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I put a lot of time into producing these files which is why you are met with this page when you open the file.

In order to generate this file, I need to scan the pages, split the double pages and remove any edge marks such as punch holes, clean up the pages, set the relevant pages to be all the same size and alignment. I then run Omnipage (OCR) to generate the searchable text and then generate the pdf file.

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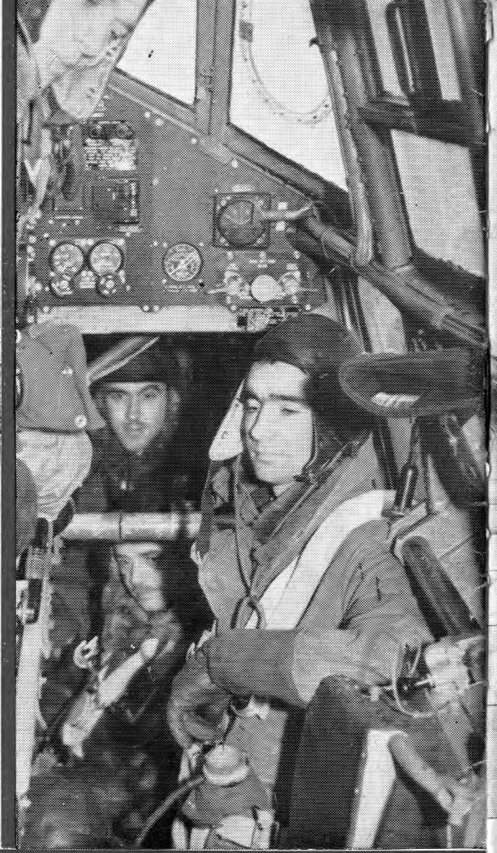
It is my hope that you find the file of use to you personally – I know that I would have liked to have found some of these files years ago – they would have saved me a lot of time !

Colin Hinson
In the village of Blunham, Bedfordshire.



The two top photographs show a bomb aimer and other members of the crew in a Halifax.

These pictures give an appearance of congestion, but the four-engined Halifax is one of the largest and most roomy of our bombers although the crew are placed as near together as possible for convenient working. The pilot's seat is placed high up, well in front of the engines. Behind the second pilot's seat is the flight engineer and below is the radio operator's post and the navigator's table. A crew of seven is carried. There is a rest station amidships.

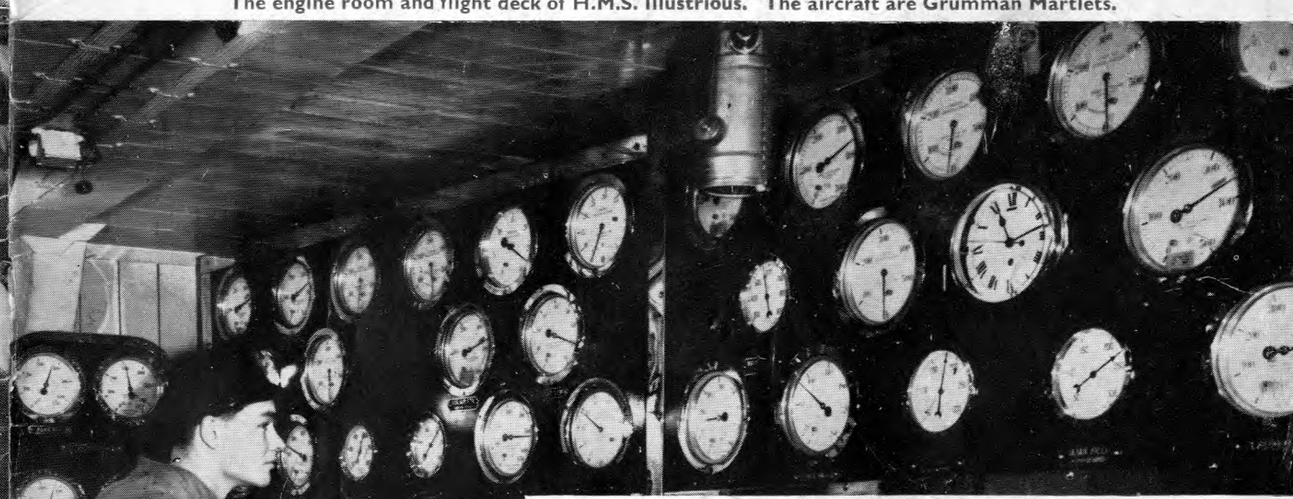
The lower picture was taken inside a Wellington.


# A.T.C. GAZETTE

AIR TRAINING CORPS

VOL. II. No. 6 JUNE, 1942 PRICE 6d.


The engine room and flight deck of H.M.S. Illustrious. The aircraft are Grumman Martlets.



## IN THIS ISSUE

# AMERICAN TRAINERS

The top picture shows a formation of North American BC-1a's (known in the R.A.F. as Harvard II). A 600-h.p. Pratt and Whitney Wasp engine gives this machine a maximum speed of 206 m.p.h. On the right below is a North American BT-14 (R.A.F. name: Yale), fitted with a 450-h.p. Wright Whirlwind it has a maximum speed of 170 m.p.h. The Ryan ST-3 in the lower picture on the left may be fitted with a 160-h.p. Kinner radial. Variants of this type are fitted with other engines and known by other names, such as PT-21, PT-22. The maximum speed is about 130 m.p.h.

# Air Training Corps Gazette

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## The Spirit of the A.T.C.

SCARCELY a week passes by without our receiving the most unexpected tributes to the work of the Air Training Corps. Some of these come from the Royal Navy and the Royal Air Force, and both of these Services speak in the highest terms of the young men who come forward to them after their A.T.C. training. They are described as well disciplined, extremely smart, well trained and of a great spirit.

Co-operation with the Home Guard has brought to this Headquarters thanks for the work done, particularly in invasion exercises; the Civil Defence authorities are grateful for the growing assistance that can be given by Cadets under 17.

We get further messages from employers, from parents, from education authorities, chief constables and others concerned with the young men of this country, all telling of the benefits of the training.

Only recently I have had two pleasing comments from unexpected sources. One of Headquarters' drivers, who sees a good many of the units in the course of our travels, used the expression: "They seem to be well bedded down now." What a pleasant phrase! A year ago, with all their enthusiasm and keenness, the work was strange; all were uncertain of the path ahead. Now during these few months they have "bedded down" and can well be proud of the results.

The other incident happened only two days before I wrote these lines. Returning from a visit to some smart and keen units on the coast, I had in the car a private soldier. As we drifted along the road on a Sunday morning, he called my attention to smart cadets in blue in every little town we passed through, and said: "Those are the pick of the young men of the country." He did not know what pleasure he gave to one who has had an intimate connection with the Corps.

Cadets, instructors, officers, committee-men and senior officers alike can be proud of their work. None of them is completely satisfied—at least we may hope that they are not, because that would be an indication of lack of further aims to achieve—but whatever the future may hold, whatever changes may come, and whatever difficulties may have to be overcome, we may well be assured that, so long as the spirit of the A.T.C. is unchanged, "all's well."

J. A. Chamier

AIR COMMODORE
COMMANDANT, A.T.C.

An all-black Hurricane IIc, armed with four 20-mm. cannon in the wings, taxies out for the take-off. Although the primary job of these all-black Hurricanes is to attack enemy night raiders, they also take part in coastal sweeps by day.

# *More Opportunities—More Responsibilities*

THROUGHOUT this summer a greater number of cadets than ever will be camped at or near by Royal Air Force stations. I hope that this will mean that an increasing number of cadets will be able to have flights in operational aircraft as a result of these increased facilities. By living at a Royal Air Force station cadets will be able to see for themselves not only the general day-by-day work of the station, but also the aircraft departing on or returning from operational flights.

These improved opportunities for seeing the Royal Air Force at work at close quarters also mean greatly increased responsibilities for cadets. It is of the utmost importance that cadets realise their responsibilities, first in maintaining proper discipline during their stay at the station, and secondly in keeping to themselves anything they may see of the equipment, work and activities of the Royal Air Force.

I know there is a great temptation when you return home to tell all that you have seen and heard to your parents and friends. You must on no account yield to that temptation. You may give away some information which perhaps to you seems quite harmless, but in fact might give valuable help to the enemy if passed on from mouth to mouth. It is always possible that you might not realise the importance of something you have seen, and because you did not think it important and told it to somebody else when you returned home, they also might not think it important, and so would pass on the information given to them, with harmful results to our war effort.

Particularly must it be remembered that if cadets do not realise their responsibilities and repeat what they have seen and heard, then the Royal Air Force may decide that cadets will not be allowed to visit aerodromes or be taken up on flights. For the few irresponsible cadets to jeopardise the facilities which are now available to the whole of the Air Training Corps would be disastrous, so I do ask you to remember that it is the individual responsibility of each one of you.

I am glad to hear that cadets generally have realised the importance of maintaining absolute silence on what they have seen and heard during their visits to Royal Air Force stations. This is highly satisfactory. The more the Air Training Corps can show to the Royal Air Force that responsibilities are realised, the more will the Royal Air Force have confidence in us and give us greater opportunities to see and hear more and more.

I hope cadets will take every advantage of the unrivalled opportunities they will get during their visits this summer to camps at Royal Air Force stations.

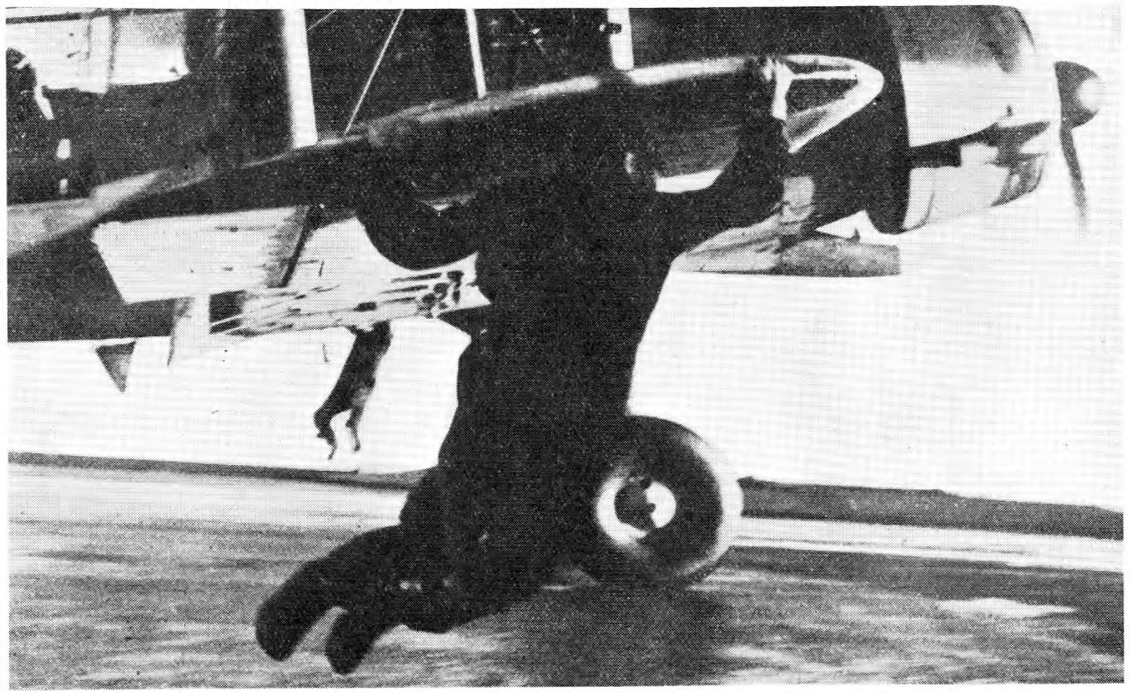
You will by now have had an opportunity to study the Physical Training Standards which have recently been issued. The fact that these standards have been issued shows the importance the Royal Air Force places upon physical fitness. Only yesterday I saw a letter written by a former A.T.C. cadet who is now undergoing his flying training in Canada. This was his PS.: "Tell the fellows to keep fit, for only to-day one of our fellows washed *himself* out because the strain of it all was too much and his health let him down." I hope that it will be found that these physical-standard tests will show how necessary it is to take part in physical-training classes. The fact that you will have to achieve these standards should make your physical-training classes more interesting for you.

I hope that as the scheme progresses each squadron will have a ladder, so that cadets as they pass their tests and accumulate more and more marks can compete the one with the other to reach the top of the ladder. I also hope that we will be able to institute a squadron ladder amongst squadrons in the Region, and perhaps eventually throughout the country; by this system of physical-standard tests, competitions of all kinds can be started, and there is nothing to prevent a squadron in Cornwall from challenging a squadron in Northumberland.

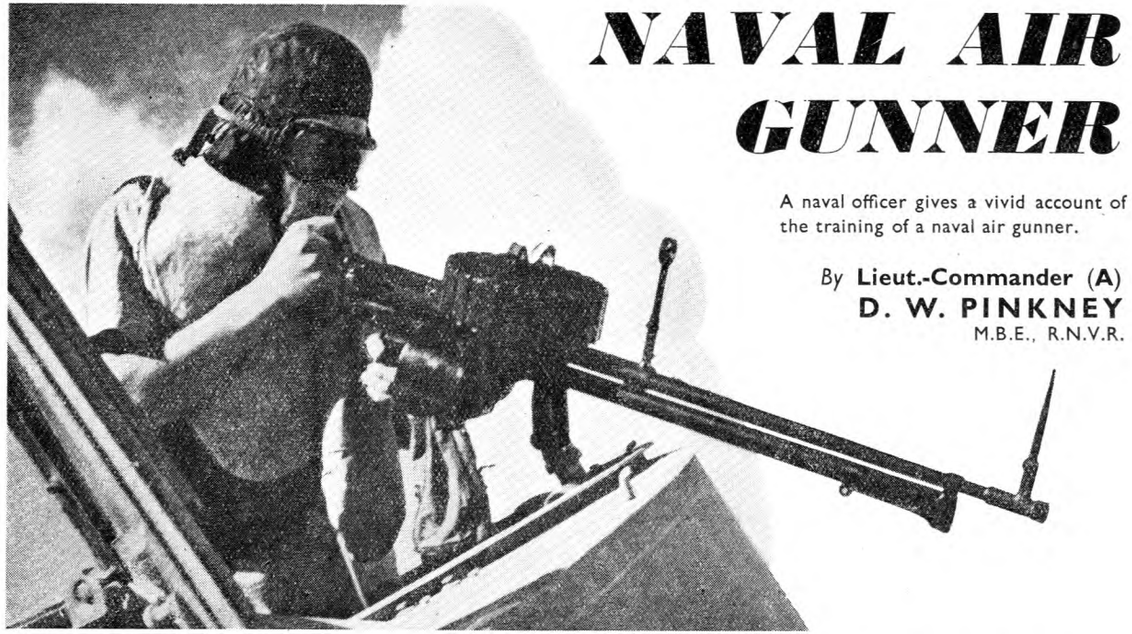
*D W Wakefield*

DIRECTOR, A.T.C.

**Members of a duty squad tackling an Albacore which has just landed on H.M.S. Victorious after an anti-submarine patrol.**







# NAVAL AIR GUNNER

A naval officer gives a vivid account of the training of a naval air gunner.

By **Lieut.-Commander (A) D. W. PINKNEY** M.B.E., R.N.V.R.

WOULD you like to fly and also join the Royal Navy? As a naval air gunner you can do both, and you would find it a fascinating life and a grand war job.

First of all, remember that there is no separate service called the Fleet Air Arm. It is the Royal Navy that you will enter, and the Fleet Air Arm is only one of its vital activities.

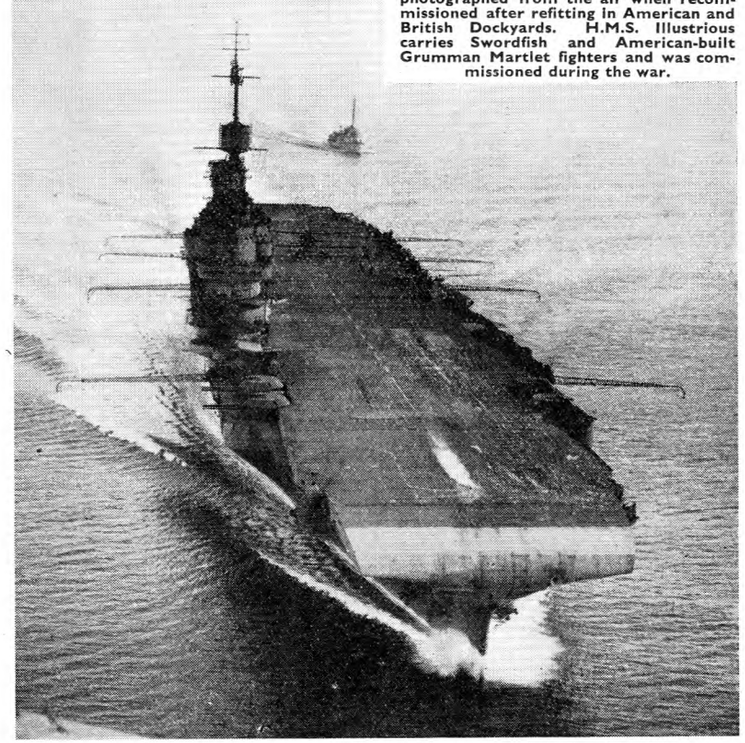
Your training will be done under naval officers and men, many of them fresh from actions like Narvic, Matapan and Taranto. Under their cheery insistence you soon learn a little of the unwritten traditions and work of the senior service: "a sailor first and all the time, and every job—no matter what it is—done smartly, thoroughly and with a good will."

So don't be surprised if a bit of rifle and bayonet drill, P.T., deck scrubbing and "work ship" come your way, and when you draw your kit it will comprise, amongst other gear, a hammock, oilskins, and lanyard, as well as a complete naval flying outfit.

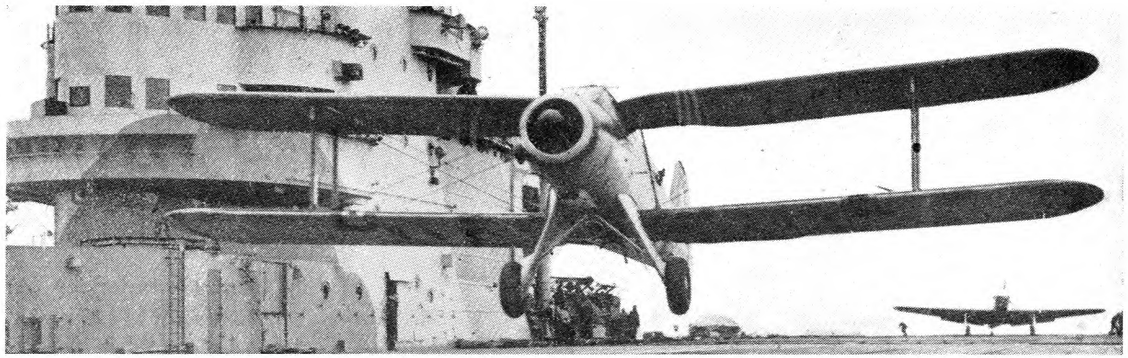
### Early Training

Your early training will include such things as boxing the compass, simple knots and splices and boat-pulling. You will be wakened in the morning by a bugle call and the duty petty officer coming round calling: "Wakey, wakey, rise and shine," or, "Heave out, heave out, lash up and stow," and some will probably shout: "Show a leg, show a leg," just as they did in Nelson's time. As an extra encouragement you may possibly hear an additional cry of: "Eggs and bacon for breakfast."

Your depot will be known as a ship; for example, H.M.S. St. Vincent or H.M.S. Collingwood; and orders during the day will be "piped" sea-fashion either direct or through loud-speakers. You will join a course of about 35 pupils. Some of them may already be partially sea trained, others will come from many different walks of life. One recent course, for instance, included a bank manager,



**The aircraft carrier, H.M.S. Illustrious, photographed from the air when recommissioned after refitting in American and British Dockyards. H.M.S. Illustrious carries Swordfish and American-built Grumman Martlet fighters and was commissioned during the war.**



An Albacore (Fleet torpedo-spotter reconnaissance biplane, 1,065-h.p. Taurus engine) taking off from the flight deck of the aircraft carrier H.M.S. Victorious.

several business men, a Methodist preacher, a musician and an acrobat. As the training progresses you will all get to know each other and form an exceedingly happy team; and you will soon learn that work shared is trouble halved, with a lot of fun thrown in.

Each course is supervised by a divisional officer. His duty is not only to look after the general efficiency of the course, but also the welfare of the pupils in it. He is easily approachable, and is willing to give good advice on all personal problems and difficulties. He is usually an old hand at the game, and often knows what your trouble is before you have fully explained it. You can tell him anything you like and rely that it will go no further. When you want to see your divisional officer, all you need to do is to make the request and put it through the petty officer of your course.

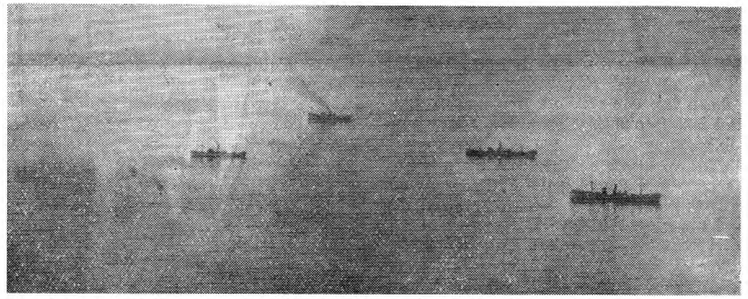
At your first depot you will be given your preliminary air-gunner's training. This consists mainly of Morse exercises and elementary air gunnery. In all probability you will have the use of a first-class indoor swimming-bath, and the opportunity of passing a simple but exceedingly useful swimming test.

### First Flight

After this you will proceed to an air-gunners' school, where the syllabus includes wireless, Morse exercises, armament training, firing, stripping and cleaning machine-guns, code and cypher work, lamp signalling, flag signals, semaphore and many other sides of naval training specially applicable to the air gunner.

You will even be taught to handle and fire the "Tommy" sub-machine-gun—nothing comes amiss to the Navy.

The buzzer exercises are gradually speeded up, and as soon as you attain the necessary proficiency you will get your



"As you look down over the side you will get a glimmering of some of the marvellous jobs ahead . . ."

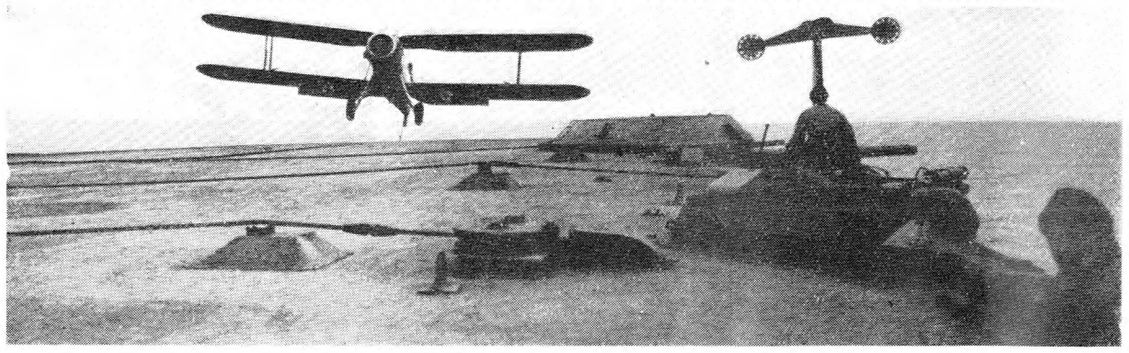
first trip in the air in a naval aircraft. Your pilot opens the throttle, you take off, and the ground begins to sink slowly away from you. You are soon up to 2,000 feet, and as you look down over the side you will get a glimmering of some of the marvellous jobs ahead of you, such as searching for and shadowing enemy ships, submarine hunting, bombing, fighting, patrolling and spotting for the Royal Navy. In fact, you are going to act as the eyes of the Fleet; the new amphibious and airborne sailor.

On your first flight you will not be expected to carry out any communication with the sea, ground or other aircraft. You will be given this opportunity of getting used to the sensation of flying, and of learning the positions, details and purpose of some of the aircraft gear you will use; and there will still be plenty of time for a bird's-eye survey of the country and sea beneath you.

### Examination

After the first part of your air-gunner's course there is an examination, and it is seldom that anyone fails to pass it. Such failures as there are are usually those who find difficulty in Morse signalling. There is a small proportion of people who for some reason or another find this difficult. It is therefore better to weed them out early, though before doing so they are given every possible chance of making the grade. To fail on this score is no disgrace whatever, and there are many other useful jobs waiting elsewhere.

An Albacore, flaps down, landing on H.M.S. Victorious. Notice the arrester hook which is about to engage the landing wires.





"The air gunner has begun to 'find himself' and feels a growing confidence in his work . . ."

Those who pass carry on with the second part of the course, which includes intensive wireless, a good deal of flying, and firing air-type machine-guns on the ground ranges.

### Leading Seaman

At this juncture the air gunner who has up to this moment been rated Ordinary Seaman or Naval Airman is allowed to "ship his killick." In other words, he becomes an Acting Leading Airman, with the coveted badge of an anchor, or "killick," on his left sleeve. He has now definitely got his foot on the ladder of promotion. How far he can climb it in the future is up to him: there is no limit. As a leading hand he has privileges as well as extra responsibilities, and is further initiated into the duties, responsibilities, comradeship and rewards which the Navy holds in store for those who deserve them. Again he realises that he is first and foremost a sailor, whilst carrying out the duties of a naval air gunner.

The final examination is a test of the application, hard work and keenness of the pupils. It is therefore seldom that anyone fails to pass.

By now the air gunner has begun to "find himself," and feels a growing confidence in his work. He gets his gear together and climbs into the aircraft with a feeling of certainty that he can get and keep in wireless touch with his ship or station and, in case of need, take to his gun and use it to good purpose.

### Air Firing Course

His next adventure is an air firing course carried out over the sea. His pupil stage is over, and he is allowed more freedom and time to himself. He still has his daily Morse-buzzer exercises to keep his speed up, but his main job is to go into the air, fly over the sea and fire at aerial targets towed by other aircraft. This part of the syllabus usually occupies three weeks, and, if the weather is fine and the going good, his life is full of interest, variety and excitement.

All the time he is carrying out his air firing exercises and endeavouring to punish the towed target with his gun, he has to keep a look-out for enemy and other aircraft. It can well happen that a German aircraft suddenly appears out of the blue, delivers its attack and gives the budding air gunner his first taste of the real thing.

His air firing course over, he returns to his former station, and is very soon off to sea. It is here that the "Silent Navy" steps in and forbids the disclosure of details in the next chapter of an air gunner's life. Otherwise it would be possible to tell many stories of exciting and gallant work, the results of which may be seen in the daily papers and recognised in the honours lists.

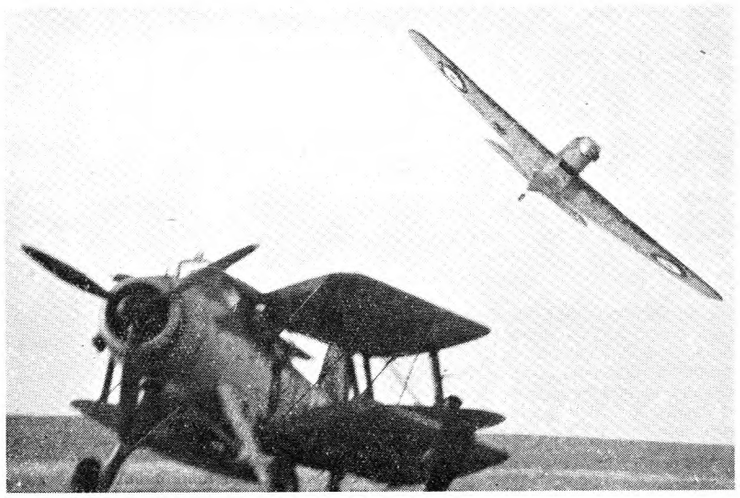
Suffice it to say that he will soon be putting into practice everything he has learned in his training, including certain confidential sides of his work which cannot be divulged here. He will be carrying on the grand traditions of the Royal Navy, afloat, in the air, and ashore, from the Arctic to the Southern Seas.

It is not surprising, therefore, that a large proportion of naval air gunners intend to stay in the Service and make it their career.

What finer life could a man ask for?

How they hold the Aldis lamp in the Navy. Note that the attitude adopted is slightly different from that used in the R.A.F. (shown on page 19 of May Gazette). (Photos by Portsmouth & Sunderland Newspapers).

A Fulmar (two-seat Fleet fighter, 1,145-h.p. Merlin X engine) practising low-level attacks on the stern of the aircraft carrier H.M.S. Victorious. In the foreground is an Albacore with wings folded.



# Wing Angle in Landing

*by* **Captain Norman Macmillan,** M.C., A.F.C.

LANDING an aeroplane would be greatly simplified if every aeroplane had identical landing characteristics. Unfortunately they haven't. Not only does each aircraft betray its own peculiarities during the process of landing, but, even with the same aeroplane, changes of load or of height of aerodrome above sea-level make a difference.

Take the height of aerodrome first. The reduction of density and pressure of the air with height means that the stalling speed is increased. Therefore, to make a safe landing, both the approach and the actual touch-down must be made at a faster speed. Obviously, more room will be required to pull up after alighting, and allowance must be made for this when selecting the spot where you want the wheels to touch the surface. Wheel brakes are a pronounced advantage when landing on high ground. I remember the tremendous length of the decelerating run over the hard surface of the aerodrome at Quetta, which lay at about 6,000 ft. among the North-West Frontier mountains, when the only thing the pilot (who then had no brakes) could do was simply to sit and wait until the darned thing stopped running.

### The Undercarriage Angle Affected

But there are things to think about before the aeroplane gets on to the ground. I have said that the stalling speed is higher. What precisely does that mean to the pilot?

During flight the pilot is concerned solely (and often subconsciously) with the wing angle in relation to the air.

When the stalling speed of an aeroplane increases the wings attack the air at a smaller angle at the moment of stall. (You remember: nose down, more speed; nose up, less speed.)

Now the wing angle in relation to the fuselage is fixed. The undercarriage (or standing) angle in relation to the fuselage is also fixed.[1] So when the wing angle changes in relation to the air, the undercarriage angle is affected in relation to the ground.

The tail-wheel undercarriage, whose normal landing is three-point, must therefore be affected by change in height of aerodrome. If the aeroplane is designed to alight three-point at sea-level, it will have to be landed with the tail wheel slightly off the ground when landing at a high altitude. If it landed tail-up at sea-level, it will land still more tail-up at height, which might dangerously increase the risk of turning over on the nose. If it landed tail first at sea-level, it will probably land three-point at height.

[1]See drawing in April number of the *A.T.C. Gazette*.

### Extra Care Needed

These changes affect the visual judgment of the landing, and for that reason must be borne in mind, especially as they occur at the end of an approach glide which is steeper than the normal approach glide at sea-level. And they call for slightly different handling of the elevator control.

A change of load will alter the stalling speed, even at sea-level. When the load is increased, the effect is similar to that caused by an increase in aerodrome height. But it must be remembered that the total load is also increased, so that a greater stress is placed upon the undercarriage by every bump. And then it is incumbent upon the pilot who likes to look after his aeroplane to take special care in landing.

### Other Effects

But the change in load may (in addition to altering the weight) affect the position of the centre of gravity. The farther aft the centre of gravity is located, the more tail-heavy the aeroplane becomes; and the farther forward it is shifted, the more nose-heavy is the aeroplane. A tail-heavy aeroplane is inclined to stall during the approach and landing, and a nose-heavy aeroplane is difficult to level out. Both conditions upset the feel of the stick during the process of alighting, and should be avoided whenever possible. Moreover, an aeroplane with the C.G. too far aft is apt to stall on turns and spin, and when it spins it is more difficult to get out of the spin, while an aeroplane which is nose-heavy, although exceedingly difficult to spin, is also difficult to manœuvre. The correct position of the C.G. is particularly important in wartime, when the pilot never knows when he may be called upon to fight, and when manœuvre may become most important and spinning most dangerous. So find out where the C.G. of your particular aeroplane ought to be located, and trim any change of load so that you disturb it as little as possible.

Some of Captain Norman Macmillan's articles in the *Gazette* have gone into his new book *How to Pilot an Aeroplane*, published by George Allen & Unwin at 2s. 6d. It is hardly necessary to say that the book is a good one.

### Frail Tails

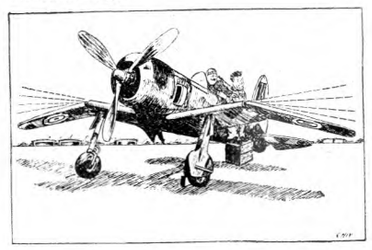
The rear end of a fuselage has several important duties to perform. Through its appendages the aeroplane obtains directional and longitudinal stability and control; accommodation for many items of equipment; defence by gun turrets. That is its purpose in the designer's mind. The fact that it has to take ground shocks from the tail wheel during landing is a nuisance. This may explain why some designers appear to design their aircraft to alight at their slowest landing speed with the tail wheel off the ground; the long girder of the fuselage is then subjected to flying, running and standing loads, but not to the shocks of landing.

When aircraft touch tail first, this feature is almost certainly due to accident, brought about by the streamline shape of the aircraft, or by the desire to keep the main undercarriage as short as possible; for a short main undercarriage saves weight and makes for easier retraction and stowage.

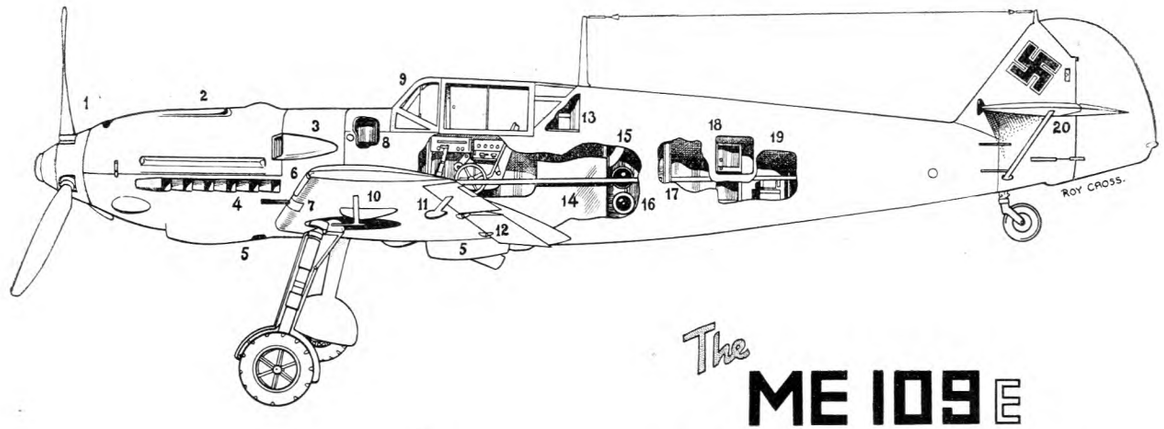
### Nose Wheel Advantages

The nose-wheel undercarriage possesses the advantage that it is never intended for three-point landings, and the main undercarriage can therefore be designed to absorb all the initial landing load. On the other hand, the quick throw forward on to the nose wheel cannot be controlled by the pilot, as can the load on the tail wheel. The nose wheel thus has to be of more robust construction than the tail wheel, and for obvious reasons its leg must be longer, which makes it more difficult to retract. But, with its advantages of ready accommodation to all conditions of landing at all altitudes; automatic breakdown of lift, which prevents ballooning; improved view for taxying and, in transport aircraft, greater comfort for the passengers, there seems every likelihood that it will oust the tail-wheel type.

And that is good from the point of view of the pilot, because it will enable him to judge his landings solely from wing angle, and he will cease to trouble about the angle of the undercart. By simplifying the landing it will offer the nearest approach we are likely to get to a similarity in landing characteristics among aircraft, even including seaplanes, in which the take-off and landing are carried out in much the same way as in a landplane fitted with a nose-wheel undercarriage.

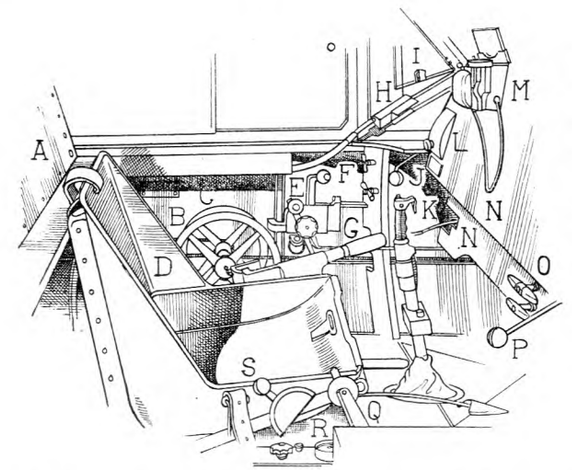






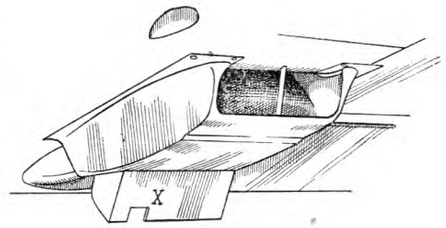

# The ME 109E

Still in service with many German fighter squadrons, the Messerschmitt Me. 109E is powered by the Mercedes-Benz DB601A motor of 1,150 h.p. Tankage is for 88 Imperial gallons and the loaded weight is 5,520 lbs. The drawing above shows: 1, The 3-bladed V.D.M. airscrew; 2, Two 7.9-mm. machine-guns in fuselage; 3, Supercharger air intake; 4, Ejector exhausts; 5, Radiators; 6, Handley Page slots; 7, 20-mm. cannon in each wing; 8, Oil tank; 9, Windscreen glass 2¼ in. thick; 10, Pitot tube; 11, Mass balance; 12, Slotted flaps; 13, Locker; 14, L-shaped fuel tank and (15) tank-filling pipe; 16, Oxygen bottles; 17, Armour bulkhead; 18, Radio locker; 19 Radio equipment including transmitter, receiver and dynamotor power unit; 20, Tail unit is strut-braced and adjustable for trimming. Tail wheel is not retractable.

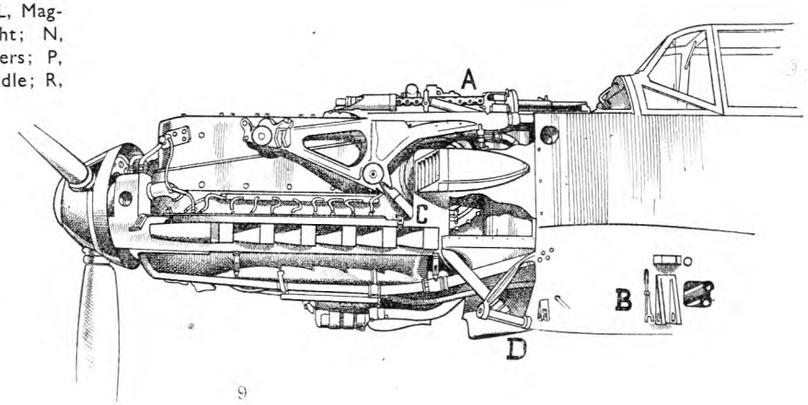



The cockpit is rather narrow and there is little head-room. A shows an armour plate behind the pilot and above his head fitted to some Me. 109s.; B is wheel for adjusting tailplane and C emergency undercarriage retracting wheel. Other fittings are: D, Seat; E, Throttle; F, Emergency boost control and fuel switch; G, Seat-raising handle; H, Dashboard light; I, Small hinged panel in windscreen; J, Lever for wheel retraction; K, Control column with gun trigger; L, Magneto switches; M, Reflector sight; N, Instrument panels; O, Flare triggers; P, Petrol pump; Q, Hood locking handle; R, Oxygen controls; S, Harness bolt.

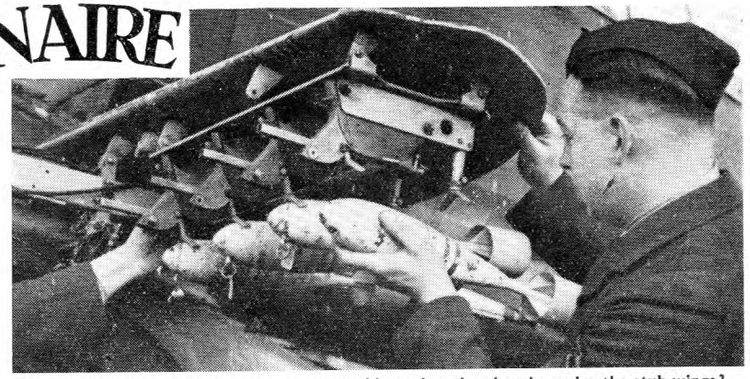
A close-up of the port wing radiator. There are three in all, one under each wing and one beneath the motor. Airflow through the radiator is controlled by the opening and closing of the flap (X).




The motor is suspended on Elektron forged mounts with rubber anti-vibration pads, and can be changed easily. Machine-guns (A) and air intake (C) can be clearly seen. The undercarriage leg hinges at D and main wing fixing sockets are at B.



# ? AIR QUESTIONNAIRE ?



**Q.—Can the Westland Lysander carry anything other than bombs under the stub wings?**
**A.—Yes. Parachute food-containers, etc., and, when employed on the Air-Sea Rescue Service it can carry a dinghy on each stub.**

### Medical

*Q.—Why is the A.T.C. medical examination not the same as that of the R.A.F?*

A.—The A.T.C. examination is designed to discover whether you are *likely* to become fit for the R.A.F. Your physical condition will probably improve while you are in the A.T.C., so if you are at all likely to make the grade the doctor will pass you. But as he is inclined to take the hopeful view, it is bound to happen sometimes that a cadet still isn't up to R.A.F. standards by the time he is 18. However, if you have been trained as air crew and are not able to pass the R.A.F. Medical Board when old enough to join, you may be able to enter as ground crew. Any attempt to insist on air-crew, or even ground-crew, medical standards on entry in the A.T.C. would be unfair to the cadet who was determined to improve his physique. And, after all, the A.T.C. is a physical as well as a technical training corps.

### Stripes

Q.—*In April's "Gazette," page 16, there is a picture of two cadets wearing lance-corporal's stripes. Is there such a thing in the R.A.F. or A.T.C.?*

A.—No. The picture was taken, as stated in the caption, in A.D.C.C. days, when a lance-corporal's stripe was authorised. Corporal is now the lowest N.C.O. rank.

### P.T.

Q.—*Is it possible to obtain a pamphlet or leaflet on P.T. exercises for cadets?*

A.—Try the War Service Scouts Handbook, 6d.

### Badges

Q.—(1) *Why not more arm badges for trades in the A.T.C.?*

(2) *Why not white cap-slips for cadets training as air crews?*

(3) *Why can't proficient air-crew cadets wear a form of wings?*

A. (By a cadet.) Why all this childish, unearned snobbery? Why not wait till we have earned the things in the R.A.F.?

### Specs

Q.—*If it is impossible for men wearing spectacles to become pilots, could you please explain to us why?*

A.—Spectacled men can become very good pilots (Mannock had bad eyes), but the R.A.F. has a wide choice of volunteers, and it prefers to have pilots who need the minimum of artificial aids. You might lose your aircraft because you lost your glasses.

### Officers

Q.—*Can a potential officer who has the technical qualifications for a full-time technical commission, but is stopped from joining up by being in a reserved job, become an A.T.C. officer?*

A.—Yes, if he is over 19. But he must resign his A.T.C. commission if he is de-reserved.

### Occupation

Q.—*Does it matter what your occupation is when you join the R.A.F.?*

A.—No. Only your qualifications will count.

### Star Charts

*Q.—Can you publish copies of the R.A.F. Star Charts in pocket size?*

A.—No. We reproduced them in the December and January numbers, but they are Air Ministry copyright and we have no paper for the work.

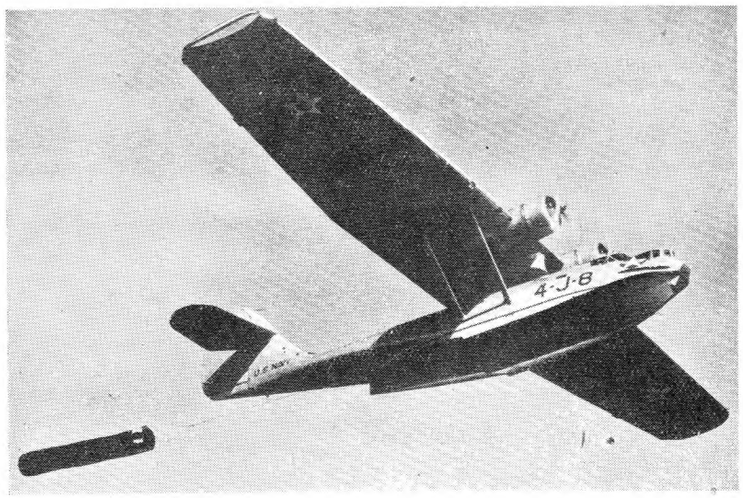
### Back Numbers

*Q.—Is it possible to obtain back numbers of the "Gazette" from you?*

A.—No. Every issue is sold out as soon as it appears.

*Q.—Where can I get a list of aviation books?*

A.—The National Book Council, 3 Henrietta Street, London, W.C.2; price fivepence, including postage. This list includes only books now in print. A longer list including books obtainable only from libraries can be obtained from the Library Association, Malet Place, London, W.C.1, price 6d., or 2/- a dozen, including postage.




**Q.—What types of aeroplanes are used for drogue-target towing?**

**A.—Various, including the Fairey Battle, Hawker Henley, Westland Lysander and the Blackburn Skua. It is unusual to see an aeroplane the size of the U.S. Navy Catalina performing this duty, as shown in this photograph.**



# A TRADITION WORTH MAINTAINING

## A word to ground crews

*by* **Captain W. E. Johns**

A FAMOUS pilot, on the eve of an attempt to lower the Britain-Australia record, said to me: "These shows are not won in the air; they're won or lost on the ground." I knew what he meant, but at that time, coming as it did when every newspaper was singing his praises, the remark sounded odd. It stuck in my mind, and thinking it over I saw more and more clearly how true were the words he had uttered.

They implied that success depended not so much on him, the pilot, as his ground staff; and this was not to be denied, for if any one man among the many who had worked on the aircraft had failed in his job, by no matter how small a margin, then the flight was doomed to failure before the start, and all the skill and daring of the pilot would avail him nothing. If any one of the mechanics servicing the aircraft at any stage between Britain and Australia glossed over his work, then the flight must end in failure, perhaps disaster.

It might be no exaggeration to say that from stage to stage the life of that pilot was in the hands of men whom he did not know, had never seen before and might never see again, men who, moreover, would not get even a reflected share of glory if the flight was a success. That pilot was well aware of it, but I sometimes wondered how many of the public, when they read the headlines in the papers announcing the arrival of the "intrepid birdman," so much as gave it a passing thought.

If that was true in peace, then it is certainly true (I nearly said "truer") in war. In peace, the carelessness of a fitter or rigger might lose a pilot his reputation; in war, sooner or later, it almost certainly costs the pilot, and his crew, their lives.

### A Tribute to Maintenance

An aircraft is a wonderful piece of work, but it takes very little to stop it. Its two main parts, the airframe and engine, are each made up of thousands of components, and a flaw in any single one of them may bring ruin on the whole. A scrap of loose solder left in the tank or a few threads of cleaning material in a petrol lead may be enough to hamstring all the horses gathered under the engine cowling. The fact that engine or structural failure rarely happens is in itself a tribute to the men who make the parts, assemble them, and those who maintain the aircraft on its station, all men who, like the scene-shifters in a play, are rarely seen upon the stage—and never in the spotlight.

These men are as indispensable to the success of the show as the leading actors, yet because we do not see them we may forget that they are there, and they are apt to be overlooked when the bouquets are handed out—except by those inside the show. The British as a rule do not seek floral tributes, but all the same, no man likes to think his efforts pass unnoticed, or are taken for granted. And that is probably why, in this war, the Government, quite rightly, has been to pains to see that praise is evenly distributed.

Even when a slip on the part of a mechanic—whether by carelessness or inefficiency is immaterial—does not have a fatal consequence, it may seriously affect a young pilot by raising a doubt in his mind as to the efficacy of his equipment. Let me give you an example, an incident, which, in retrospect, is not without its amusing aspect. It occurred in the days before metal airscrews were thought of.

**Members of a ground crew checking up and closing the door before the pilot takes off for a sweep across the Channel. The black crosses painted on the fuselage indicate that the Flight Lieutenant has eight victories to his credit.**

### A Rare Occurrence

I went up for target practice. Coming down in a steep dive I took aim and fired. Instantly my teeth were nearly shaken out of my head by the most frightful vibration. Automatically I throttled back and stuck my nose down. I own that I had not the remotest idea of what had happened, and it was only when, hoping to avoid a forced landing, I cautiously opened the throttle a little, did I discover that I had no airscrew. I had shot both blades clean off. Now, this is my point. For some time after that, every time I fired my guns I flinched. I wasn't afraid of them, nor did I think it possible that the same silly ass who had mistimed my synchronising gear would be allowed to do so again; but at the back of my subconscious mind there lingered the memory of that awful vibration which threatened to throw my engine off its bearers. So you see what a little thing can do.

Of course, some mechanics are more conscientious than others, and in the rough and tumble of the early days of flying there were pilots who, questioning the zeal of their mechanics, resorted to a simple expedient to make sure that their work was properly done. When the

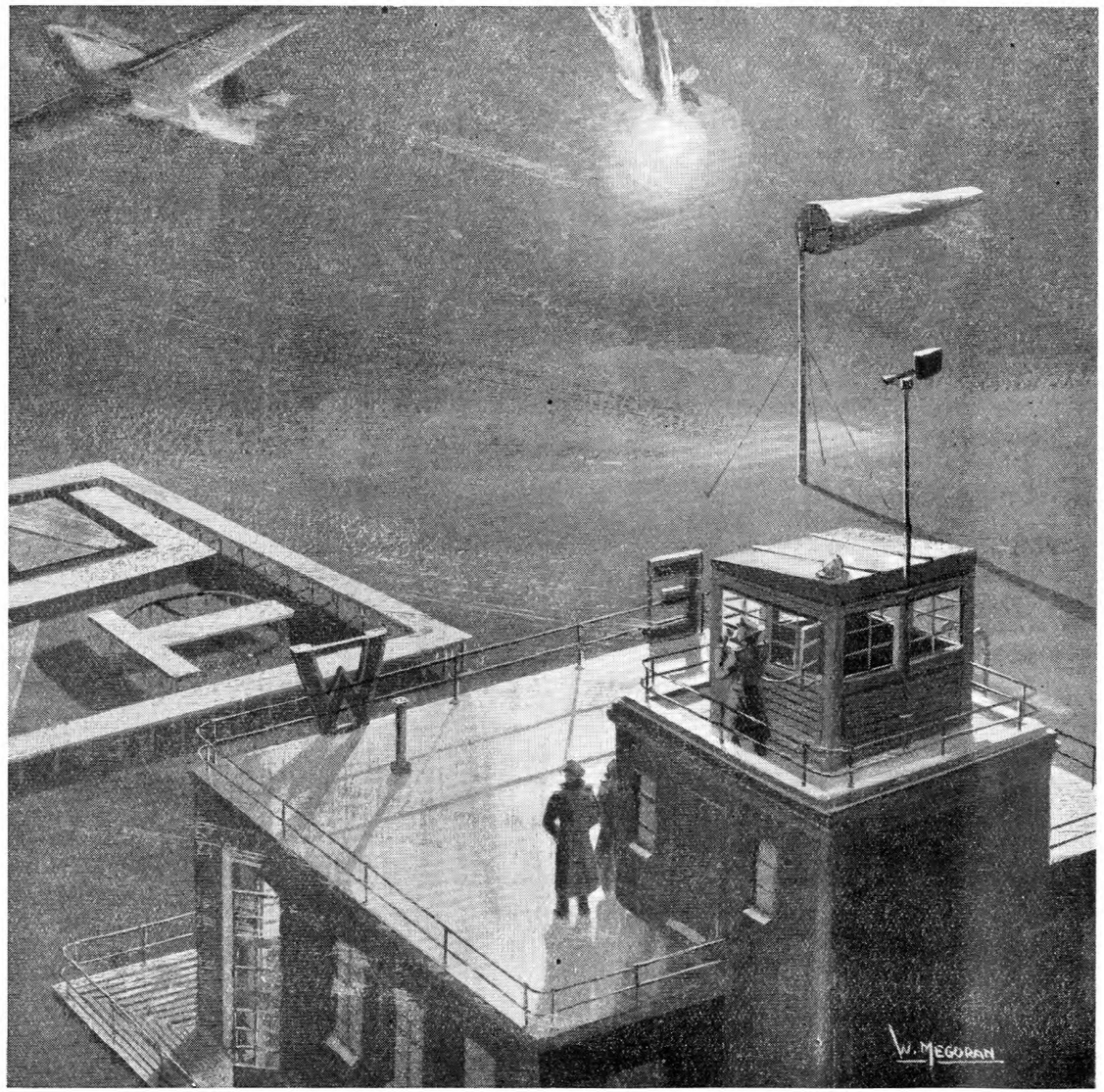
pilot took the machine up on test, he invited the man who had done the job to go with him. The mechanic, knowing this, was thus encouraged to, shall we say, screw up the last turnbuckle, and not leave it hanging by a couple of threads because he was in a hurry to get to the cinema.

**Confidence**

There was, and perhaps still is, an old argument, that it is up to the pilot to see that his machine is in perfect order before he takes it into the air; but I could never agree to that; in the first place, few pilots are qualified to carry out a genuine inspection, and secondly, there is not always time. For this reason the well-being of a pilot and his crew are still largely in the hands of the people who make the machine and the fellows who maintain and service it.

These chaps, we admit, may not always get full credit for what they do, but against that we must allow that they do not have to share the risks of those whose job it is to take the aircraft through a sky stiff with flak and enemy machines. Supervision by sound N.C.O.s can go far to keep an aircraft in good order, but even this is not infallible, and the day a slipshod job is passed by a slipshod N.C.O. is likely to be an unlucky one for the pilot. When you get down to the brass tacks of this matter it ends at the conscience of the individual mechanic. A pilot must trust his mechanics, because if he didn't his life would be one long anxiety. I think most fellows realise this, and for that reason, perhaps, in twelve years' regular service I never heard of a mechanic letting his pilot down. That's something worth remembering, and a tradition worth maintaining.

**This picture portraying the workings of flying control at night and in bad weather was drawn from a series of rough sketches on the spot. The D.F.C.O. outside the look-out cabin on the roof is in R/T touch with the pilot of the aircraft, passing bearings to bring him over the aerodrome, giving him the barometric pressure, etc., and the courses to steer when breaking cloud. Pyrotechnics are fired from the ground in thick weather to help the aircraft, and when seen slowly descending produce weird effects, throwing the buildings and signals area into bold relief.**







**Air Liaison Officer briefing Army co-operation pilots about to take off on a reconnaissance flight. Speed and accuracy in reporting observations are of paramount importance in Army co-operation work.**

# Telling Intelligence

A realistic training exercise devised by

**ALFRED GORDON BENNETT,** F.R.S.A., No. 271 (Colwyn Bay) Squadron.

THE word "intelligence" possesses more than one meaning, and whilst it may imply one thing to the civilian, the soldier, sailor or airman uses the word in a different sense. Intelligence, to the man in the Forces, signifies knowledge of the enemy, news concerning his plans and projects, data respecting the strength and disposition of troops, ships, aircraft and so on.

The gathering of this information, the sifting-through and report-making have developed into a task of such importance that experts known as intelligence officers are chosen for this work.

They must be accustomed to interviewing and interrogating officers and men, as well as prisoners, suspected spies and quislings. The I.O. must be mentally alert, quick to detect a flaw in logic or argument, a gap in reasoning, and errors of judgment, a lack of veracity or continuity in a statement, and other inaccuracies in verbal reports. In a word, his qualifications are those of a judge, a detective and psychologist.

In the Royal Air Force it is usual for I.O.s to be attached to all operational squadrons; and when a bomber crew return it is to the station intelligence officer that they report.

The ability to make accurate reports on operations, either verbally or in writing, is an invaluable asset. The man who, immediately after the heat of battle, can give a restrained, balanced account of his experiences is ahead of the one who, no matter how skilled he may be in other directions, gets himself tied up and involved or contradicts himself.

How does Intelligence affect the A.T.C.?

In the R.A.F. it is the educated man who has the advantage every time; and the first step in education is to be able to express one's thoughts intelligently. Indeed, there are occasions when the entire success or failure of an enterprise may depend upon one man's ability to express himself. So I hit on the idea of introducing an exercise which covers the other subjects in the pre-entry training.

The exercise is based on the idea of sending out "crews" on imaginary raids. The organisation involves the co-operation and assistance of practically every section of an A.T.C. unit.

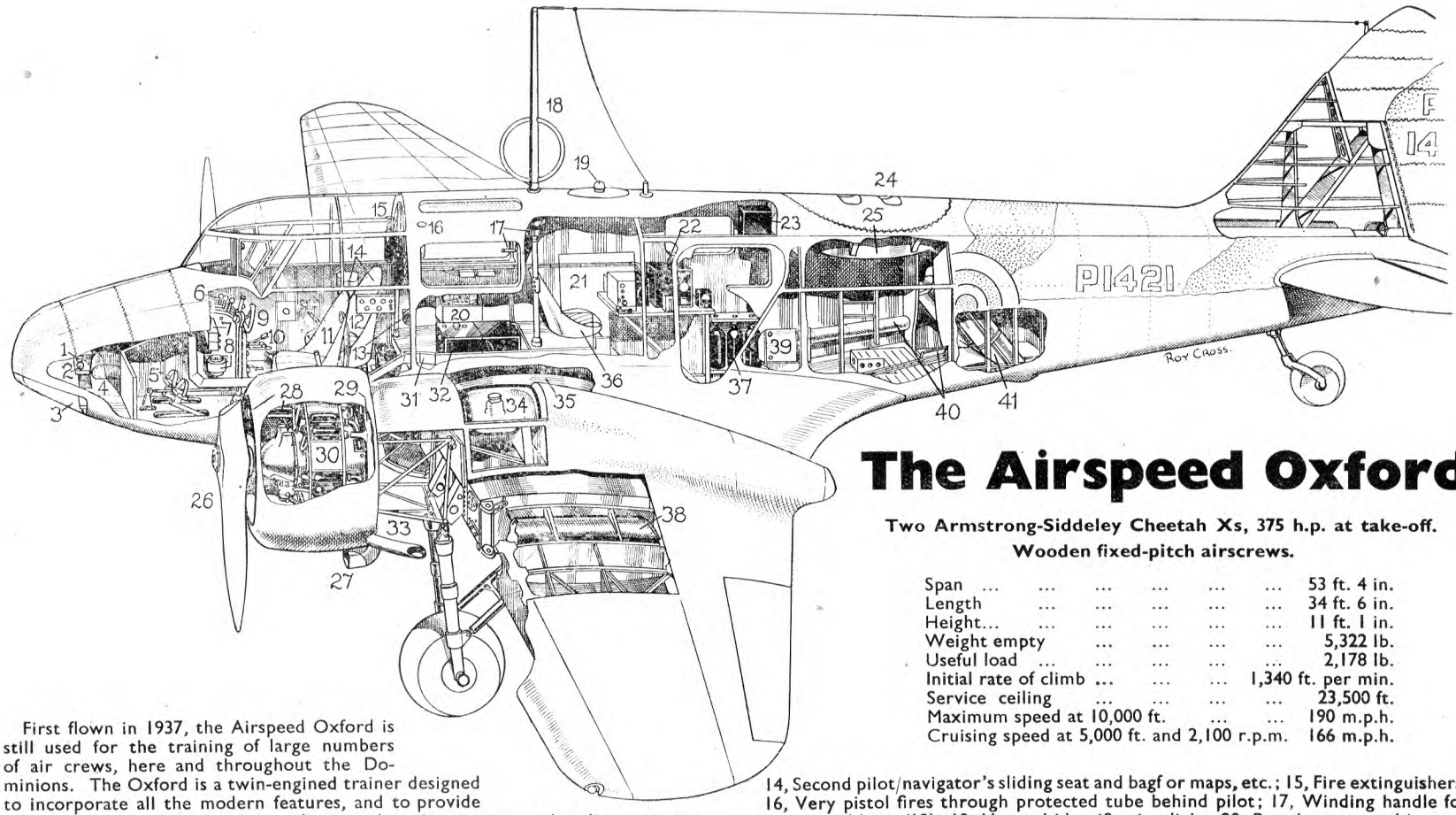
For example, I am preparing to send out my first crews on an experimental raid on a manufacturing town and railroad centre in enemy-occupied territory. Pilots and crews have been chosen, either by ballot, voting or selection. Each has been required to pass a simple but rather tricky examination, in which he is expected to demonstrate his powers of observation and his knowledge of technical subjects. A "brief" has been prepared to cover the operation, with the co-operation of the signals officer, the navigation officer, the meteorologist and the armament officer.

This will be read to the crews by the I.O., who will explain the precise objectives and method of approach on a target photograph projected by episcope. The signals officer briefs the wireless operators; and the navigation and meteorological officers give their advice on course and weather.

At the conclusion of the raid the crews will provide verbal and written reports (including Air Force slang if desired) on the operation to the intelligence officer, whilst the navigators and wireless operators will give *their* reports to the officers or N.C.O.s in charge of their departments. There will be log-keepers at base, and logs will be kept by the crews during flight in correct official style.

During the raid the crews can be subjected to "hazards" (e.g. motors shot-up or tail gunners injured); and it will be the business of the pilots to incorporate accurate descriptions of incidents in their reports.

Behind all this make-believe lies the teaching of each member to write and speak graphically, to develop self-confidence, initiative and to lend zest to the study of subjects which, dry as they may seem in a textbook or on a blackboard, leap to life when treated in this graphic fashion.




# The Airspeed Oxford

**Two Armstrong-Siddeley Cheetah Xs, 375 h.p. at take-off.**
**Wooden fixed-pitch airscrews.**

| | |
|---|---|
| Span ... ... ... ... ... ... | 53 ft. 4 in. |
| Length ... ... ... ... ... | 34 ft. 6 in. |
| Height... ... ... ... ... ... | 11 ft. 1 in. |
| Weight empty ... ... ... ... | 5,322 lb. |
| Useful load ... ... ... ... ... | 2,178 lb. |
| Initial rate of climb ... ... ... | 1,340 ft. per min. |
| Service ceiling ... ... ... ... | 23,500 ft. |
| Maximum speed at 10,000 ft. ... ... | 190 m.p.h. |
| Cruising speed at 5,000 ft. and 2,100 r.p.m. | 166 m.p.h. |

First flown in 1937, the Airspeed Oxford is still used for the training of large numbers of air crews, here and throughout the Dominions. The Oxford is a twin-engined trainer designed to incorporate all the modern features, and to provide training in navigation, bombing, photography, air-gunnery, and radio operation.

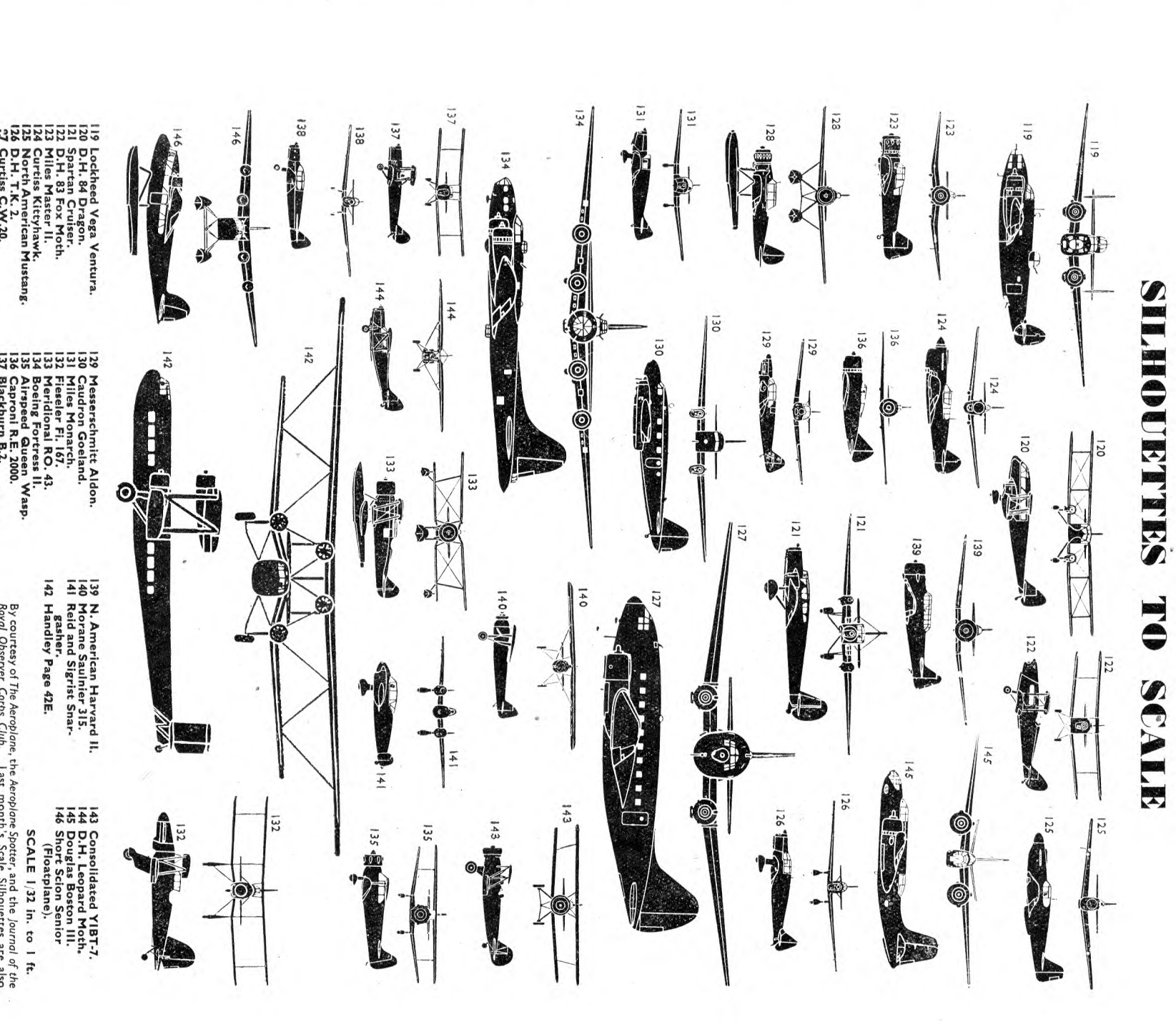
Interior details undergo slight modification on some machines, according to the training purposes to which they are put. The drawing above, for instance, shows a different radio installation from that used on earlier machines, and the gun turret has been dispensed with. In all cases there is provision for a second pilot, the dual controls being stowed to provide access to the bomber's position in the nose. Landing lights, which are not shown in the drawing, are situated just outboard of the port-engine nacelle.

Fairly complete equipment is carried as is shown by the following key: 1, Tail-drift sight; 2, Bomb sight; 3, Bomb-aimer's window; 4, Cushion; 5, Rudder pedals; 6, Engine controls and landing-light switch; 7, Bomb-selector switches; 8, Compass; 9, Wheel brake lever on control wheel; 10, Undercarriage and flap-operation levers; 11, First pilot's seat; 12, Very cartridge rack; 13, Battery and undercarriage warning horn; 14, Second pilot/navigator's sliding seat and bagf or maps, etc.; 15, Fire extinguishers; 16, Very pistol fires through protected tube behind pilot; 17, Winding handle for directional loop (18); 19, Upward identification light; 20, Parachute stowed in case; 21, Position of fuseboard on port side of cabin; 22, Radio transmitter, receiver and batteries; 23, First-aid kit; 24, Skylights in cover over gun-turret position; 25, Permanent base for gun-turret installation; 26, Wooden or V.P. airscrew (wooden shown); 27, Air intake; 28, Air inlet for oil cooling; 29, Exhaust-collector ring; 30, Armstrong-Siddeley Cheetah X motor; 31, Trough carrying wiring from instrument panel; 32, Radio tuner and fine adjustment; 33, Engine bearers; 34, Oil tank in each nacelle; 35, Inboard port fuel tank (49 gallons); 36, Wireless operator's seat; 37, Oxygen bottles; 38, Outer port fuel tank (29 gallons); 39, Parachute stowage case; 40, Control-cable runs; 41, Rear compartment with two flare tubes and camera stowage. Part of the fin is uncovered to show construction.

*(Figures are those given by "Jane's All the World's Aircraft," other authorities differ in some details.)*



# SILHOUETTES TO SCALE




119 Lockheed Vega Ventura.
120 D.H. 84 Dragon.
121 Spartan Cruiser.
122 D.H. 83 Fox Moth.
123 Miles Master II.
124 Curtiss Kittyhawk.
125 North American Mustang.
126 D.H. T.K. 2.
127 Curtiss C.W.20.
12. Arado Ar. 196.
129 Messerschmitt Aldon.
130 Caudron Goeland.
131 Miles Monarch.
132 Fieseler Fi. 167.
133 Meridional R.O. 43.
134 Boeing Fortress II.
135 Airspeed Queen Wasp.
136 Caproni R.E.2000.
137 Blackburn B.2.
138 D.H. Moth Minor Coupe.
139 N. American Harvard II.
140 Morane Saulnier 315.
141 Reid and Sigrist Snargasher.
142 Handley Page 42E.
143 Consolidated Y1BT-7.
144 D.H. Leopard Moth.
145 Douglas Boston III.
146 Short Scion Senior (Floatplane).

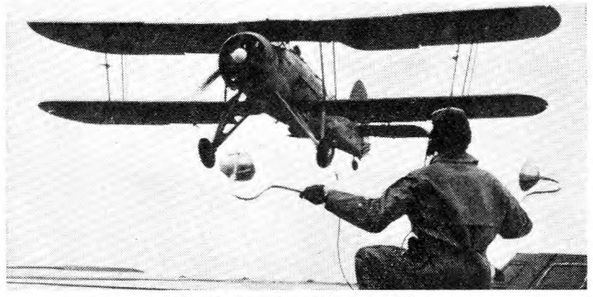
**SCALE 1/32 in. to 1 ft.**

By courtesy of *The Aeroplane*, the *Aeroplane Spotter*, and the *Journal of the Royal Observer Corps Club*. Last month's Scale Silhouettes are also owed to the same sources.

"You are at the right height to land-on."

"Put your starboard wing down."

"You're doing fine, keep going."



"You're nearly ready to land."

"Nice landing."

# THE A.T.C. AND THE ROYAL NAVY

By **Vice-Admiral J. K. IM THURN**
C.B., C.M.G., C.B.E., Flag Officer, 'Y' Entries.

THERE are already in the A.T.C. many cadets under training who have been enrolled under the "Y" Scheme for service as pilots, observers or telegraphist air gunners in the Naval Air Branch, more usually referred to as the Fleet Air Arm. There are many more who are hoping to enrol either for general service or for service in the Fleet Air Arm.

Some of these cadets were in the A.T.C. before enrolling under the "Y" Scheme; others joined only after enrolling, but in both cases their reason for being A.T.C. cadets is to obtain the best possible pre-entry training before being called up for actual service in the Fleet Air Arm. For those who are going to serve their country in the Royal Air Force or the Fleet Air Arm, the A.T.C. training is invaluable, and it may be said to break the back of certain essential subjects which will form an important part of their subsequent service training.

### The Value of A.T.C. Training

The A.T.C. provides pre-entry training for naval candidates both on the general-service side and in the Air Branch, and nearly 20,000 cadets have already expressed a preference for naval service. Not all of these will qualify for entry under the "Y" Scheme, which is particularly concerned with picking out the candidates who are likely to make the grade for promotion to commissioned or non-commissioned rank through the lower deck, and for which, in consequence, high standards of physical and mental fitness and powers of leadership are necessarily required. All of them, however, have a chance of getting into the Service of their choice in one capacity or another, and all of them will benefit tremendously by their A.T.C. training if they take it seriously.

To take flying crews of the Fleet Air Arm first, the A.T.C. syllabus of training includes nearly all the ground subjects which they will require to study right up to the final stages of their training. Additional subjects which candidates may usefully take are signals and ship recognition. I know that some of these subjects are liable to be uninteresting in their early stages. Air navigation, meteorology and signals, for example, may seem very dull to start with, but, important as they are to R.A.F. pilots and observers, they are even more important to the Fleet Air Arm, whose aircraft normally operate from a moving platform (an aircraft carrier) which may be steaming at high speed in any direction.

### Fleet Air Arm Duties

The three main duties of the Fleet Air Arm are, of course, reconnaissance, bombing and fighting. In other words, its object is to provide the Fleet with a long-range telescope and a long-range gun or torpedo, and to deny these advantages to the enemy.

I mention signals as being particularly important to the Fleet Air Arm, since signalling in one form or another is the only method at sea by which intelligence can be passed ffom the aircraft to the Fleet, so that however gallant and successful the air crew may have been in obtaining important information for the admiral, all will be thrown away if the signal link is unreliable.

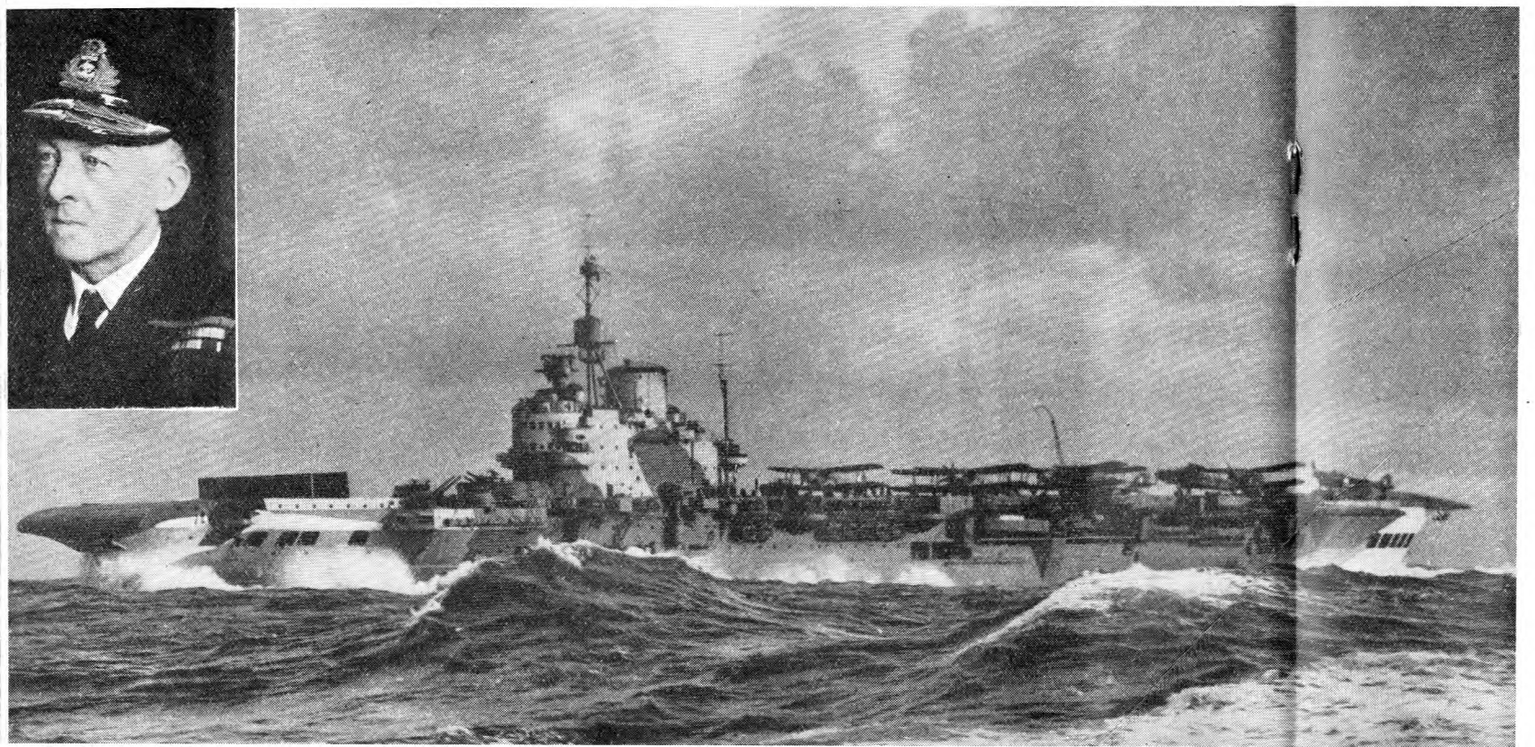
I have not referred to flying training, as, apart from certain specialised work which is learnt in the final stages of the training of the Fleet Air Arm air crews, the technique of airmanship is the same in the Fleet Air Arm and the Royal Air Force. Everything learnt in the A.T.C. about actual flying will be of direct use to the cadet during his subsequent training for the Fleet Air Arm.

### The Ground Crew

There will be many in the A.T.C. who are more keenly interested in the technical side of flying than in actual flying, or who, while hoping to become air crews, will find themselves disappointed, for

**H.M.S. Victorious, sister ship to H.M.S. Illustrious. Displacement 23,000 tons. Speed more than 30 knots. Complement 1,600 officers and men. The machines which can be seen on the flight deck are Fairey Albacore torpedo-spotter biplanes and Fairey Fulmar eight-gun fighters.**

**Vice-Admiral J. K. im Thurn, C.B., C.M.G., C.B.E.** *(Inset).*



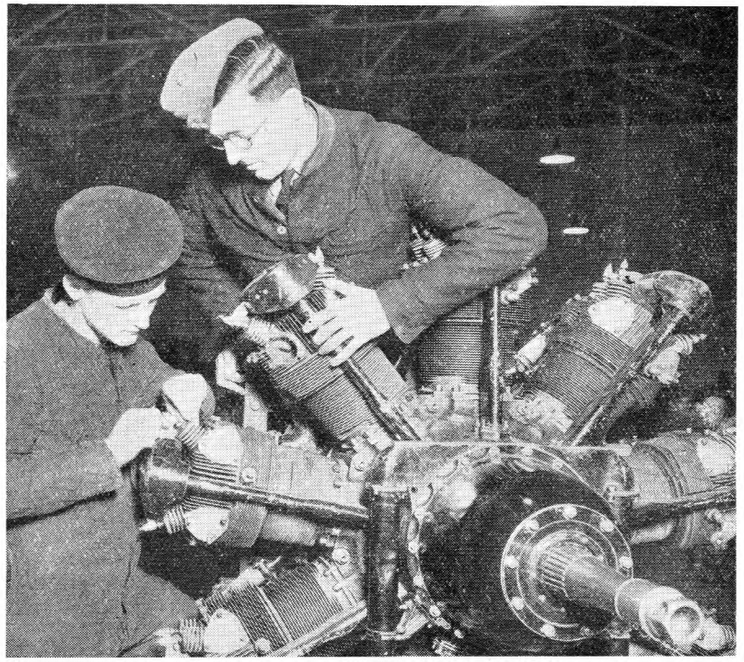
**Rear Admiral A. L. St. G. Lyster, C.B., C.V.O., D.S.O., Fifth Sea Lord and Chief of the Royal Naval Air Service during a visit to his old flagship, H.M.S. Illustrious, in which he flew his flag when she was in action in the Mediterranean. Here he is seen with Captain A. G. Talbot, D.S.O., R.N., now in command of the Illustrious. Below is the Commander (Flying) directing operations from the flying bridge. The aircraft on the left is a Grumman Martlet. Those with wings folded are Fairey Swordfish.**

physical or other reasons. To these the A.T.C. syllabus offers a first-class pre-entry training for service as maintenance crews. No flying service has a greater need of first-class maintenance crews than the Fleet Air Arm, whose aircraft are nearly always operating over the sea, when a forced landing means the loss of the aircraft and the possible loss of the crew. Moreover, even in the case of those who are going in for air-crew duties, it is a tremendous advantage to know all that they can learn about the functioning of their aircraft and all its accessories and equipment. I would, therefore, urge all those who are hoping to get into the Fleet Air Arm in any capacity to take the fullest possible advantage of both the air-crew and maintenance-crew syllabuses provided by the A.T.C.

These tractors, known as dodgem s, are used for pulling aircraft about on the flight deck of a carrier.

**For the Sailor**

Finally, there are many A.T.C. cadets who have chosen the A.T.C. as their pre-entry training corps for general service in the Navy. They will learn in the A.T.C. the essential elements of good service, *esprit de corps*, how to wear uniform and to be proud of it, and how to give and take orders, while the general service knowledge that they will gain in the A.T.C. will also be of great value to them.



CO-OPERATION.

A sailor and an airman at work on an engine. There are still some R.A.F. personnel on aircraft carriers.

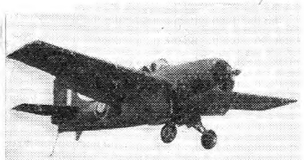
**Training Camps**

There is one last aspect I would like to mention. The Navy has comparatively few shore-based air stations in Great Britain, but to each of these stations are affiliated as many local A.T.C. units as it can handle, and close on 50 A.T.C. units have already been affiliated in this way. In addition, special facilities are provided for training courses for A.T.C. officers who may wish to give specialised instruction to their naval candidates, and training camps are organised for "Y" Scheme entrants and other prospective candidates for the Navy. In combined operations against the enemy, the better that the men of the R.A.F. and the Navy know one another the easier it will be to co-operate successfully.

**Co-operation**

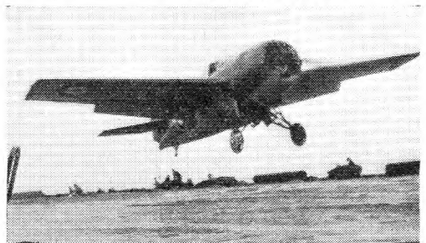
I hope I have made it plain how vitally interested the Navy is in the success of the A.T.C. We in the Navy are grateful for its assistance, and it has already provided, in the sphere of pre-entry training, an example of that co-operation between the Services which is so essential to the winning of the war.

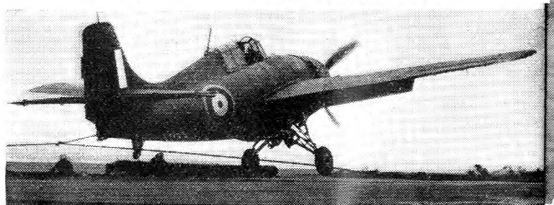
John H. in Thurn.
Vice Admiral.



A MARTLET LANDS-ON.

In the first picture the arrester hook is seen dangling. In the second picture where the machine is just touching down it is barely noticeable; in the third it can be clearly seen engaging the arrester wires.





# The Altimeter as a Barometer

**DAVID VINE** gives you a few hints on familiarising yourself with the altimeter.

AN easy way to get to know your altimeter is to turn it into a barometer. Hang the altimeter in the open and carefully note changes in the readings. The pointer will move above or below zero owing to local changes in the pressure of the atmosphere. Changes take place in a few days representing many hundreds of feet on the altimeter.

**Learn the Atmospheric Pressure**

This proves that the readings on the dial can be affected without moving the altimeter, and that therefore an altimeter is really a barometer which records variation in the pressure of the atmosphere quite independent of its height. Atmospheric pressure changes considerably from hour to hour, so when the altimeter is reading any height above the earth, that reading must be affected by the atmospheric pressure acting at the time. Therefore, if we wish to have our altimeter reading accurately we must know the atmospheric pressure, so that we can allow for it.

That is why a pilot approaching an aerodrome asks for the atmospheric pressure there. If he is using a sensitive altimeter he turns the knob at the bottom of the instrument which moves the pointers until the atmospheric pressure given to him is shown on the sub-scale at the bottom of the dial. The height reading on the altimeter will then be corrected. Therefore, when he lands, his altimeter should read zero on the dial, while still showing the given atmospheric pressure on the sub-scale.

**Finding Your Ground Altitude**

If you wish to know the height of your district above sea-level, obtain the sea-level atmospheric pressure and move the small knob until that reading is shown on the sub-scale. The height can then be read off the dial in the normal way. As a cross check move the pointers until they reach zero, then compare the reading on the sub-scale with the sea-level atmospheric pressure, changed to millibars,* and the difference will be the height above sea-level in millibars. To change this to height, remember that one millibar represents 30 feet. Therefore, if you find that the sea-level atmospheric pressure is 1010 millibars, and the sub-scale reads 998 millibars, your height above sea-level is 1010−998, which equals 12 millibars. Therefore, 12×30=360 feet, your local height approximately.

When using the sensitive altimeter as a barometer, put the hands to zero every morning and record the pressure changes as indicated on the sub-scale. Then it is purely and simply a barometric reading.

With the simple altimeter, that is, the mark XIII service type, pressure in millibars is not recorded; in other words, there is no sub-scale, the atmospheric pressure being indicated by height only. You can use it as a barometer by turning the dial until the lubber line lines up with the mark seen through the hole cut in the dial. The pointer will then show the height in feet. This is the height corresponding to the *local* barometric pressure.

The simple altimeter is calibrated on the Isothermal law, which fixes the sea-level atmospheric pressure at 1,013.2 millibars. Simple altimeters are generally used in training aircraft and sensitive altimeters for operational work.

**Corrections for Temperature**

It is also necessary to correct the altimeter for temperature changes. There are two ways of doing so. The first is by the Isothermal law, which assumes that the temperature is 10 degrees Centigrade everywhere. The second, the I.C.A.N. law, assumes that the temperature at zero height is 15 degrees Centigrade with a regular temperature decrease (or lapse rate) of 1.98 degrees C. for every 1,000 feet. This law is more accurate than the Isothermal, and is generally used on sensitive altimeters.

For normal operational flying the I.C.A.N. calibration of the sensitive altimeter will give a reading with sufficient accuracy, but for certain types of bombing greater accuracy is necessary. Therefore the height and air-speed computer is used for further correction.

If you continue to use it as a barometer the altimeter will lose all its mystery and difficulty and provide a series of interesting experiments.

*1,000 millibars are approximately equal to a column of mercury 29½ in. high—therefore one millibar is roughly a thousandth part of normal sea-level pressure.

Where altitude is tricky. Avro Ansons crossing the Canadian Rockies at 11,000 feet during flying training for R.A.F. cadets.

# PLASTICS

## **Peter Garrod Chinn** gives some details of new materials

PLASTIC materials are now being used in aircraft production for many purposes. Probably the widest use to which a plastic composition is being put is in the construction of cockpit covers, windows, gun turrets, etc. Most well-known of this type of plastic material are two thermo-plastics—Perspex and Plexiglas, the former the proprietory name of a composition most widely used in British aircraft and the latter an American product.

Besides being less than half the weight of glass, these materials are more transparent and will stand up to bad weather. Being resilient, they will resist more than twice as much shock as glass, and both have the desirable qualities of being easily formed into curves and sections.

### Manufacture

Plexiglas is supplied in large sheets up to 2½ in. in thickness, though for most components ⅛ in. to ¼ in. are the thicknesses most widely used. The sheet is first hung in an oven. At a temperature between 225 and 250 degrees F. Plexiglas becomes sufficiently pliable to be formed over moulds into acute curves. Care must be taken to ensure that the sheet does not exceed the given temperatures, as it may develop slight distortions which would impair the vision of the crew when the section was fitted to the aircraft.

When cool the Plexiglas section is lifted off the mould and trimmed up, for which ordinary metal and woodworking tools are suitable. It is necessary to ensure that during drilling, buffing, etc., frictional heat is not allowed to develop, as this may soften and mar the surface. The complete Plexiglas sections may subsequently be bolted, riveted and cemented into their frames.

Very much wider uses will yet be made of plastic materials in aircraft construction. There is every possibility that soon after the war some aircraft will be made almost entirely of plastic or of wood-plastic compositions.

### Other Processes

In the United States, where development has been less hampered by the necessity for all-out war production, several wood-plastic aircraft have been built. One of the pioneers in this form of construction is the Fairchild Engine & Airplane Corporation, who, with the co-operation of the Haskelite Manufacturing Corporation developed the Duramold process.

By the Duramold process it is possible to produce fuselages, wings, and tail units possessing the durability of a metal structure with the low maintenance costs of wood, yet without the disadvantages of dry-rot, corrosion, risk of fire or moisture-absorption.

Duramold consists of wood-fibres in the form of veneers bonded together over moulds with thermo-setting resins under heat and pressure. Perfect monocoque structures can be formed with varying surface thickness to take care of stress concentrations.

A similar process was used by Timm Aircraft Inc. for their successful "all-plastic" low-wing trainer, and the same company was reported to be designing, for building by the same process, a 400-m.p.h. fighter based on Howard Hughes's former world landplane record holder.

Another wood-plastic system of construction which shows promise is that developed by the Fletcher Aviation Corp. In this process moulds and heat-pressure forming are not employed. An internal structure is built up on jigs over which Plasti-ply sheets are bonded by a process known as Plyweld, forming a perfect monocoque structure. Plasti-ply sheets are made of two birch plies up to ⅛ in. thick, resin-bonded together at angles so that when formed over a structure many of the properties of geodetic construction are said to be gained.

The practicability of this system has been demonstrated in the Fletcher FBT-2 primary and basic trainer, a low-wing monoplane which has been designed with a view to simplicity and ease of construction, even to the extent of vertical and horizontal tail surfaces and wing panels (a symmetrical section being used) being interchangeable with each other.

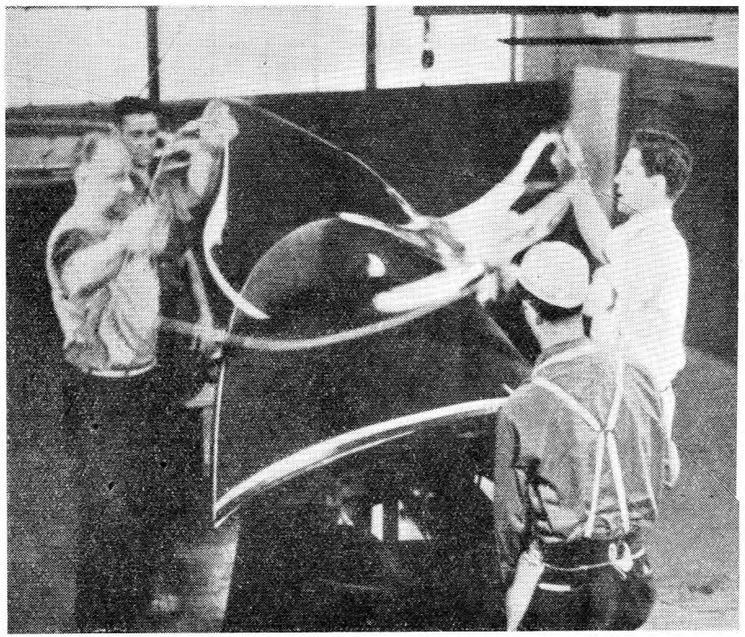
The new American Langley light twin-motor monoplane is also built on a moulded wood-plastic system, known as the "Vidal" process. Mahogany plies of varying thicknesses up to ⅛ in. are secured over moulds and bonded together in at least three laminations with vinyl thermo-plastic resins by the application of heat and pressure in special ovens. A temperature of about 200 degrees F. is maintained for a period governed by the thickness of the material, after which the part is cooled and removed from the mould. The finished wood-plastic parts are then joined together with phenol-thermosetting resins, which, once cooled, will not flow again with further heat applications.

### Advantages

Summarising, it may be said that most wood-plastics have the following characteristics:

1. Lighter than aircraft alloys and heavier than aircraft wood, but with many times the latter's tensile, compressive and shear strength.
2. Non-absorbent, and thus not liable to warp.
3. Non-inflammable.
4. Will not decay nor harbour insects.
5. Mostly unaffected by acids and oil.
6. Will not crystallise and weaken when bent to shape.
7. Will not rust or corrode.
8. Can be conveniently moulded to almost any shape and can be rapidly produced.

**Workmen placing a hot sheet of Plexiglas over a cloth-covered mould to form part of the nose section of a Martin Marauder bomber.**





# AERO-ENGINE SUPERCHARGERS

With the advance and development of high-altitude flying, a practical knowledge of supercharging is essential to all training for the R.A.F.

## by **John Ibsilon**

MOST readers of the *A.T.C. Gazette* are familiar with the function of the supercharger. It is a producer of compressed air, which is used in forcing fuel into the cylinders of an aero engine at altitudes where the outside air pressure is diminished and where, without the supercharger, horse-power would fall off. It consists of a centrifugal blower (a bladed wheel) revolving within a tight-fitting housing.

It was not to counteract the adverse effects of height that the first superchargers were fitted to aeroplane engines. In all engines running on full throttle there exists in the intake manifolds a vacuum representing a negative pressure of two pounds or more. The introduction of a rotary inductor, otherwise a centrifugal blower, is sufficient to neutralise this negative pressure.

### Carburettor *v.* Injector

Power at altitude is a different proposition. While operating at altitude, or at the height for which the supercharger has been designed, the engine runs smoothly and without stress. But near the ground a strain is placed on the structure of the cylinders and on other parts of the engine, because a heavier charge than is needed is entering. One solution is to gear the supercharger, but even then it is suitable for operation only at a few heights and the gearing apparatus is complicated and "touchy." An advantage of the German petrol-injection system (although the pump equipment is weightier than the carburettors in use on British machines and is composed of 1,576 parts compared with the British four or five hundred) is that while the amount of air entering remains constant, the mixture is adapted for different altitudes by regulating the amount of pure fuel entering with it.

In 1936 the idea was conceived of using the compressed air from the supercharger to cool the valves and pistons. This was achieved by having the exhaust and inlet valves open at the same time for a longer period than had been thought possible, with a resultant increase in horse-power. It also facilitated the use of bigger piston heads.

### Turbo-Supercharger

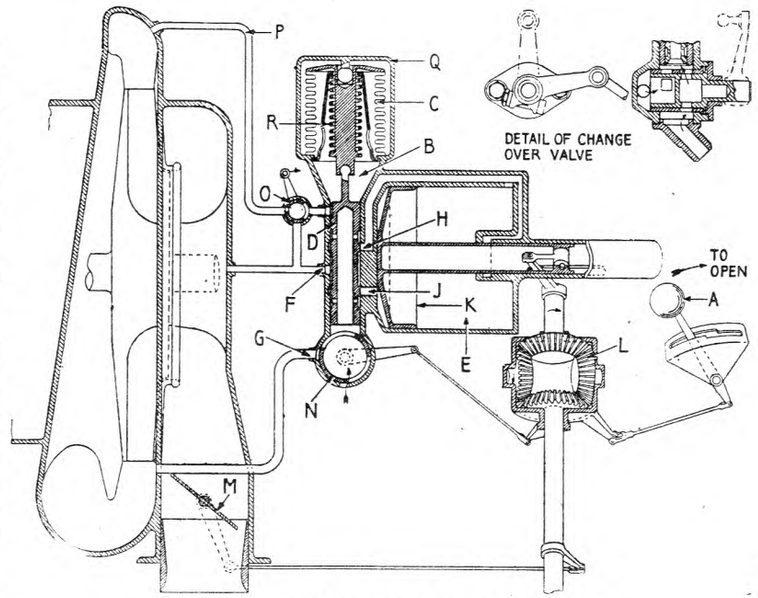
Recently, intimations of the part which stratosphere aircraft are destined to play in aviation have caused work to begin on improving existing types of turbo-supercharger and on designing new ones. The turbo-supercharger is a great advance on the ordinary supercharger. It does not depend upon an independent factor, but upon the exhaust gases from the engine. These pass into a nozzle, which distributes their flow against the vanes of a turbine. The turbine drives a centrifugal blower, which produces the compressed air. Hence the name "turbo-supercharger." Sea-level pressure has to be maintained inside the housing of the nozzle, turbine and blower. If the pressure inside the housing was the same as that outside, the resistance to the exhaust gases would become less as altitude increased, and the charge would become heavier out of all proportion to the power of the motor, until something cracked.

### Japanese Practice

The only military aircraft at present in service which has turbo-superchargers is the Flying Fortress, but some of Japan's newest types, still on the "secret list," are reported to be fitted with them. They were developed by Mitsubishi Jakogyo Kabushiki Kaisha at Nagoya under a veil of obscurity, while Japan was spreading the idea through foreign agents that her air force was equipped with hopelessly obsolete aircraft and engines.

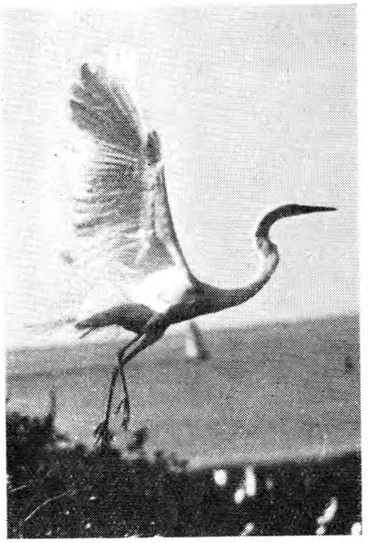
It must not be assumed that America and Japan have gained initial advantage in this. Deep inside the "back rooms" of all the major Powers, turbo-superchargers, superior in efficiency to any that have yet appeared, are nearing completion.

*Diagram from "Aero Engines" by O. Caudwell. (Pitman. 5s.)*




ROLLS ROYCE AUTOMATIC BOOST CONTROL

A.—Throttle lever.
B.—Boost pressure chamber.
C.—Aneroid.
D.—Piston valve.
E.—Cylinder.
F.—Suction passage.
G.—Boost pressure passage.
H.—Port.
J.—Port.
K.—Piston.
L.—Differential.
M.—Throttle.
N.—Change-over cock.
O.—Cut-out valve.
P.—Boost pressure passage.
Q.—Aneroid chamber.
R.—Spring.



American egret about to take off.
*(Photograph by U.S. Bureau of Biological Survey.)*

American short-range observation aircraft doing some tree-top work.

# Lessons from Birds and Fish

**FRANK W. LANE** here makes it clear that we can learn from fish as well as birds.

### Over the Cliff

THERE used to be a flying-field in India so situated that pilots had to take off at the base of a sharply rising tract of land. At first, whenever they wanted to fly over the high plateau, they had to circle to gain height. One day a pilot watched some birds fly straight at the cliff and surmount it. He decided to do the same.

Taking off facing the plateau, he flew towards it. As he neared the cliff he found that the air currents beating against it were lifting his machine and it was being taken up as in a lift. He had discovered a geostrophic current.

### Immelmann Turn

A sparrow-hawk was once seen flying at full speed after a finch. The finch managed to dive under a mass of telegraph wires and reach the sanctuary of a shrub. The hawk, with no eyes for anything save its prospective victim, found itself flying at full speed into the bank of wires. To save itself, the hawk shot straight up into the air like a rocket, turned into a half-loop, rolled over at the top of the loop and flew back the way it had come—thus performing a perfect "Immelmann turn."

### Varied Designs

Nature has flying machines with wing spreads ranging from 13 feet to a fraction of an inch; with speeds between 100 or more down to one m.p.h.; with body weights of about 30 lb. to a few grammes; with an immense variety of wing shapes, slots, "flaps," aspect ratios, and tails.

### Speed Record

The swift, with its torpedo-like body, sickle wings and forked tail, sweeps through the air with effortless grace owing to the perfection of its aerodynamic lines. The large spine-tailed swift of India has set up a speed record of 200 m.p.h.

### Flaps

Some birds, with long, deeply forked tails, divided in two at the trailing edge, appear to use them in the same way as an aircraft uses a Fowler flap, that is, to give a larger surface, increase in camber and slot effect, giving greater lift to the wing. The frigate bird, which has a long, forked tail, has been seen to rise suddenly without any perceptible motion of its wings but with its tail spread wide out.

### Gliders

While no other mammal can fly like bats, there are several creatures which can glide. The flying-fish are well known, although "flying" is a misleading adjective.

A little-known animal, the cobego, is literally a plane from head to tail. It is furnished with an expanding membrane that runs from elbow to knee, and when, with hands and feet outspread, it takes off from a high tree it can travel a long way through the air. Sometimes it carries a passenger, in the form of one of its young, on its back.

### Silencers

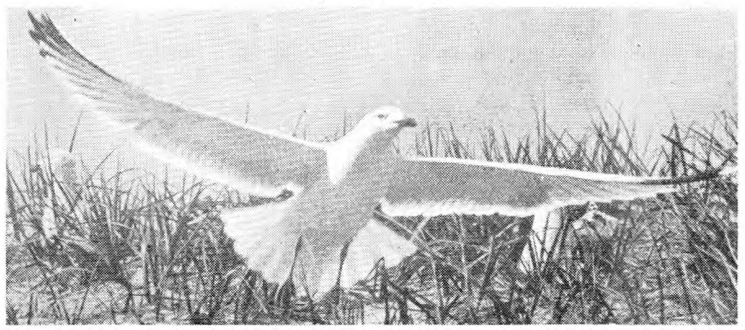
On the leading edge of the owl's wings there is a stiff, comb-like fringe, and along the trailing edge another fringe of different texture. These are thought to be largely responsible for the owl's silent flight.

Fringe on leading edge of an owl's wing.
*(Photograph by Com. R. R. Graham.*

### Parachutists

The flying-squirrels of Asia and America are also quite useful gliders. During some experiments with a tame squirrel it was found that if hurled into the air with the full force of a man's arm the squirrel sailed aloft until gravitation asserted itself and then the little beast parachuted safely to earth.

A perfect landing.

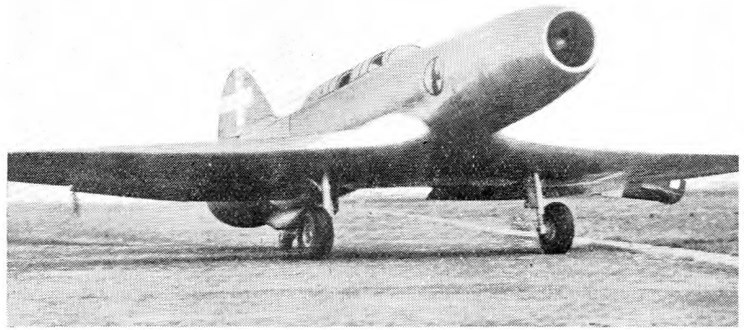




### Real Streamlines

Streamlining is of immense importance to any body designed to move through water. Water has a resistance 700 times greater than that of air, and resistance to movement in water varies as the square of the speed of the moving object. These facts help to explain why roughness on the hull of a ship (e.g. barnacles) may reduce its top speed by 30 per cent.

The most rapid fish have fusiform or "cigar-shaped" bodies and have breadth rather than height. The body of the tunny is said to be one of the most perfect streamlined contours known to Nature.



An airscrewless jet-propelled Caproni Campini C.C.2, is said to have covered 168 miles at an average speed of 130 m.p.h. Air enters a circular duct in the nose, is expanded and passes into a compressor, which may be normal I.C. engine or turbine. It is then ejected through a smaller duct with a controlled outlet behind the tail. The exhaust gases are ejected in the same duct, and aid the propulsion.

### Jet Propulsion

It is often asserted that no aeroplane propelled by an airscrew will ever be able to travel at more than the speed of sound, or about 700 m.p.h. Other methods of propulsion have therefore been suggested, such as the jet or rocket principle. And here, once again, fish come into the picture.

An aquarium official was once holding a fish, about six inches in length, with its head immersed in water. While struggling to free itself it squirted through its gills a jet of water which rose three feet in the air. The full significance of the fish's action was not appreciated until a device, which claimed to minimise the obstacles to a ship's passage through the water, was invented some years ago by an American.

He called his invention an "induced streamline system," and its main feature was the ejection of streams of water through nozzles in such a way as to overcome the obstacles to the passage of a ship through the water. In addition, the jets of water aided the propeller in thrusting the vessel through the water.

The significance of the jets of water emitted by the fish through its gills will now be appreciated. Many fish have an "induced streamline system." Of some three hundred species of swift-travelling fish which have been examined, over 270 possess gill clefts at the correct place for the most efficient use of jets of exhaled water.

The importance of this adjunct to the other factors which impel a fish forward may be judged by the fact that some fish have been seen to force themselves forward by this means alone at not much less than top speed.

### Sharp-Nose Streamlines

It has been thought that the best streamlining for very high speeds should incorporate a sharp section at both front and rear. If fish are any guide, this theory would appear to be correct.

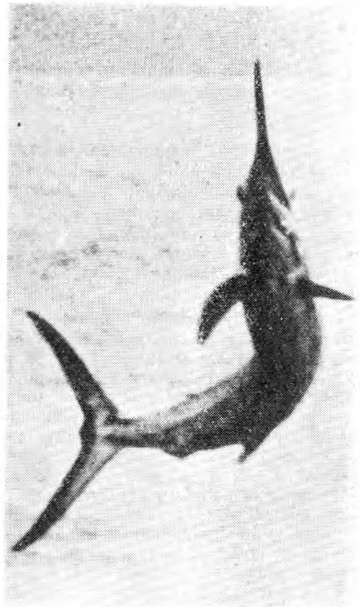
The fastest fish in the sea are the swordfishes, comprising the marlins, swordfishes and sailfishes. Some can travel in water at nearly 70 m.p.h., three times faster than the swiftest submarine when submerged.

All the swordfishes have spear-like heads with a long bony lance projecting in front. Their bodies taper towards the rear, and end in the great crescent-shaped tail.

### Lessons from Fish

There is a fish called the cow-nosed eagle-ray which "flies" through the water with a marvellous grace of locomotion. When the wings are raised they throw the water upward, backward and inward, and the reaction forces the fish through the water. On the recovery stroke the wings are contracted or curved in such a way as to offer less resistance. The whip-like tail trails far out behind, and probably acts as a steadier.

The diamond-shape of the ray is an aid to right-and-left stability. In technical terms, a triangular bow increases yawing stability, due to "sweep-back."



A striped marlin swordfish.

A tarpon umping.
*(Photo by Dimock, American Museum of Natural History.)*

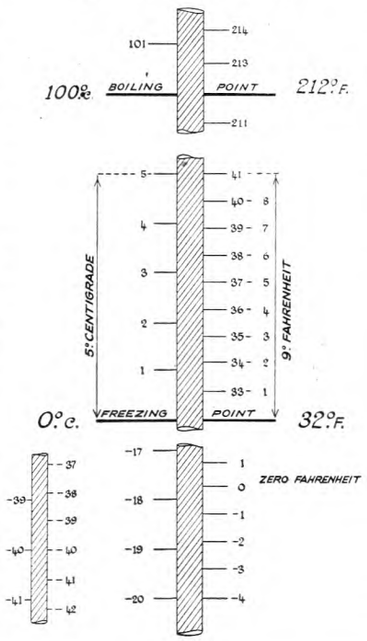
# THE MEASUREMENT OF TEMPERATURE

*by* **C. Farley**

A great deal of trouble may result if we confuse the two principal thermometer scales in use to-day, i.e. Fahrenheit and Centigrade. A few words about their origin may help to make the subject clear.

Fahrenheit made the first thermometers in 1721. Previous to that the standards used were those introduced by Newton, who took the freezing-point of water as zero and called the heat of the human body 12 degrees.

When Fahrenheit made his thermometer he took as zero point the lowest temperature then obtainable, and so it has 32 degrees below the freezing-point of water. This is a sore point with some people, who tell us that the Centigrade scale is more simple and they can't see why they should worry about the other one. The Centigrade scale did not come into existence until 20 years after Fahrenheit started making thermometers, and because the Fahrenheit scale has smaller divisions both English and American meteorologists prefer to use it. It is also the scale generally adopted for ordinary household purposes. The Centigrade scale is ideal for aeronautical instruments, the wide, simplified calibrations being less trying to read under difficult circumstances. The pilot of a Spitfire has no time for anything of a finicky nature, whereas the scientist is not hurried, and works under more comfortable conditions.




Shortly after this it was discovered that the boiling-point of water is always the same under the same barometric pressure. This gave a second easily attained standard, and the boiling point of water was fixed at 212 degrees F. under a pressure of 30 inches of mercury.

In 1742 Celius suggested calling the boiling-point zero and freezing-point 100. This led eventually to the Centigrade scale (called on the Continent the Celius scale), in which we have zero for the freezing-point, while boiling water, under 30 inches of mercury, is 100 degrees. These degrees are sub-divided into ten. It will be seen from the drawing that five degrees of Centigrade are equal to nine degrees of Fahrenheit. A formula for converting the scales is:

| *Centigrade to Fahrenheit* | *Fahrenheit to Centigrade* |
|---|---|
| $F = \frac{9}{5}C + 32$ | $C = \frac{5}{9}(F - 32)$ |

where

F = temperature on Fahrenheit scale, and
C = temperature on Centigrade scale.

It is well worth while to memorise this formula, or make a note of it, as the question of temperature is constantly arising in aviation. Although aircraft instruments may be calibrated in degrees Centigrade, authors of books on aeronautical subjects do not always follow suit, so if you can rapidly make the necessary conversions your reading will be simplified.

# BOOKS

*Aircraft Mathematics*, by Walling and Hill. 2s. 9d. Cambridge University Press. For private study or class work. Goes from elementary fractions to logarithms and trigonometry, also most navigation for proficiency certificate. Recommended for air crew and ground staff.

*Signpost to the Stars*, by F. E. Butler. 1s. George Philip & Son. Makes star location easy and adds interest to the R.A.F. charts. After reading it a walk home in the black-out becomes fascinating.

*Astro-Navigation*, by Francis Chichester. In three parts, 2s. 6d. each. George Allen & Unwin. Best of all the "Observers Books" series. From them a cadet who knows his dead reckoning can teach himself. Methods and reasons concisely described, avoiding advanced mathematics.

*Numerical Examples in Elementary Air Navigation*, by G. K. Clatworthy. 3s. 6d. Pitman. Fine collection of problems. Useful as class book and for solo refresher course. Unusual in its adequate treatment of the triangle of velocities.

*The War Service Scouts Handbook*. 6d. Boy Scouts Association, 25 Buckingham Palace Road, S.W.1. Not a kid's book—much of value for airmen. Useful information on observation, map reading, signalling, camping, existence in enemy territory, etc. Illustrations on unarmed combat alone worth sixpence.

*Air Navigation—Some Problems and Their Solution*, by M. J. Hearley. 5s. Longmans. A luxury book, but good. Contains realistic problems in navigation, with their solutions and explanations. Maps and illustrations easily read; provides useful practice for all stages.

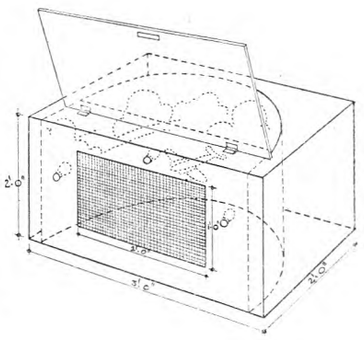
*Polish up your Mathematics*, by R. C. Fawdry, M.A., B.Sc. 5s. Bell & Sons. Ideal for officers who want to keep up with cadets. Interesting; amusing problems and historical notes. Useful for beginners, too.

# A SPOTTING BOX

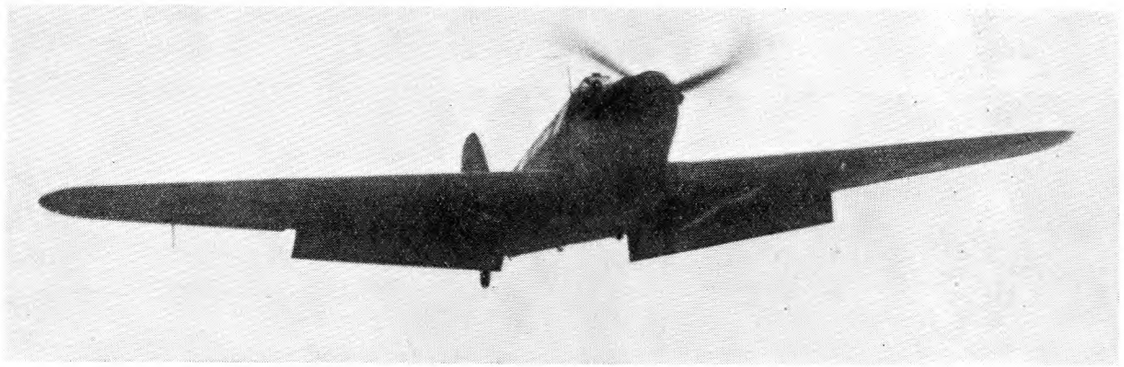
*by* **Sub-Lieut. A. G. SPENCER,** R.N.V.R.

THE "Spotting Box," illustrated, has been in naval use for some time past for instruction and examination. One of its chief advantages is that, with the 1/72 scale models, some attempt at teaching recognition at effective distances for close-range weapons can be made by placing the box at appropriate distances from the class. The distance can be progressively increased as classes become more expert. Similarly, by varying the lighting lay-out and the colour of the background, it is possible to give a fair representation of differing conditions of visibility. The gauze has a twofold purpose: it prevents the models being seen until illuminated, and on illumination it gives a valuable illusion of distance and reality.

Used in conjunction with, or as an alternative to, an episcope, the "Spotting Box" will be found a simple and worthwhile addition to training gear.—*Journal of the Royal Observer Corps Club.*







# Hydraulics

**P. W. BLANDFORD**

explains the principles of hydraulics which operate, among other things, the flaps as shown above in the photo of the Fairey Fulmar I (1,145-h.p. Rolls-Royce Merlin X engine).

ALMOST any moving part can be worked by an hydraulic system. On an aeroplane the pitch of V.P. airscrews, angle of flaps, working of bomb-doors, turrets and raising or lowering of retractable undercarriages may all be controlled hydraulically; in fact, the perfect working of the last would hardly be possible with anything but hydraulic controls.

An hydraulic system has many advantages over other systems. The power can be carried through small pipes, which may be twisted around obstructions without trouble, where any mechanical system would need complicated levers and cables. Considerable power can be exerted with little effort by the pilot. Any pressure applied is transmitted immediately through the system without any backlash or loss of energy.

### Simple Principles

Although diagrams of actual systems in use may appear complicated, the principles on which they are based are fairly simple. Providing these first principles are understood, anyone should be able to follow a particular circuit, and see how and why everything works.

Matter exists in three states — solid, liquid and gas. Solids have size and shape fixed. Liquids have fixed volume, but not fixed shape. Gases have neither fixed shape nor size, and will completely fill any container. Gases are easily compressed by force, but the compression of liquids is so slight as to be negligible. Suppose we rig up three bent tubes with close-fitting pistons at their ends. If lead is poured into one and allowed to set hard, any pressure on one piston will have no effect on the other one or on the lead (Fig. 1A). If a gas is introduced into the second tube, pressure on one piston will first compress the gas and then lift the other piston, which will, however, not rise so much as the other is lowered (Fig. 1B). If a liquid such as water or oil is put in the third tube, pressure applied to one piston will cause the other to rise an equal amount immediately (Fig. 1C).

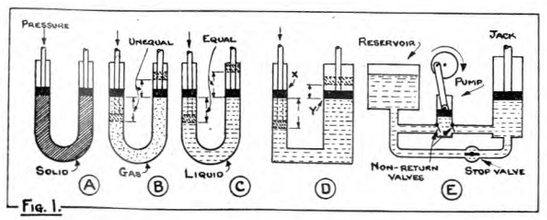


Fig. 1.

### Elementary Practice

If the tube shown in Fig. 1C is replaced by the apparatus shown in Fig. 1D, a mechanical advantage will be obtained, i.e. a small force moving piston X through a long distance will lift piston Y with much greater force through a shorter distance. If the small piston is arranged to be driven mechanically, and a supply of fluid maintained from a reservoir through non-return valves, the arrangement can be used to lift heavy weights on the large piston. To lower the weight, a return line is needed, with a stop valve included to prevent the liquid returning when the weight is being lifted (Fig. 1E). This provides all the essential parts of a simple hydraulic system.

There are many kinds of hydraulic systems devised by the various makers, but although they differ in detail and design they are all based on the same principles. Most makers specify their own particular kind of fluid, usually consisting of a mixture of oils. The circuits shown in this article are not intended to represent any particular system, and the drawings of components are only diagrammatic.

The actual movement of parts such as bomb-doors or undercarriages are controlled by hydraulic jacks through levers or links (Fig. 2). A simple jack has a cylinder containing a piston carrying a connecting rod. When fluid is forced into one end of the cylinder and allowed to run out of the other, the piston is moved. Jacks are made in many sizes, ranging from the giants that work the undercarriage of a heavy bomber to the midgets that move an engine control.

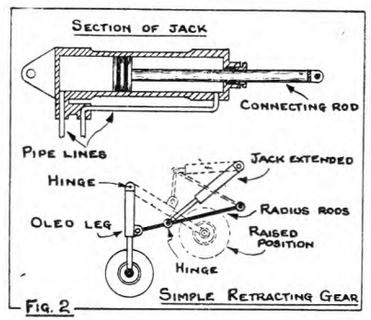


Fig. 2.

### Control

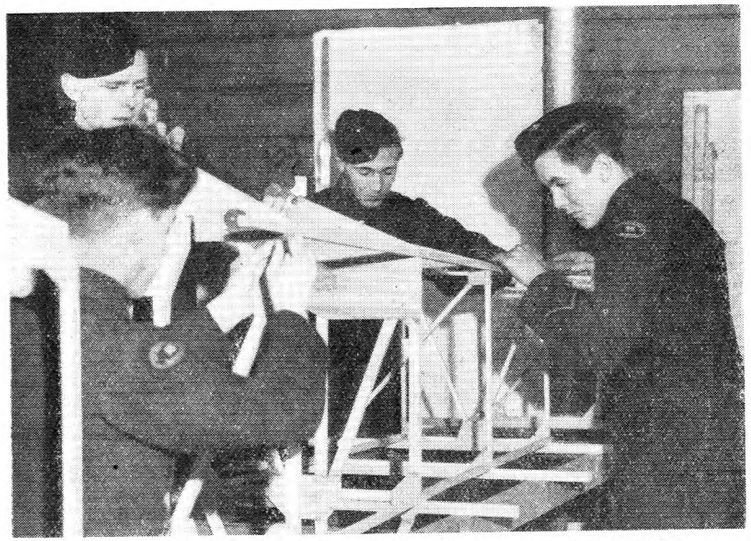
There has to be a component to control the direction of the fluid, and this is called by most makers a selector box or selector valve. It is the selector box that is connected to the lever which the pilot moves when he wishes to operate his flaps, undercarriage, etc. The selector box is the most complicated part of a system, especially where many operations are carried out hydraulically. All that the selector box does when the pilot moves the lever is to connect the down line to one side and the up line to the other side of a particular jack (Fig. 3).

There are usually two pumps for circulating the fluid—a hand pump for emergency and testing on the ground, and an engine-driven pump that works continuously, and pumps the fluid into the selector box which, when set at "neutral," returns it to the reservoir.

There are many ingenious kinds of

(*Continued on page* 30)

# AIR TRAINING NEWS



Cadets of the Southgate Squadron assisting with the construction of a glider.

THE COMMANDANT GLIDES.—The Commandant's special interest in gliding was revealed recently when he visited a camp which had been arranged for the training of instructors. After he had seen how things were shaping he suggested that he would like to make a flight himself. The Chief Instructor, who has the last word in such matters, said that the Commandant, like everyone else, would first have to demonstrate his proficiency by doing a ground hop. Accepting this edict, the Commandant did his probationary ground hop, and not until then was he launched to the maximum height. Although he had not glided for some years, his skilful handling of the machine evoked general admiration.

GLIDING AT LIVERPOOL.—The Liverpool Wing has an ambitious scheme for the formation of a large centre to train gliding staff, where a big range of equipment, tools, motors, etc. will be available. There are now ten squadrons in the wing. The courses have been standardised, of which there are three a year, each sixteen weeks, followed by examinations and a short vacation.

AIRCRAFT RECOGNITION.—In the first Area Recognition Contest in Scotland held at an R.A.F. station, No. 1305 (Strathmore) Squadron won the St. Andrew Challenge Shield against teams of 40 units representing 4,000 cadets. One hundred pictures were shown each for five seconds, and Cadet David C. Duncan, of No. 1305 Squadron, scored 200 out of 200 points. Two made only one slip.

IMITATION ALDIS LAMP FOR INDOOR PRACTICE.—The body of the lamp is a coffee tin, 4½ in. in diameter and 3 in. deep. A metal handle and trigger are fitted to the outside of the lid, and on the inside of the lid is a 16-volt lamp and lampholder. The beam is directed through a ¼-in.-diameter aperture in a metal tube about 5 in. long fitted in the bottom. Although the aperture is only ¼ in. the tube itself is 1½ in. in diameter, and is blacked on the inside to prevent reflection. The sight consists of an oval tube soldered to the top of the barrel. The device has the advantages that it can be easily made out of scrap and provides indoor practice in projection, as there is no projecting beam and the light can be seen only when the lamp is accurately directed at the observer.—(Submitted by Mr. Stanley Palmer, No. 306 (Runcorn) Squadron.)

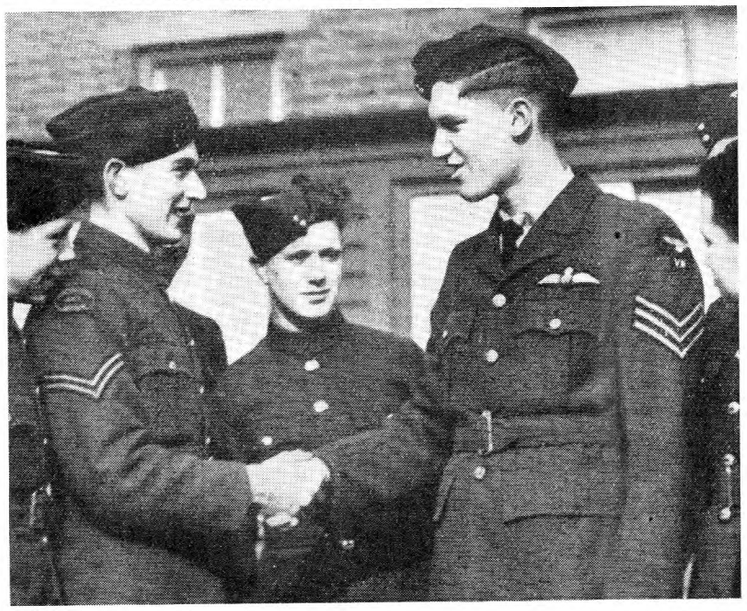
CADETS ARE UP DOWN UNDER.—The Australian Air Cadets organisation, known throughout the Commonwealth as the Air League, is nearing a membership of 45,000. Elementary training is given in two-seater gliders which are said to be very safe and do not fly faster than 20 m.p.h. Later on cadets go over to sailplanes, in which some have stayed in the air for as long as four hours, covering long distances. Cadets are in two divisions, juniors under 16 and seniors from 16 to 18½. All are in uniform, and they are also provided with standard overalls to work in the workshops.

W.J.A.C.—The Women's Junior Air Corps has opened Headquarters at 19 Berkeley Street, London, W.1., under the direction of Lady Haward, who will be interested to hear from anyone interested in the movement or desirous of forming a unit.

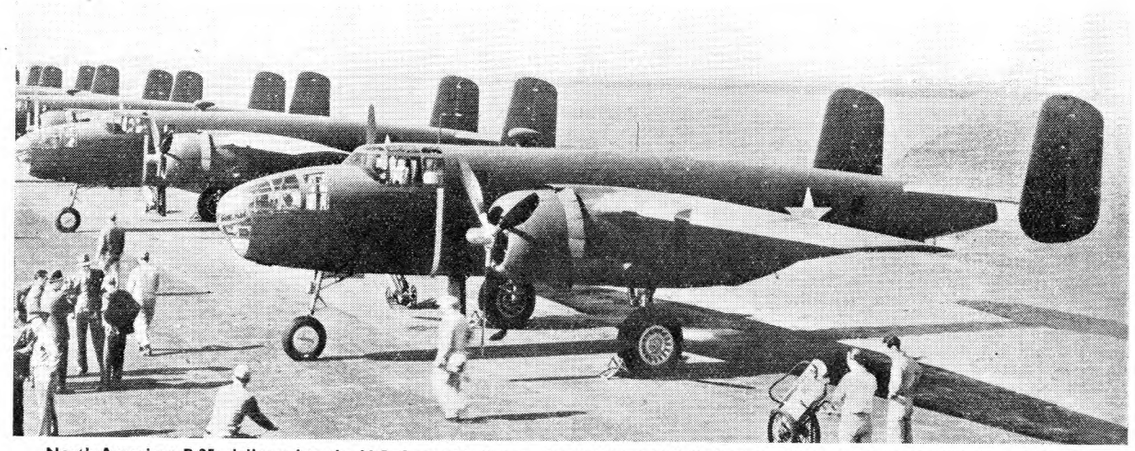
INVASION EXERCISES.—Here is an account of the invasion exercises in which cadets of the Kingsbridge and District, South Devon, No. 1876 Squadron, took part during a week-end some time ago. They acted as messengers for the defending forces and were in great demand. Had there been double their numbers all would have been found jobs.

Cadets were posted to control centres, fire stations, headquarters of Home Guard, and other troops, both in the urban and rural districts. Their duties commenced on a Saturday afternoon at 5.15 and did not end until the Sunday at 5.30 p.m. In spite of long hours without a break they all enjoyed the exercises.

**Sergeant R. Shirley, first Dagenham cadet to receive his wings in the R.A.F., was presented with a wrist watch by the Mayor when he visited his old squadron.**







**North American B-25s delivered to the U.S. Army Air Force. According to "Life" these are being delivered to Britain and Russia. The type has been nicknamed "Mitchell," after Brigadier-General Mitchell, who was dismissed the U.S. Army some years ago for saying that the U.S.A. ought to have more aeroplanes. General Mitchell died before the war, but after Pearl Harbour the U.S.A. Congress voted unanimously to recommend his posthumous promotion to Major-General.**

Many cadets were captured by the invading forces, and quite a number escaped after capture. One party escaped from a locked and shuttered room at 3 a.m., after the post to which they were attached had been captured by the invading forces. They then made contact with their defending troops two miles away and in two different directions, and warned them of the nearness of the enemy. After that, they made their way back to the very place from which they escaped, and got away with a travelling canteen which was in the grounds of the premises.

Senior cadets were put on guard with rifles at the main entrance of the chief control centre. According to information received from the officer in charge there, they frustrated the attempt by the enemy disguised in uniforms of fire workers from obtaining entrance. The uniforms had been taken from fire workers who had been captured. It was considered that by their smartness the cadets saved the main control centre from being captured.

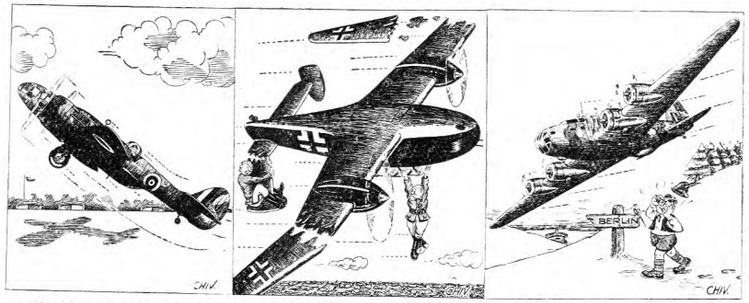
A cadet who was captured with several others when the enemy captured the rural A.R.P. post to which he was attached is supposed to have fallen asleep and to have started to sleep-walk. It may be that he expected to escape, but apparently the plan failed.

Reports have been received by the squadron commanding officer. All speak of the smartness and efficient manner in which the cadets carried out the duties allotted to them.

PHYSICAL-TRAINING TESTS.—The Air Training Corps is a physical as well as a technical training corps. That point was well made by Mr. W. W. Wakefield, Director of the A.T.C., when at an Air Ministry Press Conference he announced the new physical-training tests. The tests have been widely circulated among squadrons, so there is no need to repeat them here. We merely emphasise the following points. No cadet will be debarred from the R.A.F. merely because he has failed to pass them. The tests give an equal chance to the agile and to the strong. It is fairly easy to obtain the 500 marks to qualify for proficiency, yet to pass them all at "special" can be counted as a good achievement.

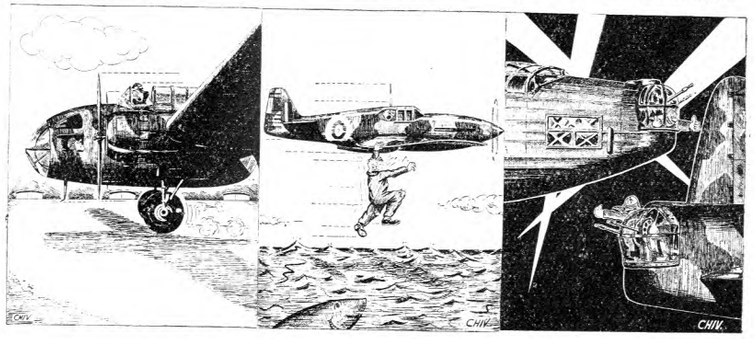
BADGES.—Good-conduct badges always looked a little old-fashioned on cadets. In the R.A.F. three indicate 15 years' full-time crime-dodging service. In the A.T.C. each meant one year's part-time service and not necessarily any proficiency. The new four-bladed propeller badge (indicating leading cadet) can be obtained in a year, indicates achievement. In an efficient unit every cadet with a year's service should have either a proficiency star or a propeller badge. The interesting thing about the new badge is that you can qualify for it without qualifying for a proficiency star. A year's service is necessary for the proficiency star, but not for the propeller badge. The propeller badge will be worn by N.C.O.s, but the proficiency star will not, as every N.C.O. in future will have to qualify for it before getting his stripes.

**HIDDEN NAMES** (no prizes offered).




**Oh, Martin, why won't Maryland?** — **"Ach, vot a mess, Herr Schmitt."** — **No flying for trespassers.**

**"First we'll bomb Ham, den Cologne."** — **You must hang on a little longer.** — **We're well in town to-night.**



"TARGET FOR TO-NIGHT."—The 129 Squadron (Tunbridge Wells) is staging a series of "Target for To-Night" exercises. Teams of three cadets only, comprising navigator, W/O air and W/O ground, work with the signals officer and the navigation instructor.

In the room representing the aircraft are the navigation chart, deviation card, rules and log; a mock-up telephony set, a Morse key, ear-phones, radio log book, list of hypothetical X signals and an "inter-com" loud-speaker for control room announcements.

In the control room is the other end of the "inter-com," and a control panel by which the signals officer can "take over the air" from the ground transmitter. This also cuts out the aircraft set when control is working with base, as the aircraft would not hear these communications in practice. The control is also provided with a Morse key and head-phones.

The control panel is made up from an old press-button tuning unit from a wireless set, and operates a light on the transmitter when taken over by the control officer.

The ground radio-station equipment is a duplicate of that used in the "aircraft."

SPEED IN MORSE (by Edward Ware, Morse Instructor, 323 Squadron, Epsom and Ewell).—What is the fastest one can send and receive? Using five-letter words as a basis, to send at 40 words per minute would mean tapping out 200 characters, or, if you like, 3.33 characters every second.

Even if we found somebody capable of sending so fast the human ear could hardly attune itself to such a speed. It might even find difficulty in taking in all the characters at 35 words per minute, whilst very few people can write 30 words per minute without the help of shorthand.

A really comfortable working Morse speed is between 20-25 words a minute. I have found it easier to read good sending at this speed than to read bad sending at 12 words a minute. It is far better—and quicker in the long run—to send slowly, with the knowledge that the man at the other end is reading you, than to pump the stuff at him as hard as you can, only to find at the end of the message that he has missed whole passages. A good operator will be able to go on far longer, and more accurately, at 20 words a minute, secure in the knowledge that he has a bit in hand, than one who attempts to go flat out.

When sending above 25 words per minute, consciousness of the fact that you are pushing the speed up is felt, comfortable working vanishes, and soon you are falling over yourself with consequent loss of time through rubbing out. However, it *is* possible to send at 30 words per minute, but speeds beyond that I will not vouch for.

The golden rule is never to send faster than you can receive. This usually gives the man at the other end an idea at what speed to work. If you do try to send faster, your ear, not being accustomed to the higher rate, will be unable to tell should you form a character badly and your sending will suffer.

NAVIGATION.—A device to demonstrate variation, deviation and their relation to True, Magnetic, and Compass courses has been submitted by Pilot Officer G. W. Gregory of Uppingham, Flying Officer R. Parker of Newcastle-upon-Tyne, Flying Officer Richards of Bargoed, and others. Details vary, but generally the instrument consists of three compass roses (such as those published in the April *Gazette*) arranged to rotate one within the other, and a model aeroplane. Many such devices are in use in other squadrons.

## SPEED TEASER

A CRUISER is pursuing an enemy steamer. Their speeds are 32 and 21 knots. When they are 54 nautical miles apart an aircraft leaves the cruiser and overtakes the steamer. It then flies back to the cruiser, turns and overtakes the steamer again, and continues like this, flying backwards and forwards between the two ships until they are only 10 nautical miles apart. How far has the aircraft flown, if its average speed has been 121 knots?

(*Solution on page* 30)

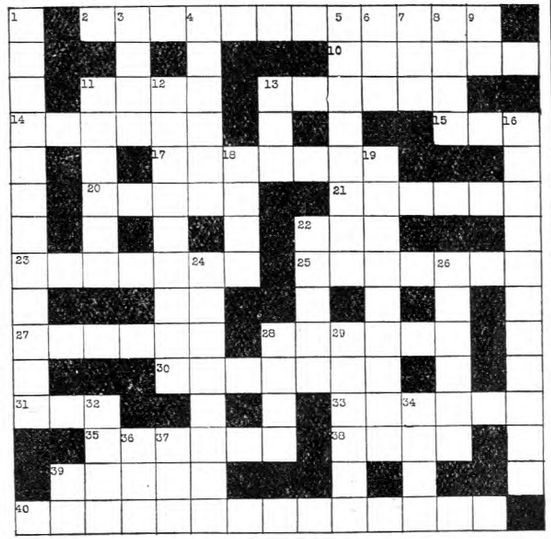
## What are They?

(*See page* 3 *of cover*)

1, The tail unit of a Westland Whirlwind I; 2, The tail unit of a Link Trainer; 3, Flare chutes in a Short Stirling; 4, A 20-mm. cannon and magazine in the port wing of a Hawker Hurricane IIc; 5, Parachute pack, crew type; 6, The detachable rack or stub wing on the starboard spat of a Westland Lysander; 7, A cine-camera installed in the leading edge of the starboard wing of a Hurricane IIc; 8, Fin and rudder of a Short Stirling I; 9, Starboard wing and motor of the Northrop Flying Wing; 10, The four 20-mm. cannon in the nose of a Westland Whirlwind I; 11, The cockpit and stick of a Supermarine Spitfire.

## R.A.F. CROSSWORD

Composed by Flight Lieut. S. C. NUNN, No. 272 (Wisbech) Squadron. (*Solution on page* 30.)



### ACROSS

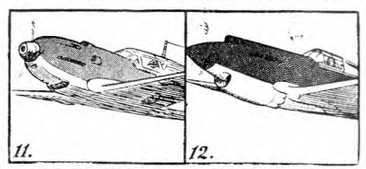
2. Foundations of freedom laid by San Diego (12).
10. A balloon can't be this when deflated (6).
11. The teetotaller signaller must often put this down (4).
13. Wizard engine (6).
14. This could be true (6).
15. No good unless you take it good (3).
17. W.O.s hand drill (7).
20. Easily collected from engine (5).
21. Merlin cooler (6).
22. The drink (3).
23. Four wheels on the Stirling can do this (7).
25. You must conform with the official form of this (7).
27. An impelling signal (6).
28. R.A.F. test pilots should make good judges for these (6).
30. Prominent (7).
31. See 32 Down (3)
33. Memory losing contact (6).
35. Builders of the F4B-4 (6).
38. Use carbon with it (4).
39. The devil of a trainer. (5)
40. Some have three fins and two rudders, some just twin fins and rudders (2 words, 4, 10).

### DOWN

1. Dark, fiery, fabulous fighter (2 words, 9, 3).
3. —— to you (4).
4. Slip this (6).
5. Dread gen is muddled (8).
6. "—— present and correct, sir" (3).
7. We have taken 'ell out of this unit (3).
8. It would be neat if you bombed this volcano (4).
9. Director of Equipment (2).
11. Includes 12 Down at Westminster (6).
12. Navigation sums to find T.A. (9).
13. Navigators' reading material (3).
16. A long teacher (2 words, 5, 6).
18. A step could make this nuisance (4).
19. The Romans don't like this now (9).
22. An old weapon in a Typhoon (5).
24. This puss hunts tin fish (8).
26. Not an officer, but gets saluted (6).
28. Bell music (4).
29. Troops one behind another (2 words, 2, 4).
32. With 31 across—aerofoil convexity (4).
34. Disorderly Flight (4).
36. O doctor (3).
37. More would make this more backward (3).
39. Drizzle and good visibility (Beaufort) (2).







*11.* *12.*

### RECOGNITION CONTEST

THESE drawings are taken from an aircraft recognition contest- promoted by the Duke of Gloucester's Red Cross and St. John Fund. Forms and particulars can be obtained from the Secretary, 22 Lancaster Gate, London, W.2.

### SUMMER CAMP

THE North-Western Region Summer Camp announced in the May *Gazette* has been reconstituted as an R.A.F. camp. The cost to cadets and officers will therefore be on the standard scale, and applications for accommodation should be made through the usual channels.

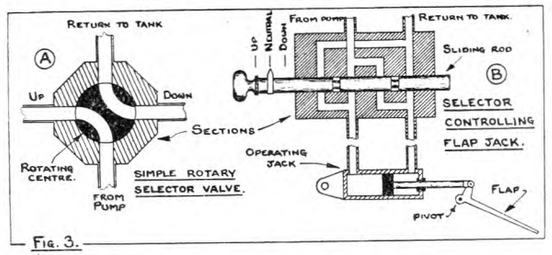
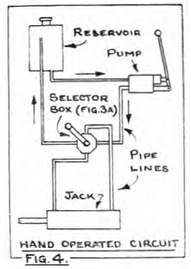



FIG. 3.




HAND OPERATED CIRCUIT
FIG. 4.

# Hydraulics (*continued from page* 25)

pumps, all designed to give a smooth, steady pressure, free from pulsations.

The reservoir is usually arranged in a high-place, so that gravity can assist the suction of the pump. The reservoir is not just a tank: it may contain baffles to prevent all the fluid running away from the outlet when the machine is banking, several outlets for emergency systems, and a filter for cleaning the fluid.

### Pressure Release

There is one other important component. Suppose the components so far mentioned are connected up and an operation selected: the engine-driven pump will force oil into one side of the jack; the piston will travel as far as it can and stop; then the pump will go on building up pressure, and eventually something will burst. To prevent this happening, some sort of cut-out has to be provided. This is usually done by letting the built-up pressure overcome a spring valve which allows the fluid to return to the reservoir. In some systems the cut-out valve is arranged in the selector valve, and the lever returns to neutral at the end of an operation; while in others the cut-out valve is a separate component.

Where a hand pump only is fitted there is no need for a cut-out, as it becomes impossible to work the handle after the jack has reached the end of its travel. The circuit in that case is very simple (Fig. 4).

There is always a risk of part of a system being shot away, so an alternative method of lowering the undercarriage has to be arranged. This may take the form of a second hydraulic system, compressed gas operation, or a mechanical arrangement of cables and pulleys.

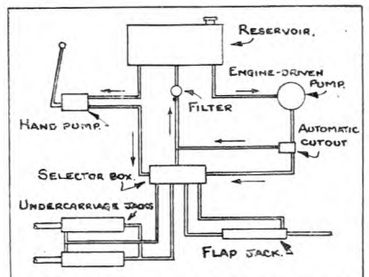
### Locking Systems

Components may be locked in position by one of two methods. There can be an hydraulic lock, in which, at the completion of an operation, the selector lever is returned to neutral, sealing the fluid in the pipe lines. As the fluid is incompressible, the component cannot move in either direction. This is of particular value in the locking of flaps at any desired angle. There can be a mechanical lock, in which the final movement of the piston brings a locking bolt into place. This is more useful in the case of an undercarriage where the locking bolt takes any shocks, reducing the strain on the hydraulic system. On an undercarriage there is a micro-switch coupled to the locking bolt. This operates lights in the cockpit, showing green when the undercarriage is in the "locked-down" position and red when it is in any other.

### Maintenance

An hydraulic system is very reliable, and needs little servicing. It must be examined for leaks occasionally, and the correct level of fluid maintained in the reservoir. Checking of the latter is included in the "D.I." of most machines. The biggest enemy to the correct working of a system is the presence of air in the pipes. As pointed out earlier, a gas will compress when a pressure is applied. If there is air in a pipe, when pressure is applied the air will compress, and the full load will not be transmitted to the component, making its movements sluggish and uncertain.

To remove air the system has to be "bled," i.e. at each component in turn a vent-screw has to be loosened and fluid pumped through that component until fluid unmixed with air is seen to leak out.




TYPICAL AEROPLANE HYDRAULIC SYSTEM
FIG. 5.

## *Stars to Study this month*

EACH month different groups become visible early in the evening. By studying a suitably placed group and committing to memory the positions and names of three or four individuals each month, one can easily learn all the navigation stars in the northern hemisphere in less than a year.

The date given is near the new moon, the time 9.30 p.m. in the winter and later in the summer, all times Summer Time or Double Summer Time. Earlier than the given dates and times allowance must be made. This will be very slight within a week and a few hours either way.

*June* 13*th*, 11.30 *p.m.*

The Plough is inclined towards the south-west, and the Sickle is westwards. In the east the Northern Cross comes well into view. Part of the Scorpion appears above the SE. horizon.

Learn this month: Spica, Alphacca, Vega.

### SPEED TEASER SOLUTION

(*See page* 28)

Relative speed of ships = 32 − 21 = 11 knots.

Distance shortened = 54 − 10 = 44 nautical miles.

Time taken to shorten distance

$$= \frac{\text{Distance}}{\text{Speed}} = \frac{44}{11} = 4 \text{ hours.}$$

Aircraft was flying for 4 hours at 121 knots.

Distance it flew = 4 × 121 = *484 nautical miles.*

### *SAVE PAPER*

The Editor, and printers and paper merchants, thank all cadets who sent parcels of waste paper. Others are reminded that if they send parcels of waste paper to the *Gazette* printers, The Stanhope Press, Love Lane, Rochester, Kent. they will help in the production of the *Gazette* and will receive aircraft identification charts to the value of the postage they expend.

### Crossword Puzzle Solution

(*See page* 28)

ACROSS. — 2, Consolidated; 10, Elated; 11, Beer; 13, Merlin; 14, Course; 15, Aim; 17, Tapping; 20, Grime; 21, Glycol; 22, Sea; 23, Retract; 25, Address; 27. Rocket; 28, Trials; 30, Salient; 31, Cam; 33, Forget; 35, Boeing; 38, Iron; 39, Demon; 40, Avro Manchester.

DOWN.—1, Blackburn Roc; 3, Over; 4, Stream; 5, Deranged; 6, All; 7, Tai; 8, Etna; 9, D.E.; 11, Budget; 12, Estimates; 13, Map; 16, Miles Master; 18, Pest; 19, Gladiator; 22. Sabre; 24, Catalina; 26, Ensign; 28, Ting; 29, In file; 32, Mber; 34, Rout; 36, O M.O.; 37, E.O.M.; 39, D.V.

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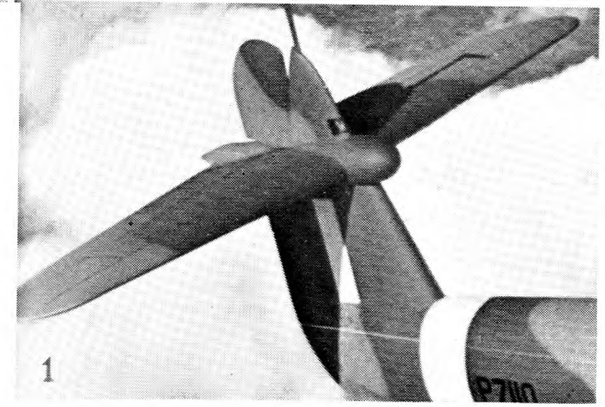


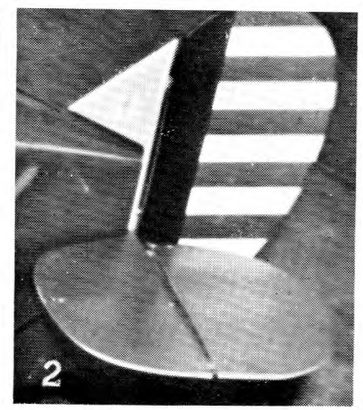


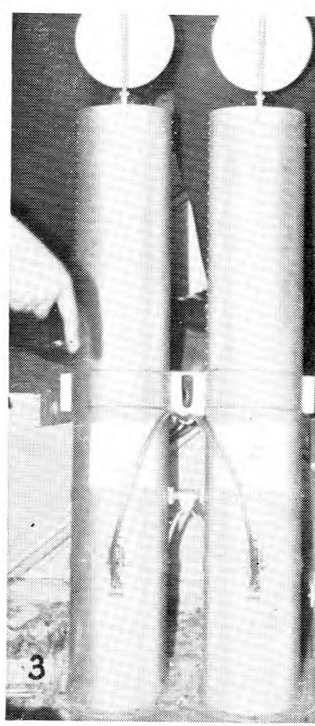


## WHAT ARE THEY?

Here are eleven pictures of parts of aircraft or equipment, some of which you may have seen in your visits to aerodromes, and all of which have been illustrated in some form or another in previous issues of the *Gazette*. Some you will easily recognise, others may be a little difficult. You can test your powers of observation by naming them and your knowledge by recalling some details about them. If you have never seen the things before you will find the pictures interesting and instructive. Key on page 28.