AIR TRAINING CORPS GAZETTE

VOL. III No. 5
MAY, 1943

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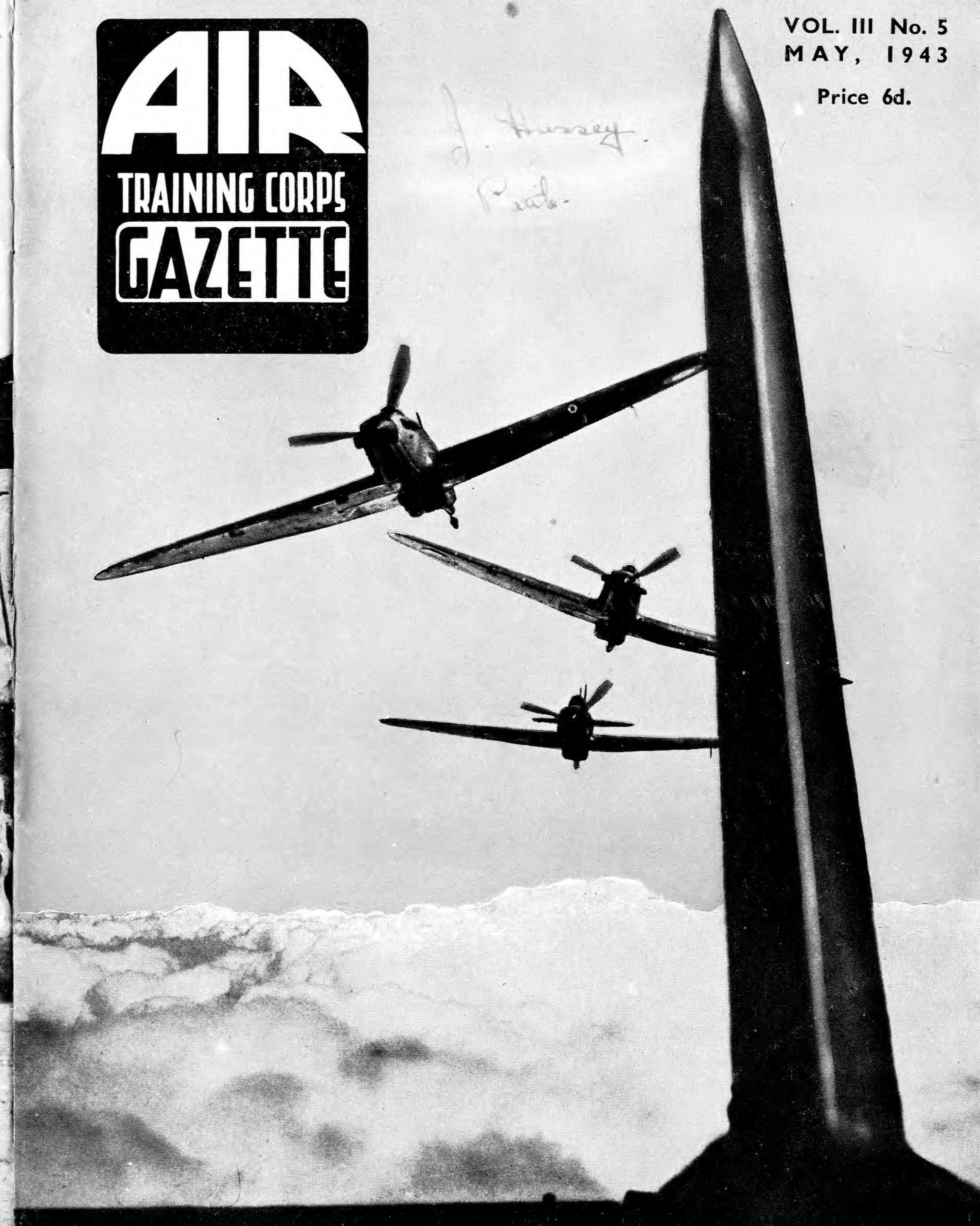
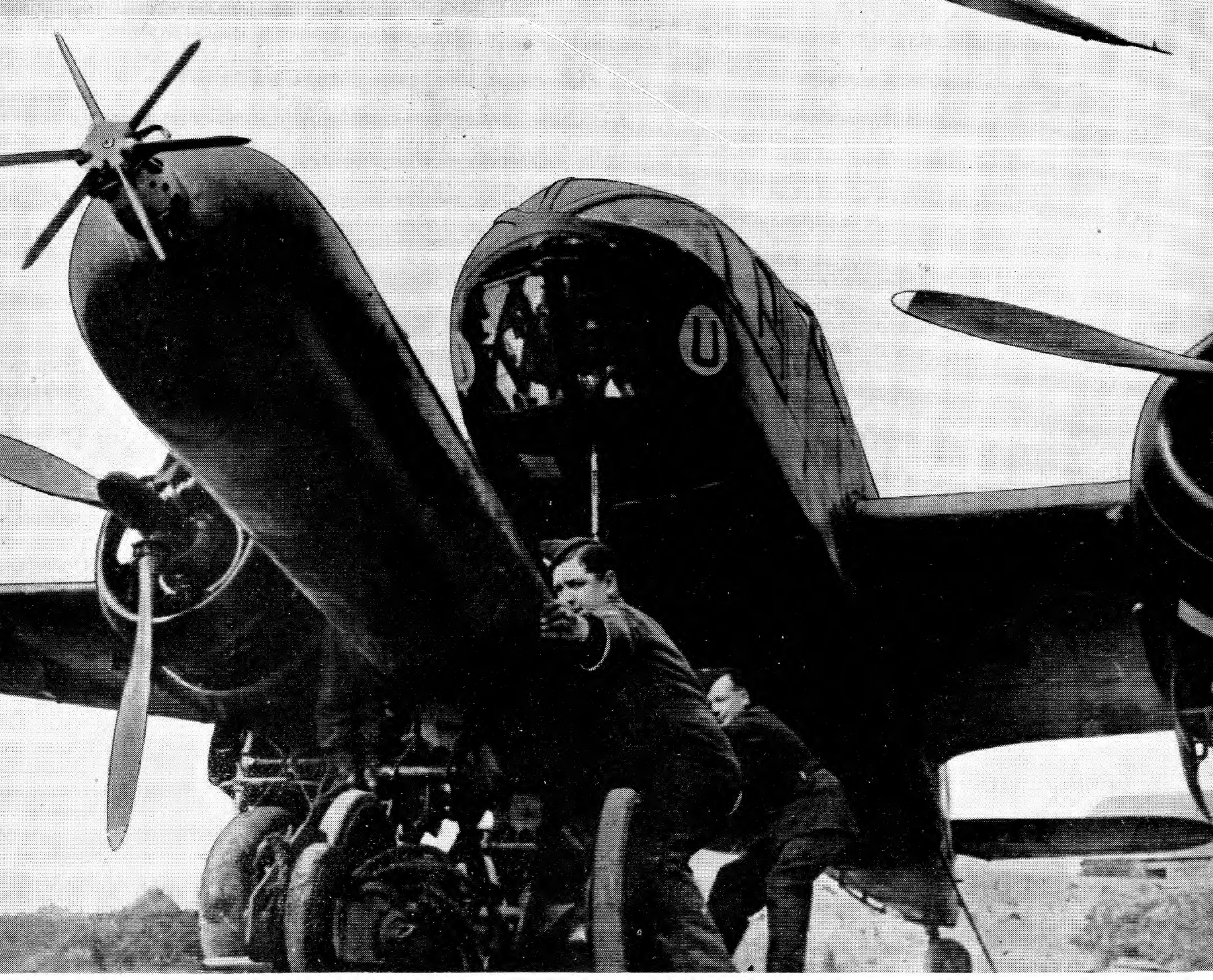


The Curtiss Kittyhawk pictured here is being put through its paces by a Curtiss-Wright Corporation test pilot. Kittyhawks have given valuable service in the Western Desert, in Tunisia and in Burma.

Below: A Beaufort of Coastal Command being loaded with a torpedo.



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Edited by Leonard Taylor.

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Wings for Victory

Dear Mr. Wakefield,
May I express to you, both personally and on behalf of my Committee, our sincere appreciation of the great assistance rendered by your organisation during the London "Wings for Victory" Week.

The co-operation and support of the A.T.C. in very many directions contributed largely to the success of London's "Week" and is, I know, proving of immense value in similar campaigns throughout the country. I should be glad if you would accept yourself and convey to all concerned our warmest thanks.

Yours sincerely,
(Sgd.) KINDERSLEY,
President.

Efficiency for Victory

From AIR CHIEF MARSHAL SIR CHARLES PORTAL, G.C.B., D.S.O., M.C.:

On behalf of all ranks of the Royal Air Force, I thank you for the Message which the Air Training Corps has sent on the occasion of the twenty-fifth anniversary of the Royal Air Force.

The efficiency and enthusiasm of the Air Training Corps make us as confident in the future of the Royal Air Force as we are proud of its achievements in the past.

100%

EXAMINATIONS are not an end; they are necessary evils—mere tests of progress.

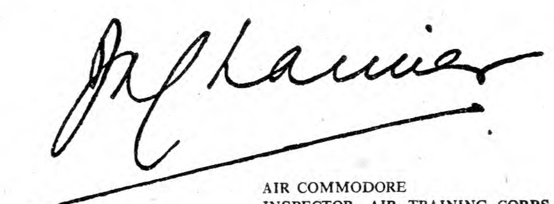
Take, for example, a cadet N.C.O. of whom I heard some time ago. He passed our examinations in all his subjects by the smallest of margins, and then went on with the old Part II Syllabus; when he came to the Aircrew Selection Board he got hardly any marks in mathematics, was graded very low in the Morse aptitude test and barely scraped through on General Intelligence. He did not get his heart's desire of training in the pilot-navigator-bomber category.

Officers, instructors and cadets must all realise that a pass is a thing which shows highly creditable progress by the cadet, who must carry on to perfect his knowledge in these elementary subjects. We shall be of the maximum value to the Royal Air Force if our young men go forward disciplined, smart and physically fit and really "fluent" in the handling of elementary figures, in elementary Morse, solidly understanding the elements of navigation or of their trade, quick at aircraft recognition, and with their general intelligence and power of expression stimulated and quickened.

That is enough for any young man.

We must not be beguiled by these horrible examination passes or we may lose sight of our object, which is to be well founded for training in the R.A.F. and if possible

"100% fit for training."



AIR COMMODORE
INSPECTOR, AIR TRAINING CORPS

Nose-wheel UNDERCARRIAGES

by DAVID VINE

WHEN we notice the unusual landing-gear of the Lockheed Constellation shown above, we must remember that all aircraft have to be designed to operate in two different environments, namely, on the ground and in the air. If an aeroplane is inefficient or exceptionally unstable on the ground it will never get into the air. With big heavily laden freighters, running on only two wheels at speeds approaching 100 miles an hour, ground stability is such a difficult problem that experts are of the opinion that the nose wheel will eventually become universally used on all big air freighters.

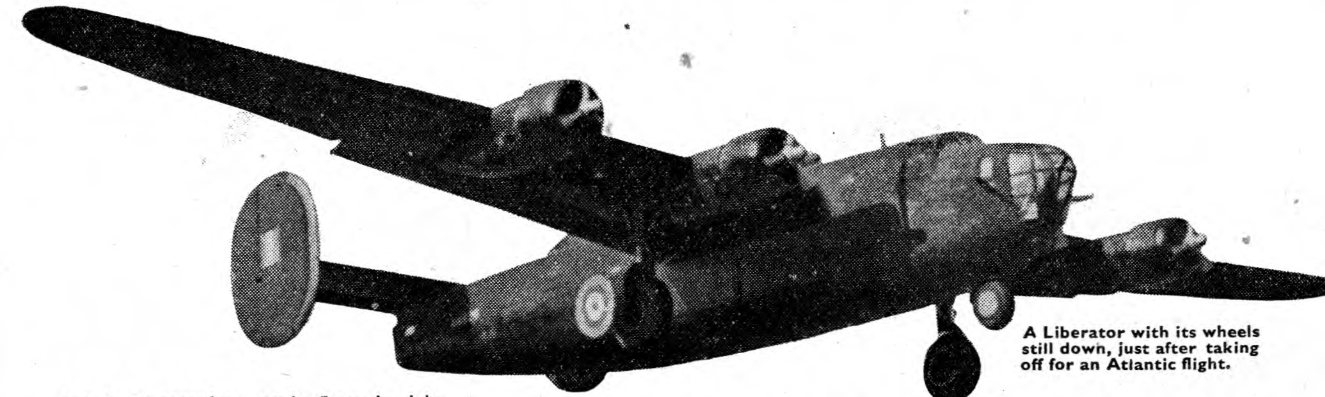
The primary reason for the nose wheel is to provide extra directional stability when travelling over the ground at high speeds by keeping *three* instead of *two* wheels in contact with the ground until the aircraft is airborne. A tail wheel is off the ground long before the take-off, and therefore cannot stabilise the aircraft at speed.

Landing Advantages

The second advantage of the nose wheel for big air freighters like the Constellation arises from the first. By providing extra directional stability on the ground at high speeds, an aeroplane can be flown in right to the actual touchdown. Consequently higher wing loadings, higher operational speeds and bigger payloads are possible. The tail-wheel type of aeroplane must be partially stalled for the touchdown. This disadvantage increases with the size of the aircraft, and limits wing-loading considerably.

Few nose wheels are directly controllable by the pilot. The nose wheel of the Skymaster is centralized firmly, but not completely, by an oil damper called a snubber. This allows a movement of about 30 degrees either side, but centralizes the wheel immediately the turning force of the rudder or the brakes is removed. Some difficulties have yet to be overcome before nose wheels can be made fully steerable from the cockpit of very big aircraft.

Airborne. The wheels of the Airacobra have left the ground, but have not yet been retracted.



A Liberator with its wheels still down, just after taking off for an Atlantic flight.

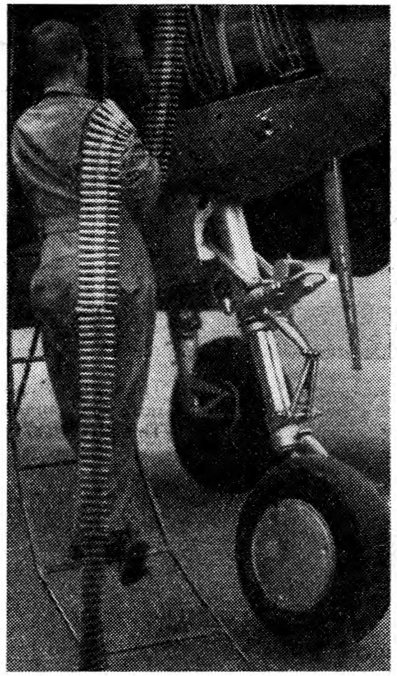
The nose wheel of the Horsa glider.

Braking

Owing to their greatly increased landing-speeds and higher wing loadings, nose-wheel aircraft have to be fitted with more powerful brakes than can be fitted to tail-wheel aircraft, owing to the fear of the latter nosing over. So nose-wheel aircraft can be fitted with more powerful brakes without the fear of nosing over, and therefore a nose wheel indirectly reduces the landing run. The brakes on the double wheels of the Skymaster are hydraulically operated. Each wheel has a separate brake, and each brake is composed of many plates running together like a plate clutch. Half of these plates are made of bronze and are fixed to the rotating wheels. The other half are made of steel and fixed to the stationary hub. When the brakes are applied these plates are pressed together by hydraulic pressure, thus creating a most powerful braking action.

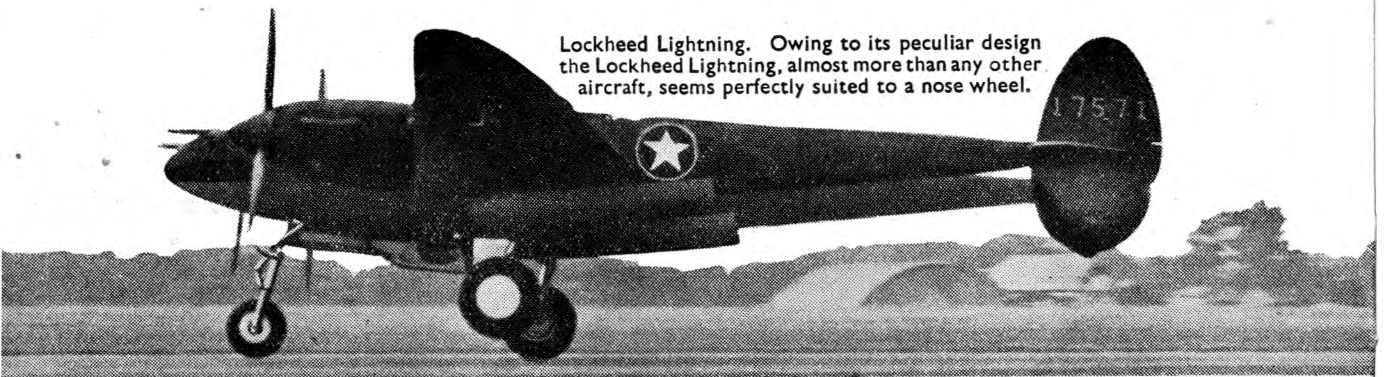
Actually, the nose wheel has no aerodynamic advantages to compare with the vitally important one of keeping the aircraft steady at high speed during touchdown and take-off. Indeed, so important a contribution is the nose wheel in this respect that it can be safely prophesied that all big civil air freighters and air liners of the future will be fitted with them in the cause of safety. The nose wheel may not solve all the problems of making big, heavily loaded aircraft more tractable at high speeds on the ground, but it is certainly a big step towards it.

Several outstanding aircraft are fitted with nose wheels. These include the Douglas B-19, the Boston and Skymaster, the North American Mitchell, the Bell Airacobra, the Lockheed Lightning and the Airspeed Horsa glider. These aeroplanes can be looked upon as pioneers in the development of the nose wheel, which, fitted to freighters and air liners of to-morrow, will make air travel all the safer, because the aircraft will be safer on the ground.

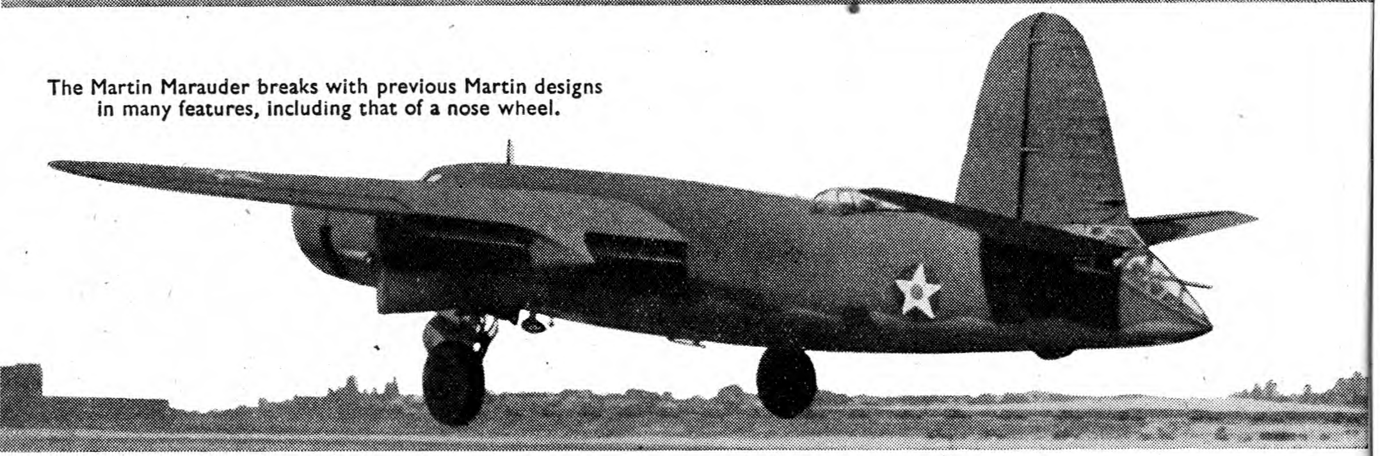


Nose wheel of the Lockheed Lightning.

An Airacobra taking off.



Lockheed Lightning. Owing to its peculiar design the Lockheed Lightning, almost more than any other aircraft, seems perfectly suited to a nose wheel.



The Martin Marauder breaks with previous Martin designs in many features, including that of a nose wheel.

The North American Aviation Inc., engaged in aircraft manufacture since 1928, have gone over to the nose wheel in the Mitchell bomber, which has proved a very useful aeroplane in Libya and elsewhere. This picture shows a Mitchell landing after one tyre had burst on take-off and the other on landing.

When Consolidated decided to make an amphibian of the Catalina, they chose a nose-wheel undercarriage. The amphibian Cat is known as the Catalina III or Cansos, and is being delivered to this country.

Aircraft THERMOMETERS

by ASTRO

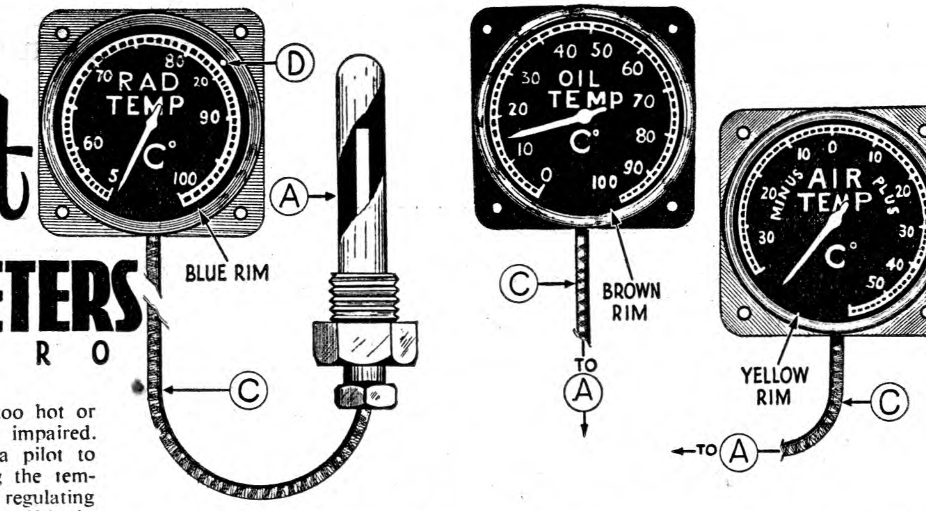


Fig. 1. The Mark VIII H only has no boiling-points indicated.

IF an aero engine becomes too hot or too cold its efficiency is impaired. Therefore it is essential for a pilot to have some means of knowing the temperature of his engine, and of regulating it if necessary. This is important if he is to get the best out of his engine or nurse it when damaged.

The temperature of a liquid-cooled engine is indicated by means of a *Radiator Temperature Indicator*, shown at Fig. 1, that of an air-cooled engine by the *Oil Temperature Indicator*, shown at Fig. 2. For purposes of correcting altimeter and air-speed indicator readings, it is important to know outside temperatures. The *Outside Temperature Indicator*, like the other two instruments, has a dial (Fig. 3) situated on the instrument panel.

All the dials of these instruments are marked off in degrees Centigrade. The radiator temperature indicator, Fig. 1, is the Mark VIII, and, like the Mark VI, is calibrated (marked off) from 50 degrees to 150 degrees C. The Mark VIII H is calibrated from 40 to 140 degrees C. The oil temperature indicator is calibrated to indicate temperatures between 0 and 100 degrees C., while the outside temperature indicator (Fig. 3) has a temperature scale of between plus 53 degrees to minus 35 degrees C., which is the outside temperature range from ground-level to 26,000 ft. This height will be approximate to −35 degrees C. taken in the I.C.A.N. standard atmosphere, which assumes a constant decrease in the air temperature of 1.98 degrees C. for every thousand feet of altitude, starting at 15 degrees C. on the ground. All these thermometers are really pressure gauges operated either by vapour pressure, which varies with changes in temperature, or by mercury expansion and contraction due to variations in temperature. These are all indicated by a pointer movement on a dial marked off in degrees Centigrade. As it is important to know whether the cooling liquid in the radiator is boiling or not, and as boiling-points vary with atmospheric pressures the various radiator boiling-points for varying altitude pressures are marked by red dots opposite the particular altitude at which the boiling takes place. If the pointer rises to, say, the radiator boiling-point for 20,000 ft., then the pointer will be opposite the red dot marked "20" in

The Radiator Temperature Indicator

A small bulb (Fig. 1, A) generally containing ether projects deep into the cooling liquid in the hottest portion of the engine radiator. A pipe or capillary tube (C) leads from this bulb to the indicator on the panel. The capillary tube projects down into the bulb (A) and leads to a Bourdon tube at the instrument. A Bourdon tube is a curved steel tube sealed at one end which tends to straighten when pressure is applied to the liquid or vapour in it, like the distending paper toy seen at Christmas parties, which unrolls when you blow into it. This movement of the Bourdon tube causes a pointer to move over a dial calibrated in degrees of temperature. At normal temperature the bulb (A) is only about half full of liquid ether. The upper portion is vapour. The capillary tube (C) is filled with liquid ether. As the temperature rises the ether vapour increases in pressure. This pressure is transmitted to the liquid ether in the capillary tube, and thence to the Bourdon tube, which operates the pointer.

The pilot, noting a decrease of temperature on his radiator temperature indicator, would realise that the engine was not hot enough. He would then increase the temperature of the engine by closing his radiator shutters. On the other hand, if the temperature became too high, he would open the radiator shutters, thereby decreasing the temperature of the engine.

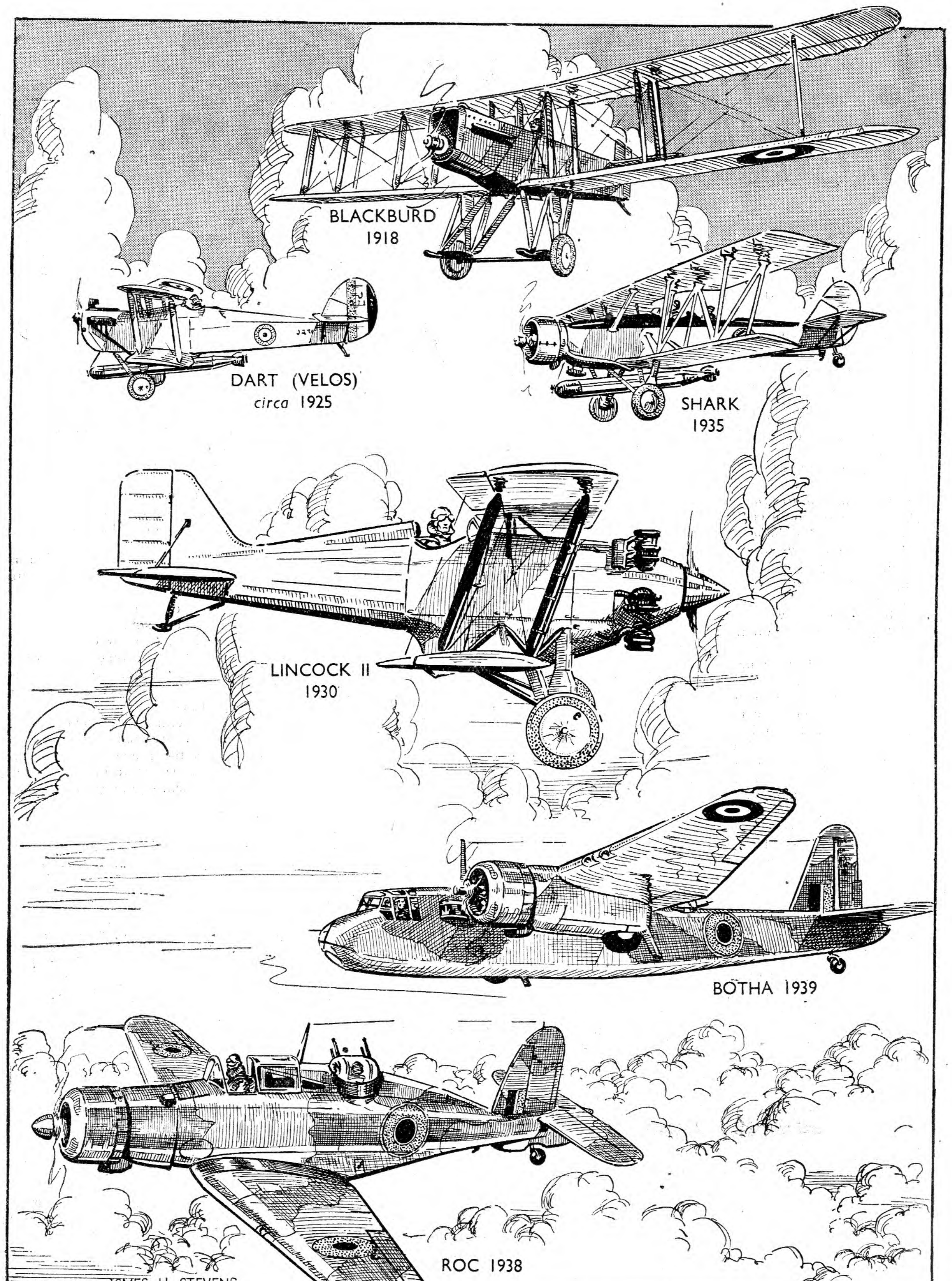
The Oil Temperature Indicator

The operation of the oil temperature indicator is similar in principle to that already described, but mercury is used instead of a volatile liquid. This means that changes of temperature cause changes of volume of the mercury. The bulb (A) is immersed in the oil in the engine sump. Mercury is enclosed in the bulb and in the capillary tube connecting to a Bourdon tube at the indicator. As the oil temperature increases so the mercury expands and the expansion acts as a pressure in the bulb and tubing. The deflection of the Bourdon tube under this pressure causes a pointer to indicate the mercury expansion as a temperature on the indicator dial. The indicator is fully compensated for errors.

Mercury expansion and contraction is also used in most outside temperature thermometers (Fig. 3). A similar bulb, capillary and Bourdon tube are filled with mercury and situated somewhere outside the aircraft (usually embedded in the wing), from which a pipe leads to the instrument on the panel. Outside temperatures can thus be recorded with a high degree of accuracy.

Electrically operated thermometers are now coming into use, but are not yet so widely used as the pressure-gauge types described above, which form part of the standard instrument equipment on British aircraft.

"Heavens! that 'plane can travel—didn't even hear you coming!"
"The sound will be along in a few minutes, Sir!!!"



Aerobiographies X—by C. G. Grey

ROBERT BLACKBURN

Bob Blackburn, as he still is to all his friends, began his air experiments back in the dark ages of 1908 or 1909. His father was an engineer in Leeds, so Bob had plenty of material and tools and shop-space, and he made good use of them. The first documentary evidence that I can find about him is in 1910, but he had, I know, been cavorting along the beach at Filey (Yorkshire) for a year before that.

Flying Bedstead

Apart from his early gliders, the first Blackburn machine to get off the ground was a monoplane which had a chassis rather like a bedstead. The pilot and the tank and the engine sat on the bedstead, and the plane and tail were carried on struts, four-poster fashion, above it. The airscrew, a tractor, was driven by a chain from the engine below. It was not at all unsightly, judging by the standards of those days.

Why no mention of Bob Blackburn's work appears in the old blue *Aero*, which I started in May 1909, I cannot imagine. Bob was either too modest or too busy to tell me about himself. But by the end of 1910 he had become the Blackburn Aeroplane Company, as a branch of R. Blackburn Ltd., Engineers, of Leeds, and at the beginning of 1911 was running a very successful flying-school at Filey, on the Yorkshire coast. The chief pilot was Benny Hucks, who had till then been flying for Claude Grahame-White. He became one of the world's most famous test-pilots in 1914-18, and died of influenza, as millions of others did, after the war.

The Blackburn Monoplane

The Blackburn monoplane of 1911-12 was one of the best aeroplanes in this or any other country. Hucks flew one all over England, Scotland and Wales, giving demonstrations. Lieut. Spenser Grey, R.N., a remote cousin of mine, bought one for himself, and shocked the Senior Service by flying it demonstrationally and sensationally, though *not* professionally for hire or reward. He just believed in letting the English people know that we had a good thing, at a time when everybody thought that any French or American aeroplane *must* be better than our home products. Our people still have that idea that anything foreign must be better than anything British—we are shockingly poor self-advertisers.

A Good Engine

Some of those early Blackburn machines had the Isaacson engine, a fixed air-cooled radial, a beautiful piece of work which, if only somebody had gone on with its development, might have given the type a start even before Roy Fedden came along with his Cosmos Jupiter, which was the origin of the historic Bristol series.

Some of these monoplanes survived until 1915, but when war broke out the Blackburn Aeroplane & Motor Co., Ltd., of Olympia (formerly a skating rink like Sopwith's first works), Gledhow Hill Road, Leeds, started making B.E.2c biplanes, and it also opened a seaplane works at Brough, on the Humber, up above Hull, where they made experimental machines for the Royal Naval Air Service. Bob Blackburn's chief co-director was Stuart Hirst, the big boss of Zambuk, which he still is, I believe, though he has left Blackburn's.

In 1916 the firm built the famous Kangaroo, originally a twin-float, twin-engined biplane. It was later remodelled as a long-range torpedo-bomber, and was in fact our first twin-engine torpedo-bomber. As a bomber it did immense voyages, for those days, hunting for submarines. Its 250-h.p. Rolls-Royce Falcons were very reliable. The type was used as a twin-engine "converter" till 1930 or later.

Torpedo Aircraft

Blackburn's also took over the development of the Sopwith Baby single-seat floatplane, and the Sopwith single-engined Cuckoo, which was our first torpedo dropper. And in 1918 they made the Blackburd torpedo dropper, a lanky-legged, three-bay biplane, with a span of 52 feet and a 350-h.p. Rolls-Royce Eagle. From then on Blackburn's specialised in torpedo craft—the Swift, the Dart, the Ripon, the Baffin, and a lot more, all good sound stuff, mostly with the 530-h.p. Napier Lion (three-row, 12-cylinder, broad-arrow type). Major F. A. Bumpus, late R.A.F., joined the firm in 1919 as Chief Technician.

In 1923 Major J. D. Rennie, who had helped John Porte (Lieut. R.N. and later Lieut.-Col. R.A.F.) to develop our big flying-boats at Felixstowe during the war, joined Blackburn's to produce flying-boats. They built some fine stuff—the Iris I, II and III, the Perth, the Nile and the Sydney—but they were all experimental work, and mostly with experimental engines wished onto them by the Air Ministry, so none of the boats ever went into production, as they deserved to do. But Major Rennie's very latest types may well revolutionise the operation of flying-boats, if the Air Ministry goes on with them.

Bluebird, Cubbaroo and Lincock

On the land side the firm made, in 1925, two craft at opposite extremes—the little Bluebird of about 20 h.p. and the colossal Cubbaroo biplane with a 1,000-h.p. Napier Cub. The latter was not perpetuated, but the Bluebird, an all-metal, side-by-side biplane, later with a 100-h.p. Siddeley Genet and later still a 120-h.p. Gipsy III, did an immense amount of training work right up to 1938 or so.

Also there was the Lincock, a single-seat fighter-trainer, with a 215-h.p. Siddeley Lynx, one of the best aerobatic machines ever.

A Family Team

The outstanding quality of Bob Blackburn has always been his readiness to take a chance on an experimental design. And in this he has been backed by his brothers Norman and Charles, since they came into the business after the war. Norman, toughest of the tough and immensely popular, was an R.N.A.S. pilot, and was still flying vigorously when war began in 1939. Charles had most of his left arm shot away in 1914-18, but still works hard for his living. With Mr. E. Hudson, for years the Secretary and a director of the firm, and Reggie Rhodes, their London Director, they are a regular happy-family team.

In 1936 the old firm hooked up with Denny's of Dumbarton, the historic Clydeship builders of steamships, and Sir Maurice Denny joined the Board. That opened great possibilities for increased output of seaplanes and boats, and trade has been going strong. By 1937 the Shark torpedo-spotter-reconnaissance biplane and its Tiger engine had gone out, and the firm was at work on the Skua deck-flying monoplane, to be followed soon by the Roc, both of which have done much service with the Fleet Air Arm. The Botha high-wing twin-engine bomber did not qualify for active service, but it has done an immense amount of "converting" and navigation training, so it is earning its keep. And there are good things coming along! One likes to see the pioneer firms keeping their ends up.

Cadet Flights

Last month we published some details of cadets' flight records. Since then many other claims have been made, but none has exceeded that of Cadet Corporal Brown, and we have no room to publish them all in full.

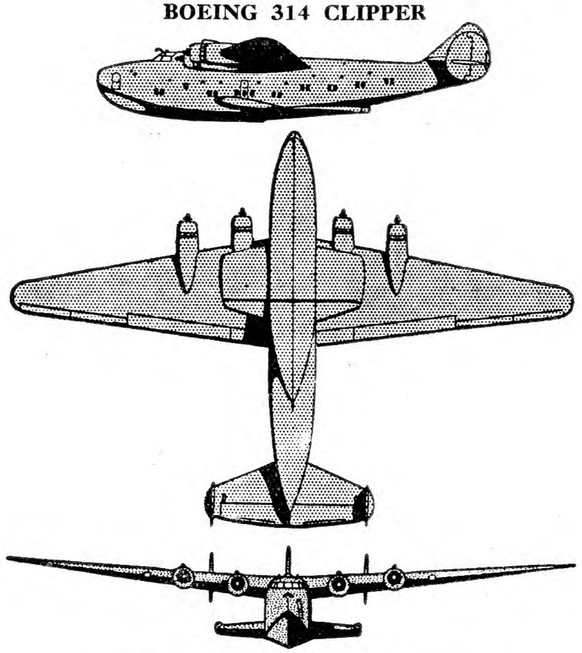
Lest any jealousy should be aroused among those cadets who have had few opportunities of flying, it should be explained that practically all the claims to high-figure records come from those who are employed at aerodromes and who consequently get their flying in the course of their work rather than as cadets.

(Series 13)

Aeroplanes You Should Know

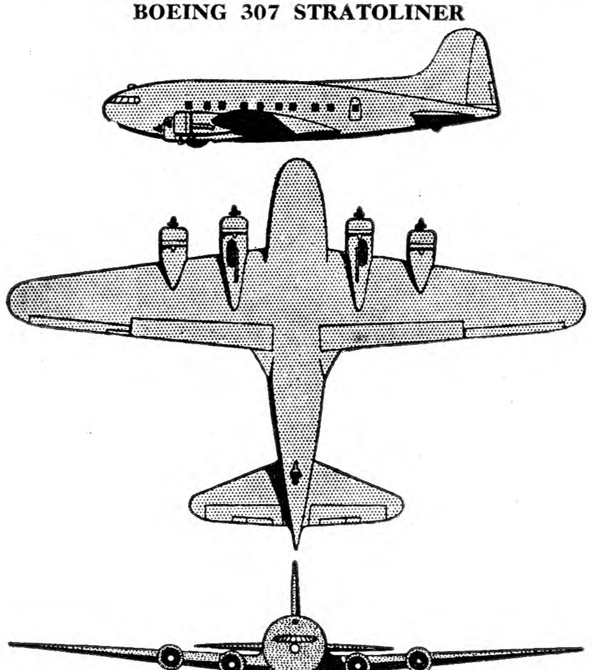
Drawn by James Hay Stevens for the "Air Training Corps Gazette"

BOEING 314 CLIPPER



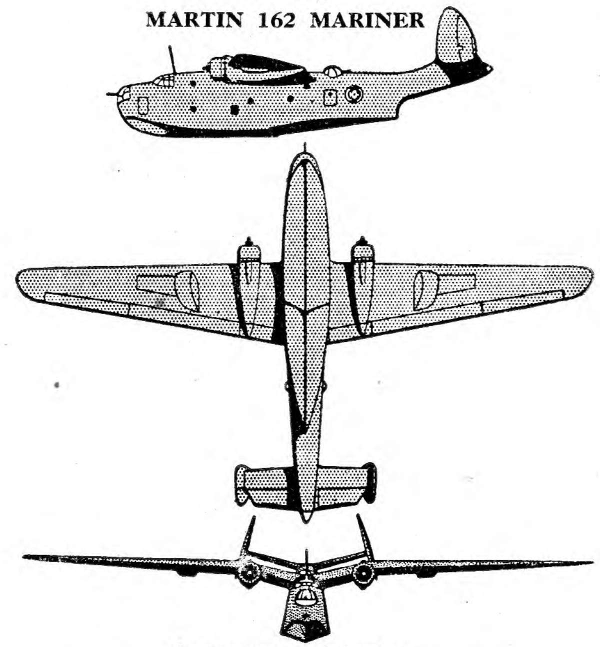
Long-range transport.
Wright Double-Row Cyclone air-cooled radial engine.
Span 152 ft. 0 in. Length 106 ft. 0 in.
Maximum speed 210 m.p.h.
Highly tapered wing, triple fins and stub wings make this aeroplane unmistakable. Used by British Overseas Airways.

BOEING 307 STRATOLINER



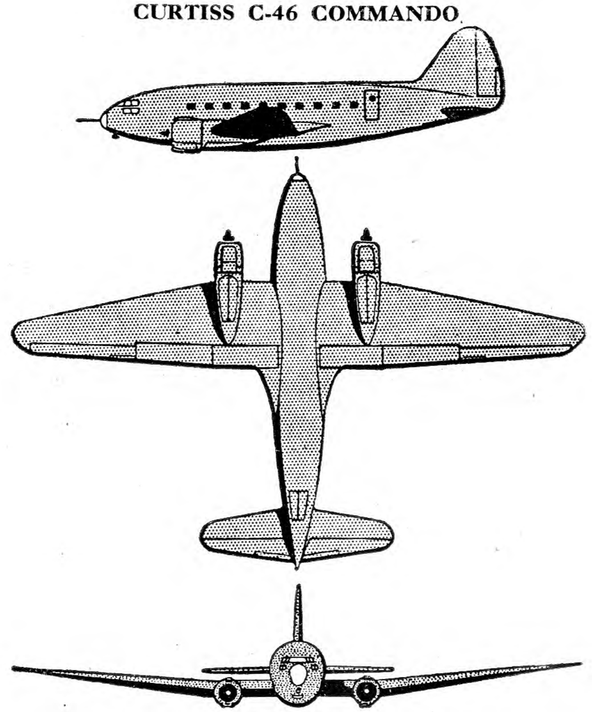
Pressure cabin transport.
Wright Cyclone air-cooled radial engines.
Span 107 ft. 0 in. Length 74 ft. 7 in.
Maximum speed 250 m.p.h.
Nacelles more inboard than British types. Fat fuselage and large triangular tailplane.

MARTIN 162 MARINER



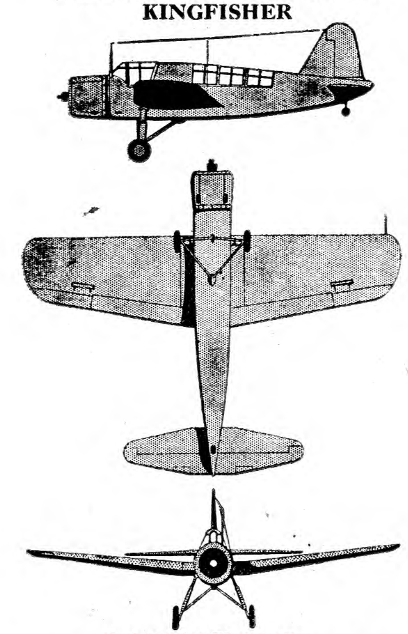
Long-range torpedo-bomber.
Wright Double-Row Cyclone air-cooled radial engines.
Span 118 ft. 0 in. Length 77 ft. 2 in.
Maximum speed about 210 m.p.h.
Close-set nacelles, gull wing and high-aspect ratio distinctive.

CURTISS C-46 COMMANDO



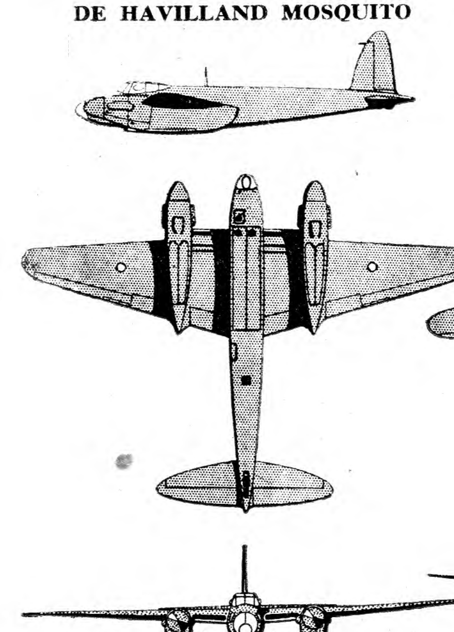
Troop transport.
Wright Double-Row Cyclone air-cooled radial engines.
Span 108 ft. 0 in. Length 76 ft. 4 in.
Maximum speed about 260 m.p.h.
Used by U.S. Air Forces and civil version by British Overseas Airways.
Plump, well-shaped fuselage, large rounded fin and rudder unmistakable.

VOUGHT-SIKORSKY OS2U-3 KINGFISHER



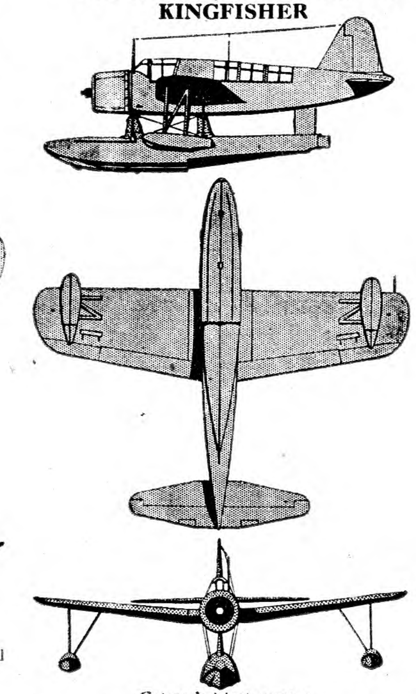
Deck-landing Fleet spotter.
Pratt & Whitney Wasp Junior air-cooled radial engine.
Span 35 ft. 11 in. Length 30 ft. 1 in.
Maximum speed 184 m.p.h.
High-pitched drone like the Harvard. Fixed undercarriage, low aspect ratio and large tail surfaces.

DE HAVILLAND MOSQUITO



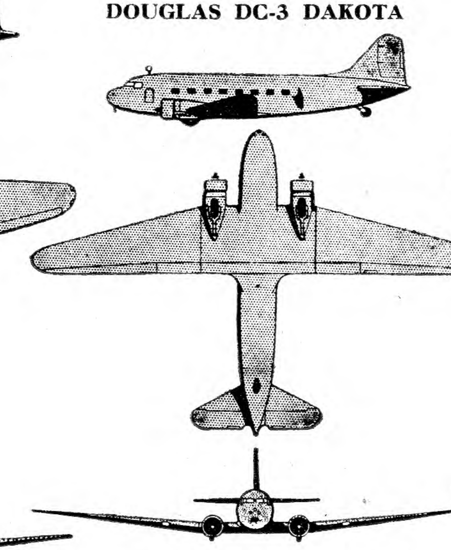
Two-seat fighter-bomber.
Rolls-Royce Merlin liquid-cooled vee engines.
Span 54 ft. 2 in. Length 40 ft. 9 in.
Daintiest aeroplane in the air. Forward-swept trailing-edge of sharply-tapered wings the most distinctive feature.

VOUGHT-SIKORSKY OS2U-3 KINGFISHER



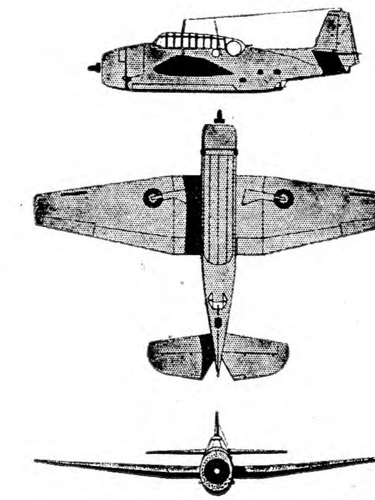
Catapult Fleet spotter.
Pratt & Whitney Wasp Junior air-cooled radial engine.
Span 35 ft. 11 in. Length 33 ft. 7 in.
Maximum speed 170 m.p.h.
High-pitched drone like the Harvard. Strutted single central float and wing-tip floats distinctive.

DOUGLAS DC-3 DAKOTA



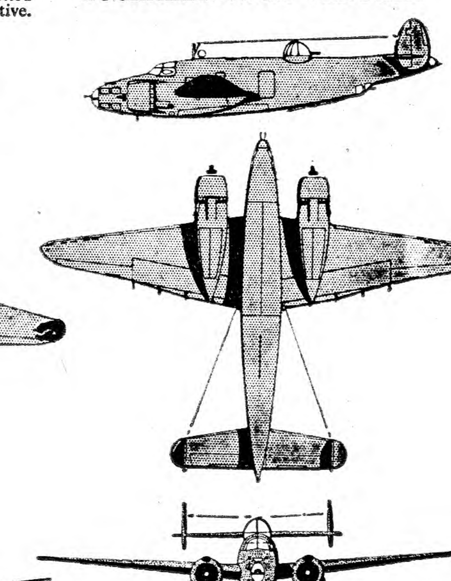
Troop transport.
Pratt & Whitney Twin Wasp or Wright Cyclone air-cooled radial engines.
Span 95 ft. 0 in. Length 64 ft. 6 in.
Maximum speed 220-230 m.p.h.
Swept-back leading-edge and close-set nacelles distinguish it from British types. Large fin identifies it from earlier DC-2.

GRUMMAN TBF-1 AVENGER



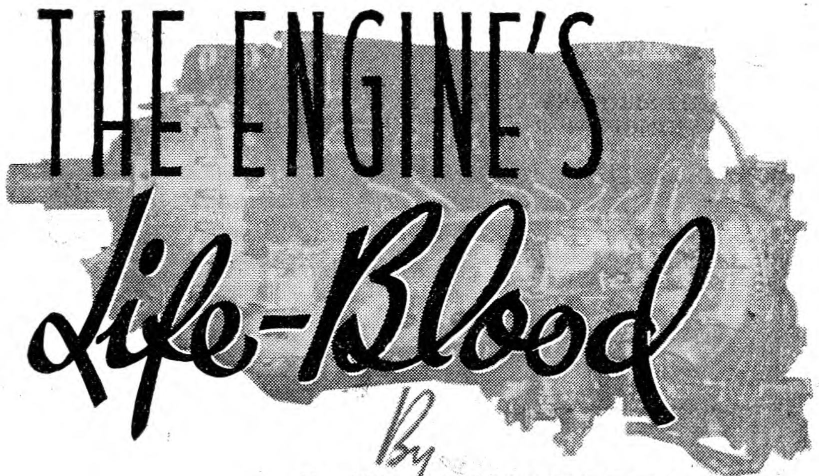
Torpedo bomber.
Wright Double-Row Cyclone air-cooled radial engine.
Span 53 ft. 10 in.
Length 37 ft. 0 in.
Maximum speed about 270 m.p.h.
Deep chest, big glasshouse, square-cut surfaces and high tail very noticeable.

LOCKHEED-VEGA VENTURA



Day bomber.
Pratt & Whitney Double Wasp air-cooled radial engines.
Span 65 ft. 6 in. Length 57 ft. 6 in.
Maximum speed 275 m.p.h.
Developed to replace the Hudson. Kinked trailing-edge, under-gun step, and turret over trailing-edge distinguishes it from the Hudson.

THE ENGINE'S Life-Blood



By **P. W. BLANDFORD**

As Harold P. Lees told you last month when he described the parts of a fuel system and gave an example of a system for a four-engined machine, the maintenance of an adequate fuel supply to the engines calls for some rather complicated equipment. The tankage used to carry thousands of gallons of fuel necessitates much piping and many cocks, together with several additional components which make a fuel-system diagram look as complicated as a wireless circuit, instead of the simple arrangement that suited the single-engined biplanes.

With a knowledge of his fuel-system layout and a study of its working, a pilot can do much to improve the performance of his aircraft.

Gravity Supply

In a single-engined biplane of the type that was general some years ago, the system was arranged simply by fitting the fuel tanks in the upper plane so that the force of gravity did all that was necessary to maintain the fuel supply. That is how the fuel system of the Moth biplane is arranged (Fig. 1A).

The single fuel tank in a Moth actually forms the centre section of the upper plane, being built in the shape of the aerofoil. It has a filler cap on top and a simple contents gauge consisting of a rod attached to a float and sliding over a scale within the view of the pilot. Also, on top there is a vent. This is important as it keeps the air pressure inside the tank the same as that outside, and also lets in air to take the place of the fuel drawn out.

A pipe from the lowest point of the tank leads down to the engine, and just below the tank a cock is fitted, so that the pilot can turn the supply on or off. At the engine end of the pipe the fuel passes through a filter before passing on to the carburettor, where in a simple type the level is maintained by a float-operated needle valve.

This is the simplest possible arrangement, yet one which cannot, in most cases, be applied to-day. On a modern aeroplane, with the engines in or level with the wings, the tanks cannot be fixed high enough to make use of gravity.

Single-Engined Monoplanes

Some single-engined monoplanes have the fuel carried in a single tank behind the pilot. In flight a pump driven by the engine draws the fuel from the tank, but for starting after a fairly long period of disuse the carburettor may have to be filled, or "primed," by some other means. A separate hand pump (called a "wobble" pump) is generally used, and arranged to bypass the main pump. It may have a cock in its pipeline so as to isolate it from the main system when not in use. A non-return valve placed in the main line prevents the fuel from the hand pump circulating back through the engine pump instead of into the carburettor (Fig. 2B). Non-return valves are used in many parts of a system. They are simple devices which, as their name implies, allow fuel to flow one way and not the other.

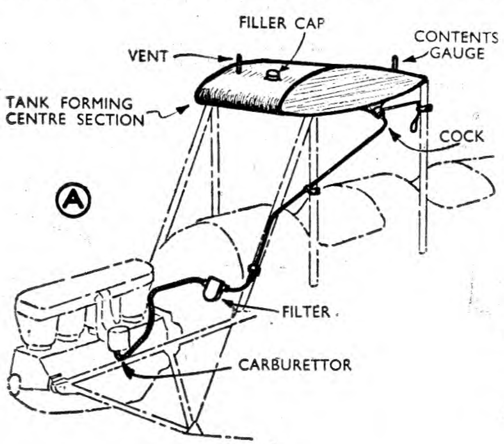


Fig. 1.

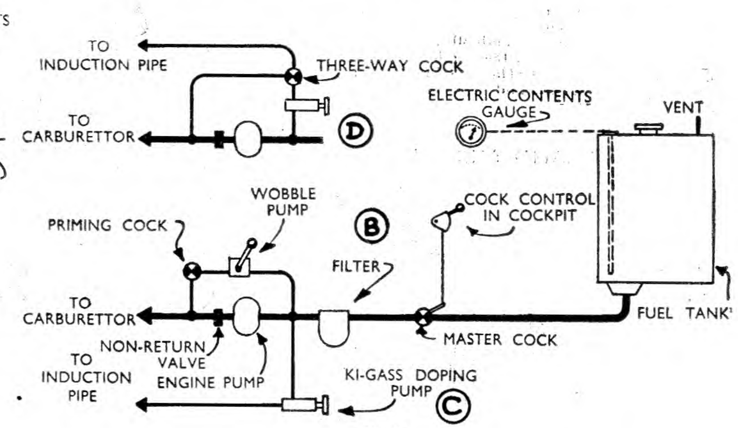


Fig. 2.

It is now usual to assist the starting of engines by "doping" them, i.e. spraying petrol into the induction system before turning them. This may sometimes be done by a "Ki-gass" pump, which draws fuel from the main system and forces it through nozzles in the induction pipe (Fig. 2C). It is possible, with a three-way cock, to arrange for the Ki-gass pump to be used to prime the carburettor as well (Fig. 2D). That method is used on the Lysander. As the two hand pumps are used only for starting, they are generally fixed where the ground crew can work them—beside the engine on a single-engined machine, or up inside the wheel-bay under the nacelle on a twin-engined machine.

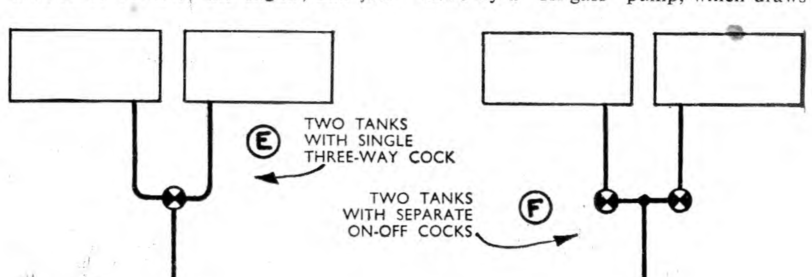


Fig. 3.

Of course, more than one tank is usually fitted. If there are two they are generally stowed in the wings at each side of the fuselage. The control can then be by a single three-position cock (Fig. 3E), or two cocks can be fitted (Fig. 3F). With the first arrangement the control is simpler.

Cocks are arranged at convenient points in the piping, and are controlled by levers in the cockpit through cables or push-rods. This is a much better arrangement than taking the fuel pipe up to a cock on the instrument panel, as it avoids using violent upward bends which can cause vapour locks. With an upward bend, air or vapour may collect at the top of the bend and cause a stoppage (Fig. 4G).

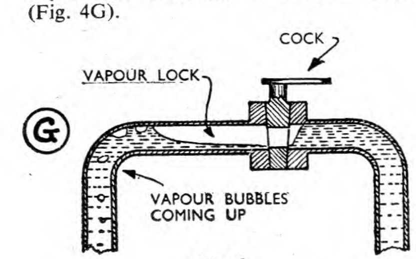


Fig. 4.

Multi-Engined Systems

The engines of most twin-engined aeroplanes are supplied with fuel from separate tanks in each wing. The system then is very much the same as a single-engine system in duplicate. It is usual, however, to join the two systems by a balance pipe fitted with a cock (Fig. 5H). This is a safety precaution. In normal flight the balance cock is kept closed, the port and starboard systems working independently. If for any reason there is a shortage of fuel at one side the balance cock can be opened and the port tanks used to supply the starboard engine, or vice versa.

Four-engined aircraft have their systems arranged on the same principle, but carried a stage further. Each engine gets its fuel normally from its own group of tanks, but balance pipes and cocks are fixed between the two engine systems at each side and also between the two halves of the whole system.

Simplicity or Flexibility

These large systems cannot be arranged without a large number of cocks. It is possible to reduce their number by letting each have several positions, to select, say, any of three tanks (Fig. 6J), but this does not have the same flexibility as a system using separate cocks (Fig. 6K), any arrangement then being possible. The former arrangement may be preferable where the pilot has to handle the fuel system as well as attend to dozens of other things. It is then worth while sacrificing a little flexibility in order to reduce the number of controls which he has to think about. In a machine which carries a flight engineer, who gives most of his time to running the engines, a multiplicity of cocks is not a disadvantage—in fact, the engineer may prefer it, as it allows him to use almost any combination of tanks he desires.

In some fuel systems the engine-driven pump is assisted by another at the tank end of the pipe-lines. A pump of any sort is not as effective sucking as it is pushing. With long pipes, probably also sloping up to the engine, and at high altitudes, the pump on the engine may be hardly capable of maintaining a reliable supply. The pump used to assist it at the tank end of the pipe-lines is driven electrically—one sort being completely immersed in the tank. To avoid having to fit a pump to every tank, an alternative arrangement is to let a group of tanks drain by gravity into a small tank, called a "collector box," fitted with an immersed pump (Fig. 6L).

When immersed pumps are fitted, a carburettor priming pump is not needed, as, when starting, the immersed pump can be switched on and used for the same purpose.

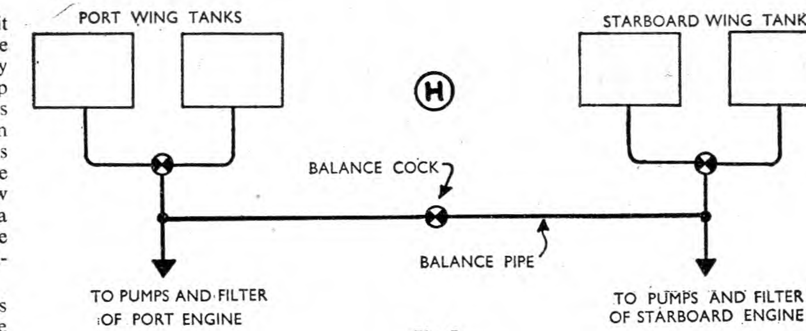


Fig. 5.

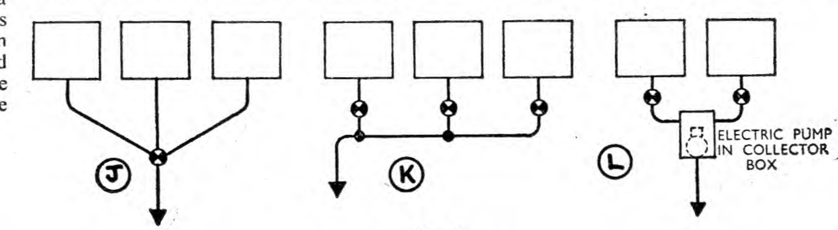


Fig. 6.

Engines are warm-blooded things. This hot-air van is used to de-ice a Hudson of Coastal Command operating in wintry weather.

Rotating Wings

David Vine *deals with the development of gyroplanes and helicopters.*
On pages 14 and 15 there are pictures of some of the machines he mentions.

FIRST, what is, and what is not, a helicopter? A helicopter derives lift, control, stability and forward motion from engine-driven propellers called rotors, revolving in a plane approximately parallel to the fore and aft axis—in other words, on top. A helicopter is not propelled by the usual propeller in front. An aircraft with such an airscrew in front and rotors on top as lifting surfaces is called a gyroplane. The name Autogiro was registered by the Cierva Autogiro Co. Ltd. as a trade name, and can be properly applied only to the products of that company.

The idea of producing hovering flight is not new. Many different types of helicopters have been designed in the past 30 years, but nearly all have been experimental rather than practical, and never produced in quantity either for commercial or military purposes. On the other hand, Autogiros and other gyroplanes have been made and used in quantity all over the world. The R.A.F. have quite a lot. It is therefore aviation news to hear that at last the helicopter is to be used in quantity for U-boat spotting and bombing. Many years of patient experiment and experience have gone into the latest helicopters which are to be used for this vital anti-submarine work. This is good news not only for our shipping, but for the progress of aviation. It is, of course, impossible here to touch on every step in the development of the helicopter, but several outstanding machines will be considered, each acting as a milestone in the progress of the helicopter.

The first helicopter was propounded by Leonardo da Vinci, but it was not until 1908 that a really practical step was made in the design of direct lift and hovering flight. This helicopter was designed and built by M. Louis Breguet, the designer of so many successful French aeroplanes. The troubles were those of all early aerodynes, namely, stability and control, a problem which has dogged the helicopter more persistently than any other aerodyne. This machine of 1908, despite the difficulty of controlling it, did fly a distance of 64 feet at a height of 15 feet.

The next milestone was a rather ungainly effort which came in the early nineteen-twenties, and it actually flew, but not far. It had twelve two-bay biplanes in two sets of six, set radially round a thick central shaft driven by a radial engine. The rigging of those twelve biplanes which comprised the two rotors must have been a nightmare. It was trouble enough rigging a two-bay biplane of the Avro 504 type: what it must have been like getting the correct angles of those twelve biplanes passes comprehension. No wonder it was called the "rigger's nightmare."

A little later—about 1925—came the Berliner helicopter. It was really a biplane with two horizontal rotors above the top wing. No one could get away from the biplane in those days. Lateral control was obtained by a set of three controllable flaps hinged at each wing tip. Directional control was quite conventional by a rudder. No control was possible from the rotors. About this time the helicopter was abandoned as unpractical owing to the difficulties of controlling it.

But in 1935 M. Breguet, still working on helicopters, produced, in collaboration with M. Durand, a very successful direct-lift and hovering aircraft called the Breguet-Durand helicopter. This machine rose vertically upward to 100 feet and flew forward at 62 m.p.h. Directional control was by a conventional rudder, while lateral control was accomplished by changing the plane of the two rotors, which were universally mounted, self-centring and controllable, so presaging modern methods of helicopter lateral control. This helicopter had two twin-bladed rotors counter-revolving on the same vertical shaft. The rotors were set one above the other, and were 52 feet in diameter. Normal turning revs. were about 130 a minute. This machine weighed two tons.

Some of you may remember the mild sensation which the Focke-Wulf 61 created when in 1938, and piloted by a woman, it flew inside a Berlin sports building. This aircraft set up many world records for helicopters. In 1938, apart from its sensational indoor flying, it also flew 143 miles at 70 m.p.h. This helicopter had two separate control rotors on outriggers, like the Vought Sikorsky. The Focke-Wulf 61 could rise and descend vertically and could hover in the air in fully controlled and stable flight.

In the first Vought Sikorsky direct-lift aerodyne full control was obtained by varying the planes of the rotors, the rudder being abandoned. Both the Breguet and Focke-Wulf used a rudder for directional control.

A year later there was a drastic change in the basic design of the Vought Sikorsky from three to two rotors. Control was not affected by this change. The illustrations on pages 14 and 15 show the latest quantity-produced Vought Sikorsky helicopter demonstrating its hovering abilities and its exceptional control and stability while hovering. The girl is actually talking to the pilot and handing something to him while the machine is in flight. The downward and forward view from this latest helicopter is exceptional owing to the rear position of the engine or engines. The cabin is roomy and the whole a neat and compact job. This helicopter is said to ascend and descend like a hotel lift and hover like a sparrowhawk—in fact, just the thing for operating from the cramped decks of merchant vessels against the U-boat.

But the helicopter may do more than beat the U-boat: it may yet beat the aeroplane by turning every flat roof into an aerodrome and every town square into a landing-ground.

BOOKS

Wings of War
(An Air Force Anthology)
(1942.) Edited by F. Alan Walbank. **B. T. Batsford Ltd.** 12/6. 164 pages. $8\frac{1}{4}'' \times 6\frac{1}{2}''$. 52 photographs.

A collection of tit-bits from books, official reports, newspapers and other documents relating to flying since the earliest days. Not the best examples of aeronautical literature and too disjointed to form a history, but interesting all the same.

Britain at War—The Royal Air Force from January 1941 to March 1942
By Air Commodore L. E. O. Charlton, C.B., C.M.G., D.S.O. Hutchinson. 21/-. 312 pages. $9\frac{3}{4}'' \times 7\frac{1}{4}''$. 376 illustrations.

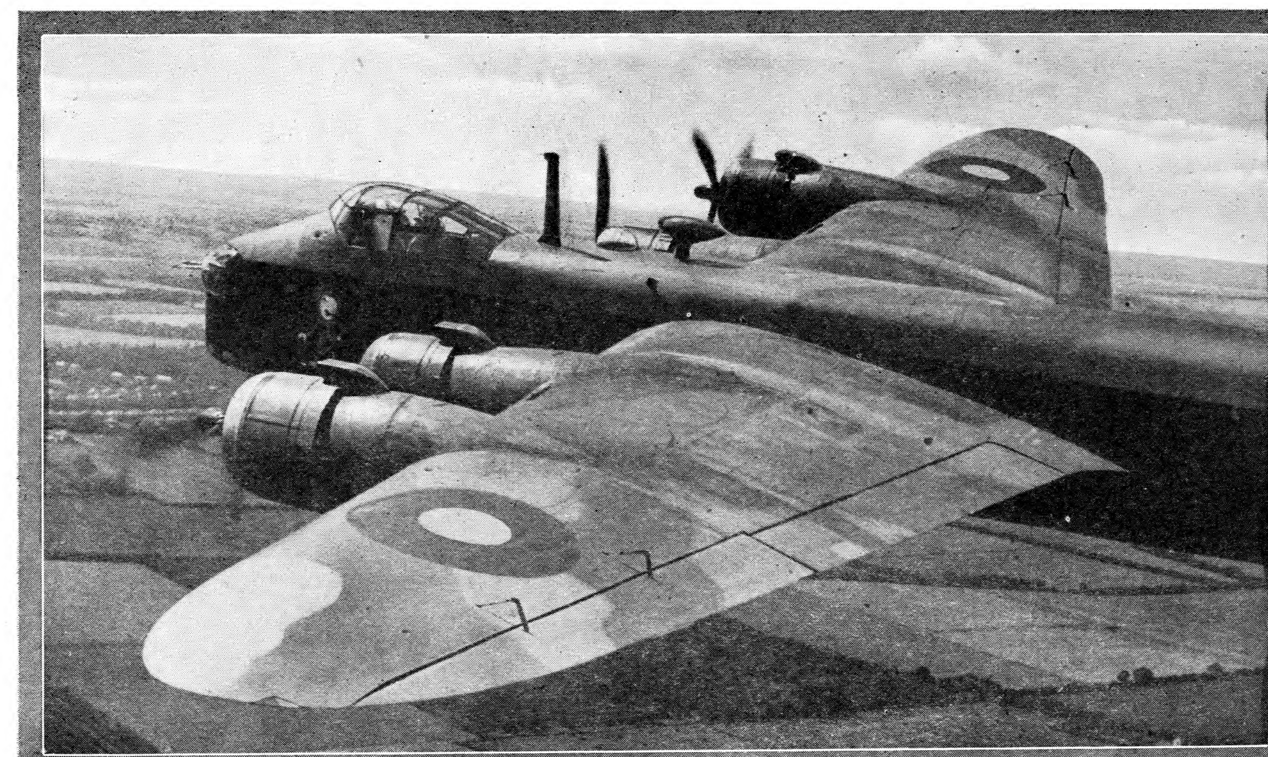
A well-illustrated, well-written and well-produced record of R.A.F. achievements in the period mentioned.

Aircraft of the Fighting Powers
VOL. III. Harborough Press. 21/-. 80 pages. $11'' \times 8''$. Many drawings and photographs.

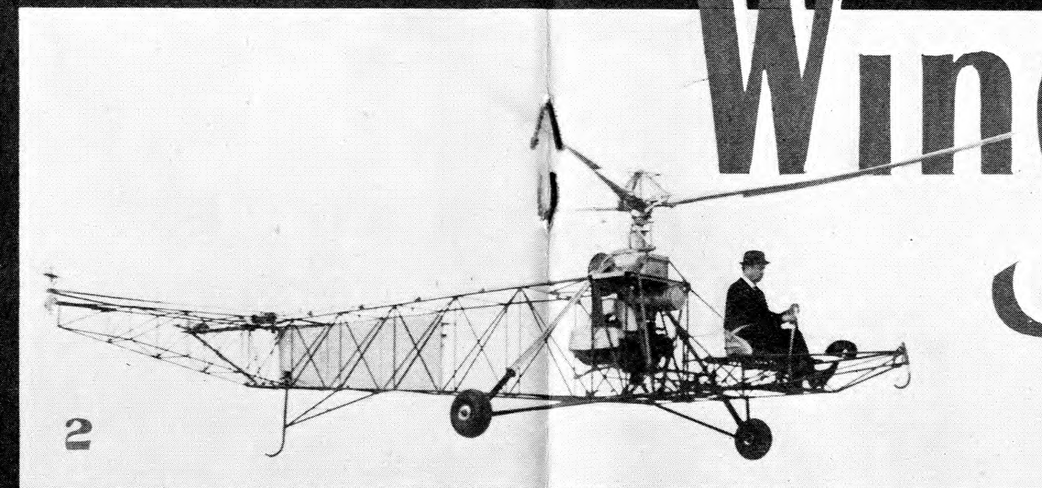
This, the third volume of *Aircraft of the Fighting Powers*, gives particulars, photographs and drawings of 82 aircraft. Of these 35 are American machines not dealt with in the other two volumes, and about an equal number of British, German, Italian, U.S.S.R., Japanese and Netherlands types. Although intended primarily for the aero modeller, *Aircraft of the Fighting Powers* in its three volumes covers altogether 257 types or variations, and is a useful work of reference for anybody.

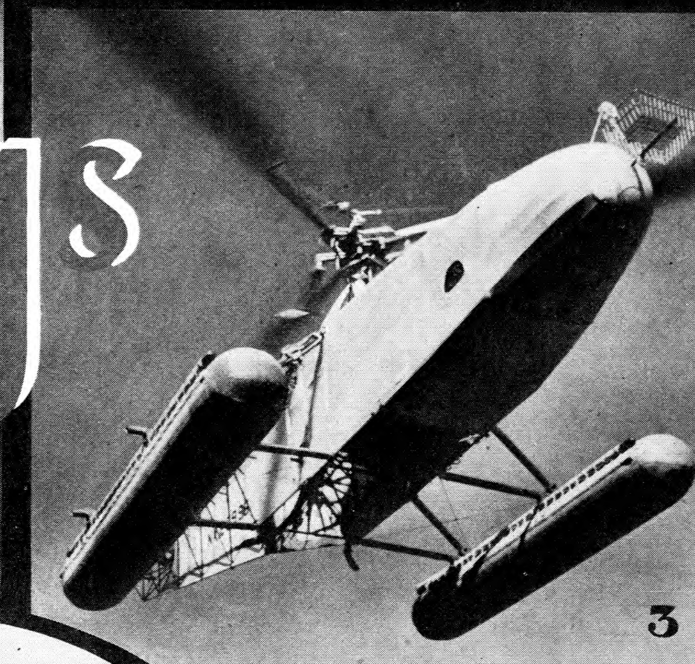
Further Book Reviews appear on pp. 24 & 25.

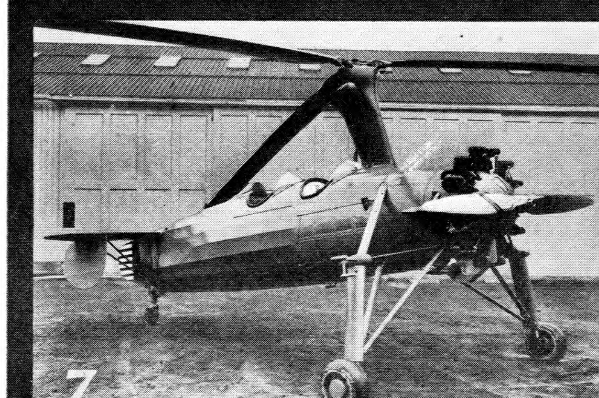
Above: Halifaxes. Below: Stirling.

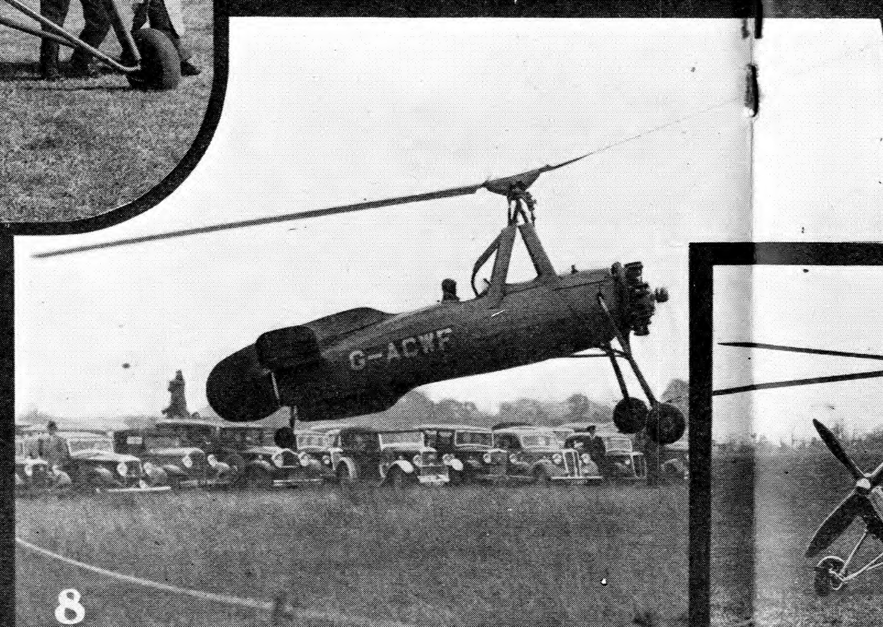


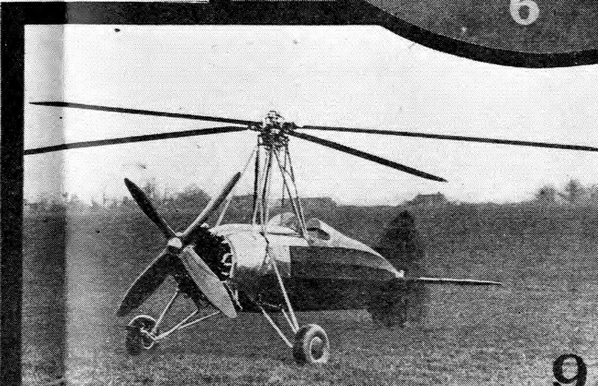
ROTATING Wings

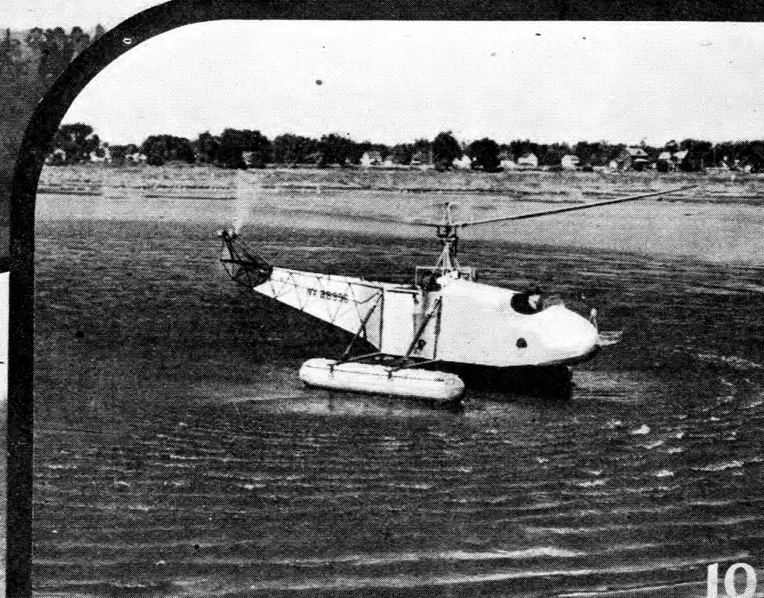




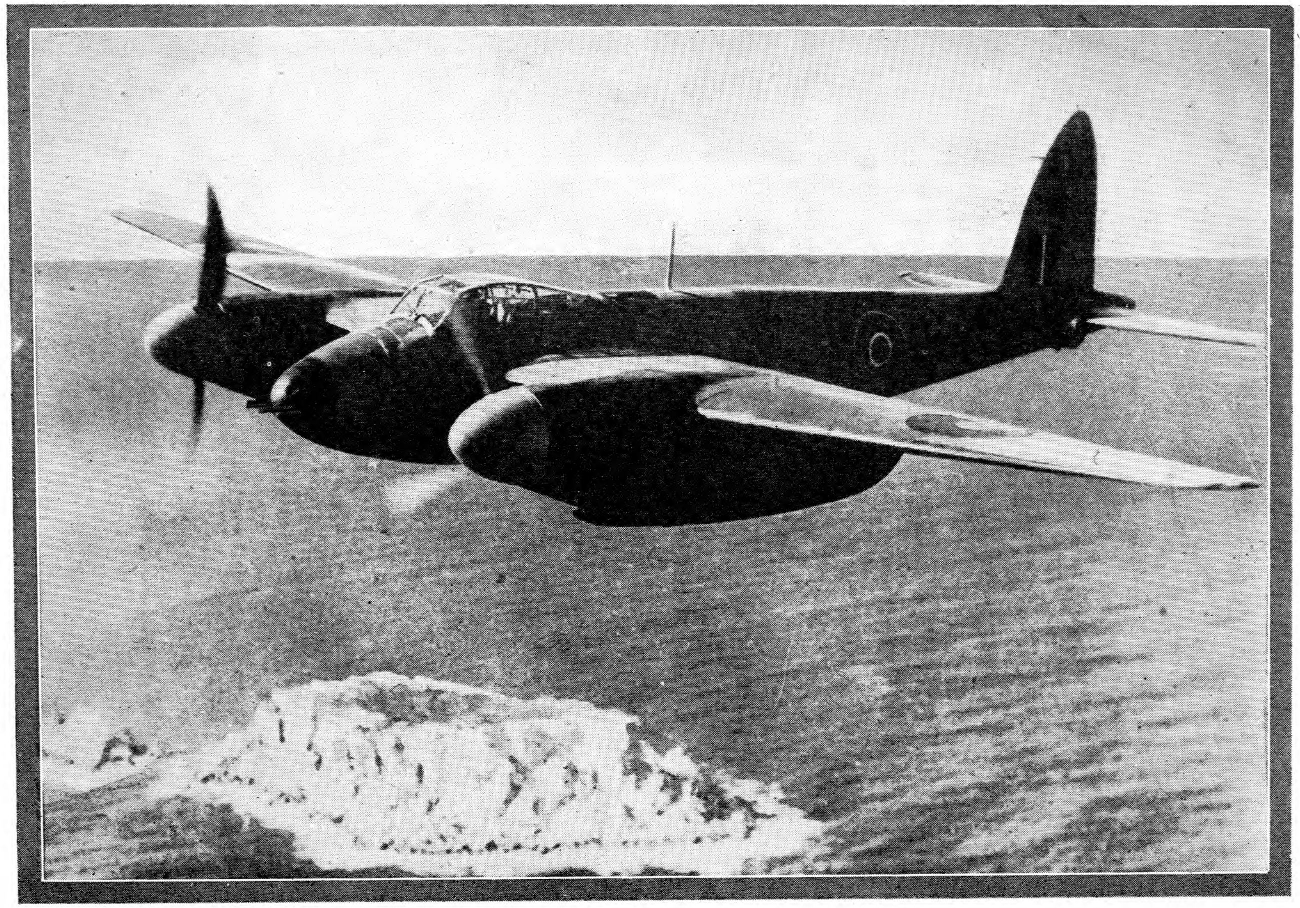




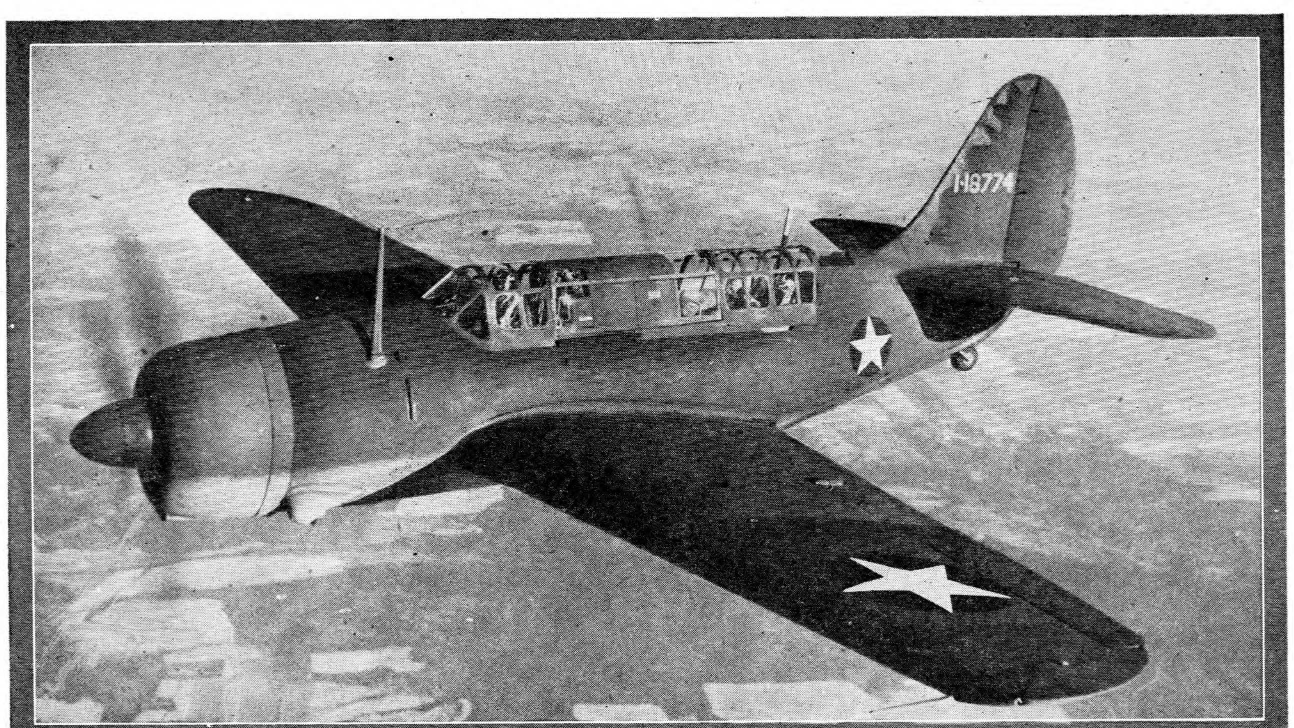




1. The new cabin Sikorsky helicopter, with tricycle undercarriage.
2. Igor Sikorsky flying his helicopter in 1940.
3. The Sikorsky VS-300, similar in principle to No. 1, but fitted with floats.
4. The Autogiro in use by the R.A.F.
5. The Hafner gyroplane.
6. The jumping Autogiro taking off (after taking off, the nose drops a little).
7. The Kellett YG-11 Autogiro.
8. The jumping Autogiro landing.
9. The Kay gyroplane.
10. The Sikorsky VS-300.



Above: Mosquito. **Below: Helldiver.**



Making Good

MORE D.R. NAVIGATION

by **Squadron Leader J. L. MITCHELL, D.F.C.**

Effect of Wind

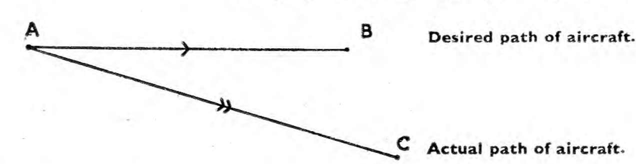
WE have briefly described Position, Direction and Speed in an earlier article. Briefly is the word, because we must never get the impression that navigation can be learnt overnight by a correspondence course or by simply sitting in the classroom reading textbooks.

We are now going to consider the effect of wind on the movement of an aircraft. Wind may assist or impede the movement of an aircraft according to the strength and direction with which it is blowing. The speed of the aircraft *in relation* to the ground will differ from the speed indicated. This actual rate of travel over the ground is known as the aircraft's ground-speed.

In addition to this effect on the ground-speed of the aircraft, the wind is also going to have an important effect on the path of the aircraft over the ground.

Calculation of Wind

Suppose you want to fly from A to B (for the sake of our example, B is due east and 100 miles from A). Steering on a course 090°T. and maintaining a constant speed of 100 m.p.h. on the air-speed indicator you would, quite reasonably, expect to find yourself over B at the end of one hour's flying. However, on looking at the ground after an hour has elapsed you realise that you have not arrived at B, for you can recognise the "Pig and Whistle" at C. Evidently you have been blown off the required course, since you are certain that your compass course was accurate.



In the diagram the line AC represents the track of our aircraft; that is, the actual path it took over the ground. Yet the line AB was the "course," or heading, which we maintained with scrupulous accuracy. The wind has had some effect on the aircraft; it has, in fact, blown the aircraft off track by a distance BC in the period of one hour's flying.

To reach B we must take this wind effect into account. Clearly, if we know what the effect is going to be (from its forecast strength and direction), we can allow for it in the calculation of the course we shall be required to steer. The angle (BAC), i.e. the difference between the Course and Track, is called the Drift. We name it "port" or "starboard," denoting whether we are drifting to the port or starboard of our course.

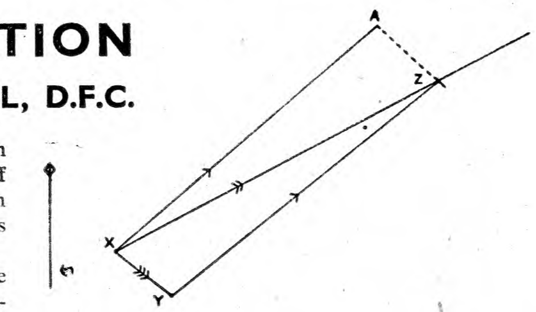
Had the weather experts been unable to forecast the strength of the wind accurately on such a flight as this, our ending up over the "Pig and Whistle" at C would provide a means of calculating it. If AB represents our "Course" and the distance we should have covered in one hour, according to our air-speed indicator (i.e. the air-speed), and if AC represents our actual "Track" and the distance we actually covered in one hour (i.e. our ground speed), then BC will represent the distance the wind has blown us in this time. Now, if we measure the length and direction of the line BC on our map we shall know our wind strength and direction, in terms of miles per hour and degrees (T.).

Calculation of Course

Suppose we have an accurate forecast of the wind strength and direction. To make good a required track, we must set about plotting our course. Clearly, from our earlier discussions, we must allow for this wind effect.

The first step is to lay off and measure the track required.

From our starting-point at X we lay off a line XY, representing the direction and speed of the wind. Now, in this example we have used a wind from 315° at 20 miles per hour. (Note, always use figures, and not such expressions as "north-west.") The length of this line



XY must be to some convenient scale for drawing purposes, say, one-tenth of an inch = one m.p.h.

With our dividers centred at Y, and opened on a radius representing our air-speed at the same scale, we mark off the track at Z. Now, we have a line YZ representing our air-speed. With parallel rulers we draw XA, from X, parallel with YZ. This line will represent the course we will have to steer. If we join AZ (thus completing the parallelogram), we shall see that AZ will represent the wind effect bringing us to the point Z at the end of one hour. So long as we maintain the heading XA at the prearranged speed, and the wind remains constant, we shall continue to make good our required track in the direction XZ.

The Arrow Convention

Finally, notice the little arrowheads on our diagrams. These not only indicate the direction of the wind or aircraft, but also serve to indicate which line is which, saving a lot of muddle in complicated diagrams.

One arrowhead always represents the Course.

Two arrowheads always represent the Track.

Three arrowheads always represent the Wind.

THE KEY MAN

THE WORK OF A BOMBER WIRELESS OPERATOR

Described by WING COMMANDER **W. E. DUNN**

The wireless operator of a Flying Fortress tuning in.

THE wireless operator of a bomber aircraft has a full and interesting job. He is responsible to the captain of his aircraft for the efficient working of five separate wireless installations and of the intercommunication telephone system throughout the aircraft. He also has to act as the electrical engineer of the aircraft.

W/T Set

His main concern is the wireless telegraphy (W/T) transmitter and receiver used for the transmission and reception of Morse. He sits by this outfit throughout almost the whole of any flight, listening on the receiver on certain set frequencies. With this installation it is possible for messages to be sent to and from the aircraft and its base. The messages handled may be recall messages—necessary when the weather suddenly becomes unfavourable after the bombers have taken off: diversion messages, sent to aircraft when the bombers' own airfield has become fogbound; sighting reports, when the bomber sights a large convoy or other interesting target for Coastal Command to attack; or distress messages, which are sent when the aircraft requires assistance.

Loop Aerial

Attached to the receiver is a loop aerial, housed in a fairing which looks rather like an Easter egg perched on top of the bomber. The loop aerial enables the wireless operator to take bearings on wireless beacons. These bearings make it possible for the navigator to plot the position of the bomber during its flight. Any number of aircraft can obtain bearings from the same wireless beacon at the same time, and no transmission need be made by the aircraft.

A disadvantage of the loop aerial is that it is possible for the enemy to send out signals similar to those being radiated by our W/T beacons in order to lead our aircraft astray. As we have large numbers of wireless beacons, there are always some which are safe to use.

M/F D/F

When an aircraft is in distress, the navigator may not have time to plot loop bearings. In order to provide a quick wireless aid and also to enable the controllers on the ground to know the position of the aircraft, a network of medium frequency direction-finding stations (M/F D/F stations) work on a number of frequencies, so that a bomber can obtain a fair idea of its position. The wireless operator calls up a suitable M/F D/F station, and whilst the aircraft is transmitting, three M/F D/F stations obtain bearings on the aircraft and the control station plots these bearings, and thereby obtains the approximate position of the aircraft, which is then transmitted to it.

H/F D/F

Nearly every airfield at which a bomber aircraft is likely to land is provided with a high-frequency direction-finding station (H/F D/F station), by means of which aircraft can be guided to that airfield from shorter ranges. This facility is particularly useful at night, and also by day when low cloud or fog obscures the ground. To obtain help from an H/F D/F station the W/T operator of the aircraft tunes to the frequency required and then calls. Whilst the aircraft is transmitting, the ground H/F D/F station takes a bearing and then transmits to the aircraft a coded message (meaning: "The magnetic course to steer with zero wind to reach me is .... degrees"), the whole process taking less than one minute.

R/T

The radio telephony (R/T) transmitter and receiver for the transmission and reception of speech is usually operated by the pilot of the bomber, but the wireless operator has to keep a careful eye on the set to ensure that it continues to work properly. The set uses an ordinary 120-volt high-tension battery, and therefore has only a limited range. The use of a common frequency allows pilots to talk to any airfield near which they happen to be flying. Landing instructions are passed to pilots by this means.

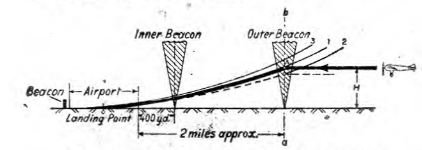


Diagram of a beam approach system in use before the war.

The Beam-Approach Receiver

Many airfields are provided with wireless beams which are directed down a runway. The beam-approach receiver in the aircraft can detect the airfield beam at some distance from the airfield, and the aircraft can then fly down the beam and land on the runway. The actual procedure is much more difficult than that sounds, and calls for much practice and skill. These beams are also very useful as guides to a particular airfield and avoid the necessity for "queuing up" for messages from the H/F D/F station. The beam-approach receiver is also operated by the pilot, but again it is the job of the wireless operator to keep it serviceable.

Launching a kite to carry the radio aerial of an American dinghy.

Dinghy W/T Transmitter

Every bomber aircraft carries a rubber dinghy large enough to accommodate the whole crew. The equipment of the dinghy includes a self-contained W/T transmitter. The aerial, consisting of 208 feet of wire, is supported by a kite, which is launched either by hand or by means of a special rocket. In calm weather a collapsible vertical mast aerial is used. Wireless distress signals are radiated by the sole process of turning a handle on the transmitter. The handle drives an electrical generator which produces the necessary power for the transmitter and also automatically sends the Morse for S O S. The Air-Sea Rescue aircraft and launches can then obtain loop bearings on these transmissions and thus quickly locate the dinghy. The dinghy transmitter is lined with cork, so that if it falls

Wireless operator at an R.A.F. ground station.

into the sea it floats, and, being water-tight, suffers no harm. (See last month's article on "German Dinghy Transmitters.")

Crew Intercommunication

It is of great importance that the captain of a bomber aircraft shall be able to speak to any member of his crew. The rear gunner must be able to give warning of the approach of enemy fighters—the air bomber must be able to guide the pilot up to the target and the captain must be able to issue general orders to each and all members of the crew. The requirements are met by means of the "inter-comm." system, which consists of a telephone network terminating at all crew positions in the aircraft. Each member of the crew has his own microphone and earphones attached to his flying-helmet. A two-valve amplifier produces sufficient amplification to enable speech to be understood above the din caused by the engines. The efficient working of the "inter-comm." is a very important responsibility of the wireless operator. When aircrew are dressed up for operational flying they are liable to be clumsy in their movements, and the operator is frequently called on to repair damaged sockets and leads.

Electrics

Most of the installations described rely on the main electrical supply in the aircraft. This supply is derived from a 24-volt accumulator battery which is kept charged by an electrical generator driven by one of the engines. Our wireless operator has to keep check on the voltmeter and ammeter connected to this circuit, so that the battery is not allowed to become discharged. Visual signalling systems, cockpit lighting and other electrically operated circuits complete the electrical aspect of the bomber wireless operator's responsibilities. He must know where all the fuses and switches are located, so that he can do something about it if any particular circuit fails.

Operational Procedure

On a normal night-bombing flight the wireless operator keeps continuous watch on his W/T receiver, working to a more or less set programme given to him at the main briefing. This programme includes listening on certain frequencies at specified times during each hour of the flight. He is also kept busy obtaining loop bearings on various wireless beacons. In the target area he sometimes has to assist in the dropping of flares and leaflets. On the return journey he may have to obtain fixes or bearings. On many occasions the wireless operator has been instrumental in getting the aircraft safely back to Britain. Many crews also owe their lives to the skill with which their wireless operators transmitted the S O S before their aircraft finally "ditched."

Large numbers of wireless operators of Bomber Command have already been awarded the Distinguished Flying Cross or Distinguished Flying Medal for their skill and daring displayed on operational flights.

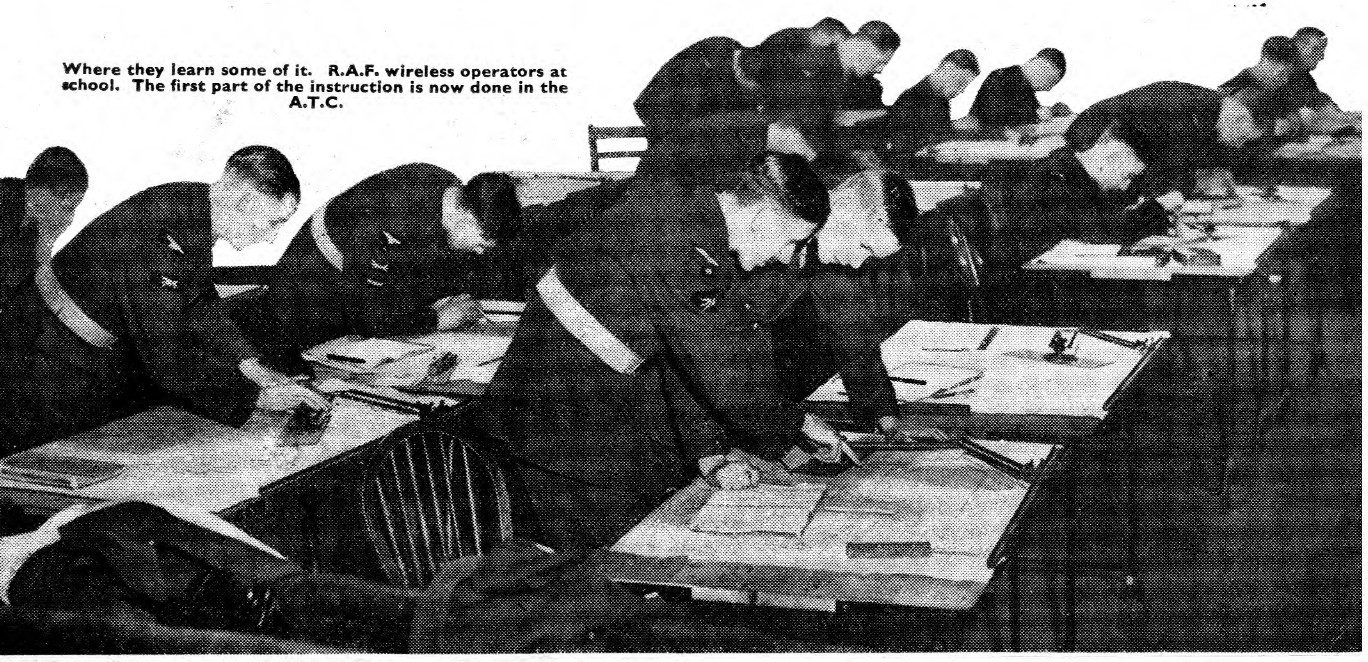
There is a tradition existing in Bomber Command epitomized in an Order of the Day published by the Air Officer Commanding-in-Chief Bomber Command which appears above.

Wireless operators are certainly doing their share to maintain this tradition.

ORDER OF THE DAY

The safety of aircraft and of their crews is found to depend again and again upon the methodical efficiency, care, intelligence and devotion to duty of the Signals Service. Captains of aircraft should know that when the safety of their aircraft is endangered by fog or by other conditions of bad visibility, they can rely absolutely on the Signals Service to bring the aircraft home to safety.

The tradition of the Signals Service is that the safety of aircraft overrides every other consideration and every other interest, and the personnel of the Signals Service spare no effort to bring every aircraft safely to port. The Signals Service aspires never to lose an aircraft.



Where they learn some of it. R.A.F. wireless operators at school. The first part of the instruction is now done in the A.T.C.

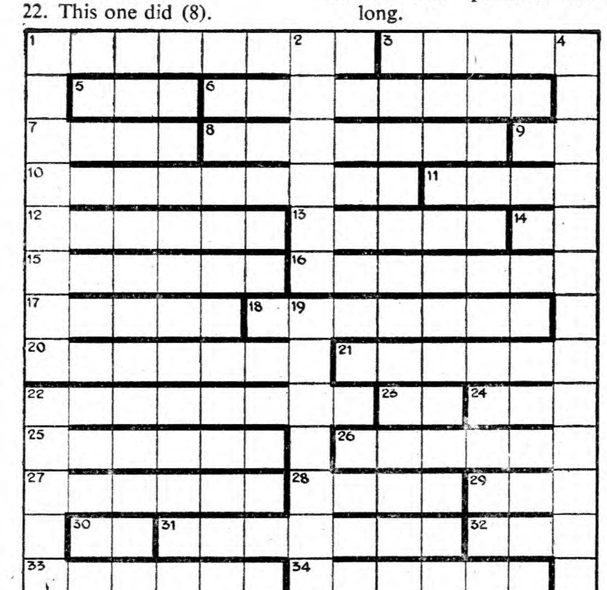
CROSSWORD

ACROSS

1. T.S.R. biplane (8).
3. Ex-G.R., now trainer (5).
5. For good flying in the face of the enemy (3).
6. Twin-tailed troop transport (8).
7. An R.A.F. autogiro (4).
8. One of their latest aircraft is airscrewless (7).
9. Comes before 20, or the Italian for "Stork" (2).
10. Stringbag (9).
11. "As pants the —— glider tug"? (4).
12. A feathered and stormy Percival (6).
13. Welsh wing? (5).
14. Famous for the malaria-carrying insect (2).
15. White or red — still a transport (6).
16. The Lockheed 10 (7).
17. Could be called a civil 27 (5).
18. Ran the Gauntlet (7).
20. Has never taught the Hun a lesson (7).
21. Didn't win many (6).
22. This one did (8).
23. Dornier (2).
24. Director of Public Relations (3).
25. A tug on the Thames (6).
26. A wild beast from the land of the West? (6).
27. Upper class trainer? (6).
28. Also known as flags, but those are not by Blackburn (4).
29. It flies, but sounds like a stone (3).
30. 210 is the latest (2).
31. See R42.
32. Uncle Sam's Army? (3).
33. The engines are in the Do 26, but not in the He 177 (6).
34. Fw target for the Merchant Navy (6).

DOWN

1. Maker of 27.
2. Alternative to 20.
4. Makers of Harvard.
19. Scottish flying-boat?
22. Yet their products are long.



Key to Bandits

(Reading in columns from top to bottom)

Left column—1, Cant Z.506B Airone; 2, SM. 79 Sparviero; 3, Me 109E; 4, He 177; 5, Me 110 (two machines); 6, Do 217E. *Middle column*—1, He 111K Mk. Va; 2, Ju 90B; 3, Ju 87B; 4, Bv 141; 5, Bv 138B. *Right column*—1, Ha 139; 2, Fw 189; 3, He 115 K2; 4, Ju 87B; 5, Hs 126; 6, Breda 88 Lince; 7, Mitsubishi Navy OB-96-4.

CADET CAMP

by Cadet Sergeant

WHETHER you are under canvas or on an R.A.F. or Fleet Air Arm station, you will need certain items of kit which are very easily forgotten. There may be a N.A.A.F.I. canteen on the aerodrome, but usually these places have barely enough stock for the airmen, who have less opportunities than you of popping into Woolworth's.

Things to Take

Take a mirror with you—a small pocket-size one from your sister's handbag will do; a spare packet of razor blades (saying that you never shaved before is not an excuse for coming on parade with a fluffy chin). Take a box of matches and (if you smoke) plenty of cigarettes and a lighter. Remember to have some notepaper and envelopes and a book of stamps (N. A. A. F. I. has enough to do to supply the demands of the airmen). A fountain-pen or a pencil and a clothes brush will also be handy. A comb, needle and thread and a pair of scissors are semi-essential items in addition to your usual toilet kit if you are to remain as smart as when you started out. A torch will often be useful, and for goodness' sake get a hair-cut before you go away—the R.A.F. doesn't like seeing its younger brethren with hair down to their knees. I don't suppose you will overlook your toothbrush, although the number of cadets that do is surprising. One or two safety-pins on a card may help you out of some awkward situations, and a few spare buttons don't take up much room. If you are taking your kit in a suitcase, put a strap around it—the seams might give, and in any case you might need to use the strap as a trousers belt. Whether you use a kitbag or a suitcase, put a couple of labels on it with your number, name and address and the address of the station you are going to — do this even if you are taking your luggage with you. I don't think you need to be told to write the label in block letters. Although you don't wear your gas-mask at parades now, remember to take it on your trip. And, by the way, quite a number of people neglect to take a pair of gloves and a scarf. Even when the weather is good it can be awfully cold when you fly at height, and there is always the possibility of your getting a flight on any station, operational or not.

The mirror from your sister's bag will do

Get your hair cut.

Money Matters

Take enough money, but not too much. A pound should be enough for any cadet to live on for a week, even if he smokes twenty cigarettes a day. Don't leave your money lying around, and don't flash it about—there is no need to put temptation into the way of others less fortunate than yourself. Ration your money out, and don't go above the sum you have allowed yourself for each day. Remember that at the end of the week you will want to have a celebration in a small way, so don't run yourself down to about sixpence—you will feel a little out of things if the others decide to paint the town a mild pink on the last night. And don't forget your fare home from the station when you get back. One more thing about this money business—don't borrow. You will probably be away with other cadets whom you have never seen before, and it is so easy to forget a debt to a comparative stranger. If you suddenly find yourself in dire straits — go and see one of your officers, who are there to help you.

Your parents will be glad to hear from you as soon as you arrive, so don't keep putting off that letter to them — write as soon as you can.

Don't take this kit business too seriously and roll up at the train with a trousers press in one hand and an electric iron in the other. If you find that knife-edge crease in your trousers fading out, put them, neatly folded, under your mattress or palliasse, which, if it is as hard as it seems, will be as good as an iron.

Too seriously.

Your ration cards should be taken to any station you visit, unless you receive orders to the contrary.

Take a book with you. A Penguin is a size that won't take up much room. I should advise a book of short stories, as a full-length novel loses its attraction if you have to keep putting it down every so often. If all the cadets in the party take one book each there will be plenty to read.

Just like Mother makes it.

Things to Do

When you get to camp, remember that you are under R.A.F. supervision, and don't try to get too friendly with the R.A.F. non-com. He won't have any. You won't see many officers, but you will find the N.C.O.s and men very helpful—especially the ground crews. Aircrew men as a rule have very little time for anyone who doesn't fly. You will see perhaps too much of your own officers, who never seem to realise, good types as they may be, that you would like to get along on your own for a little, as you are on holiday. Americans never know whether to take the A.T.C. as a glorified Boy Scout movement or as part of the R.A.F. Don't rely on them for any flights.

And about this flying business. Some people warn you against asking pilots for flips, but—nothing venture, nothing gain (remember the motto of the Corps). Mind you, I am not advising you to skip parades or lectures to run about all over the field missing airscrews by inches. But if you want a flight you've got to go and get it—there's no use your sitting about waiting for the Group Captain to come round to you with a gilt-edged invitation card. But *don't* go too far, and never fly unless you have given up your blood-chit to the responsible officer.

You will find the N.C.O.s and men very helpful.

Watch Your Feet and Hands

Watch where you are putting your feet when you are climbing over aircraft. Don't step off the walkway and walk along the wing of a Tiger Moth, for instance — the riggers won't appreciate that nice design you've torn in the fabric with your size twelves. If you sit in the cockpit of a 'plane and feel that you must meddle with the controls, be careful. If you try to move the stick or rudder bar, and it won't budge, do not force it. And if you see that attractive little button on the top of the stick—*don't* touch it. The guns might be empty, but on the other hand airmen don't like having to duck and run for their lives at odd moments of the day. One two-second burst from eight guns can cause a lot of grief. (R.A.F. men get a lot of detention for doing this kind of thing.) So save it up for a Hun later on.

Gilt-edged invitation card.

Beware of that propeller blade you're leaning against; the motor might be warm, and if it were switched on—well, perhaps you like your hair parted that way. Those blades can be awfully heavy. A pool of petrol or oil is usually provided in every hangar for bright types to drop lighted cigarettes in. And aircraft are neatly arranged on trestles so that parties of cadets can climb on to one side and push them off. Ground-crew men simply love cadets who come up and ask questions when they are working all out on a repair job that has to be finished within the hour.

Tact and Discipline

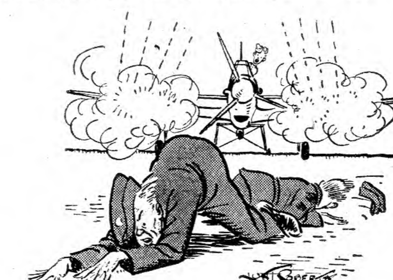
A word to cadet N.C.O.s. Those pretty chevrons on your arms count for precisely nothing in the R.A.F., so don't go up to an R.A.F. disciplinary corporal and give him a few orders on the strength of your third stripe. He won't like it at all. And don't expect an L.A.C.—one of those chaps with the props on their arms—to jump to it when you bawl at him. He may be old enough to be your father—he might even *be* your father!

Your job as an N.C.O. when you are down there is to keep an eye on the cadets. Don't run off and leave them if you see a chance of doing some flying. The temptation will be great, but neither they nor your officers will take a very good view of that kind of action. And don't take it on yourself to give cadets permission to clamber in and over aircraft when you haven't applied to an R.A.F. authority.

Try to ease up a little on the discipline. I know only too well how cadets can show off, but remember that they are on holiday—and after all, you can take it out of them when you get them on the square back home.

Well, that's about all. Camp life does look full of restrictions, but it is a darned good life, and is thoroughly enjoyed by officers and cadets alike. On an R.A.F. station you get an education in Service affairs that other people would give a small fortune to obtain. And remember not to spill any secret information—you have been told of this many times, but cadets are still known to be divulging information, and it must be stopped.

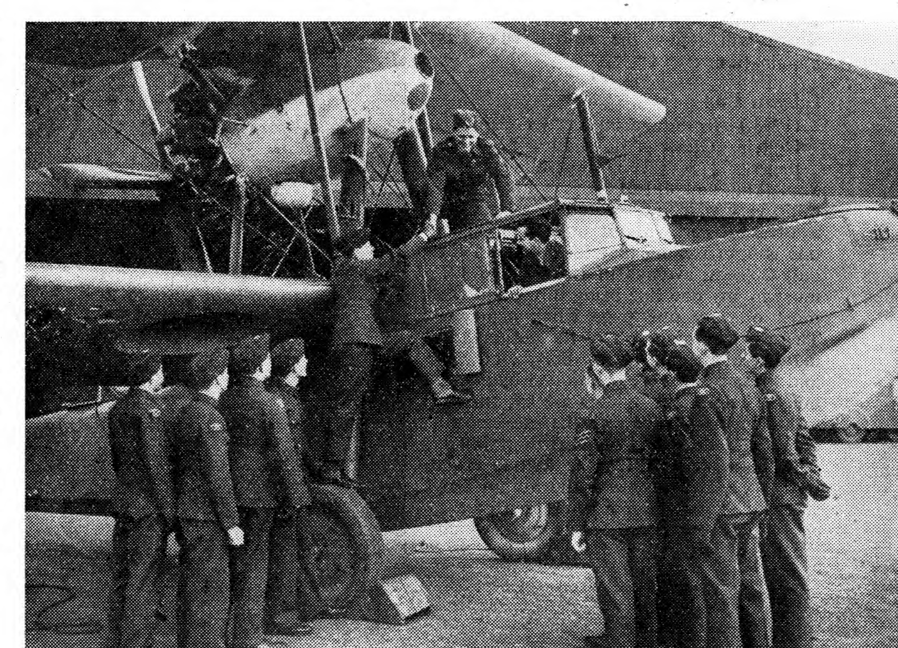
Nevertheless, as long as you take heed of the points raised, you won't get into trouble—so take those little items of kit with you (you have no idea how important they seem when you haven't got them), and enjoy your camp.

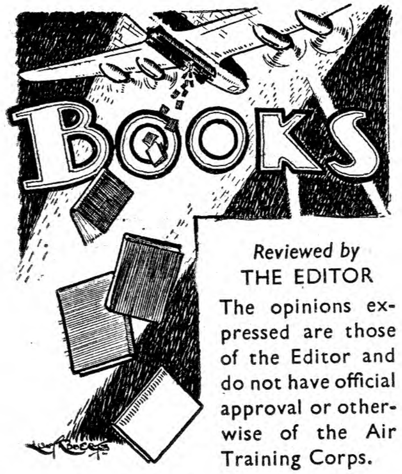


Save it for a Hun.

Cigarette ends not to be thrown here.

Mind your feet and hands.





Reviewed by
THE EDITOR

The opinions expressed are those of the Editor and do not have official approval or otherwise of the Air Training Corps.

The "Gen" Book

(March 1943.) By Flight Lieut. Charles Gardner. Hutchinson. 7/6. 180 pages. 7¼"×4¾". Illustrated.

An attractive catalogue of aircraft in which Flight Lieutenant Gardner, himself a Catalina pilot, strikes a new note by giving, in addition to the photographs and usual performance figures, a short history of each aircraft. He has also something to say about the flying qualities of some. About 100 types, British and American, are dealt with.

Spitfires Over Malta

By P/O Paul Brennan, D.F.C., D.F.M., P/O Ray Hesselyn, D.F.M. and Bar, and Henry Bateson. Jarrolds. 2/-. 96 pages. 7¼"×4¾". Illustrated.

Between March and July 1942 Malta suffered what is probably the most terrific air bombardment that any place has so far had without defeat. This book tells of the work of the Spitfire pilots who came to the island's defence and succeeded in lessening the German and Italian attacks. A modestly written account of those intense days when Malta was having its hardest time, and one which will repay the reader who has imagination.

Libyan Log

(1943.) By Squadron Leader Eain G. Ogilvie. Oliver & Boyd Ltd. 5/-. 103 pages. 7¼"×4¾". 33 illustrations.

Something new out of Africa—and something very welcome—would be a book by a press officer without any "I"s. This one is approaching that ideal. There are only 200, an average of two a page, the most in any one line being three, and the most on any one page being eighteen. There is a photograph of the author and another of his tent. A few Service officers and press officers are mentioned by name, but the rest of the fighters are left anonymous, in accordance with the tradition of those who have had an R.A.F. training.

In between the "I"s the writing is of fairly good quality, and the author has succeeded in conveying some idea of the fighting and of the conditions under which great deeds were done.

Volcano Island

By J. M Spaight, C.B., C.B.E. Geoffrey Bles. 7/6. 144 pages. 7¼"×4¾". Five photographs.

A review of our bombing operations and policy, with many raids briefly described and commented on. Earlier raids, here seen in retrospect, seem less effective than we then thought them. But, as the author points out, our raids are growing in weight and effect, while the power of the enemy to retaliate appears to be lessening. This disparity once established tends to increase rapidly, and the author is soberly hopeful of increasingly good results from our bombing policy.

They Flew Through Sand

By Squadron Leader George W. Houghton. Jarrolds. 6/-. 120 pages. 7¼"×4¾". 16 Illustrations.

Although a little self-conscious with too many "I"s, this account of the air fighting in North Africa is welcome, the events to which it relates being of such intimate interest to so many of us. The author, a press officer, was given adequate facilities to see what was going on, and succeeds in conveying some scraps of information and rough impressions.

Wings of Destiny

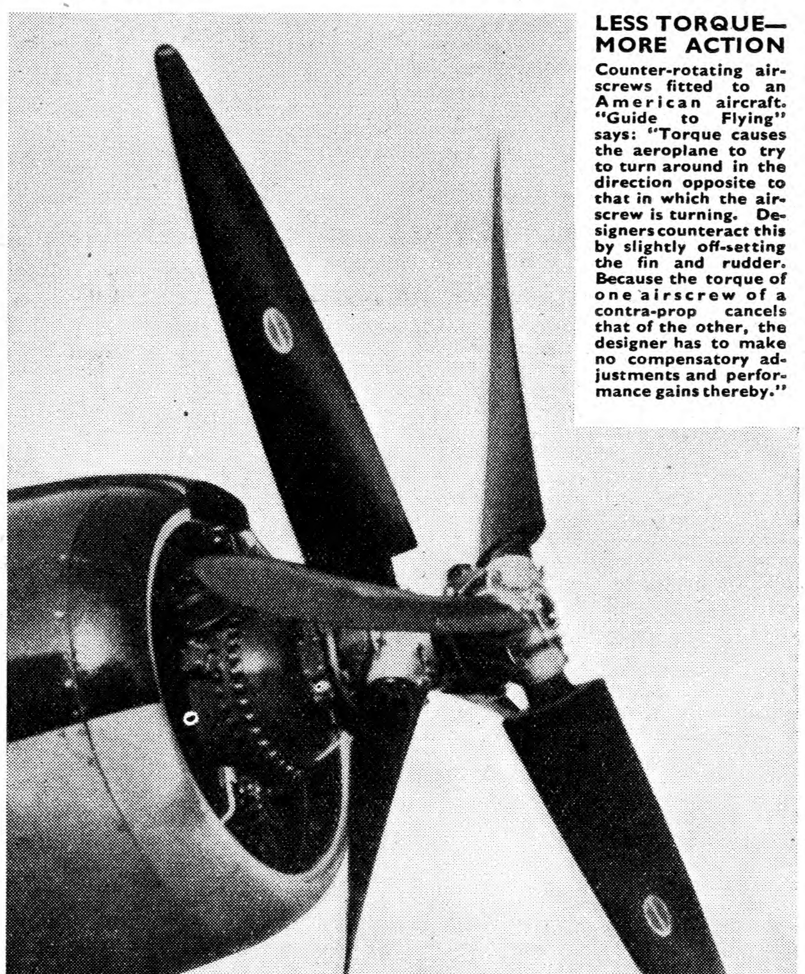
(1943.) By The Marquess of Londonderry. Macmillan. 12/6. 252 pages. 8½"×5½".

Some remarks on the political events leading to the war, but does not tell the whole story. Nicely bound.

School Physics

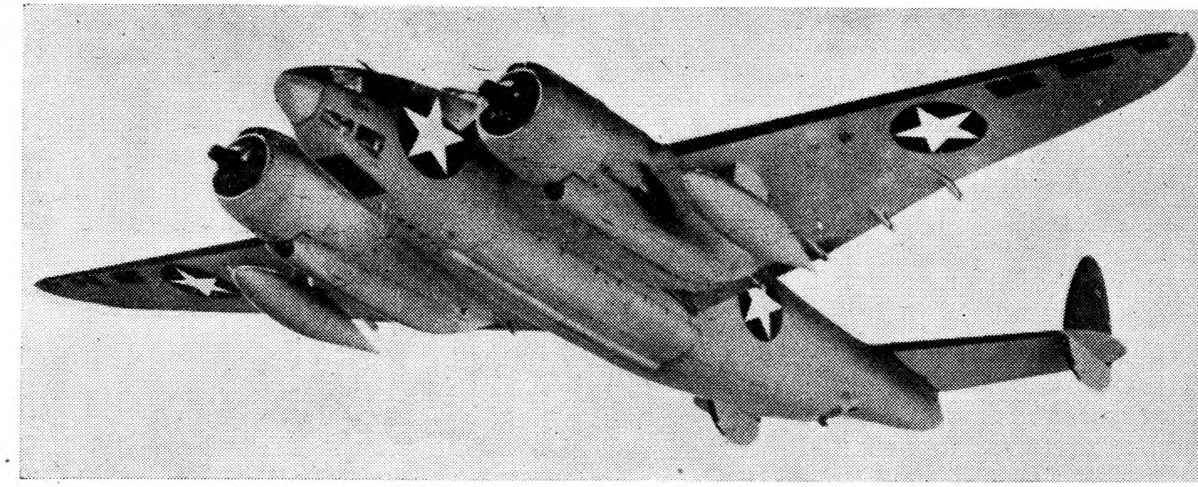
PART 1. (1943.) By T. M. Yarwood, B.Sc.(Hons.). Macmillan. 5/-. 365 pages. 7½"×5¼". Illustrated.

A remarkably interesting and lucid mingling of practice and theory. Is based on a four-year concentric school course in physics, but is so delightfully written and well illustrated that anyone can dip into it or read right through it with pleasure and profit. Aviation and other modern developments are used for practical demonstration of physical principles. So are commonplace things, such as gas meters and domestic boilers. The latter are not in the curriculum of the A.T.C., but the cadet in learning their workings may acquire a feeling for machinery and a knowledge of basic principles which will be valuable to him when he gets to the more romantic machinery of aircraft. It is a pity that the title implies it is merely a school book.



LESS TORQUE—MORE ACTION

Counter-rotating airscrews fitted to an American aircraft. "Guide to Flying" says: "Torque causes the aeroplane to try to turn around in the direction opposite to that in which the airscrew is turning. Designers counteract this by slightly off-setting the fin and rudder. Because the torque of one airscrew of a contra-prop cancels that of the other, the designer has to make no compensatory adjustments and performance gains thereby."



Stromberg carburettors described in "Introduction to Aero Engines" are fitted to the Double Wasps of the Lockheed-Vega Ventura. This is the nautical version, with detachable petrol tanks under the wings.

Guide to Flying

By S. E. Veale. Temple Press. 10/6. 192 pages. 8½"×5½". Illustrated.

In some parts this guide to flying, with its clear writing and explanatory diagrams, is a commendably good introduction to technical matters. In others it becomes a little too involved for the novice, and some technical difficulties are glossed over. Meteorology and electricity are not dealt with. On the whole, it is a good guide, but the 45 pages of mostly uninstructional advertising should have made a lower price possible. Advertising in publications of this nature is more effective and memorable when the advertisers explain their wares (as the K.D.G. advertisement does), instead of merely decoratively praising them.

The Duties of a Licensed Aircraft Engineer

(With particulars of the Examinations for the issue of Licences.) Printed by the Air Registration Board and published by Rolls House. 1/-. 28 pages. 8½"×5½".

Will be of interest to those who are looking to civil aviation as a career after the war. Dull and unattractively produced, but official and authoritative and consequently useful.

Introduction to Aero Engines

(1943.) By "Arduus." George Newnes. 6/-. 144 pages. 7¼"×4¾". 73 illustrations.

This book goes further than its modest title suggests. In addition to the usual exposition of the elementary principles of internal combustion engines, elementary mechanics and thermodynamics are introduced simply and lucidly. The chapter on carburation is good, and includes a diagram and description of the Stromberg injection carburettor fitted to most American aircraft used here. Recent developments in boost control are adequately dealt with, and except that magnetos are briefly dismissed in one paragraph, the book should bring the reader beyond the stage of introduction to that of easy if not intimate familiarity with aero engines.

Workshop Technology

PART 1. (1943.) By W. A. J. Chapman, Ph.D., M.Sc.(Eng.), M.I.Mech.E., M.I.P.E. Edward Arnold. 8/6. 303 pages. 8¾"×5¾". Illustrated.

A really valuable book for the man at the bench. Deals with the properties of metals, processes, cutting, workshop practice, measurements, etc., covering a two-year senior part-time technical college course. Clearly written and adequately illustrated, with useful appendices.

Aircraft Identification—Japanese Aeroplanes

Prepared by *The Aeroplane*. Temple Press, Ltd. 2/-. 65 pages. 5½"×8".

John Stroud and the staff of *The Aeroplane* have co-operated with good effect in producing this directory of Japanese aircraft. Produced in the usual *Aeroplane* style, it presents four pictures and three drawings of about 40 aircraft.

Guide to the Stars

(April 1943.) By Dr. Hector Macpherson. Thomas Nelson. 6/-. 137 pages. 7¼"×8¼". Eight photographs, 18 star maps, Greek alphabet and Table of Magnitudes.

The limitation of astronomical study to the utilitarian navigational stars has its value when navigators must be trained quickly, but the brighter spirits who have the time will lose nothing by acquiring a wider knowledge. This book has much to say of the planets and non-navigational stars, but should be of use to the navigator, because it succeeds in conveying something of the wonder and beauty of the universe.

Tail Gunner

By Flight Lieut. R. C. Rivaz, D.F.C. Jarrolds. 96 pages. 7¼"×4¾". 20 illustrations. 5/-.

A first-hand account of the experiences and thoughts and feelings of a tail gunner operating from Britain. The author is "Revs" mentioned in *Bomber Pilot* (by Group Captain Cheshire), and he describes, simply and well, bombing raids as seen from the other end of the aircraft.

The Airframe and Engine Fitter's Manual

(1943.) By P. H. Simpson, M.I.Mar.E., and H. R. Langham. George Newnes. 6/-. 201 pages 6¼"×3¾". Illustrated.

A reference book in question and answer form intended for those who have some theoretical knowledge and practical experience of the subjects.

Crossword Solution

(*see page* 21)

1 A	L	B	A	C	O	2 R	E	3 A	N	S	O	4 N
I	5 D	F	C	6 F	L	A	M	I	N	G	O	O
7 R	O	T	A	8 C	A	P	R	O	N	I	9 B	R
10 S	W	O	R	D	F	I	S	H	11 H	A	R	T
12 P	E	T	R	E	L	13 D	A	V	I	S	14 D	H
15 E	N	S	I	G	N	16 E	L	E	C	T	R	A
17 E	N	V	O	Y	18 G	19 L	O	S	T	E	R	M
20 D	O	M	I	N	I	E	21 B	A	T	T	L	E
22 S	P	I	T	F	I	R	E	23 D	O	24 D	P	R
25 H	E	N	L	E	Y	W	26 W	A	P	I	T	I
27 O	X	F	O	R	D	28 I	R	I	S	29 R	O	C
R	30 M	E	31 F	R	E	C	C	I	A	32 U	S	A
33 T	A	N	D	E	M	34 K	U	R	I	E	R	N

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Bandits!

Photographs of German, Italian and Japanese aircraft.

For key see page 21.