AIR TRAINING CORPS GAZETTE

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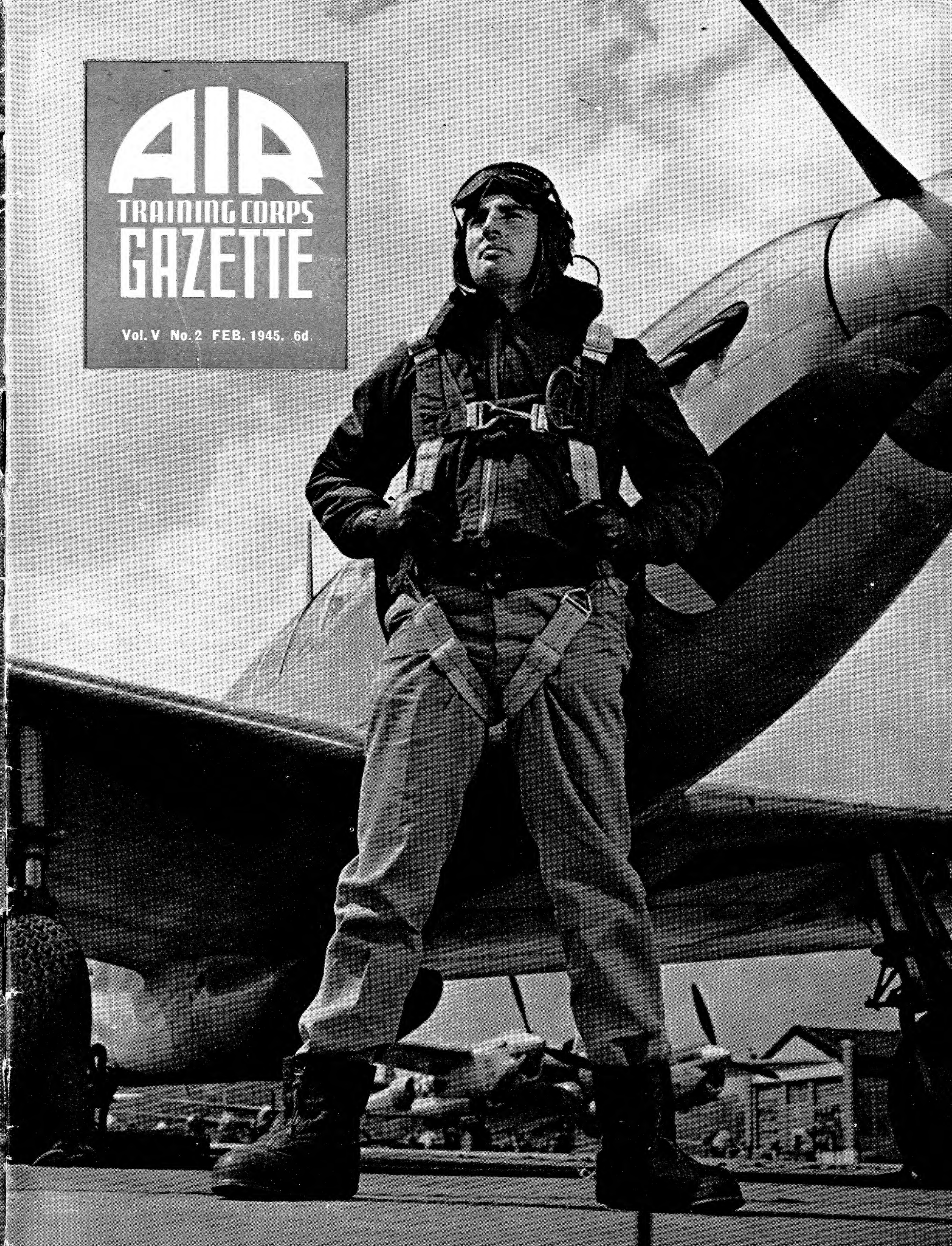

AIR Training Corps GAZETTE

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The Fifth Year

by AIR MARSHAL SIR LESLIE GOSSAGE, K.C.B., C.V.O., D.S.O., M.C., Chief Commandant, Air Training Corps

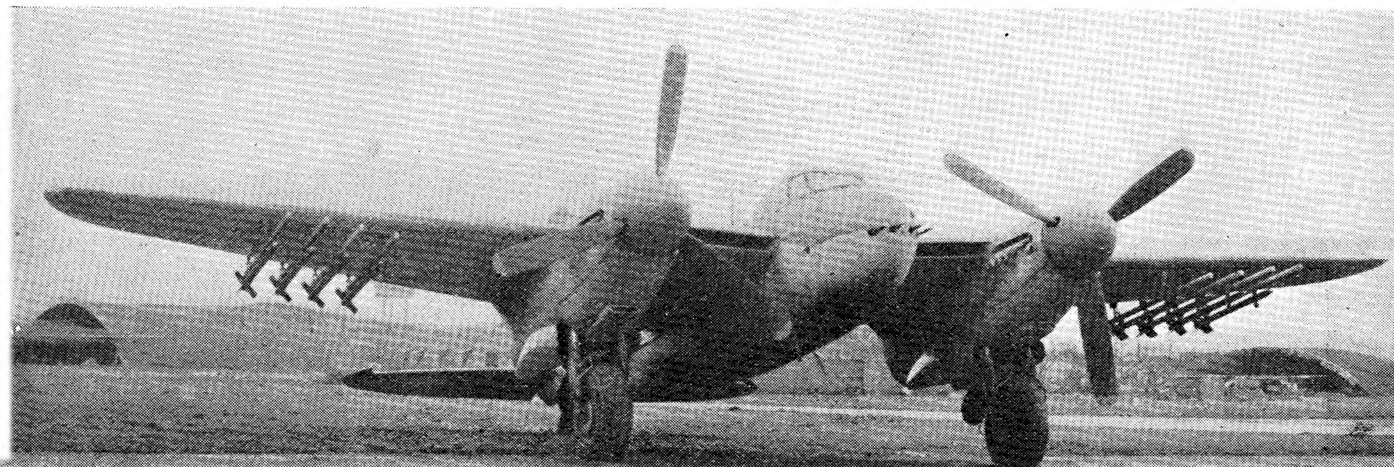
THIS issue of the *A.T.C. Gazette* marks the fourth anniversary of the Corps' foundation, for the Air Training Corps came into official existence by Royal Warrant on February 1st, 1941. It is also just a year since I had the honour of taking over command of the Corps.

For the A.T.C. the past year has been one of great achievement, but, as I said in my New Year's message in the January issue, one of great difficulty also; but the Corps has taken its disappointments "on the chin," and still carries on. Conscious of past achievement, cadets are realising the responsibility which they will bear towards the Royal Air Force of the future.

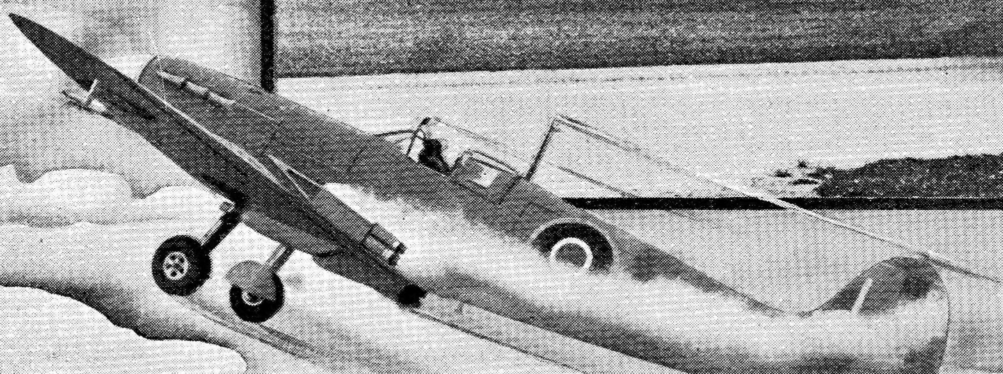
A measure of our achievement is the number of young men who have been trained and have entered the flying services. During 1944 something like 25,000 cadets joined the Royal Air Force and the Fleet Air Arm. In addition, over 5,000 went to the Royal Navy. Then about 15,000 more have gone to the Army, where, as many of them testify in letters to their former commanding officers, they are finding life interesting and a first-class outlet for A.T.C. training.

But in another way the Air Training Corps has done much in the past year in which it may take just pride. I refer to the achievements of former cadets—over 100,000 of them—who are in action as aircrews or groundcrews with the R.A.F. Their heroic deeds are chronicled, with increasing frequency, in the citations of awards given by the King for valour and gallantry in the face of the enemy. That is our true achievement, and a fine prelude to the fifth year of our existence. It is also the fine tradition which those "old boys" of the A.T.C. have created—a tradition which is part and parcel of that of the Royal Air Force. In spite of our temporary setbacks, which will pass, let us live up to our traditions and show the Royal Air Force that, as we have met the demands made upon us in the past years, we intend to meet them again when they begin once more—as they will.

The Rocket Projectile Mosquito Mark VI.

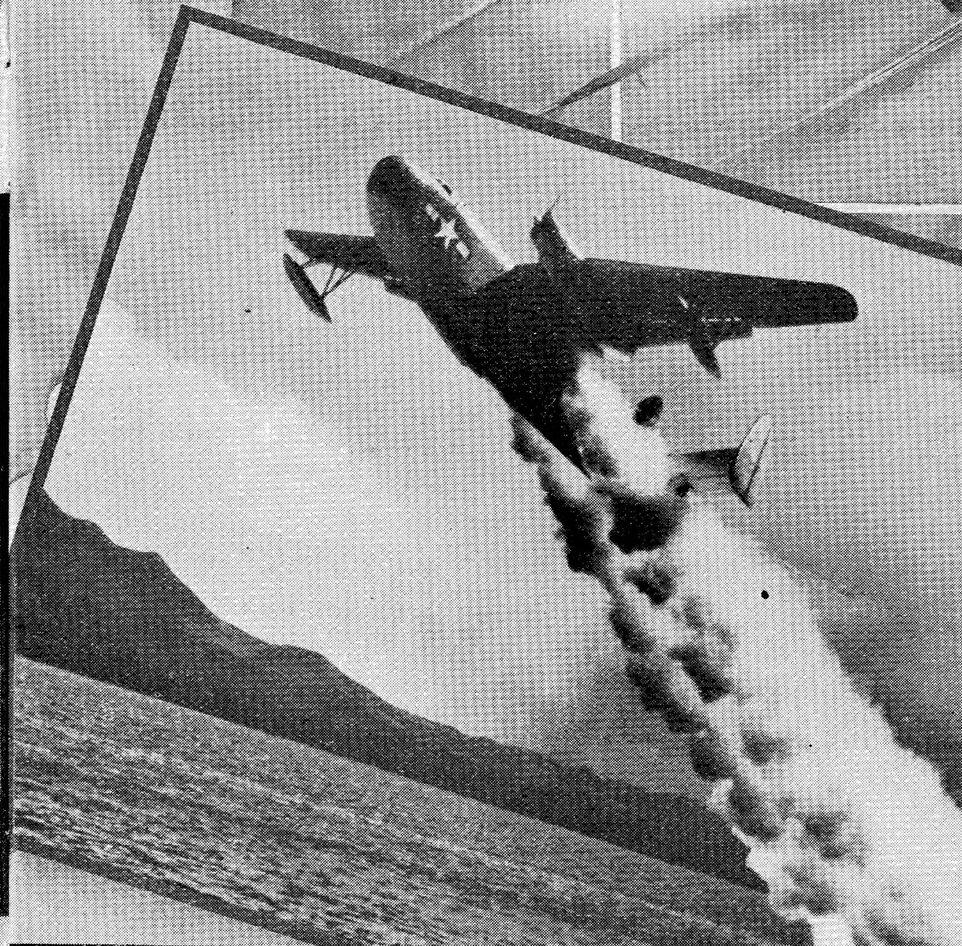


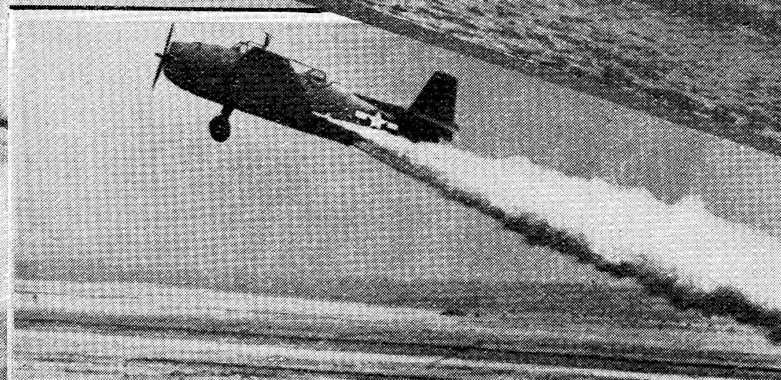
ROCKET ASSISTED Take-off



Rocket propulsion units are now being used to assist aircraft to take off with heavier loads and at greater speeds than formerly. They cut down the run from 30 to 60 per cent.

These rockets, officially known as "Rocket Assisted Take-Off Gear" (American: Jet-Assisted





Take-off) contain an explosive charge of cordite which, when fired, gives an additional acceleration towards the end of the run and thus reduces the take-off distance.

The rockets are mounted on the aircraft in two groups, one on either side of the fuselage. Each group consists of from one to four rocket-tubes, which are held in a carrier.

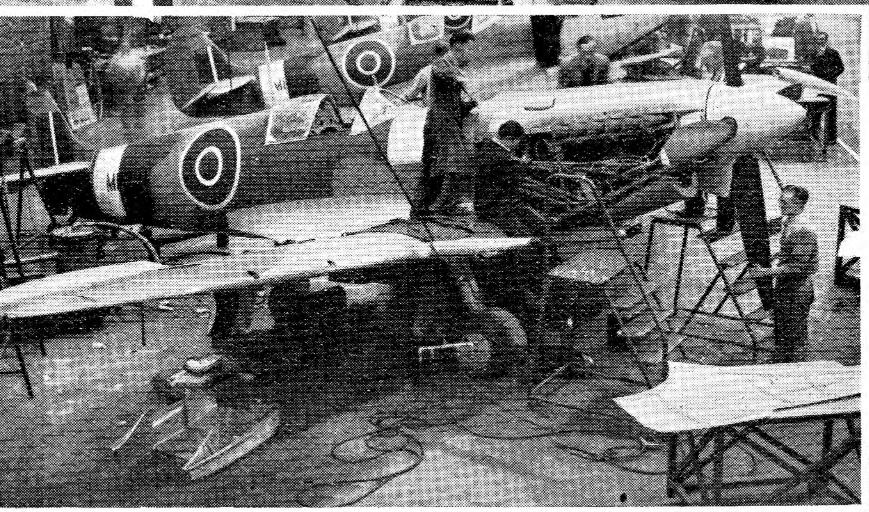
The number of rockets mounted varies according to the type of aircraft and the weight of the load.

The aircraft starts its take-off run in the normal way, and the pilot fires the rockets on reaching an optimum point.

All rockets are fired simultaneously. They give an assisted take-off lasting abour four seconds until all the cordite is expended. The rockets and carriers are then jettisoned.

The aircraft shown on these pages are (page 2, top to bottom): Vought F4U Corsair, Douglas A-20 Havoc, and the Supermarine Seafire.

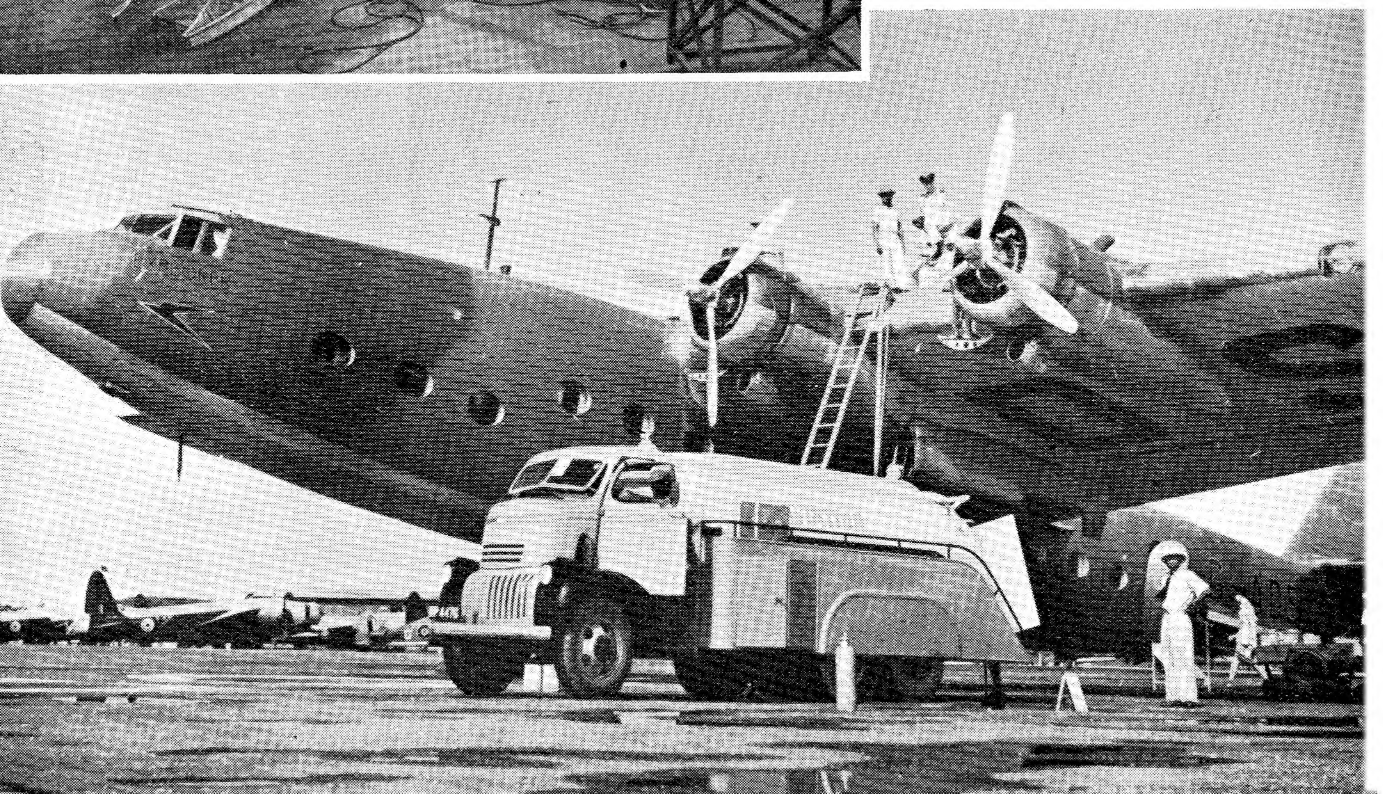
(Page 3 top to bottom): Supermarine Seafire, Martin PBM Mariner and Grumman TBF Avenger.

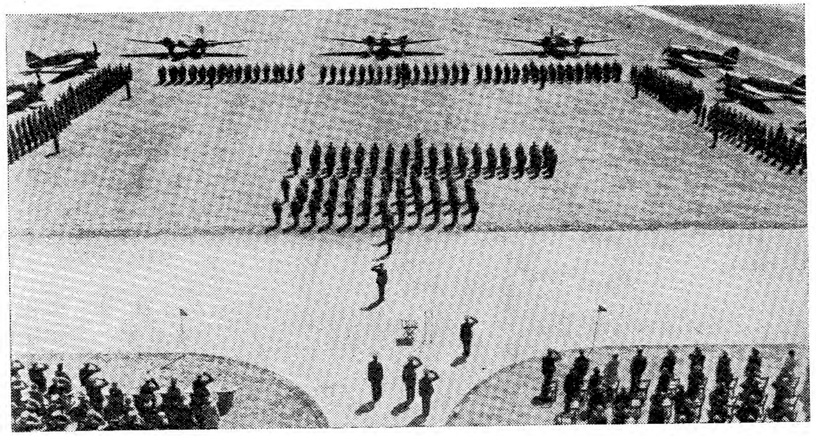


Top: Hamilcar and Hotspur gliders under construction with Sea Hurricanes in the foreground and background. The aircraft on the extreme left appears to be a flying scale model of the Hamilcar.

Left: A Spitfire production line at an M.A.P. factory, one of many turning out this type.

Bottom: An Ensign of B.O.A.C. refuelling at Accra airfield on the Gold Coast, West Africa.





The scene at Cranwell during a Wing's Passing-Out ceremony.

PEACETIME PROSPECTS

by CAPTAIN NORMAN MACMILLAN, M.C., A.F.C.

> **The prospect of the young man seeking to carve for himself a place in aviation lies along a wide highway with many converging roads. He who marches along that highway with courage has as fair a chance of fortune as any young man ever had**

THE field of activity in the air is widening rapidly. Not many years ago it was very restricted, with few openings in civil aviation, a small British aircraft industry, and but one avenue to Service aviation. From 1918 to 1938 all Fleet aircraft were part of the R.A.F. Then all naval F.A.A. pilots were officers who held two commissions — R.N. and R.A.F. — while posted for flying duties, usually for four years, after which they returned to exclusively naval work.

One used to find R.N. and R.A.F. personnel on flying decks, in wardrooms and lower-deck messrooms, but the R.A.F. never succeeded in assimilating the flying portion of the seagoing Navy.

In 1938 all the dualities of the two Services in the Fleet Air Arm were swept away; the Navy got what it had not had for twenty years—naval aerodromes ashore. This was the first real break with the vision of a unified Service under one Ministry which became actuality after the report submitted to the War Cabinet by Field Marshal Smuts in 1917.

In the Great War the difficulty with the two Services was the competition between them for the aircraft industrial resources of the country, and the Air Ministry and the R.A.F. were formed mainly to put an end to the fight between the Admiralty and the War Office for aeroplanes and engines. In this war the Ministry of Aircraft Production, acting as the aircraft supply department, has prevented the former war's strategically unsound rivalry.

But many developments have taken place during this war which have altered the comparatively simple organisation of the originally planned Air Ministry. Almost all these developments are the result of experience in this war, and for that reason it is probable that they will continue after the war. This is very important to the young man who is seeking a career in aviation, for it widens enormously the field he can choose to specialise in, and gives him the chance of several opportunities instead of the sole alternatives of R.A.F. or civil aviation that obtained in 1919.

The R.A.F. is itself a far more specialised Service than it was. Its signals organisation has expanded out of all previous ideas on this subject. Flying control is a distinct branch of activity which came from the original humble duty pilot on each aerodrome. There is the R.A.F. Regiment, with its field units and A.A. units. The armaments branch has developed enormously — from the 250-lb. to the 12,000-lb. bomb, from the .303-inch machine-gun to the half-inch machine-gun, 20- and 40-mm. cannon-gun and six-pounder gun, and from the Prieur anti-Zeppelin rockets of the Great War to the rocket projectiles of today. There are the Pathfinder Force, the Air/Sea Rescue Service, Photographic Reconnaissance Units and Air Transport Command—all new.

The relationship of the air and ground sides of the R.A.F. has altered since the war began, and the specialisation in each is likely to increase rather than otherwise, so that the mobility of the flying side will become greater, although the ground side, with the exception of that of the Tactical Air Forces, may become less mobile.

Modern air forces are huge, and the organisation behind them is vast, so that their dimensions are not less impressive than those formerly associated with armies only. If air forces are to continue to be efficient in the future they must be larger than those of the pre-war period.

The separation of tactical and strategic air forces is important. Each requires its own specialised technique to get the best results. The knowledge required for each is so great that it seems possible that in future entrants into air forces may be expected to choose one section for a career, just as army entrants go into the infantry or artillery.

The Army itself is becoming more airborne every year. There is a prospect of joining the future Army to seek an air opening of a specialised kind, whether it be to spot for the field guns from light aeroplanes or helicopters, or to train for operations with air transports, tugs and gliders. Army airfield constructional units form an indispensable ally of tactical air forces. And there is the anti-aircraft branch of the Army.

The Fleet Air Arm is expanding swiftly, aiming to possess more aircraft carriers than naval officers dreamed of a few years back. It now offers a real career instead of a temporary job. Admiral William F. Halsey, commanding the U.S. 3rd Pacific Fleet, flies his flag from a carrier. Many more admirals are likely to do so in the future.

We must face the development of the flying bomb and the rocket bomb. Both are forms of air war, no matter which branch of the Services may eventually specialise in them. They are not just a wartime freak. They have come to stay, and to be improved as weapons of war, so they will have to be manned and serviced.

Civil aviation is destined to become a great service, with its airlines forming a spider's web about the whole world. In its many branches it will offer careers to aircrews, surface engineers, aerodrome and management staffs, civil servants, lawyers.

Behind the whole shop window of aviation stands the workshop of industry, where the airframes, engines, airscrews, bombs, robots, radio, radar, pyrotechnics, instruments, tyres, brakes, guns and a thousand other things are made; where research by fuel technologists goes on continually; where specialists and less skilled workers will be needed to carry on the work of those who so far have pioneered the way to the opening of the air age.

FLYING TRAINING Command

An article specially written for the A.T.C. Gazette by AIR MARSHAL SIR PHILIP BABINGTON, K.C.B., M.C., A.F.C., Air Officer Commanding-in-Chief, Flying Training Command.

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It is not easy to condense into a few lines an account of the training organisation which produces the vast numbers of air crews in their different categories, not only for the R.A.F., but for the Dominion Air Forces and for many of our Allies; any attempt to do so without mentioning the training done all over the British Empire would be telling only part of the story.

When the war started our training facilities matched the very limited peace-time air forces of our Empire. There were very few spare airfields, much of the training load had been imposed on front-line units, there were no operational training units, and non-pilot air-crew training was virtually non-existent.

It was soon obvious that the paucity of airfields and the danger of enemy interference in this country made it essential for as much as possible of the instructional set-up to be overseas and, by agreement with Canada, Australia, and New Zealand, the great Joint Air Training Plan was put into operation. South Africa and Rhodesia were not partners in the J.A.T.P. itself, but they were not backward in setting up substantial flying training organisations of their own. India, the Middle East, the West Indies and the United States of America too afforded great help.

All parts of the Empire generously contributed whatever resources they could to the common plan, in manpower, cash and goods. There was little aircraft industry overseas in peace-time, with the result that the bulk of aircraft, material, engines, spares and instructional gear had to be provided from this country. The ambitious programme of supplies was maintained thanks to the Royal Navy and the Mercantile Marine; losses were very few.

Great numbers of instructors, maintenance personnel and pupils were sent from this country, and in addition to the great network of new schools which sprang up on Dominion soil, many existing schools were moved bodily overseas as well.

This world-wide organisation for training had not only to turn out aircrews of all kinds at an ever-increasing rate, but had also to expand itself continually and provide large numbers of ground crew for manning its own units and the operational units which were being formed and sent to the various theatres of war. Very broadly speaking, Flying Training Command in this country undertakes the business of receiving aircrew candidates into the Service, preliminary aircrew training, selection for category, and the elementary ground training of all R.A.F. aircrews. The bulk of the intermediate air training of powered aircraft pilots, navigators and air bombers is done overseas, as also some WO/Air and Air Gunner training, but we do undertake in U.K. a considerable amount of "all-through" training of aircrews, including pilots and glider pilots.

On completion of overseas training all aircrews coming to this theatre of war—not only R.A.F., but R.C.A.F., R.A.A.F., R.N.Z.A.F., and Allies, excluding Americans—all pass through Flying Training Command, which provides acclimatisation and advanced training courses before they go on to O.T.U.s for further training and entry into operational units. In this country, too, we have the Empire Central Flying School, the Empire Air Navigation School, the Empire Air Armament School, and schools for every kind of aircrew instruction, including that for tug pilots, glider instructors, beam approach instructors, flying control officers, airfield controllers, air sea rescue, Link trainer and ground instructors—to mention but a few. The majority of aircrew candidates wish to be pilots, and on the subject of flying training the thoughts of the majority turn automatically to pilot training. But it cannot be too strongly emphasised that the training of the essential and equally important non-pilot categories receives exactly the same care and thoroughness in every stage because the strength of a crew is in the hands of each member.

Let us remember also the great debt we owe to the ground staff, who service a fantastic number of types of aircraft and enable us to give several million flying instructional hours every year in Flying Training Command alone.

Operational Commands naturally have priority in allocation of airfields, with the result that training units are not infrequently moved to make way for urgent commitments. But thanks to the co-operation of all concerned, moves are done at short notice, with no more fuss than the arrival of a removal van in civil life.

Some of the men trained overseas go direct to operational commands in non-European theatres of war. Many others fly their aircraft across the Atlantic on completion of training in the normal course of events, which is in itself sufficient indication of the high standards attained.

We know that the Allies possess the finest aircraft, engines, armament and aircraft equipment in the world, but possession of these is not enough without the skill to make the best use of all these things. Such skill can only be acquired by thorough and painstaking training followed by constant practice and study to keep pace with new developments and to keep ahead of our enemies. It is not always recognised by young aircrews that training in its widest sense can never be allowed to stop if efficiency is to be maintained. It is not enough to undergo a number of courses alone, and then to "sit back". Instructors have a very responsible job which they are doing their utmost to fulfil, namely to impart to their pupils every detail of knowledge of which they themselves are possessed or can become possessed by further experience and study; and their pupils are co-operating by contributing their keenness and thirst for knowledge.

For many aircrews the training process starts when they join the A.T.C., which gives a very valuable grounding in many subjects and introduces the cadet to various aspects of service life which will serve him in good stead throughout his life within the R.A.F. and later. But it is well to remember that good training can never afford to be static and is never finished, because new developments are always arising and by constant practice alone can skill be maintained and increased.

The Battle of Britain and all other battles are not won by luck, but by a combination of guts, skill and good equipment, so it is up to us all to ensure that our training shall be maintained at the highest possible level at all times.

The A and Z of Flying Training Command, Tiger Moth and Handley Page Halifax.

Former A.T.C. cadets under training in a Dominie used for practical signals instruction in the air.

THE CIVILIAN AND HIS AEROPLANE

Private flying for the man in the street and the sportsman pilot after the war—Gliding and light aeroplanes—The cost

by Stringbag

ONE day I am going to receive a buff-coloured envelope with a crest on the back, and inside will be a note which says in effect: "Dear Sir, your commission is terminated." Maybe there will follow a few words of thanks, probably stiff and formal, but still an acknowledgment of the many hundreds of hours I have sat at the controls of one of His Majesty's aeroplanes during the past four, five, six (?) years.

The same envelope will come to many of us, for by then the war will be over and the need for pilots will be less. It will not be the vote of thanks, or the gratuity, or any other sort of acknowledgment which will be in our minds at that moment. It will be the startling realisation that it is all over—that we are to walk away from our aeroplanes, catch a train, and go shopping for one of those hard, uninspiring and supremely uncomfortable bowler hats.

And the thought which will spring up in my mind, and in the minds of thousands of others, will be the question: "Am I ever going to fly again?"

The answer, of course, is that we are, and the object of these notes is to suggest how and where and in what, and, of course, how much it will cost. It is not disloyal to do this before the war ends, for whether we are junior members of the A.T.C. or seasoned veterans with five years of war-time flying behind us, we recognise that the Peace will demand our services as civilians rather than as uniformed airmen. I do no more, therefore, than attempt to answer the question whether our love of the air can be gratified when we find ourselves in "civvy street!"

Room for All

The £2,000 a year which is the reward of a manufacturer's star test pilot will not be for many of us. The more modest £1,200 a year for a junior test pilot, or the similar sum paid to an air-line pilot, is equally likely to be out of reach. For one reason, there are too many others after the job, for another we haven't the experience, and for a third we have solicitors' practices, or grocery stores, or a printing business to look after. We are, in fact, the future of England, and we've got to get busy with it under the roof of a bowler hat.

It seems a long time ago now, but I remember how I used to snatch my own bowler hat off its peg in the office and dash out to the airport in the lunch hour. There would be just time to cram myself into a Tiger Moth, climb to 5,000 feet, do a couple of stall turns, and be back in the office at two. It was, perhaps, very silly and very bad for the digestion, but I'll do it again if I get the chance.

There'll be room in the air for all of us after the war . . . all of us who still want to fly, whether we are beginners or star turns. We shall need to remember this. And I am quite sure that we shall divide ourselves into two camps. In camp 1 will be those who don't care where they go, provided it's vertically upwards. For them it will be Sport with a capital "S" and flying for the sheer love of it. In camp 2 there will be many graduates from the first camp, but they will combine the love of the air with its utility. They will use the air to go places and do things for which they would otherwise not have the time. For instance, it is my own avowed intention to leave my post-war office early on Saturday morning, pack a gun, a fishing rod, or a bag of golf clubs into the back, and very definitely to fish, shoot, or play golf wherever I will—possibly in Scotland, possibly in France. To these ends I already have my eye on a light aeroplane which has a take-off run of 50 yards in still air, so that I shall not be tied to aerodromes.

Can We Afford It?

Now the deciding factor in all these things—whether we are to belong to camp 1 or camp 2—will be the cost. It is this which will restrict many of us to camp 1, and on the whole it is the members of this humble and impecunious fraternity who are likely to get the most fun out of their flying. In my own mind it is quite certain that their flying will be in gliders, or sailplanes, to use a more accurate term, and the cost will not be much more than running a motor-cycle, and certainly not as much as running a car. It may, indeed, cost its adherents nothing if they happen to be young and members of the A.T.C. (which may decide to continue the development of gliding after the war).

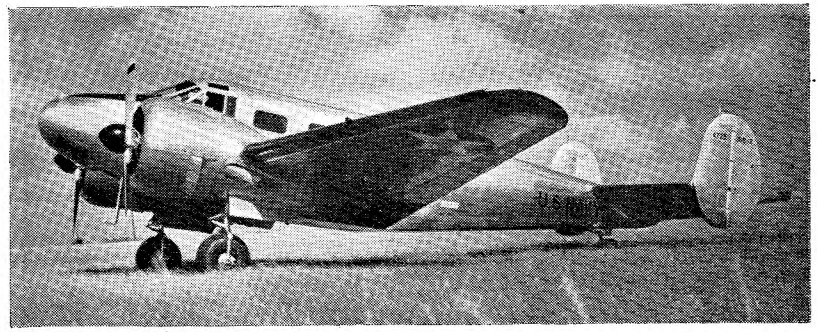
I myself spent considerably less than £50 a year on gliding in the old days, and even the most fanatical of my friends (who never let a week-end pass without visiting their club) rarely spent any more. I could enjoy the wild airs of a cumulus cloud 5,000 feet above my launching point for a cash expenditure of as little as half-a-crown. (Yes, it's down in black and white in my log-book.) And it was real flying. With sincerity I can say that some of those struggles with the air currents in a sailplane were more than equal for sheer thrill to anything I have met since in the fastest Service fighters—and I have flown the latest of them.

It is impossible to say with certainty what the exact costs are going to be. The pre-war figures are a guide. It was then possible to learn to fly a sailplane for £1 at the rate of 6d. a lesson. That is to say, a member of a private club (subscription 3 guineas) who had never been in the air in his life, could qualify for a "C" certificate by making a soaring flight for a minimum of 5 minutes and for fees amounting in all to 20s. Thereafter he had available for hire a medium-efficiency sailplane, good enough to search out the thermal staircases to the clouds, at the rate of 5s. an hour. I had spent only about £5 in fees before I found myself for the first time wrestling with a strong updraught immediately beneath a giant cumulus.

These costs will, of course, be higher in 1945 or 1946. The intermediate sailplane which could be purchased for £130 in 1939 will probably cost £250 after the war, and the really high-efficiency types, in which the records were made, will have gone up from £200 to perhaps £500.

The Auster, a development of the American light aeroplane, and built under licence by Taylorcraft Aeroplanes (England) Limited.

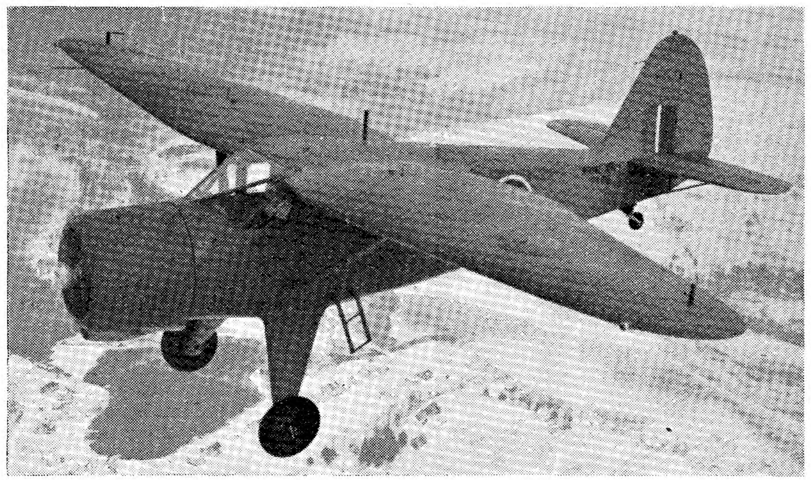
On the other hand, there are high hopes of two or three standardised types being designed and produced by mass-production methods—something which has never been attempted in the gliding world—and this will in turn reduce the final price considerably. In my opinion, and regardless of any Government subsidy which may or may not be paid, it is probable that advanced soaring will be practicable at the maximum rate of 10s. an hour. When one considers that enough excitement to last many people a lifetime can be packed into twenty minutes, this is not an unreasonable fee. A single round of drinks in a "pub" can cost more.



Now being used as a transport by the U.S. Army and Navy Air Forces, the Beech Model 18 has definite appeal to certain classes of would-be private flyers.

The Private Owner

And now for camp 2—which frankly envisages the ownership of a light aeroplane of one's own. This is a richer man's sport, but not necessarily a millionaire's. I had two friends who were private owners before the war, and neither of them spent more than £300 a year, including depreciation, insurance and the annual certificate of airworthiness. On the other hand, it is true that the man who belongs to camp 2 is the sort of fellow who was prepared to spend £450 on a sports car before the war, and his income, if he was a bachelor, had to be at least £700 a year, or, if a family man, nearer a minimum of £1,500 a year.



A four-place commercial monoplane which has long enjoyed popularity in the United States and elsewhere is the Stinson Reliant, mentioned in this article.

These possibilities do not take into consideration the ordinary club flyer—the man who learnt to fly for £30 and hired a Tiger Moth for 30s. an hour thereafter. There will always be club flying, but those who chose it will fall between the two camps. As a class, the man who wants a 100 m.p.h. aircraft to take up for a flip would do better to join a gliding club. He will get more fun out of it in the long run.

No-one is going to prophesy exactly what the light aeroplane of the future is going to cost. It is too early. The figure of £600 rumoured for one famous model is an estimate which is encouraging, but which I fear is optimistic. On the other hand, a sound aircraft carrying three people at a price of under £1,000 is an ultimate possibility.

Performance

One is on safer ground at this stage in estimating the performance of the aircraft, and thereby gauging their usefulness to those who class themselves in the second of my camps. First, I am quite convinced that we shall have machines capable of landing and taking-off from ordinary fields. The Auster is in this class, and I believe that its stalling speed is in the region of 30 m.p.h. It has won fame as the Flying Jeep, and I can see it alongside the Miles as a week-end run-about.

There will be more of the same class, probably powered with simple 4-cylinder engines developing between 75 and 140 h.p., which consume between 4 and 8 gallons of petrol an hour. If the cruising speed is between 80 and 100 m.p.h. (we shall not get anything very much faster unless the passenger accommodation is sacrificed), then the mileage costs will not be dissimilar to those of a car.

Among the light aeroplanes which I have flown since 1939, there are three which are outstanding for certain characteristics, and these in turn will have a place in the future. The first is the Service edition of Vega Gull, re-christened the Proctor. Its Gipsy-Queen engine (just over 200 h.p.) carries four people at 150 m.p.h. for an expenditure of about 9 gallons an hour. But it needs an aerodrome for operating, although its folding wings make it economical for housing.

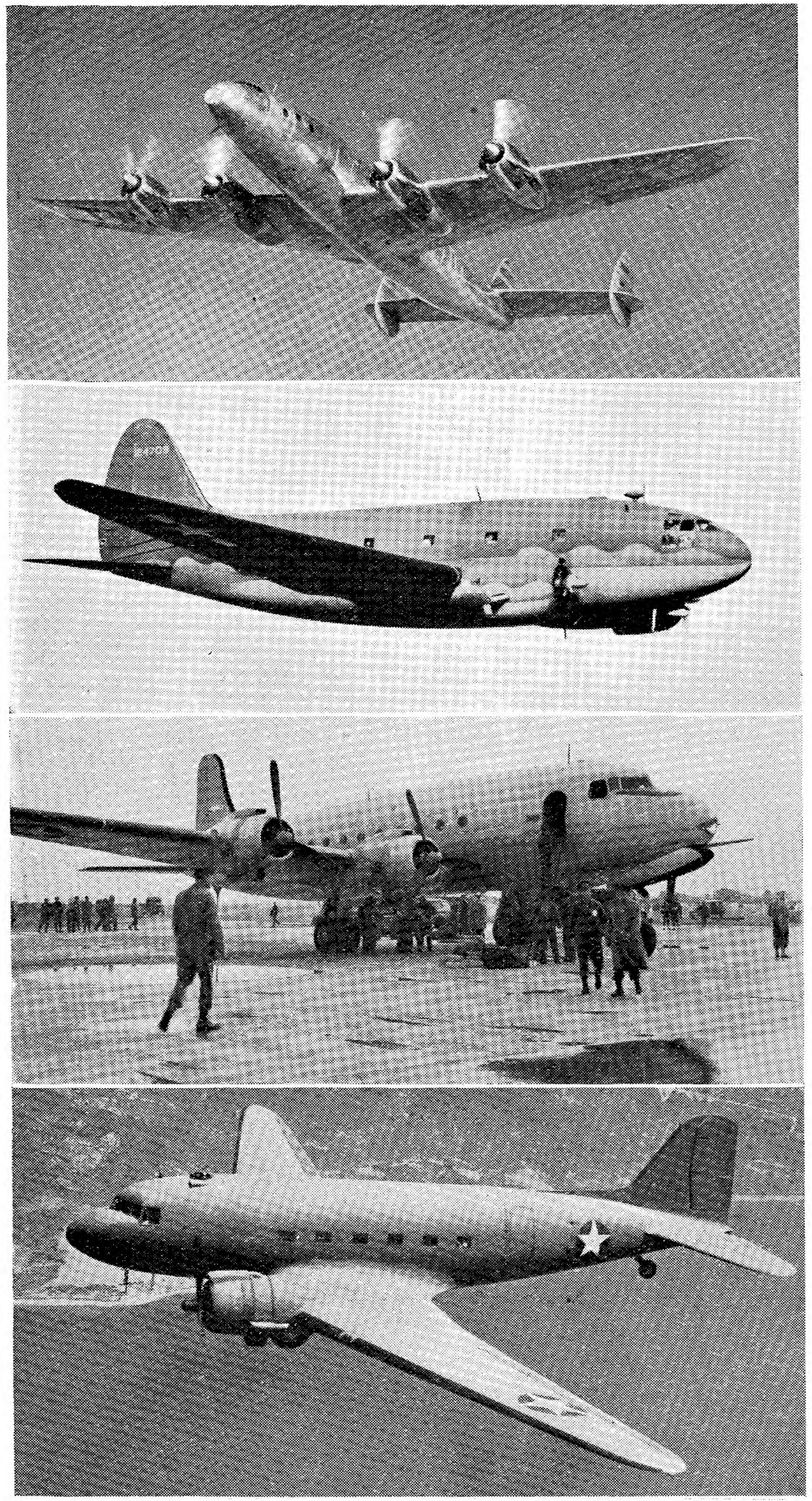
A similar proposition is the Stinson Reliant, an American job, which has been supplied to us for ferrying duties. Its advantages to my mind are its quiet-running 160-h.p. Lycoming engine, its comfortable cabin with fine all round visibility, and its excellent stability. The Reliant carries three people, but in its class may be considered a little slow with its cruising speed of around 110 m.p.h. Yet where an aerodrome is available, both the Stinson and the Vega Gull offer high-class travel. The post-war cost of aircraft of this type may initially be in the region of £3,000.

Lastly, there is what I regard as the rich man's aeroplane as represented by the American Beechcraft Traveller. In America it is regarded as the Rolls Royce of the private pilot. Not only is it one of the most lovely little biplanes to look at, but its deeply upholstered seats, its lavish instruments, its electrically operated flaps and undercarriage, its radio, its luggage accommodation . . . indeed its entire layout for five passengers, places it in the highest class. Finally, a cruising speed of 160 m.p.h. for something like five hours' duration makes it an attractive proposition for the man who has the money to spend.

To conclude this review, I must go back to the things of first importance in the eyes of the man in the street—the aircraft with the stalling speed of 30 to 40 m.p.h. and the take-off run of 50 yards. There is something here which we have not known since pre-1914 days. Coupled with extreme simplicity, which simply means that they can be maintained almost entirely by the owner-driver, aircraft of this type to sell at under £1,000 have a real future. It is in their direction that the manufacturer and the customer will find a meeting-place.

AMERICAN Air Transport

By G. LANKENAU



Among the principal types of transport aircraft used by the U.S. Forces are (top to bottom): the Constellation, the Commando, the Skymaster and the Skytrain (Dakota). Recently new civil versions of the Commando and Skymaster have made their appearance, designated CW-20E and DC-6 respectively. They differ internally from the military versions, and the CW-20E has a new nose.

THE problem of supply and maintenance by air has been taken very seriously by the Americans. They have built up vast organisations to deal with it, and about one-third of their total air strength is made up with transport aircraft.

The Naval Air Transport Service (N.A.T.S.), commanded by Captain Donald F. Smith, U.S.N., which was created on December 12th, 1941, just five days after the attack on Pearl Harbour, has since developed itself into a vast and vital organisation, flying more than a million miles of airways, including the formidable Seattle-Aleutians route. It is estimated that N.A.T.S. carries some 4,000 passengers and 2,000,000 lbs. of freight monthly, most of it mail for the troops. Freight may consist of a Washington brass-hat bound for Chungking, or a box of Radar riding from San Francisco to Port Moresby.

S.C.A.T.

While N.A.T.S. runs the airlines to the larger bases, the South Pacific Combat Air Transport Command (S.C.A.T.) carries the Radar or the brass-hat right into the forward landing strip. S.C.A.T. planes are used mainly to evacuate wounded soldiers from the fighting zone and to run the ammunition up from the ports. S.C.A.T. aircraft were responsible for maintaining the air cover over Guadalcanal in 1942, although S.C.A.T. possesses no fighter aircraft. It was impossible to get petrol and oil into the island by sea to keep the Army fighters flying from battered Henderson Field. S.C.A.T. Skytrains saved the situation by loading up large tanks in the fuselage with petrol and oil. With bare escort they got through to the Army base, past scores of Jap fighters. The air cover was maintained over Guadalcanal, and the island was safe. How many Skytrains fell blazing to the ground is not known, but this effort probably prevented a Jap comeback. Another duty carried out by S.C.A.T. is the convoying of fighter 'planes from Australia to the many air strips in the South Pacific. The S.C.A.T. crews do the navigating and the fighters tag along behind. The job was first carried out early in 1942, after a squadron of unescorted P-40s lost their way over the Timor Sea.

Naval Transport 'Planes

About the most widely used transport aircraft flying is the Douglas DC-3, of which some 7,000 have been built. They are flying in almost every part of the world. This aircraft had already established a reputation for itself before the war, and with its earlier version the DC-2 was in service with the U.S. Army. It is designated C-47. The engines are two Pratt and Whitney Wasps of 1,200 h.p. each. There was an interim version, the C-39, equipped with Wright-Cyclone engines. The naval DC-3 is called the R4D-1 Skytrain. In the Soviet Air Force the DC-3 is fitted with a dorsal turret and designated PS-84.

Used by N.A.T.S. for the Pacific long-distance routes the Douglas C-54 Skymaster was known in "civvy street" as the DC-4, although the pre-war machines differed in interior accommodation. The C-54 (Navy R5D-1) has a span of 117 feet, a speed of 285 m.p.h., and a range of approximately 3,500 miles. In the autumn of 1944 a Skymaster made a non-stop passenger-trip to Paris from New York.

Teamed with the Skymasters are Coronados and Mariners working on the long-distance routes. These flying boats, having the advantage of being able to touch-down by the atolls that are too small for landing strips, are a welcome sight to men stationed on coral islands in the Pacific.

Originally designed as a patrol bomber, PB2Y-3R, the Coronado has been converted to mail and freight-carrying recently. Coronados have four Pratt and Whitney 1,200 h.p. twin Wasp engines, a speed of 200 m.p.h., and some are equipped with submarine-detection apparatus.

The PBM-3R Mariner carries out a similar task to the Coronado, but, being a smaller aircraft, is much more manœuvrable, and so comes in for a lot of landings in confined spaces such as small lagoons. An experimental PBM has been fitted with jet-assisted take-off apparatus. As well as cargo-carrying, Mariners are flying in their original role of submarine-hunters, and many U-boats have fallen victim to Mariner bombs while lurking on the sea lanes. In 1942 a Navy PBM rescued the crew of a sunken British ship, the *San Arcadio*, under gunfire from a U-boat. There was a heavy sea running, but the pilot, Lieutenant J. A. Jaap, U.S.N., got the PBM off the water, and was awarded the American D.F.C. for his feat.

Not to be forgotten by South Pacific men is the Consolidated PBY-5 Catalina, affectionately known as "Dumbo". S.C.A.T. fliers have flown the PBY-5 under a number of different missions. Some, such as glider-towing and torpedo work, seem remote compared with the duties envisaged when it was designed in 1936. As a transport the Catalina can carry as much as 15,000 lbs. of freight. A version of the Catalina, the PBN-1, differs in having a taller fin and rudder and a sharper nose. Flying with the Soviet Air Force, the Catalina is known as the GST, but this is a rather earlier version.

For personnel transport and light delivery the Beechcraft Traveller is widely used. In the Army it is known as the UC-43. The Navy calls it the GB-2. This small biplane (span 32 feet) is easily recognisable with its short radial engine and staggered upper wing. Not many are flying in Britain, but some are used as private runabouts for high-ranking U.S. officers. Prince Bernhardt of the Netherlands uses one for touring his forces.

Also used by N.A.T.S. is the Lockheed R-5O Lodestar, an aircraft similar in shape to the Ventura. There are six variants flying, but the R-5O-1 Personnel Transport is the most used.

Consolidated aircraft now seem to be popular with the Navy. Another of their types in service carrying the freight across the Pacific is the Liberator (Army B-24, Navy PB4Y-1, Army transport C-87, and Navy transport RY-1). Converted from the bomber type, the RY-1 has all turrets removed, passengers being accommodated where the bomb-racks used to be. Mr. Churchill's private globe-trotter, the Liberator "Commando," which has been recently modified, was originally of the C-87 type. Unfortunately, the Liberator's need of a long runway prohibits its use on all but the largest airfields.

The Martin JRM-1 Mars, designed as a patrol bomber, is now diverted to transportation. In December 1943 one of these aircraft made a record flight of 4,375 miles non-stop, carrying 13,000 lbs. of mail. Powered by four 2,000 h.p. Wright radial engines, the Mars is the largest flying boat in operation at the moment.

Other aircraft in service with the U.S. Navy in varying transport capacities are: Beechcraft Expeditor (JRB-1 and JRB-2), Cessna Bobcat (JRC-1), Curtiss Commando (R5C-1), Fairchild Forwarder (GK-1), Grumman Goose (JRF-5 and JRF-6), Grumman Gosling (J4F-1 and J4F-2), Martin Marauder (JM-1), and Waco Hadrian (LRW-1).

The Army Transport Command

Until December 1941 this service was known as ATFERO (Atlantic Ferry Organisation), its duty being that of ferrying bombers to Britain. On May 15th, 1942, President Roosevelt ordered the amalgamation of all American air lines and transport enterprises, except those of the Navy, into a body called A.T.C. (Army Transport Command). The A.T.C. runs most of the U.S. Army freight around the world along some of the longest air lines in existence—Washington to Chungking, via India, Seattle to Sydney, via Pearl Harbour. Drawing its crews from veteran bomber pilots, A.T.C. is responsible for the delivery of bombers, personnel, material and mail to all U.S. Army units. Roughly the same aircraft are in service with the A.T.C. as with the Navy, but there are one or two exceptions such as the Lockheed C-69 Constellation and the Fairchild C-82.

The Constellation intended for post-war production represents the modern trend towards fast multi-motored types equipped for high-altitude work with pressurised compartments. Powered by four 2,000 h.p. Wright Duplex-Cyclone engines, the Constellation is said to be faster than a Jap fighter, though this is doubtful, seeing that the top speed is only 315 m.p.h. Stripped of its interior obstructions, the C-69 can carry as many as 60 fully-armed men. Whether these large aircraft will be used for airborne operations remains to be seen.

A fairly new type, the Fairchild C-82, has been test-flown. It is a high-wing twin-boom aircraft, powered by two radial engines, and was designed, as was the Bristol Freighter, for short-distance cheap freight hauling.

A super-transport developed from the C-87, the Consolidated-Vultee Model 39, is now flying. It is a high-wing aircraft on the same lines as the Liberator, although the fuselage is much larger and it has a single fin and rudder.

A type promised for the U.S. Army, but now out of production, is the Curtiss C-76 Caravan, which had the distinction of being abnormally large for a twin-engined high-wing type. Although the cargo weight is large, the speed is considerably less than that of contemporary types.

Another aircraft which is making a name for itself as a transport is the Curtiss C-46 Commando (Navy R5C-1). Having had its operational baptism in North Africa, the Commando is now in wide use with the U.S.A.A.F. and a peacetime modification has been built. This is designated the Curtiss Model 20E, and has extensive interior alterations to suit the peacetime airline operator. With a cruising speed of 234 m.p.h. at 60 per cent of power at 10,000 feet, the Model 20E is going to figure largely in the American post-war air network.

Numbers of Commando transports are in service on the India-Chungking route, where their weight-lifting capacities can be exploited to the full, carrying machines, motor transport and other heavy articles "over the hump" into China.

There are many more types of aircraft in the "C" and "UC" categories flying with the Americans. Percival Proctors and de Havilland Dominies are also used by our Allies. With the types of aircraft described here America faces the end of the war and the beginning of the struggle for post-war airline supremacy. The nation whose aircraft "git thar fustest with the mostest" is the one which will get priority from air-travellers. The outcome of that struggle is a long way ahead, but it is safe to say that America has a good lead already.

How Big is an Aeroplane?

BY ROGER TENNANT

What is the biggest aeroplane ever built?

Are big aeroplanes more efficient?

Is there any limit to the size of aeroplanes?

THE question of the world's biggest aeroplane is still a matter of controversy. It depends mainly on what dimensions are taken to judge by. The aeroplane with the greatest wing span in the world is the Douglas B-19, built in the United States in the years 1935-1940. With a span of only two feet less, the Russian Maxim Gorki of 1934 had a greater wing surface. The German Dornier DO-X flying-boats, the first of which flew in 1929, had a greater wing area than either of them. Consequently the DO-X was really the biggest aeroplane, but the B-19 has the greatest span, and is also the heaviest—it has a span of 212 feet and weighs 140,000 pounds fully loaded.

For a long time it was believed that to make aeroplanes above a certain size would be impossible, and that larger aeroplanes would be successively less efficient than smaller ones. Today we are faced with newer and bigger aeroplanes, faster and more efficient than their predecessors. How has this come about? The reasons are many and involved. To begin with, let us examine the reasons that once led to the belief that big aeroplanes were impossible.

The Square-Cube Law

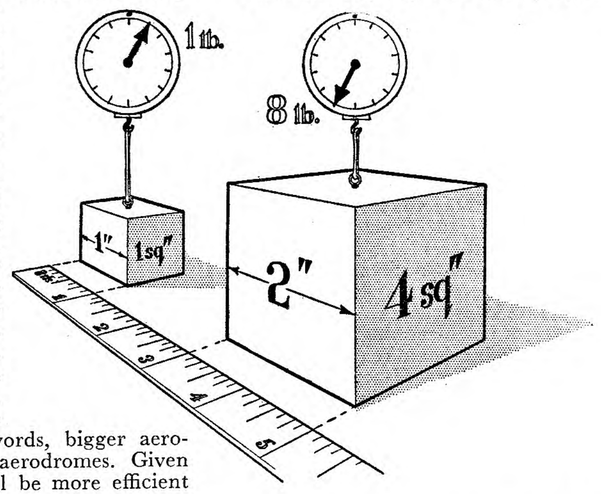
First of all, there is the 'square-cube' law. This is demonstrated in the accompanying diagram. A square block with sides one inch long has a surface area of six square inches and a volume of one cubic inch. Another block with sides twice as long—two inches—will have a surface area of 24 square inches and a volume of eight cubic inches. In other words, the second block has four times the surface area of the first, but eight times the volume, and, consequently, eight times the weight.

Now, apply this to your aeroplane, said the pessimistic gentleman of a generation ago, and what have you? Aeroplane A weighs 5,000 lb. empty and carries 5,000 lb. of load, making the gross weight 10,000 lb. It has 500 square feet of wing, which makes its wing loading 20 lb. per square foot.

Now double its size and call it aeroplane B. Its wing area will be 4 × 500 = 2,000 square feet. To keep the same landing speed and take-off speed the wing loading will have to remain the same (20 lb./sq. ft. So the all-up weight will be 20 × 2,000 = 40,000 lb. But the volume of the new aeroplane will be eight times as great, so the empty weight will be eight times the empty weight of A—8 × 5,000 = 40,000 lb. In other words, the big aeroplane can carry no load, because the increased weight of the engines and structure have taken up all the available weight. Thus said the pessimistic gentlemen of a generation ago.

The Designer Evaded the Law

But the aircraft designer has not done that. He has doubled the wing loading of the aeroplane as well as the size. He has made the wing loading of B 40 lb. per square foot. That gives him a weight of 40 × 2,000 = 80,000 lb. Structure weight 40,000 lb., load 40,000 lb. — eight times the payload of A. The penalty of increased wing loading is higher landing and take-off speeds. Aeroplane A will take off at 80 m.p.h., aeroplane B at 110 m.p.h. In other words, bigger aeroplanes need bigger aerodromes. Given that, then they will be more efficient than smaller ones.



The illustration I have given is a very crude and unsatisfactory one, because it neglects dozens of minor factors involved in building one aeroplane twice the size of another, but I will carry the illustration one stage further before I abandon it.

Will aeroplane B be more efficient than A? Consider: it weighs eight times as much as A. If its engines weigh eight times as much, they should give at least eight times as much power. But in surface area it is only four times the size of A, so its air resistance is roughly four times as great. Consequently it should be faster.

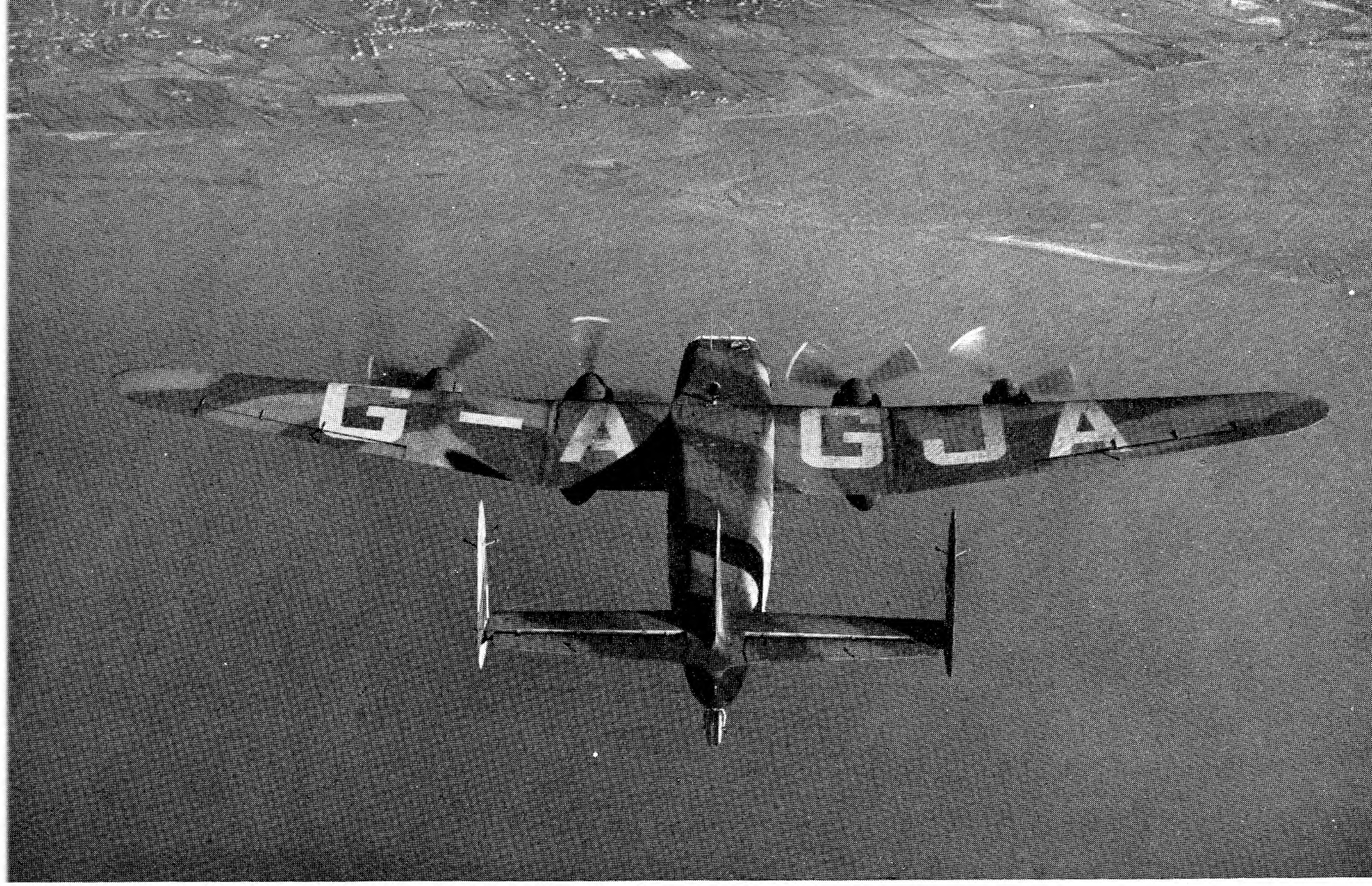
It is misleading to talk about size at all in this way. No aeroplane designer has ever built one aeroplane twice the size of a previous similar design, or is ever likely to. It is better to think in terms of weight. A designer is quite likely to build one design twice as heavy as a previous one, but size increases very slowly with weight, if at all.

For example, the Super-fortress is twice as heavy as the Fortress, but its dimensions are not so very much greater. A Halifax can carry about twice the loaded weight of an early Wellington, but its span is only about 14 feet greater. A Typhoon is twice as heavy as the early Hurricanes, but no bigger. It simply means that designers are not in fact making much progress in aerodynamics. They are just giving aeroplanes less wing surface, which means that they require bigger aerodromes and better pilots.

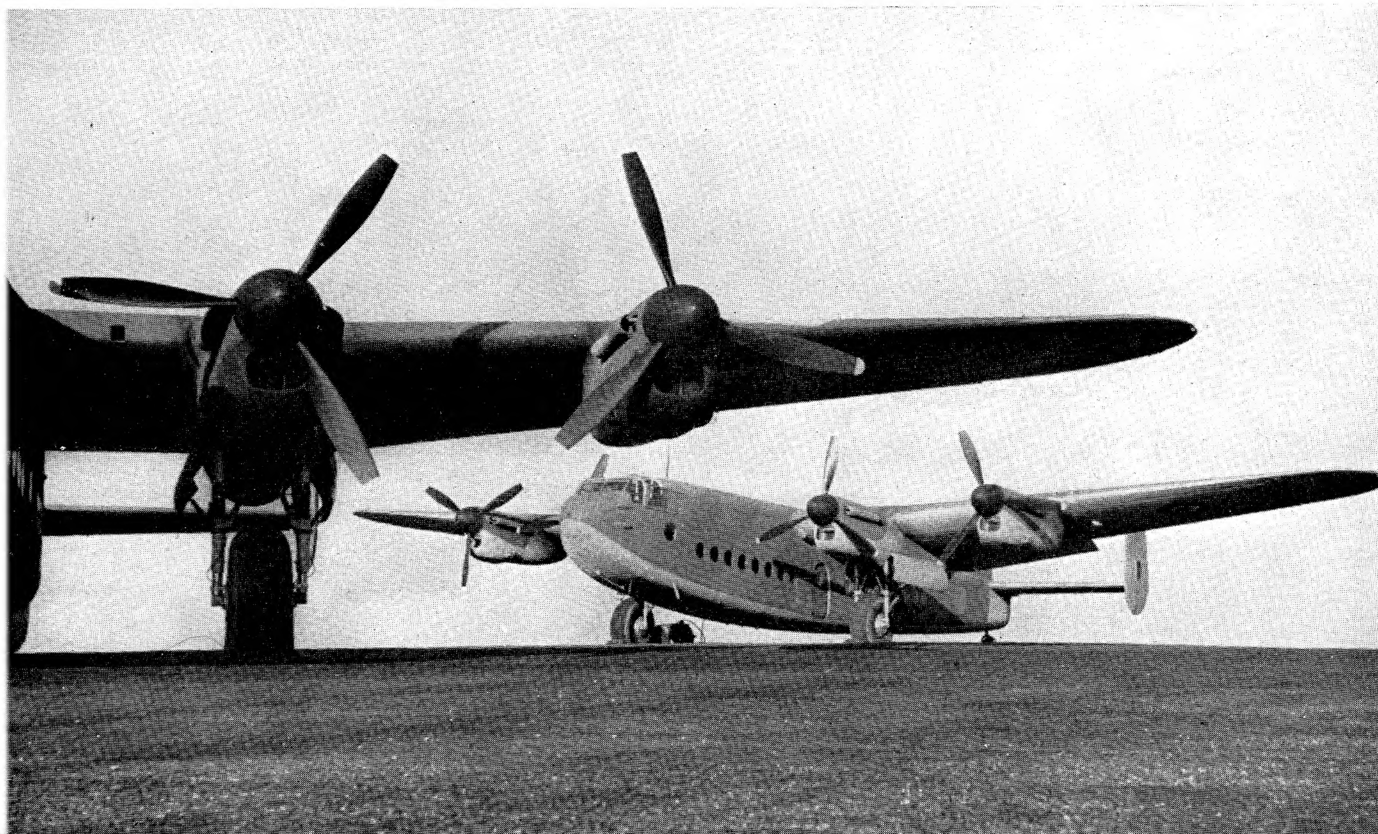
Thus it would appear that so long as we can continue to build bigger aerodromes we can build bigger aeroplanes. As far as the future is concerned, no one can put any limit to the size of aircraft that may be built. But at any definite time it is possible, roughly, to lay down the largest aeroplane that can profitably be built at that time, for this will always be limited by the size of existing aerodromes and the power of existing engines.

Thus we may say that the Douglas B-19 was a larger aeroplane than was practical for the power of existing engines when it appeared in 1939, whilst the B-29 or Super-Fortress represents the largest aeroplane practical for existing engines and aerodromes in 1944.

The size of bombers may also be limited by tactical considerations. It has never been good policy to put too many eggs in one basket. The size of commercial aircraft can be expected to increase continually. As they grow bigger, fares and cargo tariffs will decrease, and in a few years' time all sorts of goods will be carried by air that cannot economically be carried today. For long-distance passenger traffic the aeroplane is likely to supersede surface transport almost completely.



THE AVRO YORK. Less showy than contemporary glossy-finished American air liners, the York is nevertheless laying a firm foundation on which will be built a fine fleet of British commercial aeroplanes. It is taking good solid British workmanship to the Earth's four corners.



BLACK WIDOW

Jet Propulsion and PROPELLERS

By a Naval Air Engineer Officer

AN aircraft is moved forward by the thrust which is produced when its propulsion unit drives a current of air, known as the slipstream, astern at high speed. The amount of this thrust is:

$$\text{Thrust} = \text{Mass of air handled per second} \times (V_s - V)$$

where Vs is the velocity of the slipstream in feet per second and V the velocity of the aircraft. The power required to produce this thrust is called the thrust horse-power, and is:

$$\text{Thrust} \times V.$$

Propeller Efficiencies

Where the propulsion unit of an aircraft is an engine and a propeller, it is the duty of the propeller to convert the brake horse-power of the engine into thrust horse-power. The whole of the brake horse-power cannot be converted because of certain losses, the chief of these being the power necessary to overcome the air resistance which opposes the rotation of the propeller. Other losses are due to the formation of vortices or small air pockets at the tips or edges of the blades and to interference of the slipstream by the fuselage. The ratio of thrust horse-power to brake horse-power is known as the efficiency of the propeller. At normal aircraft speeds and engine horse-powers met with hitherto the efficiency of the propeller is in the order of 80 per cent to 85 per cent. When the propeller revolves at such a speed that the tips of the blades are moving at more than 950 feet per second, however, this efficiency begins to drop rapidly, until at tip speeds approaching the speed of sound the efficiency is little more than 40 per cent. The causes of this reduction in efficiency are compressibility losses and increased drag of the propeller blades due to the formation of shock waves.

Design Problems

These considerations raise a problem for the aircraft designer. Having obtained a more powerful engine for aircraft of higher performance, he requires a larger propeller to handle the increased masses of air necessary to absorb the greater horse-power. A propeller of larger diameter tends to bring the tip speeds to the range where reduction in efficiency begins. Increasing the width of the blade produces more thrust, but it also increases the induced drag of its aerofoil section, and this in turn reduces its efficiency.

It might be asked why propeller-tip speeds cannot be kept below critical speeds by having a greater reduction of speed between the engine and propeller. This is a possible solution, but if the propeller is to handle the same mass of air in the same time it would have to be both heavier and of larger diameter. The size of the undercarriage of an aircraft is determined mainly by the diameter of the propeller, which must be well clear of the ground immediately before take-off. For a variety of reasons large undercarriages are impracticable, especially in small aircraft, such as modern fighters with thin wing sections. Development of propellers on these lines is, therefore, limited by other considerations.

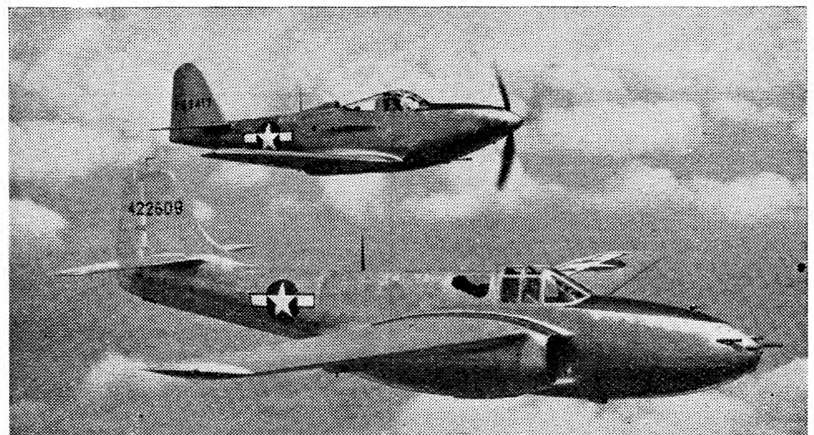
Current Solutions

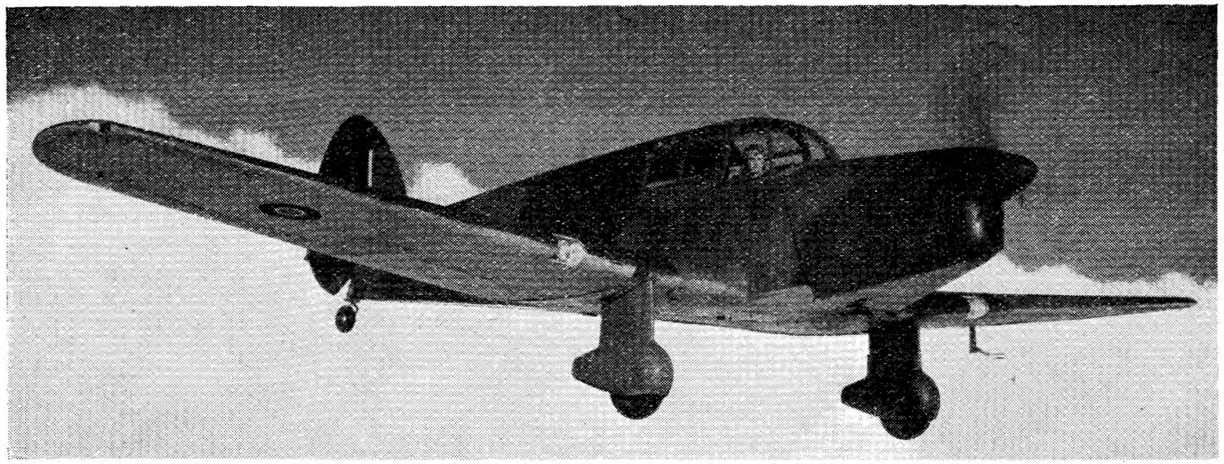
A solution to the problem was found in the early days by increasing the number of blades from two to three. The additional blade brought a slight loss in efficiency due to rotational disturbance created in front of the propeller, but this loss was comparatively small. For similar reasons four-and five-bladed propellers are now frequently seen coupled to modern powerful engines. The latest development is the contra-rotating propeller, where two sets of three blades in the same hub housing rotate in opposite directions, giving a thrust approximately twice that of a three-bladed propeller of the same diameter.

It is seen, then, that as engine powers are increased to obtain higher speeds increasing difficulties are encountered in the design of propellers to absorb the full engine output without undue loss, and that the limit of size for efficient performance is being approached. Such considerations have encouraged the development of jet propulsion where the thrust is obtained by the discharge at high speed of a jet of gases from a nozzle in the tail of the aircraft or from nozzles in the wings, the mass of air being dependent on the size of the propulsion unit's air compressor and turbine, and its velocity on the design of the nozzle.

At lower powers especially, the overall efficiency of jet propulsion is much lower than that of the corresponding engine and propeller, and it is possible that in future developments part of the horse-power of the propulsion unit may be converted into thrust by a propeller, while the balance is converted directly by means of a nozzle as found in jet propulsion units. But at the same time it is not surprising to find the first jet propulsion units in fighter aircraft, where the maximum thrust horse-power (look back to the formula in the first paragraph) is required at the higher aircraft speeds; nor to read recently in the daily press that General H. H. Arnold, Chief of U.S. Army Air Force, had said: "I do not believe that another conventional fighter 'plane—one with a propeller—will ever be designed."

A P-63 Kingcobra and a P-59A Airacomet flying in close formation. Serving now as a fighter-trainer, the P-59A is America's first contribution to the jet field.





The Percival Proctor

by Roy Cross

DESIGNED to an Air Ministry specification T.9/41 for the R.A.F. and the Fleet Air Arm, the Proctor IV is a three-four seater wireless trainer or communications aircraft, based on the earlier series of Proctor light monoplanes.

Formed by Captain E. W. Percival and Commander E. W. B. Leake in 1932, Percival Aircraft Limited has produced during its short life a spectacular series of sporting and training aeroplanes which not only sold well, but carried in their wake a long list of record flights, any one of which would have offered proof of the outstanding reliability and good flying qualities synonymous with the company's name. The good name enjoyed abroad by British light aeroplanes is due in no small part to the activities and achievements of aircraft from the Percival stable.

Development

In 1939 the type in current production was the Vega Gull, which first appeared in 1936. Bearing in mind the excellent record of this machine, it was decided to modify it for Service use as a deck-landing and navigational trainer or as a communications type. In these forms it became known as the Proctor. The Proctors I, II, and III differ only in internal arrangements; all have the de Havilland Gipsy Queen engine.

Although similar in general appearance to the earlier models, the Proctor IV has been completely redesigned, both from the structural and aerodynamic points of view. A deeper fuselage and higher tailplane offer an easier recovery from spins, and a model tested in the wind tunnel at the Royal Aircraft Establishment was the first low-wing monoplane to pass the spin recovery test without any necessary design modification. The cabin accommodation has been increased and the view from the pilot's seat still further improved.

Construction

As with the Vega Gull, the construction is mainly of wood, although the use of a waterproof synthetic resin cement throughout the structure for the bonding together of wooden parts is a new feature. Plastics are used for a number of fittings and lightly-stressed parts. The fuselage has four wooden longerons, wood frames, plywood top and sides and a formed ply bottom. The wooden two-spar wing has a centre section bolted to the fuselage, and outer port and starboard wing panels. Part of the wing folds backward on a rear spar pivot, and to allow this to happen a portion of the trailing-edge, inboard of the aileron, hinges upwards along the upper wing surface. The undercarriage, each leg of which incorporates steel springs and a hydraulic recoil damper, has Bendix mechanical brakes. Some machines are flying without the wheel-fairing spats, which are standard fittings.

PERCIVAL PROCTOR IV

Span	39 ft. 6 ins.
Length	28 ft. 2 ins
Aspect ratio	7.72
Wing area	202 sq. ft.
Track	9 ft. 9 ins.
Wing loading	17.3 lb/sq. ft.
Maximum speed (sea level)	160 m.p.h.
Economical cruising speed (3,000 ft.)	140 m.p.h.
Landing speed (flaps down)	55 m.p.h.
Rate of climb at sea level	700 ft. per min.
Ceiling	14,000 ft.
Range	490 miles (40 gallons)
Tare weight with full equipment	2,370 lbs.
All-up weight	3,500 lbs.

Accommodation and Equipment

The wireless trainer Proctor IV seats three—the pilot, wireless operator by his side, and in the cabin rear the wireless instructor, who can communicate with both pupil and pilot by means of "intercom" telephone. Any type of wireless set can be installed beside the pilot, and a direction-finding hoop, fixed and trailing aerials, plus an Aldis lamp, enable instruction to be given in all kinds of air/air and air/ground communication.

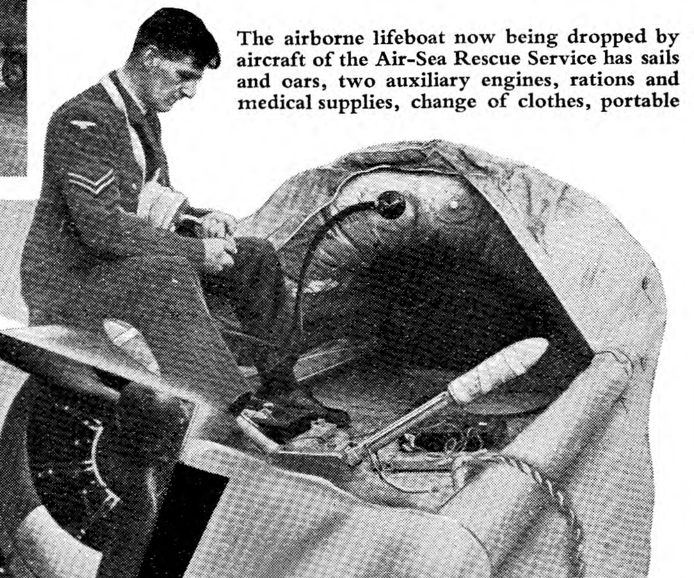
Removal of the radio apparatus provides room for the insertion of dual controls to the left of the pilot. For communications work the rear seat is replaced by a pair, making a comfortable four-seater. The machine is fully equipped for night flying.

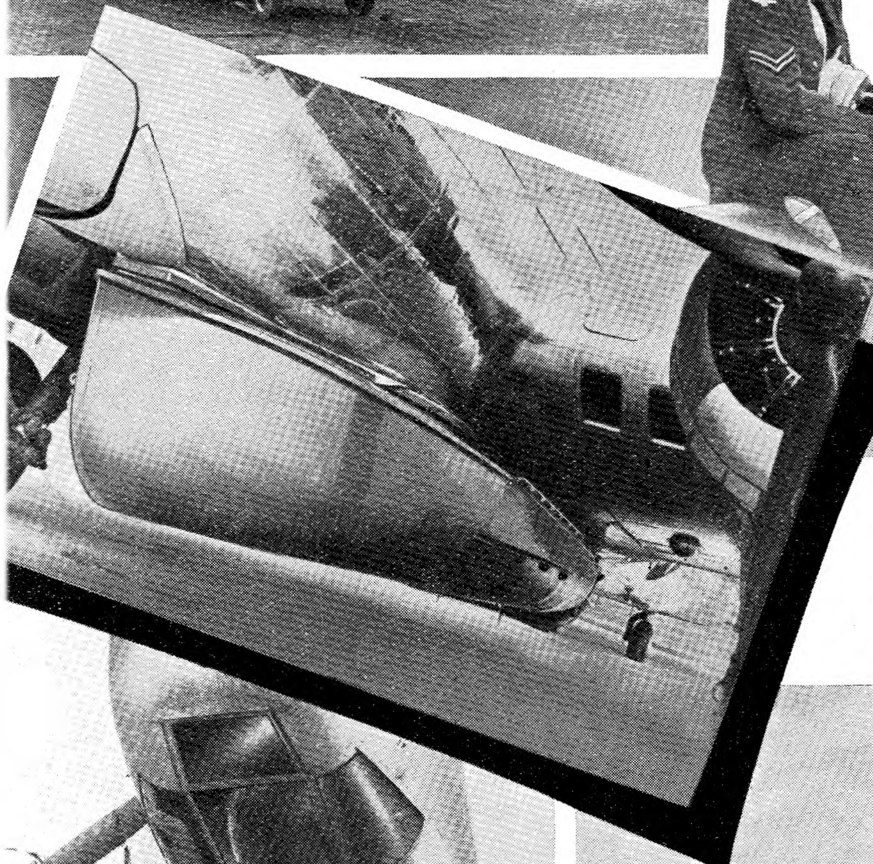
Power Plant

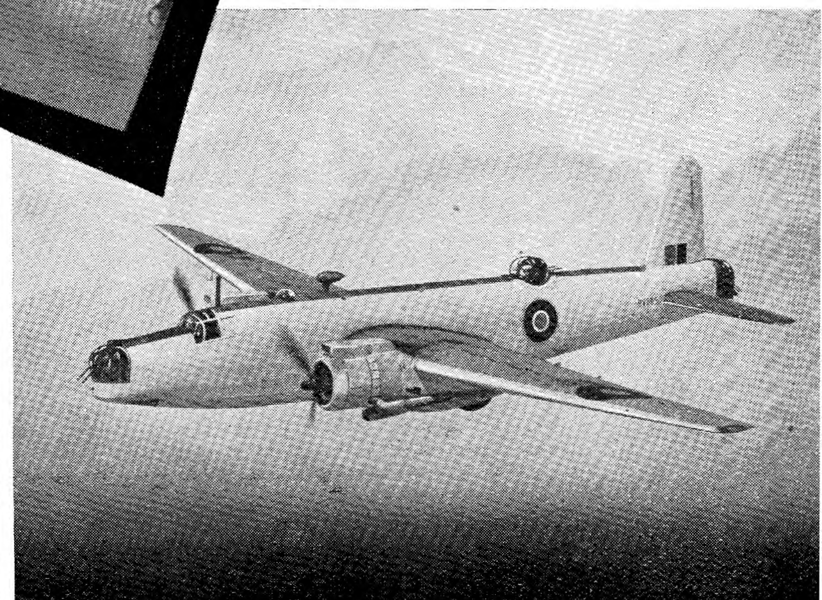
The de Havilland Gipsy-Six Series II or Gipsy Queen II drives a de Havilland constant-speed airscrew, and is fitted with an air scoop specially designed for it by Percival Aircraft Ltd. This provides a lower and more even distribution of cylinder temperatures, advantageous when operating under tropical conditions. The rated output is 205 h.p. at 2,400 r.p.m. at sea level, with an absolute maximum of 210 h.p. for take-off with C/S airscrew.

When peace reigns again the Percival Company will be fortunate enough to have in quantity production a type suitable for the world's light-plane markets. Excellent performance, endurance and economy of operation should make the Proctor IV an attractive proposition for both owner pilots and airline operatives.

Airborne LIFE-BOAT







The airborne lifeboat now being dropped by aircraft of the Air-Sea Rescue Service has sails and oars, two auxiliary engines, rations and medical supplies, change of clothes, portable wireless and pyrotechnics. Shown top is the fully-assembled boat, which automatically rights itself upon striking the water. Above: a close-up of the automatically-fired rocket life-lines which are fired as the boat falls. Left, the lifeboat slung beneath a Fortress and (bottom left) a Warwick. The last photograph is of the Coastal Command Warwick, similar to the lifeboat-carrying version.

Flight ENGINEER

BY 'AERO-SPEE'

THE story is told many times over, in the citations announcing awards for gallantry in the air, of the work being done by flight engineers in the bombers of the Royal Air Force.

The flight engineer is a comparatively new member of the air crew. His evolution can be traced with the increase in size and complexity of aircraft, and his importance will increase to a greater extent than in the case of any other member of the air crew as aircraft develop in size. Even now there are signs in very large aircraft, such as the Martin Mars, that the flight engineer is becoming the equivalent to the engineer in the seagoing liner. He is now provided with his own control room where, in communication with the pilot on the bridge, he ensures that the aero-engines are kept running in a manner calculated to give the most efficient operation for the conditions of flight being worked to by the pilot. From experience he can at once detect without continuous concentration any deviation from the normal instrument readings, and his immediate corrective action may avoid worse trouble developing which, if it had been left to the pilot, with many other matters on his mind, might have gone unnoticed until something began to break up. He is responsible for many other things besides the operation of the engines, and, broadly speaking, his various duties can be defined as follows:

1. As explained above, he is responsible for operating the engines to give the most efficient performance within the flight conditions ordered by the pilot or captain of the aircraft. To do this he must have a very complete knowledge of engine operation, so that he can adjust his boost and engine speed to the most efficient figures for every condition of flight. It is the most efficient relationship between boost and r.p.m. for any condition of flight that he must have at his finger tips, and only long experience will teach him this "engine sense."

2. He should be capable of taking over the flying controls from the pilot in an emergency and be able to hold the aircraft to a given course. This is especially important in the case of a military aircraft, where the other members of the crew will have their hands full with their own duties, and only the flight engineer can keep an eye on his own job when deputising for the pilot, since the engine controls and performance instruments are duplicated in the pilot's cockpit.

Although this function of the flight engineer is especially desirable in military aircraft, the value of being able to fly the aircraft and thus understand perfectly the operation of the flying controls and appreciate the pilot's outlook on the whole job cannot be over-estimated. It is in this way alone that a perfect understanding between the pilot and his engineer can be achieved.

3. As technical adviser to the pilot the flight engineer performs what is probably his most useful function. Although he works under direct orders from the pilot, the modern aircraft is becoming such a highly developed piece of mechanism that the pilot has to rely upon an expert technician for advice upon the most suitable conditions of flight to be adopted under any particular circumstances. Before a flight the pilot and flight engineer will probably have a conference and discuss the flight plan and the bearing which it will have upon how the engines are operated, etc. In this way, perfect understanding is achieved, and the pilot can give all his attention to flying the aircraft, with the knowledge that his requirements as far as aircraft performance are concerned are being met efficiently by the flight engineer. Obviously, the flight engineer must, on the one hand, have a perfect understanding of the functioning of the complete aircraft and, on the other hand, he must be certain that the pilot is not at cross-purposes with him on any particular point. Complete mutual understanding and trust, essential as it is, can be achieved only if both the captain and the flight engineer know their own scope of functions intimately and work together as a team.

4. Again, as technical adviser to the pilot, the flight engineer is responsible for maintaining liaison between the ground technical staff and the pilot, both after and before flight. The flight engineer's report, which would probably be surveyed and perhaps added to, at the completion of a flight, by the pilot, would be passed over to the individual in charge of the ground maintenance party, and would form the basis of the work programme in addition to the routine inspection which has to be done between flights. This report would give details of any observations made by the flight engineer, e.g. brakes require adjusting, port inner throttle control stiff, starboard undercarriage retracting gear sluggish in operation.

It is necessary for the flight engineer to take an interest in the ground maintenance work done on his aircraft, and on taking over technical responsibility for the aircraft before flight he would receive the ground staff's report on the work which they have done and any particular points of interest to himself or the pilot. Any such points would be brought to the notice of the pilot during the pre-flight conference.

5. Finally, the flight engineer has to be capable of effecting an emergency repair during flight. This function calls for a very complete knowledge of the structure of the aircraft and initiative of a very high order.

THE FLIGHT ENGINEER IN THE AIR

During take off you will operate certain engine controls and make sure that the engine limitations are not exceeded.

During the flight you will be responsible for the engines. You will yourself operate many controls, such as air-intake shutters, cooling gills and fuel-cocks. You must advise the pilot on the use of the engines in order to fly the greatest distance on the amount of fuel carried. Pay most careful attention to the fuel consumption, checking the gauges frequently and maintaining a record of the miles flown per gallon, so that you may be able to tell the captain at any time how far he can go on the remaining fuel.

In addition it is part of your job to do any small repairs which become necessary. During training you will be given practical tips on emergency repairs, but often success will depend on your own inventive ability: during this war aircraft have been saved because elevators were operated by rope, and because hydraulic systems have even been made to work on coffee by resourceful airmen.

Extract from Air Ministry Pamphlet No. 166.

BOOKS

Unofficially Reviewed by the Editor . . .

Boys of Coastal

By Squadron Leader Frank Tilsley (Cassell. 5/-.)

ALTHOUGH in the form of short stories, this book achieves a reflection of the work of Coastal Command that appears faithfully true to life. Squadron Leader Tilsley, an experienced writer, deals ably with technical matters, vividly with air operations, intimately with private lives and sympathetically with all. Some of the stories have happy endings and some have not, but all grip the attention of the reader and stir his emotions. First-class literature and good value for money, this is a book for the squadron library and one that can be enjoyed by the layman.

Escort Carrier

By Lieutenant-Commander John Moore, R.N.V.R. (Hutchinson. 5/-.)

JOHN MOORE'S books are always well worth reading. He has, in another book, dealt with the work of the Fleet Air Arm. This one is devoted entirely to the small escort carriers which have closed the gap in the North Atlantic. The descriptive writing is excellent, and the exciting operations are well recounted. The book contains a number of good illustrations. Like *Boys of Coastal*, it should be in the squadron library, and can also be enjoyed by the non-technical.

The Wright Brothers

By Fred C. Kelly. (Geo. G. Harrap & Co. 10/6.)

IT has too often been assumed that the Wright brothers were a couple of backwoodsmen who stumbled on the secret of flight by accident. This book makes it clear that their inventions were the result of careful investigation, good general education and the inspiration that comes from a happy and cultured family life. The book takes their story from their childhood until their success is established, and though perhaps there may be a few errors of detail, the book is an inspiring record of progress in the face of difficulties.

Middle East

By Philip Guedalla. (Hodder & Stoughton. 10/6.)

THE late Mr. Philip Guedalla was given special facilities by the Air Ministry to obtain material for this book. He was a writer and historian of distinction, and has here presented with the skill of an experienced historian a record of the campaign in proper geographical and historical perspective. It is a book that no student of air power should miss.

The Flying Soldier

By Major Alois Sitek and Flight Lieutenant Vernon Blunt. (Alliance Press. 7/6.)

THE equipment and training of airborne forces are dealt with in this book as fully as security permits. It is well illustrated, concisely written, and fairly lavishly produced.

This Flying Game

By General H. H. Arnold (and Lieutenant-General Ira A. Eaker). (Funk & Wagnalls.)

BESIDES being a military officer, General Arnold has been writing books for some years, and very good books, too. This one was first produced in 1936, and here appears in its third edition, with newer pictures and a few additions to the text to bring it up to date. It is, of course, written from the American angle.

General Engineering Workshop Practice

(Odhams Press Ltd. 6/6.)

THIS is one of a series of books produced by Odhams Press which are a remarkable example of wartime value. Produced by a number of experts, it contains 576 pages, 180,000 words and over 600 technical drawings, all for 6/6: It is an invaluable reference book, and is an excellent instructor for those going through a course of training in a workshop.

Air Transport and Civil Aviation

Advisory Editor: The Rt. Hon. Lord Brabazon of Tara, P.C., M.C. Published by Todd Publishing Co. Ltd. British distributors: Geo. G. Harrap & Co. Ltd. 21/-.

A great improvement on the last edition, but this one still has gaps. However, in the absence of another directory to civil aviation, it may be of value.

A NOTABLE ACHIEVEMENT

THE Air Council has expressed to the Commanders-in-Chief of all R.A.F. Commands at home, and to the Flag Officers Naval Air Stations and all R.A.F. Station Commanders concerned, "their warm appreciation of the willing co-operation and valuable assistance" in giving facilities to over 80,000 members of the Air Training Corps for training camps during 1944.

Nearly 62,000 cadets were airborne during this training.

"Having regard to the many pressing operational and other commitments of the stations at which the camps were held, the Council regard the attendances, which represent 50 per cent of the strength of the Corps in July 1944, as compared with 52 per cent in 1943 when similar difficulties were not operative, as a notable achievement," states the Air Council.

Difficulties resulting from the ban placed on holding A.T.C. camps at many stations were overcome by the willingness of the remaining stations to receive additional cadets, often at some inconvenience. A successful feature was the detailing of an R.A.F. officer for full-time duties with A.T.C. contingents at camp.

Here are the numbers of cadets accommodated at some of the Commands: Flying Training, 21,024; Bomber, 17,933; Technical Training, 9,513; A.D.G.B. (Fighter), 8,918; Coastal, 7,111; Transport, 2,389. Royal Naval Air Stations took 9,184, and some cadets went to Maintenance Command, T.A.F. in Britain, U.S. Army Air Force, and the R.A.F. in Northern Ireland.

In addition to a total of 76,864 cadets, 4,387 A.T.C. officers were also at training camps. The total number of cadets airborne was 61,590.

ERRATA

IN the November number, page 5, we published a photograph of Sergeant J. Baxter, who, we stated, had the D.F.M. There is another Sergeant J. Baxter who has the D.F.M., but this one (now Pilot Officer Baxter) has not. We regret any inconvenience caused.

On page 19 of the January issue, in the key to a drawing by Roy Cross, an item appears: "Fuel Pressure Gauge." This should read: "F, Oil Pressure Gauge."

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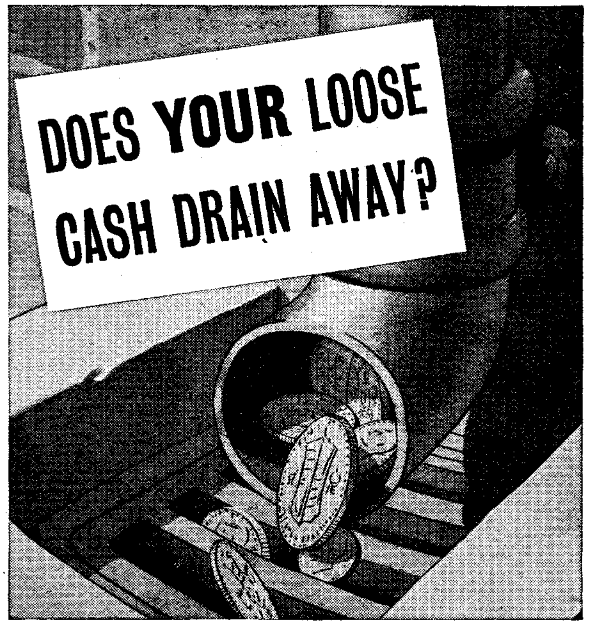

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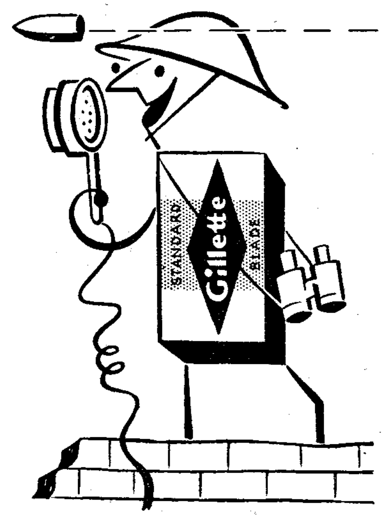

Radio Gillette calling! Hullo, to all of you back home. We can take it, out here. Blue Gillettes are temporarily 'out of action'. Meanwhile, at home, you'll find the Standard Gillette Blade can take it, too—on the chin! They're steeling our morale. As keen as ever—though a bit deployed!

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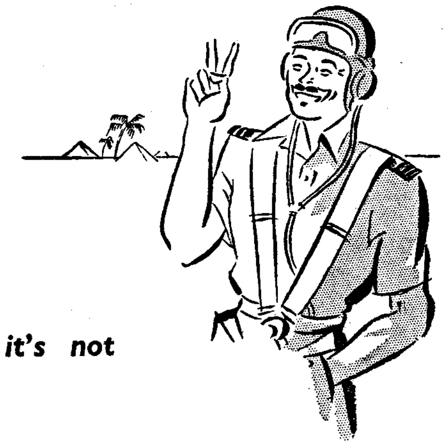

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Random Harvest

SEE PAGE 21

1, Grumman TBF-1 Avenger; 2, General Aircraft Hamilcar I; 3, Armstrong-Whitworth Albemarle II; 4, Boeing B-17E Fortress; 5, Curtiss P-40B Tomahawk; 6, Handley-Page Halifax II Series 1A; 7, Fairey Albacore; 8, North American Harvard IIs; 9, Supermarine Spitfire XII; 10, Miles Master II; 11, Avro Lancaster I; 12, Consolidated PBY-5 Catalina; 13, North American AT-16 Texan (R.A.F. Harvard II); 14, Grumman F6F Hellcat; 15, Fairey Barracuda; 16, Vickers-Armstrongs Warwick I; 17, Hawker Typhoon; 18, Douglas C-47 Dakota; 19, Grumman TBF-1 Avenger; 20, Short Stirling I; 21, Lockheed Ventura; 22, Hawker Typhoon 1B; 23, Douglas Boston; 24, General Aircraft Hamilcar I; 25, Curtiss P-40E Warhawk; 26, Martin Maryland; 27, Fairey R.P. Swordfish; 28, Supermarine P.R.XI; 29, Boeing B-29 Superfortress; 30, North American Michell; 31, Martin Baltimore IV.

Flying Features

SEE PAGE 23

1, Douglas C-47 Dakota; 2, Boeing B-29 Superfortress; 3, Grumman F6F Hellcat; 4, North American B-25G Mitchell; 5, Handley Page Halifax II Series 1; 6, Junkers Ju 88; 7, Consolidated B-24J Liberator; 8, Bristol Beaufighter; 9, Supermarine Spitfire P.R.XI; 10, Vickers-Armstrongs Warwick; 11, Republic P-47B Thunderbolt; 12, Hawker Tempest V; 13, Curtiss P-40E Warhawk; 14, Douglas A-20G Havoc; 15, Fairey Firefly I; 16, Martin PBM-1 Mariner; 17, De Havilland Mosquito IV; 18, North American P-51C Mustang.

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