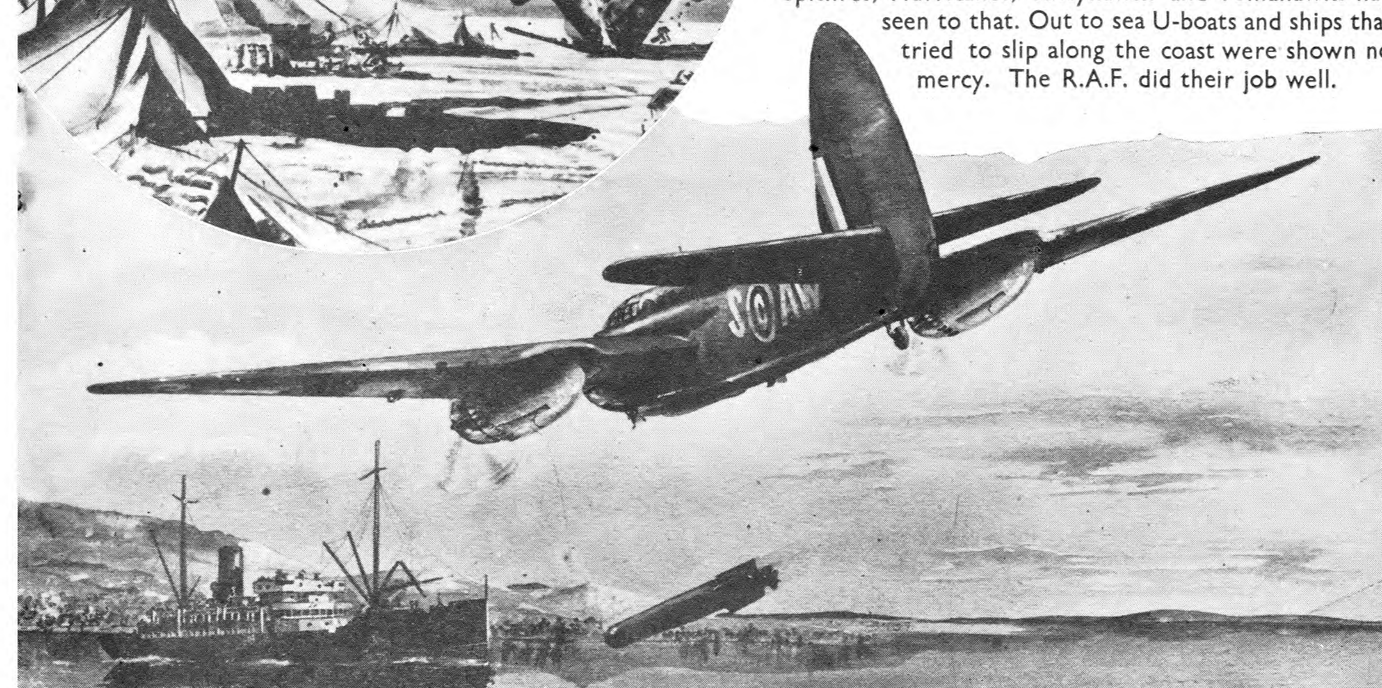
In this diagram the aircraft A is flying towards the transmitter T, and the direction of the wind is indicated by the arrow W. The aircraft is drifting 23° to starboard, and the loop aerial L has been set 23° to starboard also, so that it is only necessary for the minimum signals position to be maintained for the aircraft to keep the correct course AC in order to follow the desired track AT. *(From "Radio Navigation," W. J. D. Allan.)*

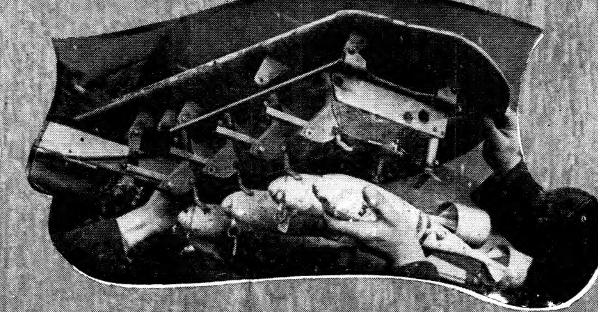
AIR WAR in the Desert

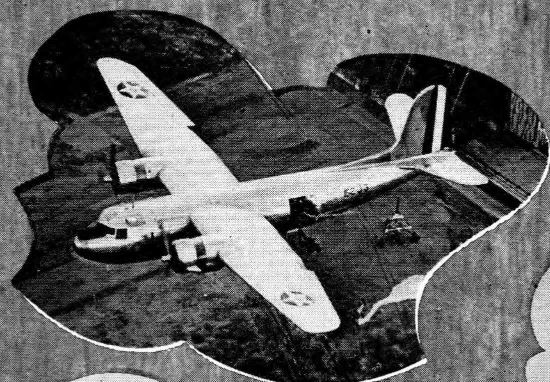
As seen by War artists

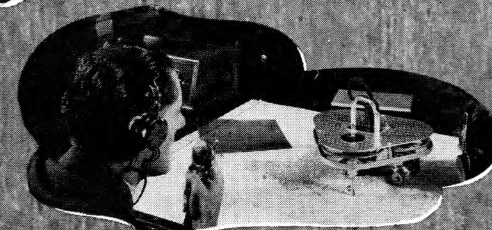
The best of Allied aircraft types, ranged in imposing strength, won command of the skies in the desert. Bombers, fighters, torpedo aircraft—British and American—attacked and beat the enemy. In the long retreat from El Alamein the German and Italian armies were bombed day and night, their lines of transport and fighting vehicles shattered and destroyed.

Officers and men of the Afrika Korps who searched the glaring skies for the Stuka umbrellas or the protecting wings of Messerschmitts looked desperately and in vain. Spitfires, Hurricanes, Kittyhawks and Tomahawks had seen to that. Out to sea U-boats and ships that tried to slip along the coast were shown no mercy. The R.A.F. did their job well.

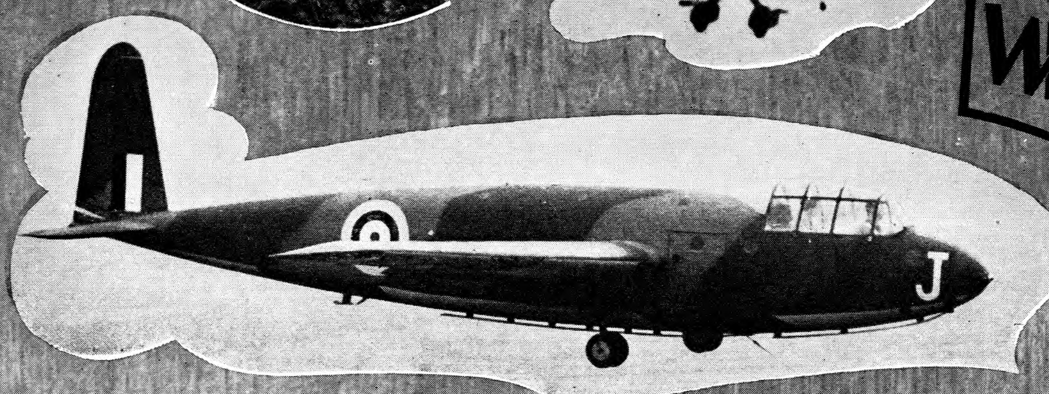


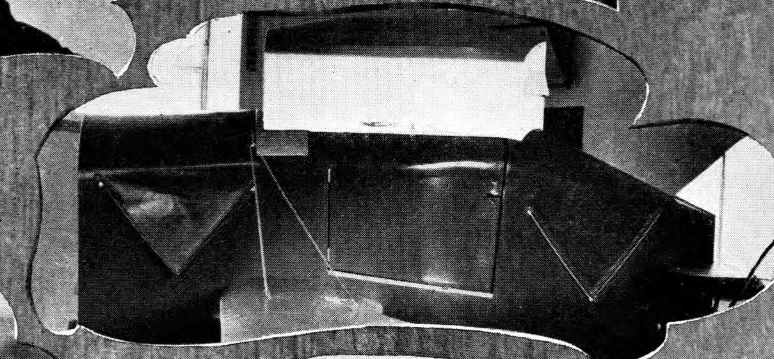


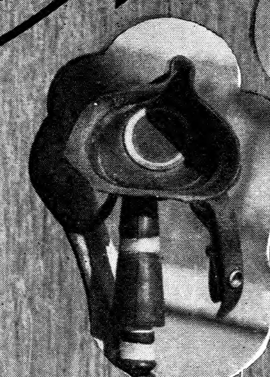


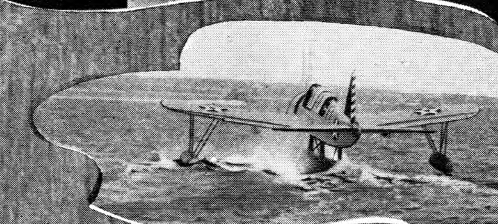


WHICH BELONGS WHERE?

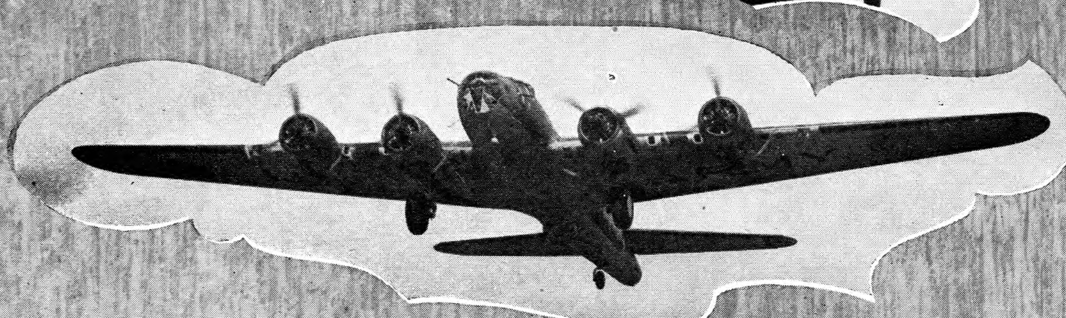


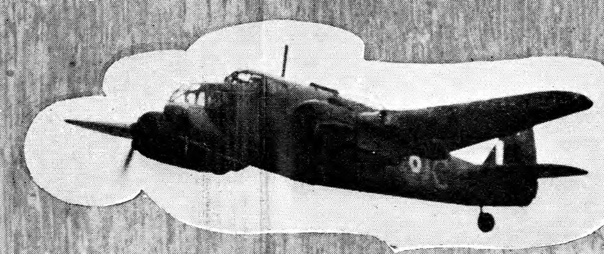


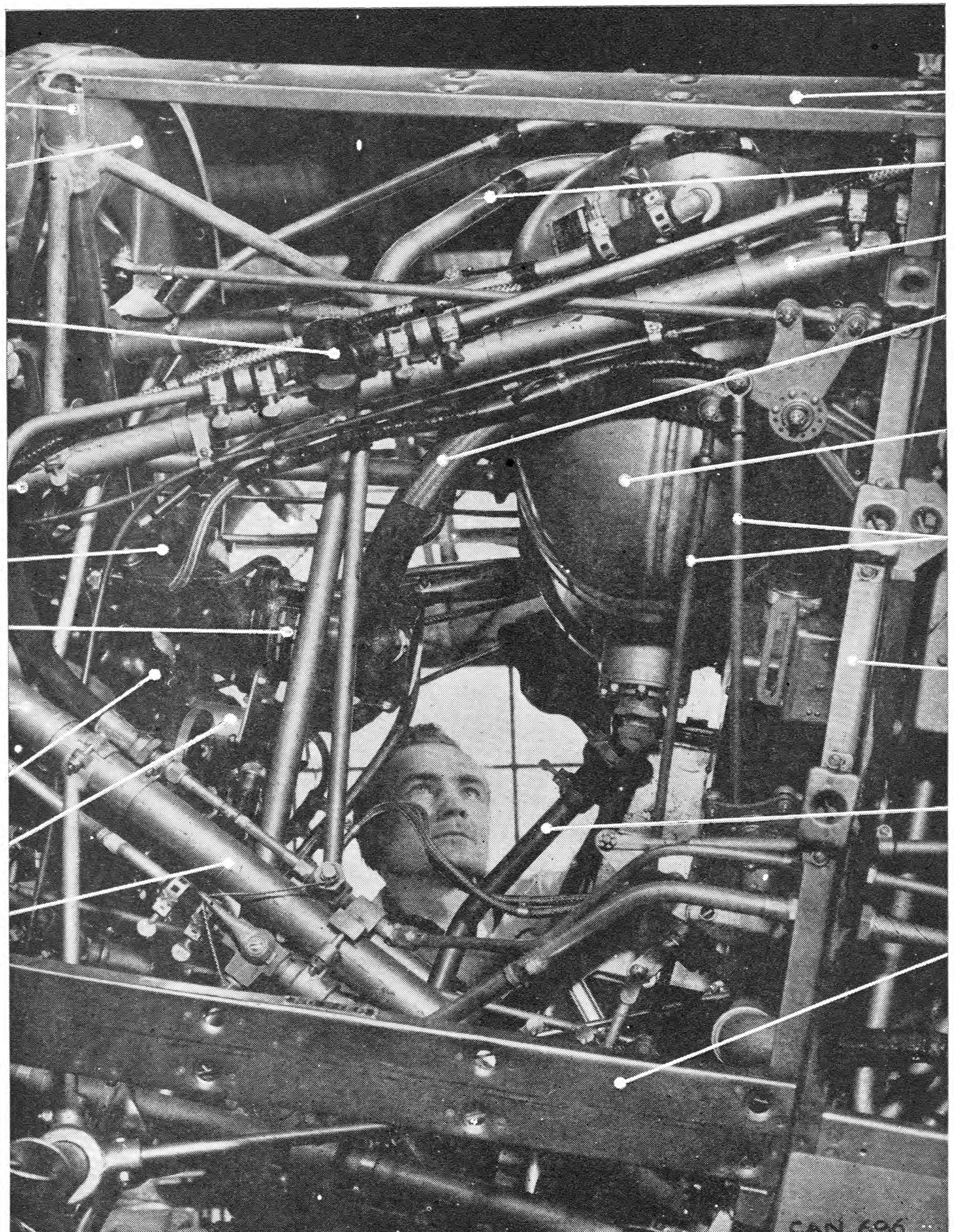




Each of these photographs has some link with one of the others, some of the pairs being cut from the same photograph. Your problem is to explain the reason for the connection. There are nine pairs and, as an extra hazard, an additional odd picture belonging to one of the pairs. (Solution on page 24.)

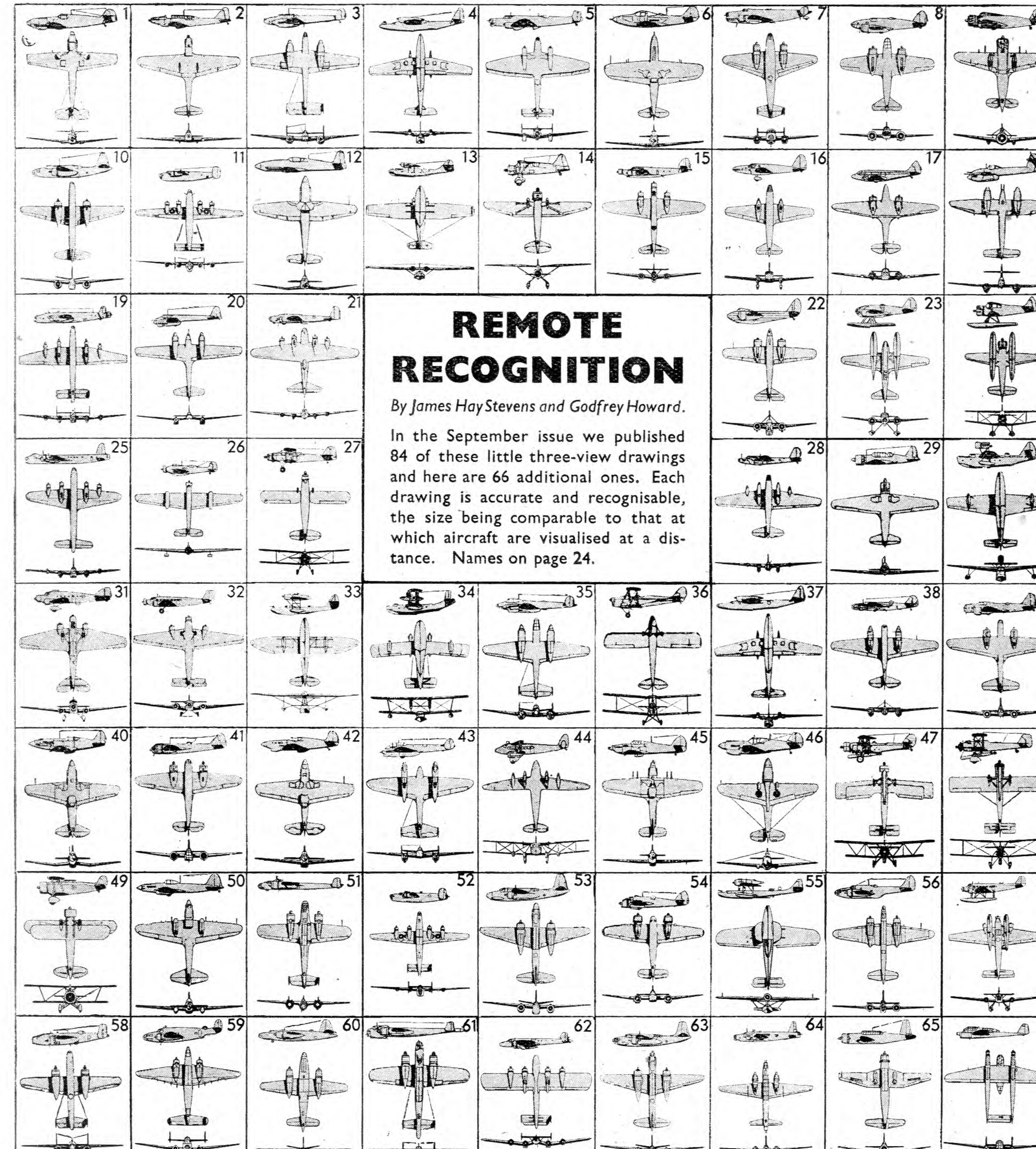






An uncovered section of the fuselage of the Harvard I! immediately behind the engine. The installation is interesting in demonstrating how space is utilized in this rarely seen portion of the cowling. It should be remembered that many months of designing work were necessary before each part was placed in the best position for operation, inspection and maintenance.

The key is as follows: **A**, socket for hand starter; **B**, bulkhead; **C**, cowl supports; **D**, oil return pipe; **E**, suspension points; **F**, vacuum pump suction relief valve; **G**, engine mounting structural member; **H**, throttle and mixture rod connections; **I**, oil tank; **J**, braided flexible conduit; **K**, electric starter; **L**, accelerating motor; **M**, fire wall; **N**, port magneto; **O**, generator; **P**, oil feed pipe.



REMOTE RECOGNITION

By James Hay Stevens and Godfrey Howard.

In the September issue we published 84 of these little three-view drawings and here are 66 additional ones. Each drawing is accurate and recognisable, the size being comparable to that at which aircraft are visualised at a distance. Names on page 24.

Gliding

by **Cadet D. SAMUELSON,** 1440 (Shoreham) Squadron

ARRIVING at the gliding aerodrome soon after nine, we met our instructor, who, after a cheery "Good-morning," outlined our programme for the week.

First we had to rig a glider, and get the winch and towing-wire lined up with the wind. Then, after the machine had been tested, we were to have six ground slides each, and, if we were considered proficient at that. we would be allowed to take the air.

Sliding

We started by having three slides each. The first to go, a flight sergeant, did well. Although he let a wing drop once or twice, he was able to pick it up again. By his third slide he was able to keep quite an even balance.

I was on the retrieving car. We started up as soon as the glider moved, and followed it up the field. At the end of its run we jumped off, turned the glider round and hooked its nose on a long, braced pole sticking out from the side of the vehicle. The wing tip was then passed to a cadet standing on the back of the car, who balanced it during the drive back to the starting-place. The towing-wire was also hooked on to the back of the car and brought back.

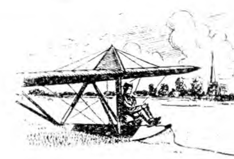
Lunch-time came, and during the break the glider was turned into the wind and I had some practice at wing balancing. The wind was strong enough to enable the ailerons to be operative.

At last my turn came, and I was strapped in, feeling absolutely terrified. Thoughts flashed through my mind of mistakes made by other cadets. I was told to keep the stick well forward and just what else was expected of me. The winch started up. My heart sank into my boots. The slack wire was taken up. In a matter of seconds I was off. After the wing orderly had let go it was entirely up to me to keep it balanced. Going along at what seemed breakneck speed, not looking at my wings, I felt the left wing drop a little. Stick over to the right. No—too much. A little the other way. It's all right now, but I'm off my course and heading too much to the left. Steer to the right. Something wrong—I'm going more and more to the left. I thought hard for a moment. If you want to go to the right, press with the right foot (forget your bicycle, which is the opposite). As I did so, the machine came over to the right. The right wing is down now. Pick it up. Steady. By this time I had come to the end of the run, and the glider had stopped. As I stepped out, feeling good and pleased with myself, the retrieving car came up. "Cor," said one of the crew, "you were going all over the field." "Miracle you didn't damage a wing," said another, dubiously examining the tip. But I remembered what they were like on their first trips.

I was soon put at ease by the instructor, who told me to be careful of my ruddering, but said that otherwise things were not too bad. By my third slide I was quite happy with the controls and was able to keep the wings well balanced, though I still imagined I was on a bicycle when I wanted to turn.

Subconscious Control

When my next turn came along I had three more slides, and found that after a



while I concentrated more closely on the lateral control, and when a wing dipped it seemed as if I automatically corrected it without thinking.

Third time round, and some cadets were allowed to take the air. Only very low, of course, but nevertheless it was a darned sight less bumpy than the ground slides had been and far more thrilling.

On these low hops the different abilities of cadets were shown; we had been told at the start that it would be more difficult to keep the glider one or two feet from the ground than it would be to fly ten or more feet up, because there is more room to correct mistakes at a higher altitude. Some cadets showed a natural ability to control the glider at that height, whilst one or two could not get the hang of it, and kited up to about ten feet and, because they had not enough speed, stalled. Then it was up to the skill of the winch driver to bring them down to earth safely. The instructor had actually put against one cadet's name in the instructor's log-book: "Stalled; saved by the grace of God and the winch driver!" When the cadet landed, he came up and said: "Gosh! it was lovely up there; flying smooth as anything, lovely landing—I hardly felt it; really smashing."

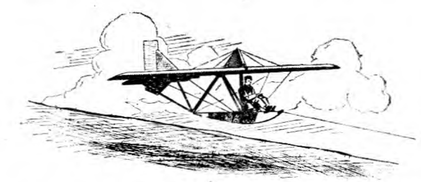
Soon it was my turn again, and I got even more scared than ever. After the straps had been adjusted—I had previously decided to have them extra tight—I was told to hold my stick slightly forward of centre, and, after I had started, to ease the stick back, and as soon as I felt myself in the air to check, by easing the stick forward, and if I could keep "daisy" height so much the better.

Off the Ground

Then I started. I was going much faster than before, and before I thought I had eased the stick back, felt myself taking the air, and was surprised to realise that I was some six feet up. I immediately pushed the stick forward—pump-handling, the instructor called it—and I came down to earth with the grace and beauty of a brick. Wow—what a bang! The bounce, coupled with the fact that the impact made me involuntarily pull back the stick, forced me into the air again, only to come to earth (very hard earth) with half the grace of the first meeting. With the bumps getting smaller and smaller, I eventually came to a stop.

I returned to the starting-place, feeling very ashamed of the whole thing. My mistakes were pointed out, and I was told that the essence of it all was a gentle touch. My next hop was not so bad, although this time I underchecked and consequently went the whole of the trip at a height of about ten feet. Although it felt very nice, I think the instructor seemed more scared than I was. The third hop I tried to keep near the ground, and, in so doing, I hit it several times. This, so soon after the big bumps in my first hop, made it perceptibly uncomfortable every time I sat down. Somebody suggested that I had made many landings but only one arrival.

Afterwards, summing up my first solos, I had to admit to myself that they were not all they might have been. I determined to do better next time.



Loss of Control

The next cadet, not having done too well on his slides, had to do two more. For his third trip he was told he could take the air. From the first he made mistakes. His left wing was down when he yanked his stick back, and he kited up at an alarming angle. He next put on left rudder and started side slipping all across the field. Skilful action on the winch prevented a nasty crash, but even so the glider returned to Mother Earth in a crabwise fashion.

When we came up to him we were able to assess the damage. The "gate" had snapped clean in half, landing-wires were broken and some fabric was torn on the right wing. The instructor examined it and said it could be repaired. The pale but otherwise unhurt cadet who pranged it seemed much relieved. Asked how he thought it happened, he quite honestly said he didn't know.

We derigged the machine; and, as somebody remarked, it had the air of a funeral procession as it was taken away piece by piece to the hangar.

Invisible Wings

Next day we wheeled out a new machine and, after rigging it, were soon away. By the time my turn came round we had witnessed some spectacular flights. Remembering my previous record (this was looked up and read to the instructor each time), I wondered if I could keep up with the morning's standard. My first flight was my best flight to date. I bumped only twice instead of eight times and the bumps were softer. The second flight I managed to keep the glider off the ground all the way, but didn't get up more than five feet.

This may sound very easy; but if you cannot do it naturally it is very difficult to judge your height. As soon as you start going up, you must ease the stick forward, and as soon as you start going down you must ease the stick back a little. Ability to do this proves that you have really mastered the machine and that you are flying it and not being flown by it. Being able to do this, I was allowed to go up to the immense altitude of fifteen feet. Then I eased the stick forward and came down in a steady glide.

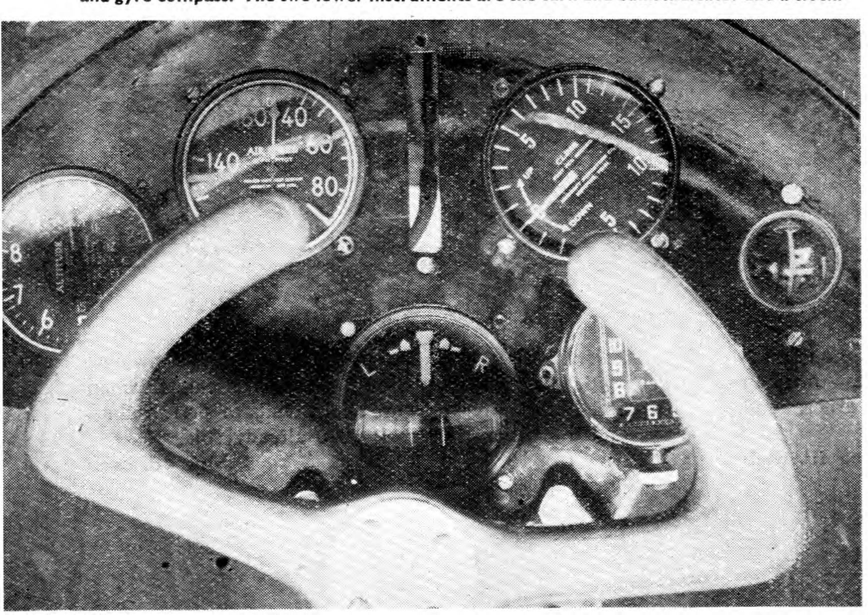
When I returned, came the crowning glory of my gliding career. I had completed the elementary stage of gliding. My tunic seemed very void of wings. There is no outward reward for gliding, though there is that inner feeling of satisfaction that although it is not a Spitfire you have flown, and though your knowledge of powered flight is still slight, you do know something more than some, and when you do get to the R.A.F. you will know how and why your 'plane reacts to the controls. You know what it feels like to become airborne at your own will, you know the sensation of flight in an open cockpit of your own, and, what is more, you do know that you have flown solo.

BOOKS ON GLIDING

Gliding Simply Explained. Michael Logan. Pitman. 9d.

Sailplanes: Their Design, Construction and Pilotage. C. H. Latimer-Needham. Chapman & Hall. 6/-.

Behind the control column of an American Army glider. The instruments, from left to right, are: altimeter, a.s.i., rate of climb indicator (the face of which appears to rotate) and gyro compass. The two lower instruments are the turn and bank indicator and a clock.



Gliding instruction for prospective Army pilots. Note the crash helmets and that the glider, a General Aircraft Hotspur II, is apparently equipped with a second cockpit for dual instruction. Army glider pilots first train on powered aircraft and then on dual control gliders.

At a cadet gliding school.

THE REVOLVING HEAVENS

by **L. R. Glegg**

A continuation of last month's How much of the heavens can you see?

IN a previous article it was shown that exactly half of the entire heavens can be seen from a given spot on the earth's surface at one time. We have now to discover which is the half that is visible and whether or not it is always the same half.

The Apparent Rotation of the Heavens

The earth revolves about its axis in the direction of the arrow X in Fig. 1 (that is, all points on its surface except the poles are continually moving in an easterly direction), and as a result the directions of the various stars from an observer on the earth are continually changing. We have no sensation of the earth's rotation, and it is more convenient to imagine that it is stationary and that it is the Celestial Sphere instead which revolves about its axis—that imaginary line which is a prolongation in both directions of the earth's own axis.

On this assumption the Celestial Sphere will *appear* to be revolving in the direction shown by the arrow Y, that is, in the opposite direction to that in which the earth a c t u a l l y revolves. Therefore to an observer in the Northern Hemisphere the stars visible will appear to revolve in one vast body in a counter-clockwise direction round the Celestial North Pole—in actual fact round the Pole Star (*Polaris*), which happens to be situated almost exactly at the Celestial North Pole. *Polaris*, then, is the only star which does not seem to change its position in the sky, and it always indicates the direction of north (except, of course, to an observer at the North Pole, where it is directly overhead). Now look at Fig. 2, in which AOB represents the plane of the horizon of our original observer (see December *Gazette*, page 20). As we imagine the earth to be stationary, the disc which AOB represents will also be stationary, whilst the Celestial Sphere indicated by the circle rotates about its axis (the dotted line joining the Celestial Poles).

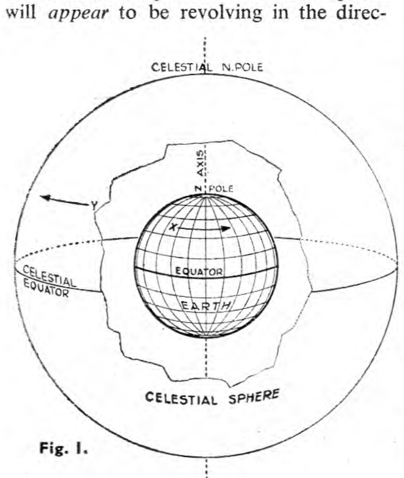


Fig. I.

It is clear that all the stars north of the line CB will be visible all the time as they make their circular journey round *Polaris*. Stars lying anywhere on the part of the Celestial Sphere between C and A, however, will in due course sink below the horizon disc AOB, rising above it once more after the sphere has revolved further. Thus all the stars in this part of the heavens will rise and set once in each rotation of the Celestial Sphere; those which are relatively far north will sink below the horizon only for a short while, and those which are well to the south will spend most of the time out of sight, rising above the horizon only for a brief space of time. Any stars on the Celestial Equator will naturally be above the horizon during exactly half of each revolution of the Celestial Sphere. Finally, stars which are south of the line AD will *never* be visible to our observer.

Fig. 2 is drawn to show the part of the heavens visible to an observer in Southern England (i.e. about Lat. 50° N.), as were those in the preceding article; it is interesting to consider how much can be seen by observers in other parts of the world.

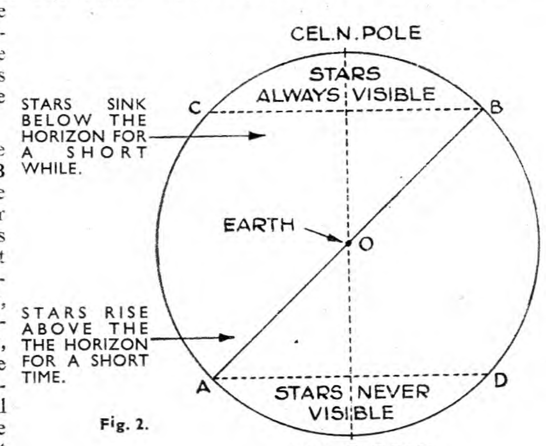


Fig. 2.

The Visible Heavens in Other Continents

The part of the Celestial Sphere which is at some time or other above the horizon of an observer clearly depends on his latitude, since this determines the angle which the line AOB makes with the axis of the sphere (to put it mathematically, AOB is a *tangent* to the terrestrial sphere drawn through the position of the observer O, that is, a line at right angles to the radius of the earth at his position).

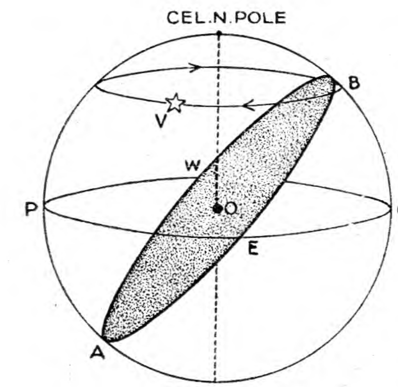


Fig. 3.

Take first the case of an observer at the North Pole. AOB will be a line at right angles with the earth's axis (since he is standing at one extremity of it), and A and B will be points on the Celestial Equator. He will therefore see all the stars in the Northern Celestial Hemisphere *all the time*—they will never set—but at no time will any of the stars in the Southern Celestial Hemisphere be visible. All the stars in the northern half of the heavens will thus appear to be revolving around *Polaris*, which itself will be directly above his head. Make a sketch of this for yourself, on the same lines as Fig. 2, if it is not quite clear.

Next imagine an observer at the Equator. The line AOB will now coincide with the axis of the sphere, and he will see *all* the stars in the heavens—though remember he will see only half of them at any one time. If he faces east they will approach him like the advancing crest of a great wave, rising above the horizon to the east, reaching their maximum height in the sky as they cross his meridian, then sinking and finally disappearing below the western horizon, only to appear again in the east later on as the heavens perform their slow rotation, and so on for eternity. *Polaris* will always be just grazing his northern horizon, never quite rising or setting, and all other stars will be above the horizon during exactly half of each revolution of the Celestial Sphere.

We have already considered the case of an observer at some intermediate point between the Equator and the North Pole. AOB is inclined at an angle to the axis, and at some time or other he will see all the stars of the Northern Celestial Hemisphere and some of those in the Southern; just how many will depend on his latitude: the nearer he is to the Equator the more will he see.

In a similar way you can easily determine for yourself what part of the heavens will be visible from the South Pole or from any other point on the earth's Southern Hemisphere. Note that from that Hemisphere rotation of the heavens will appear to be in a *clockwise* direction round the Celestial South Pole, instead of counter-clockwise as we see it in England. Unfortunately, there is no convenient "Pole Star" at the south, so that rotation takes place round an imaginary point in the southern heavens.

The Horizon Disc

It is customary to speak of stars which spend part of the time below the horizon (and over half of those visible in England do so at some time or other) as "rising in the east" and "setting in the west." This does not mean, however, that they rise due east and set due west of an observer. Look at Fig. 3, which is really just the same as Fig. 2, excepting that an attempt has been made to draw a solid picture of the Celestial Sphere instead of a sectional view. In Fig. 2 on page 20 the plane of the horizon was represented by a single line, AOB; the horizon plane of our observer (still in Southern England) is now shown as what it actually is: a circular disc (shaded for clearness) which divides the Celestial Sphere into two halves. B is the most northerly point on the observer's horizon, A the south point, and E and W the east and west points respectively.

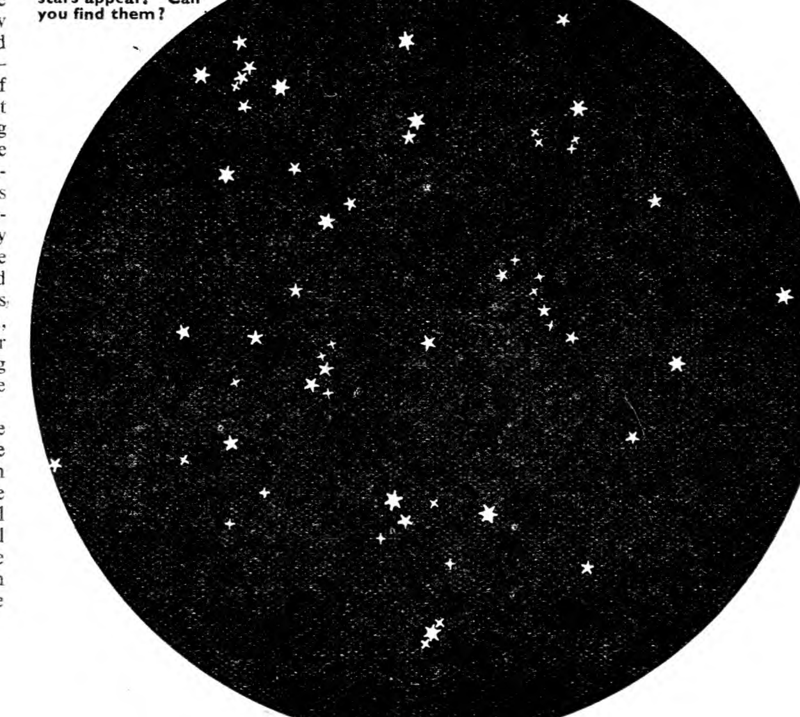
In this diagram we see the bright star *Vega* (V) travelling along its circular path round the Celestial Pole (in a counter-clockwise direction, as seen by the observer viewing the sky). *Vega* is only just sufficiently far from the Celestial Pole for it to sink below the horizon of this observer in Lat. 50° N., and it therefore does so only for a very short time. You will see that it rises and sets quite close to the *north* point (B) of the horizon, but nevertheless it definitely rises to the *east* of this point and sets to the *west*. This is an extreme case, but a glance at the diagram will show that *any* star which is at some time below the horizon must rise at some point on the eastern horizon line AEB and set on the western line AWB. Only a star which happens to lie on the Celestial Equator (PEQW) will rise due east (at E) and set due west (at W), and this applies no matter in what part of the world the observer is situated (unless he is at either of the earth's poles, as seen from which none of the visible stars ever appear to set).

Seasonal Change in the Aspect of the Heavens

We have so far used the word "visible" somewhat loosely, applying it as descriptive of any star which is above an observer's horizon. But what if in its movement across the sky, from rising to setting, a star is above the horizon only *during the hours of daylight*? Its light is so faint in comparison with that of the sun that we cannot distinguish it, so that to all intents and purposes it is invisible. This is the explanation of the well-known fact that some stars are seen only at a particular season of the year. The Orion group of stars, for example, rises above the horizon in England once during every rotation of the heavens all the year round, but in summer rising and setting takes place during the daytime, and we have to wait till winter for them to be seen.

The reason for this seasonal change of the times of rising and setting will be explained in the concluding article of this series.

In this star map, 17 of the 24 principal navigation stars appear. Can you find them?



CIRCUIT DIAGRAMS

JOHN SINCLAIR *explains the art of reading circuit diagrams*

A CIRCUIT diagram enables us to understand the operation of a combination of components without resort to a physical examination of the piece of apparatus or equipment being studied.

To understand the operation of a circuit the reader must have some knowledge of the symbols used and the methods adopted in the preparation and layout of the associated diagram.

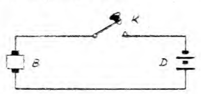


Fig. 1.
Representation of a simple buzzer circuit. K—Key. B—Buzzer. D—Dry cells.

In all electrical and radio circuits, the connecting wires (irrespective of the gauge of wire used), are depicted as straight lines. Consider a very elementary circuit diagram (Fig. 1). The wiring which connects up the key, buzzer and battery is symbolised by means of straight lines, whilst the components are depicted as symbols. If they had not been shown in this manner it would have been necessary to draw them as the eye sees them—a laborious and quite unnecessary task.

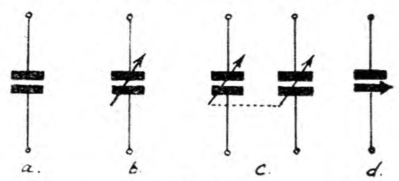


Fig. 2.
The symbols used to represent (a) Fixed (b) Variable, (c) Ganged, and (d) Semi-variable (or Pre-set) condensers.

As the symbols shown in Fig. 1 are probably fairly well known to most readers, let us now consider some of the other recognised component symbols employed in circuit diagrams.

The most common electrical and radio components are condensers, resistances and inductances. As electrically-minded readers know, condensers differ in capacity from a few micro-micro-farads to many micro-farads. They can be in fixed or variable form, wet or dry, large or small—in fact, their variety is legion. However, by adopting a standard type of symbol to represent *all* condensers, the difficulty of size, shape, capacity, etc., is

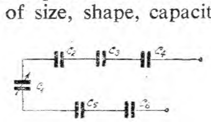


Fig. 3.
When several condensers are included in a circuit diagram, they are usually keyed C1, C2, C3, etc. and their values given in the caption. For example: C1—.0001μF, C2, 3—.001μF. C4—.01μF. C5, 6—2μF.

largely overcome. Fig. 2a illustrates the symbol used for all fixed condensers—two parallel lines, that is all. If a con-

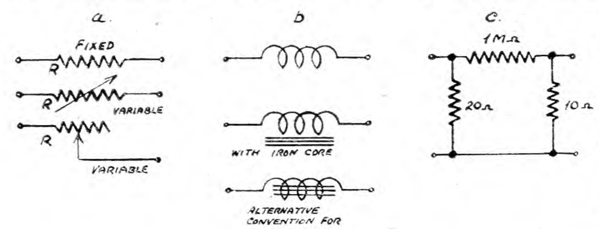


Fig. 4.
Symbols used for (a) Resistances, and (b) Inductances. Frequently the values of resistances are given alongside the symbol (c).

denser is of the variable type it is shown as in Fig. 2b—the diagonal line representing variability. A pair of ganged condensers would be indicated as shown in Fig. 2c.

In order for us to *understand* the reason for the inclusion of a specific component, its value is shown against the symbol, or, alternatively, the symbol itself is "keyed" to agree with a reference in the caption beneath the diagram. For example, Fig. 3 shows an arrangement embodying a group of six condensers "keyed" C1, C2, C3, C4, C5, C6, respectively. Reference to the caption will give the actual values. The prefix "C" is invariably used to link up condenser symbols with the actual capacity values.

In all circuit diagrams a *pure resistance*

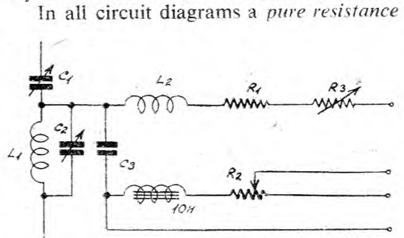


Fig. 5.
An imaginary circuit "keyed" in accordance with standard practice.
C1—.001μF Variable.
C2—.0005μF Variable.
C3—.01μF Fixed.
L1—10 turns 20 s.w.g., 2 in. former.
L2—R.F. Choke.
R1—5000 ohms.
R2, 3—2000 ohms Variable.

is depicted as shown in Fig. 4a. By "pure resistance" is meant a component such as a potentiometer, a resistor, or a volume control. If, however, the resistance acts as an inductance, it is depicted as shown in Fig. 4b. Examples are the tuning coils of a receiver or transmitter.

Resistances are "keyed" as R1, R2, R3, etc., or the resistance represented is given in ohms or megohms alongside the symbol (Fig. 4c). In the case of tuning coils the letter L (remember, L is the recognised symbol for inductance, as C and R are the recognised symbols for capacity and resistance) is usually placed next to the symbol and the inductance data (turns, diameter, wire, etc.) given either in the text or in the caption. Frequently, however, the symbol L is used to indicate that an inductance such as an L.F. choke has an iron core. In such cases the inductance value is given in Henrys (H) or Millihenrys (mH) alongside the symbol, as shown in Fig. 5, which is a composite (and quite imaginary) circuit embodying the various symbols so far described.

The important point to remember is that a tiny symbol can represent a very large component.

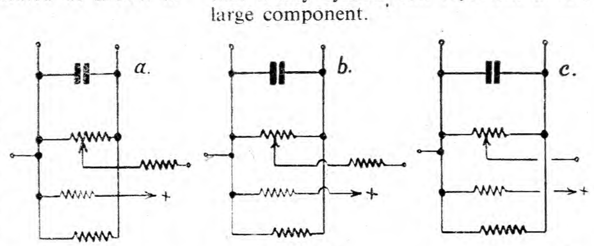


Fig. 6.
Three methods of showing "cross-overs." Joins are indicated by heavy dots.

Joins and Cross-overs

The draughtsman's usual method of depicting a joint is to place a heavy dot at the junction point. It should be noted, however, that the actual physical point of connection in the piece of equipment being considered may be at a different point altogether. If, however, the circuit is "buzzed through" (as the process of checking a circuit is called), it will be found that the junction is complete—unless, of course, the draughtsman has been at fault!

It frequently becomes necessary to show one wire crossing another wire to which it is not connected. The usual method is to show an intersection without a heavy dot (see Fig. 6a). This is the commonly accepted standard laid down by the

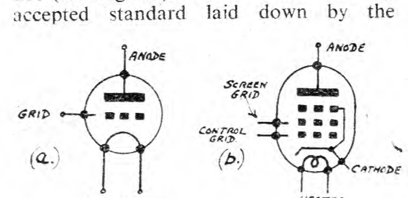


Fig. 7.
Symbolic methods of depicting (a) battery operated triode and (b) mains operated pentode. The electrodes are labelled for guidance only.

British Standards Institution, and is the one most generally used in service circuits. The radio Press, however, has modified the cross-over as a loop (Fig. 6b).

A third way is to show a break in one of the intersecting wires, as Fig. 6c, but this is not very often used.

Valves

Next to the condensers, resistances and inductances, the most common components in every radio set are the valves. Imagine, if you can, how difficult it would be without the aid of a circuit diagram to illustrate the wiring to even a simple triode valve. Fortunately, right from the earliest days of valve development certain recognised symbols have been used to depict the various electrodes. The anode (or plate), for example, has always been shown as a short, thick horizontal line placed above a broken line which has been accepted as the symbol for a valve grid.

The symbol used to illustrate a valve filament varies somewhat, but in the case of battery-operated types the arrangement shown in Fig. 7 can be regarded as general. Fig. 7a shows how the three electrodes are drawn to represent a triode valve; the circle embracing them is usually employed, but its use is not universal. It is common practice to employ a "key" for linking up the valves in a diagram with their type numbers. For example, in the case of a three-valve receiver employing one stage of R.F. a detector and an audio-amplifier, the valves would be keyed V1, V2 and V3 respectively, and their actual types referred to in the text or quoted in the caption.

Fig. 7b illustrates the usual arrangement employed for depicting a mains-operated valve of the pentode class. In *all* circuit diagrams the *control* grid is placed next above the filament or cathode.

Complicated circuits employing multi-electrode valves are beyond the scope of this article, but any reader who finds himself confronted with a difficult combination may address his enquiry to the writer, c/o The Editor.

Layout

Perhaps the most difficult part of a circuit draughtsman's job is that of deciding upon the best layout to adopt. Fortunately, in this connection certain well-defined rules are known to him, but

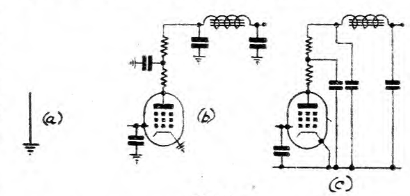


Fig. 8.
A. The standard symbol used to indicate an earth connection.
B. The usual method of indicating earth connections on a circuit diagram.
C. The same circuit with earth connections taken to a common earth line.

even so, ingenuity and care must be exercised. For example, it is the usual practice to lay out a receiver circuit from *left to right*. This means that the aerial circuit and components are on the left and the loud-speaker and associated components are on the right. It is also usual to draw all valves in a horizontal plane across the diagram, except special valves, which may be regarded as auxiliary (examples are the beat-frequency oscillator in a superhet and the rectifier).

Earth connections (irrespective of where they are made in the actual set) are indicated by the symbol illustrated in Fig. 8a. For the sake of simplicity it is usual to show earth connections in the manner of Fig. 8b, but sometimes all "earthy" points are shown joined to a common earth line as in Fig. 8c, and although this is in effect how they are joined up in the set, it is far less complicated to use the other method on paper. Most Service diagrams are shown this way.

The aerial connections are invariably shown at the top left of a receiver diagram and top right of a transmitter diagram.

Provided the reader has a sound knowledge of basic theory, no difficulty should be experienced in following the layout of even complicated circuit diagrams. Basic knowledge, so essential to-day, will enable a reader to say at once: "That is an electrolytic condenser, that is a volume control, that is a by-pass condenser, that a tuning inductance."

No wireless operator or mechanic can hope to make good progress unless he studies circuit diagrams and learns to read them correctly.

In conclusion, it may be mentioned that although there is a comprehensive list of standard circuit symbols available for use, deviations often occur. The radio engineer will constantly meet with these peculiarities, but with a good grounding in the basic study of circuit preparation he will soon recognise them without difficulty.

BOOKS ON THE SUBJECT

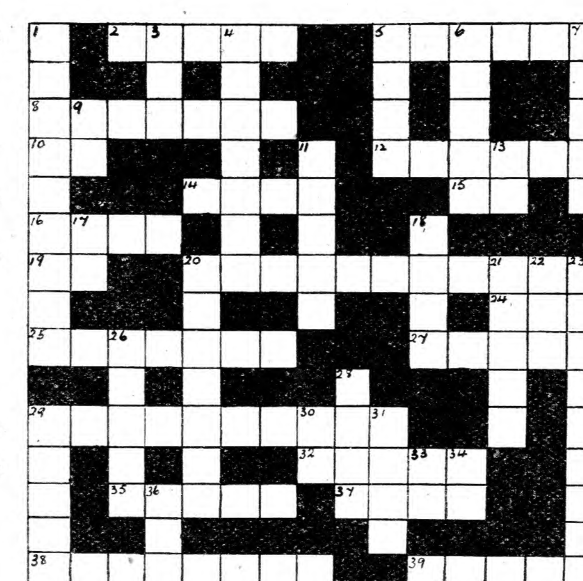
Radio Simplified. John Clarricoats. Pitman. 4/6.

Wireless Terms Explained. "Decibel." Pitman. 2/6.

Radio Communications. Eric Reid. E.U.P. 2/6.

RADIO CROSSWORD

Compiled by A. E. IRWIN, Instructor, No. 159 (Weston-super-Mare) Squadron.



ACROSS

2. Has at least three electrodes (5).
5. Rectifiers (6).
8. Transformer winding (7).
10. Low tension (2).
12. Insulator (6).
14. Often associated with cycles (4).
15. Low frequency (2).
16. Used in soldering (4).
19. Same as 30 Down (2).
20. Will step-up voltage (11).
24. Magic —— tuning (3).
25. To demodulate (7).
27. Reproduced by loudspeaker (5).
29. Type of dial (10).
32. M.C. loudspeaker may have one (5).
35. Common path (5).
37. D.F. aerial (4).
38. Negative particle (8).
39. Period (5).

DOWN

1. Function of valve (9).
3. Part of switch (3).
4. For obtaining fractional parts of scale (7).
5. Station locator (4).
6. Type of valve base (5).
7. Parallel circuit (5).
9. Radio-telephony (2).
11. Travels 1,120 ft./sec. (5).
13. Direction finding (2).
17. Low frequency (2).
18. Part of loudspeaker (4).
20. Small additional condenser (7).
21. Indicates current or voltage (5).
22. Same as 24 Across (4).
23. Maximum response (9).
26. Can be L.F. or H.F. (5).
28. Wound on former (4).
29. Mutual conductance (5).
30. Intermediate frequency (2).
31. Gas used in wavemeter lamp (4).
33. Opposite to HI (2).
34. Double pole (2).
36. Obsolete type of transmitter (3).

GONE WITH THE WIND

CAPTAIN W. E. JOHNS *believes in the future of Rocket Flight*

CADETS who find time to listen to the Brains Trust are certain to "prick up their ears" when questions asked step into the field of aviation. (No, I am not going to describe how flies land on the ceiling, because this fascinating problem, after being a standing joke for about 2,000 years, was solved by the R.F.C., by actual demonstration, in the last war.) In a more recent sitting of the Brains Trust a question was asked about the possibilities of rocket flight.

No Faith in Flying

When this question about rocket flight came over the air I felt myself wishing, for once, that I was in the party, because having watched the progress of this particular form of flight I might have been able to provide information more substantial than mere opinion. Those of us who have grown up with aviation are sceptical of scientific predictions. In 1896, Lord Kelvin, a scientist with a world-wide reputation, declared that he had no faith in aerial navigation, and on that score declined to become a member of the Aeronautical Society. In 1908, Lord Rayleigh, in his address to the Royal Society, said: "This question (flying) is now settled, and the tendency was perhaps to jump too quickly to the conclusion that what can be done as a feat will soon be possible for the purposes of daily life." And in 1907 the British Secretary for War refused to enter into negotiations with the Wright brothers, saying: "I have nothing more to add to my last letter to you. The War Office is not disposed to enter into relations at present with any manufacturer of aeroplanes." We may assume that he had obtained scientific opinion on the prospects of these vehicles.

Rocket Flight Will Come

Now, a few words on rocket flight. As sure as fate it will come, because if there is one lesson that history teaches it is this: when determined men set their hands to a project, sooner or later they get there. Such men have been working on rocket flight for some time, so let us get in on the ground floor and see what has been done so far. As you probably know, rockets are being used in Germany at this moment to project heavily loaded aircraft off the ground, but how far Germany has got with literal rocket flight I do not know. The matter may have been shelved for the duration, but just before the war she was spending a lot of money on rocket research. And rocket flight was achieved.

On November 5th (appropriate date!), 1933, under conditions of the greatest secrecy, the first passenger-carrying rocket made its first successful flight. The experiment was carried out on Rugen Island, in the Baltic. The rocket was projected six miles through the atmosphere. The force of its descent was broken by a parachute. The pilot returned to earth uninjured, but shaken. He was Otto Fischer. The designer of the aircraft was his brother, Bruno Fischer.

German Experiments

The experiment was carried out under the auspices of the German War Ministry. In the first experiment, the previous year, the flight had ended in the death of the pilot. This was the reason (said the Reichswehr) for secrecy. The people on the island were told nothing about it. Newspaper men were kept at a distance.

At six o'clock on a fine Sunday morning Otto Fischer shook hands with his brother and crawled through a steel door into the rocket. A minute later there was a flash, an explosion, and the vehicle had disappeared from its container. Soon afterwards it came into sight, floating down from a great height, suspended nose upward from a parachute that had been released automatically when the rocket reached its culminating point. The rocket came to rest on the sand, and the pilot, smiling though pretty badly shaken up, emerged.

Later, Otto Fischer described his sensations. He said he heard the roar of the explosion, and the next instant an unbearable weight seemed to be crushing him to death. Then he lost consciousness —or nearly lost it—presumably owing to the tremendous acceleration, which would naturally drain the blood from his head. When he recovered, his altimeter read 32,000 feet, and the aircraft was falling. He became aware that the asbestos bulkhead on which he was standing was very hot.

It was estimated that the initial explosion had shot the rocket to 200 feet, and the rest of the altitude had been obtained by rockets fired automatically at timed intervals. The Reichswehr officers stated that they were very well satisfied, and bought the designer's plans.

Bigger and Better Wars?

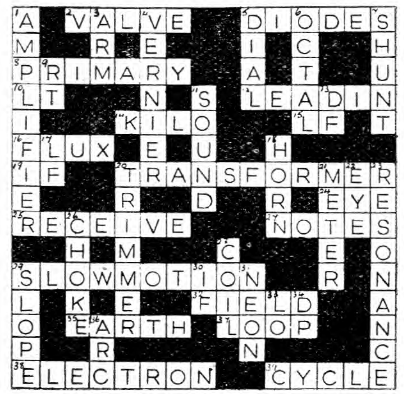
After that, I think, no one will say that rocket flight is impossible. We are not concerned here with the desirability of such flight, or with the obstacles with which designers are confronted. We quote this particular flight simply to show that it has been done. It was a beginning, and the rest will follow just as surely as flight by aeroplanes began with an ascent lasting for a few seconds. Lift up your eyes and you will see what progress flying has made in forty years. That will give you some idea of what progress rocket flight may make within forty years from the end of the war. It is a fascinating thought that once rocket flight has been established, interplanetary travel will become a possibility, and "a war of the worlds" will be only a matter of time.

BOOK ON ROCKET FLIGHT

Stratosphere and Rocket Flight. C. G. Philp. Pitman. 3/6.

CROSSWORD SOLUTION

(*See page* 23)



REMOTE RECOGNITION

(*See page* 17)

1, Messerschmitt Me. 109E; 2, Fairey Battle; 3, Messerschmitt 110; 4, Dornier Do. 26K; 5, Junkers Ju. 86K; 6, Bell Airacobra; 7, Piaggio P.32bis; 8, Caproni Bergamaschi Ca. 310 Libeccio; 9, Breda 65; 10, Douglas Boston I; 11, Consolidated Liberator; 12, Heinkel He. 113; 13, Consolidated Catalina; 14, Westland Lysander; 15, Cant. Z.1007bis Alcione; 16, Caproni Bergamaschi Ghibli; 17, Airspeed Envoy III; 18, Westland Whirlwind I; 19, Handley Page Halifax; 20, Focke-Wulf FW187 Zerstorer; 21, Boeing Fortress I; 22, Savoia Marchetti S.M.85; 23, Caproni Ca. 312bis; 24, Airspeed Queen Wasp.

25, Short Stirling I; 26, Vickers Armstrongs Wellesley; 27, Fairey Albacore; 28, TB bomber (Russian); 29, SU-2 (Russian); 30, MBR-2 (Russian); 31, Savoia Marchetti S.M. 81 Pipistrello; 32, Junkers Ju. 52/3mz; 33, Cant Z.501; 34, Short Singapore III; 35 PE-2 (Russian); 36, De Havilland Moth Major; 37, Dornier Do. 26; 38, SB-3 (Russian); 39, DB-3 (Russian); 40, MIG-3 (Russian); 41, Bristol Blenheim I; 42, YAK-1 (I-26) (Russian); 43, YAK-4 (Russian); 44, De Havilland 86B; 45, Hawker Hurricane IIc; 46, Curtiss Kittyhawk; 47, Blackburn Shark; 48, Vickers Vildebeeste.

49, Meridioniali RO.37bis; 50, IL-2 Stormovik (Russian); 51, Dornier Do. 17; 52, Consolidated Liberator II; 53, Douglas Havoc II; 54, Bristol Beaufighter; 55, Dornier Do. 18K2; 56, Martin Baltimore; 57, Junkers Ju. 52/3mW; 58, North American Mitchell; 59, Lockheed Vega Ventura; 60, Martin Marauder; 61, Dornier Do. 217E2; 62, Blohm und Voss Bv. 142; 63, Douglas Boston III; 64, Wellington II; 65, Vultee Vengeance; 66, Focke-Wulf Fw. 189.

WHICH BELONGS WHERE?

(*See pages* 14 *and* 15)

R.A.F. launch and machine gunner. Bomb rack and Lysander. Under-turret and Boeing Fortress. Twin-engined Douglas D.C.-5 and parachutes. Instructor with "crab" and Link trainer. Soldier-pilot and Hotspur II glider. Oxygen mask and fighter pilot. Beaching chassis and Kingfisher. Torpedo and Beaufort. Air gunner and four-engined Boeing Fortress.

BOOKS . . .

Flight to Arras
By Antoine de Saint-Exupéry (translated by Lewis Galantière). 160 pages. $7\frac{1}{2}'' \times 4\frac{1}{2}''$. Heinemann. 7/6.

One flight: one book. Antoine de Saint-Exupéry, besides being a pilot of long experience, is a practised writer. With skilful, sensitive touch he describes in detail the thoughts and feelings of a pilot undertaking one very dangerous reconnaissance flight over Arras during the Battle of France, and his subsequent reflections in the fading evening peace of a French village when the flight was done. There is realism in this book and profound thought, and the delicate yet sure touch which must become the hallmark of the best air literature.

The Complete Air Navigator
By D. C. T. Bennett, F.R.Ae.S. Pitman. 15/-. 368 pages. $8\frac{1}{2}'' \times 5\frac{1}{2}''$.

This book was first produced in 1936, and covers the whole of the ground for the first-class air-navigator's licence. This is the fourth edition, and contains a number of alterations and additions to bring it up to date. It is about the best book of its kind on the market.

One of Our Pilots is Safe
(1942.) By Flight-Lt. William Simpson, D.F.C. Hamish Hamilton. 7/6. 232 pages. $7\frac{1}{4}'' \times 4\frac{3}{4}''$.

The story of a pilot who went to France with a Battle squadron in 1939 and who, after waiting for action during the winter of that year, was shot down in the Battle of France and afterwards spent two years in a French hospital. It throws a good light on the French who stood in the front-line of the battle, and may be regarded as one of the more valuable additions to war literature.

This is a grim story, but an inspiring one. It reveals fortitude not only in the heat of battle, but also in the long days of suffering that so often follow.

Adastral Bodies
(1942.) By Basil Boothroyd. George Allen & Unwin. 5/-. 95 pages. $7\frac{1}{4}'' \times 5''$. Illustrated.

A humorous account, reprinted from *Punch*, of the first few weeks of a recruit's service in the R.A.F.

Air Cadets Handbooks—No. 6: Radio
By I. R. Vesselo and R. D. Morrison. Allen & Unwin. 2/-. 95 pages. $6\frac{1}{2}'' \times 4''$.

The authors are to be congratulated on having compressed into very small compass the fundamental principles of aircraft radio. Those who are receiving practical instruction will find this, with its terse definitions and its clear diagrams, a useful pocket-book.

STRICTLY UNOFFICIAL
The opinions expressed are those of the Editor or of private reviewers, and should not be taken as implying any recommendations by the Air Training Corps.

The Observer's Book of Airplanes
(1942.) By Joseph Lawrence. Frederick Warne. 4/-. 189 pages. $5\frac{1}{2}'' \times 3\frac{1}{2}''$. Illustrated.

This book contains illustrated drawings and particulars of 108 different types of aeroplanes. It would be quite a comprehensive book if the author had put complete drawings of all aeroplanes described, instead of illustrating only parts of some of them, and had aimed at a greater degree of accuracy.

Pinpoint the Bomber
By Francis Chichester. Allen & Unwin. 10/-. An air-game book with 46 pages and maps.

Three navigation and map-reading games are contained in this book, which includes a large-scale map of the territory from Kent to the Rhineland. From certain clues provided the players must pinpoint their positions on the map while making an imaginary flight.

Besides the actual games, the book contains useful hints on map-reading and navigating, and it can be regarded as one of the most ingenious, fascinating and useful war games that have been devised. Every squadron should have a copy.

Pilot's Wife's Tale
(1942.) By Esther Terry Wright. John Lane the Bodley Head. 7/6. 189 pages. $7\frac{1}{2}'' \times 4\frac{3}{4}''$.

An interesting and unusual story of the R.A.F. as seen by the wife of one of the pilots who was shot down in the Battle of Britain.

Sea-Flyers
By C. G. Grey. Faber & Faber. 7/6. 256 pages. $7\frac{1}{2}'' \times 4\frac{3}{4}''$. 19 Plates of Photographs.

An interesting and informative story of the progress of airships, flying-boats and seaplanes by one who has had unusual opportunities of following their progress and who writes well.

Aircraft Radio
By D. Hay Surgeoner, A.F.R.Ae.S. Pitman. 15/-. 154 pages. $9\frac{1}{4}'' \times 7\frac{1}{4}''$. Photographs and Diagrams.

The second and revised edition of a book written before the war, dealing with peacetime aircraft radio and airport and airway lighting.

Key to As You See Them

(*See Inside Back Cover*)

At the left of the page is a Consolidated Catalina I flying-boat; to the right a Hawker Hurricane IIc and a Fairey Battle in target-towing marking. The three aircraft below the Battle are Douglas SBD-3 dive bombers, and the single machine to the left of them is a Handley Page Hampden I. Left again is a de Havilland Tiger Moth, and beyond that a Curtiss P-40F, or Warhawk, fitted with an exterior long-range fuel tank. A Bristol Blenheim IV is below; underneath that a North American Mustang I, and a Hawker Audax, now used for glider-towing purposes.

The two aircraft on the opposite side of the panel are a North American Mitchell I (the B-25c), and below it a German fighter, the Focke-Wulf Fw. 190H. Beneath the panel, on the right, are three Hawker Hectors, and to the left of them a Westland Whirlwind I. Below the Whirlwind is a Douglas DC-5, to the left of which is a Boeing Fortress II and below that an Avro Anson. To the right of the DC-5 are, first, a Supermarine Spitfire Vb, beyond and slightly above which is a Consolidated Liberator III with a Junkers Ju. 87 dive bomber beneath.

Below the German is a head-on view of a North American Mitchell, or B-25c, and to the left of that are two Armstrong-Whitworth Whitleys, and to their left a General Aircraft Hotspur II glider flying in the opposite direction. Beneath the Hotspur is a Douglas C-47 transport (military version of the DC-3), to the right of which is a Curtiss P-40 and beyond an Avro Lancaster. Beneath the Lancaster is a Bristol Beaufighter I, and to the left of that another machine used for night-fighting, the Boulton-Paul Defiant I.

NOTE TO NAVIGATORS

In the December number, on page 11, column 1, 3,000 was printed instead of 300. We thank all those who have written pointing out this error, which was obviously a misprint.

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AS YOU SEE THEM
Photograph Recognition

For Key see page 26