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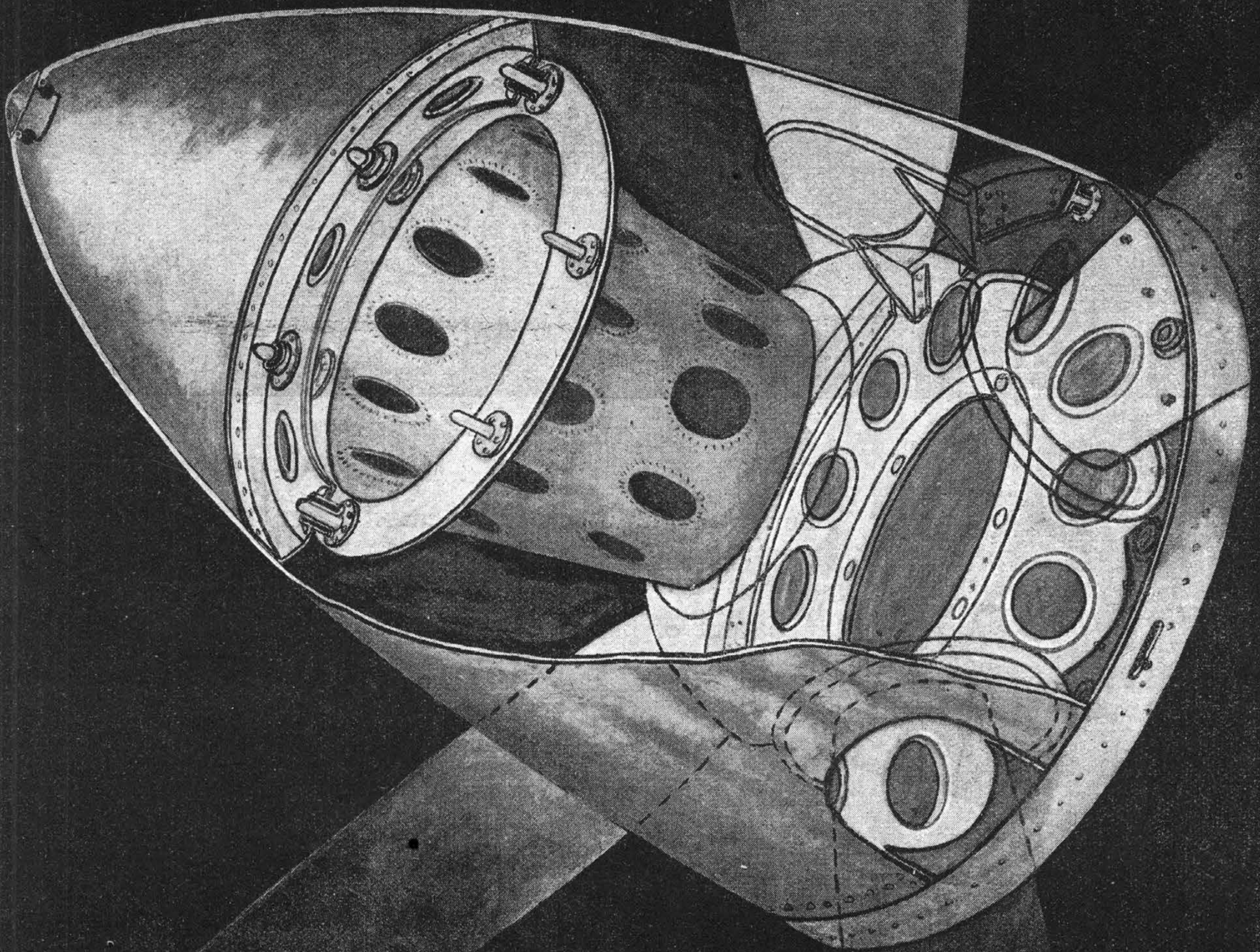
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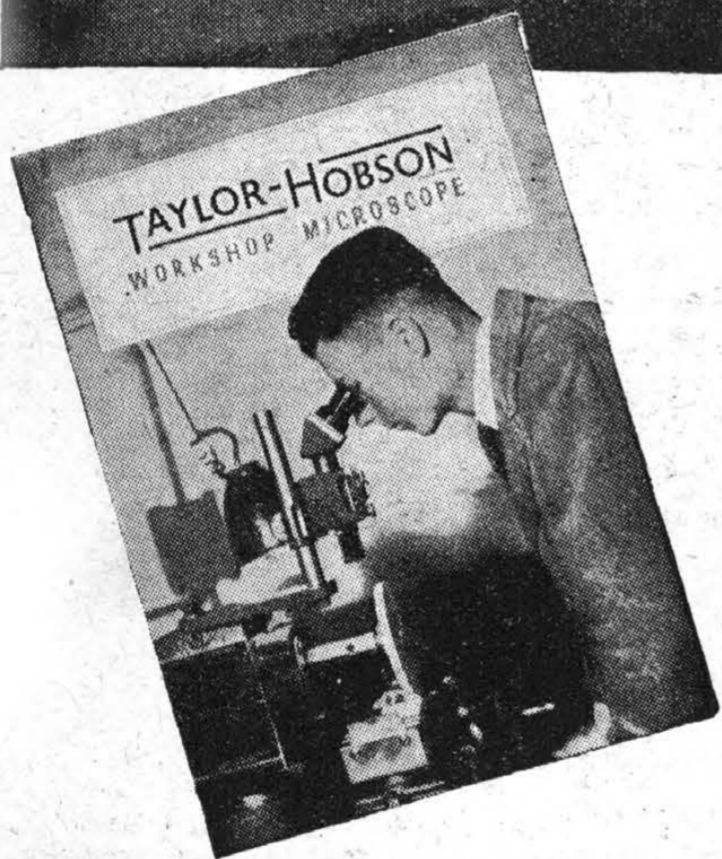
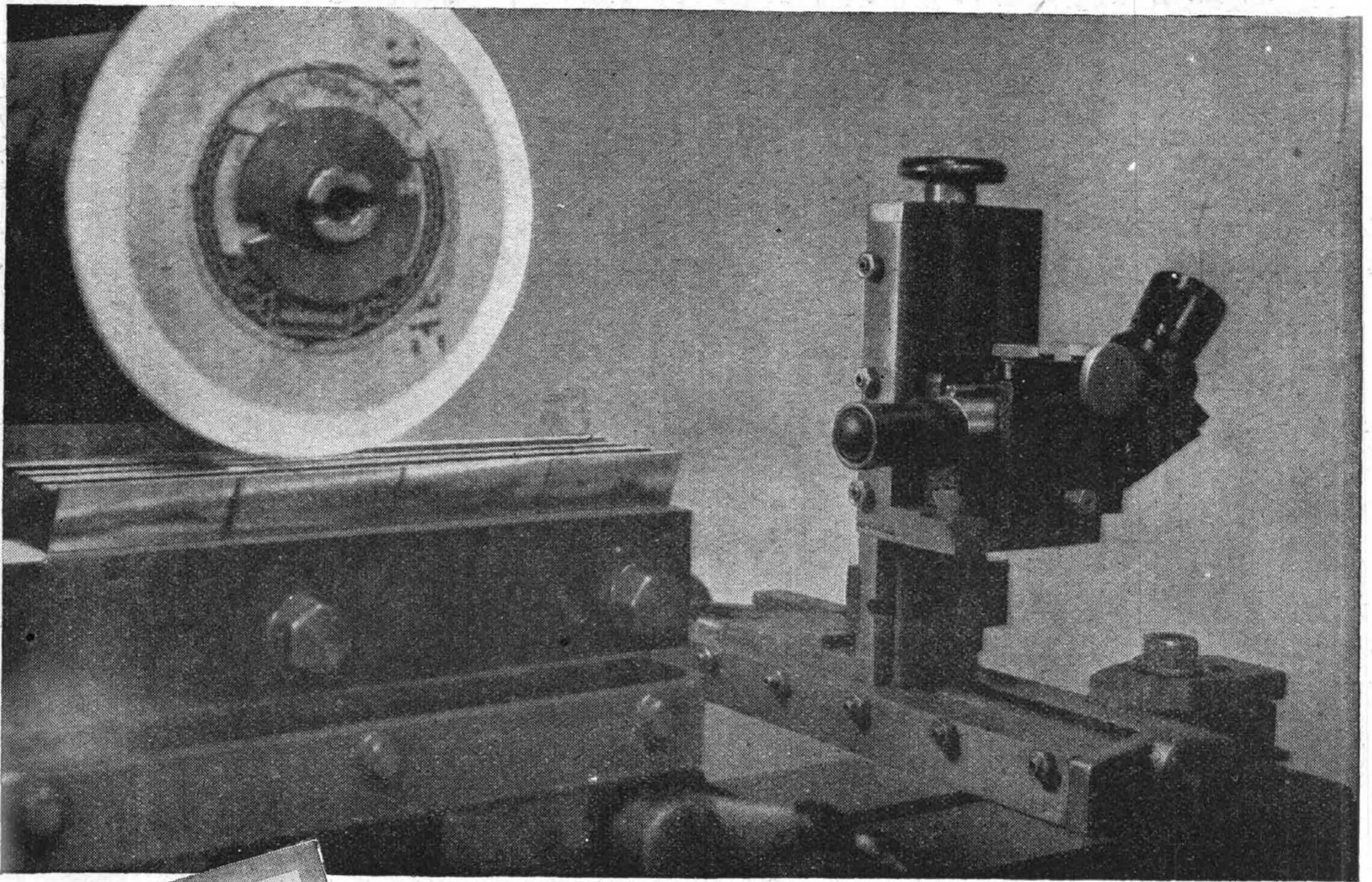
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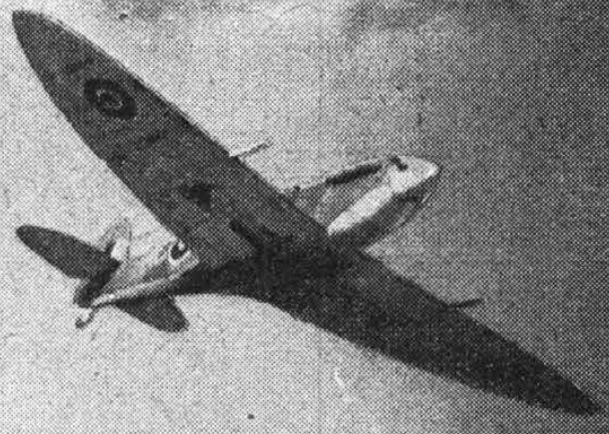


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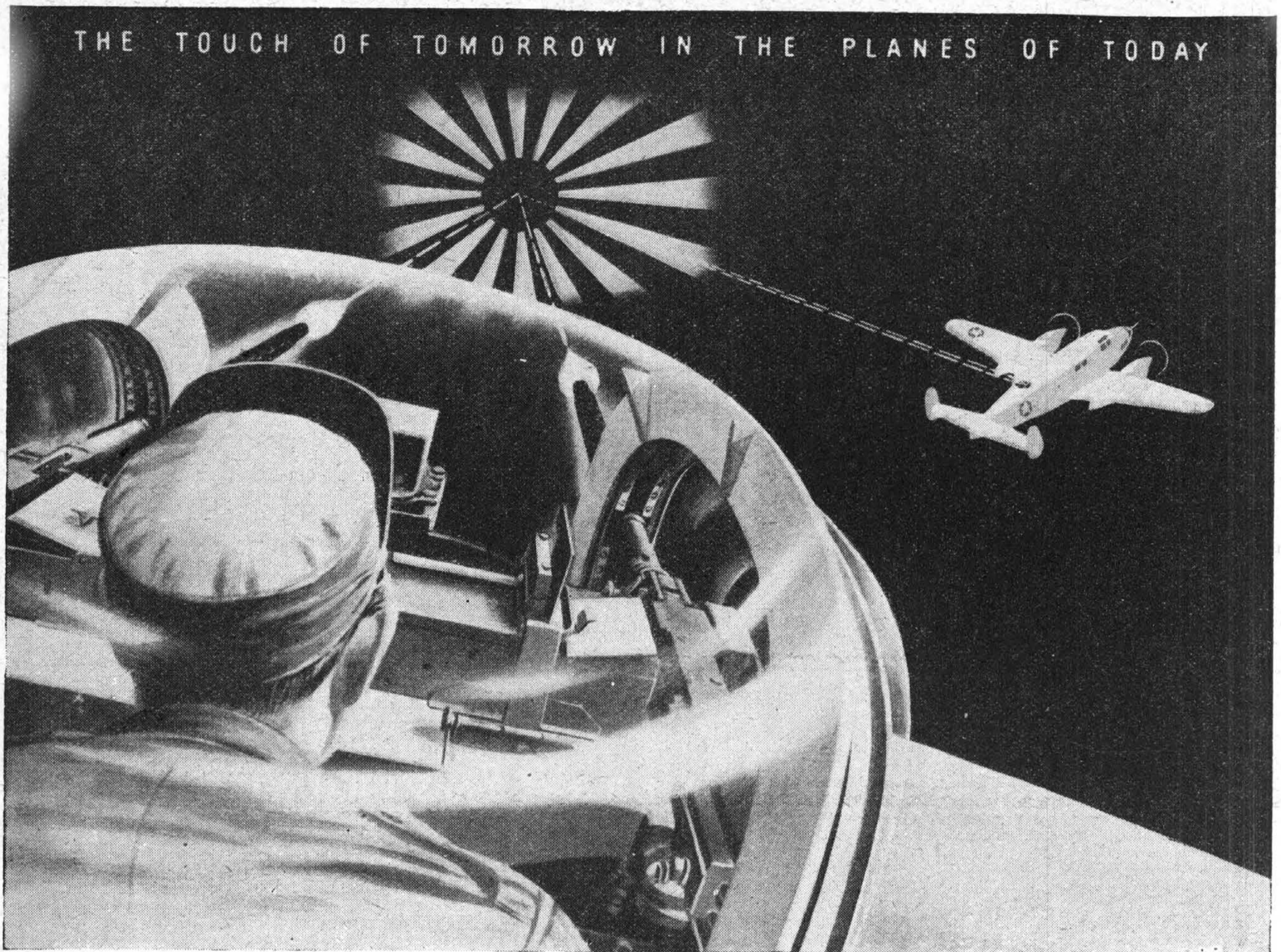
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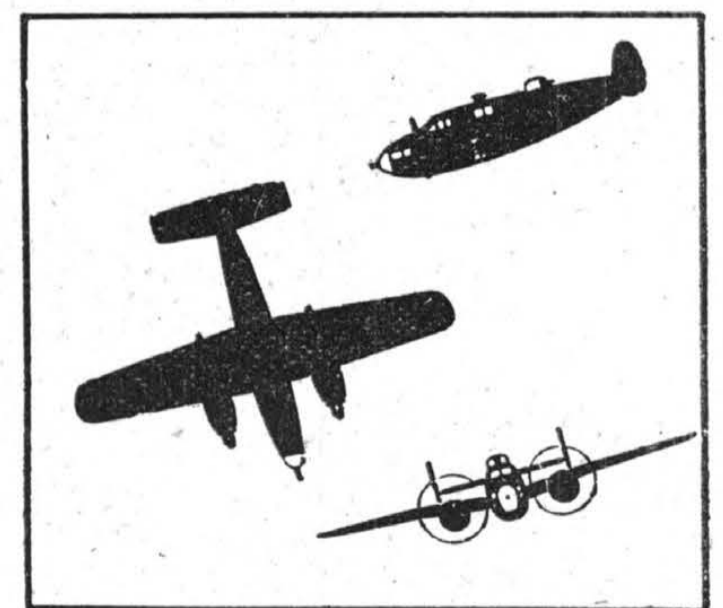
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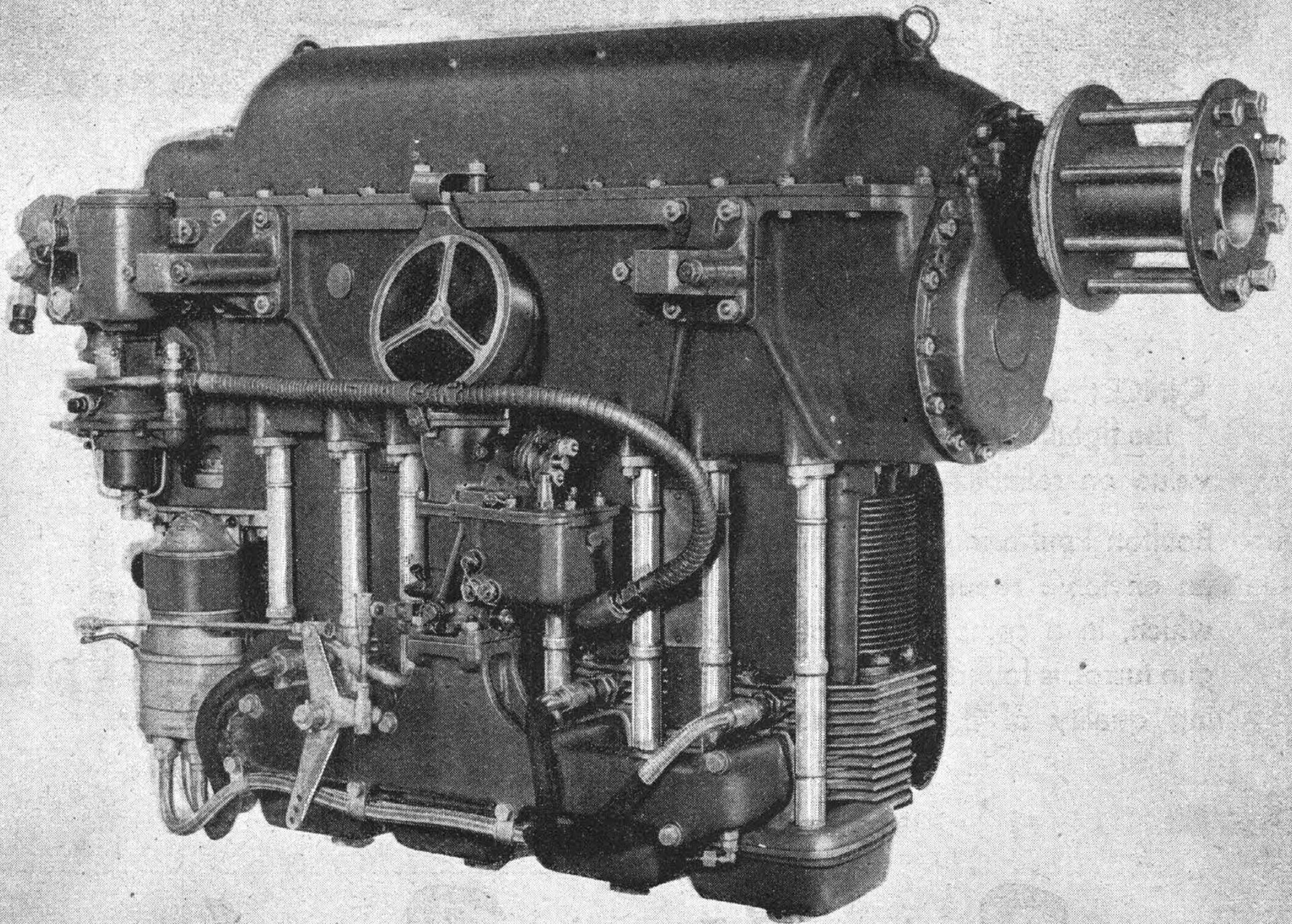
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90 h.p.

100 h.p.

150 h.p.

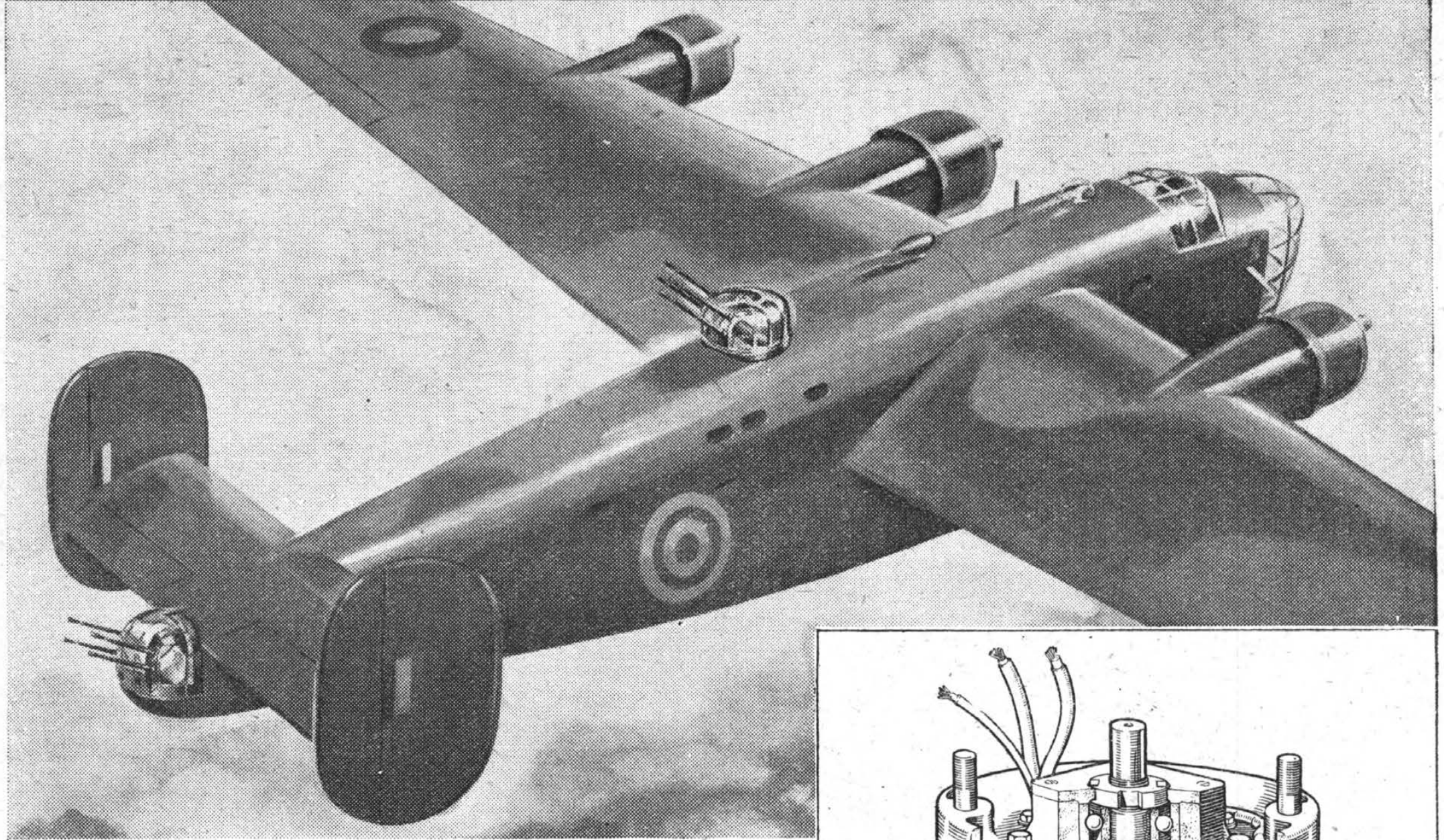


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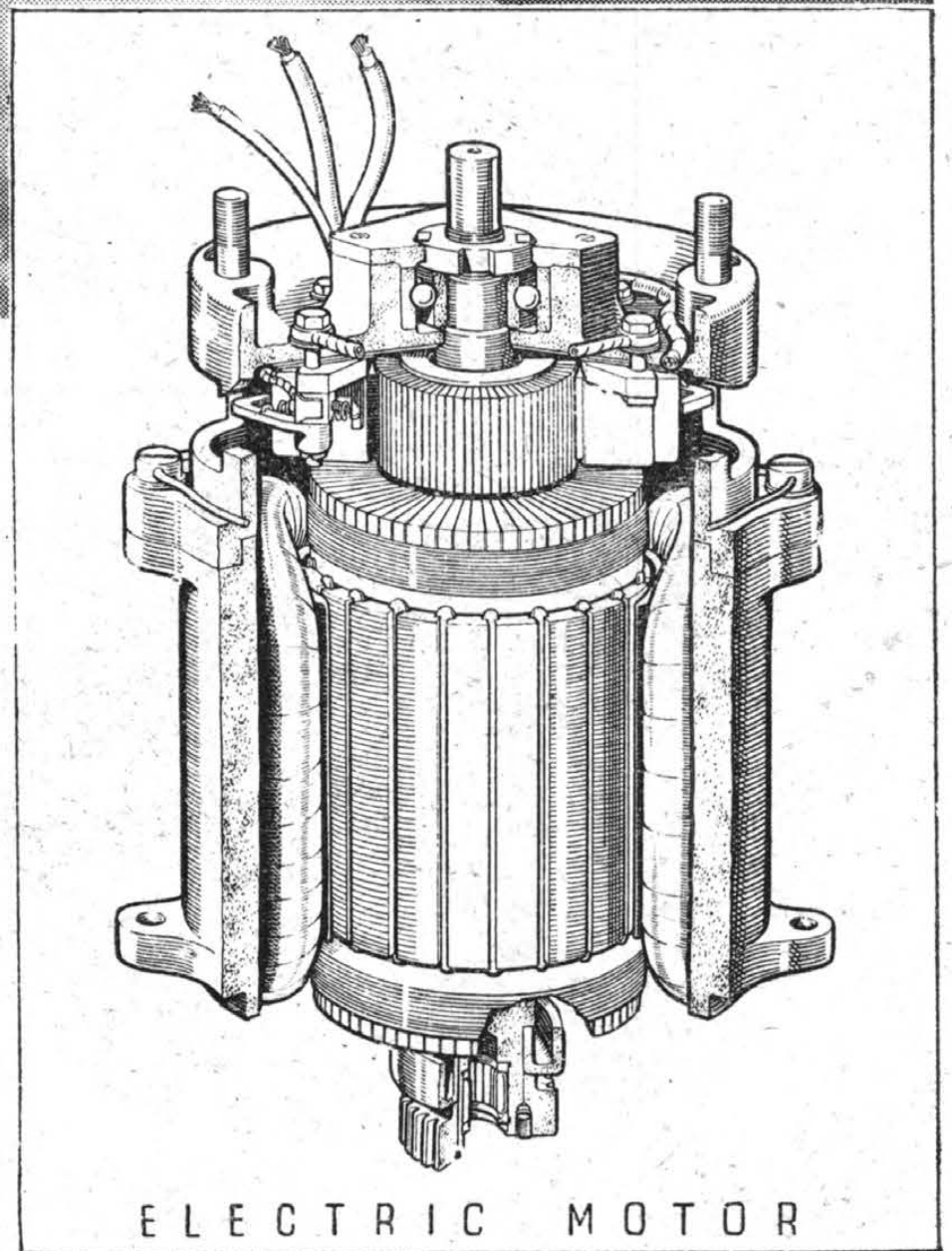
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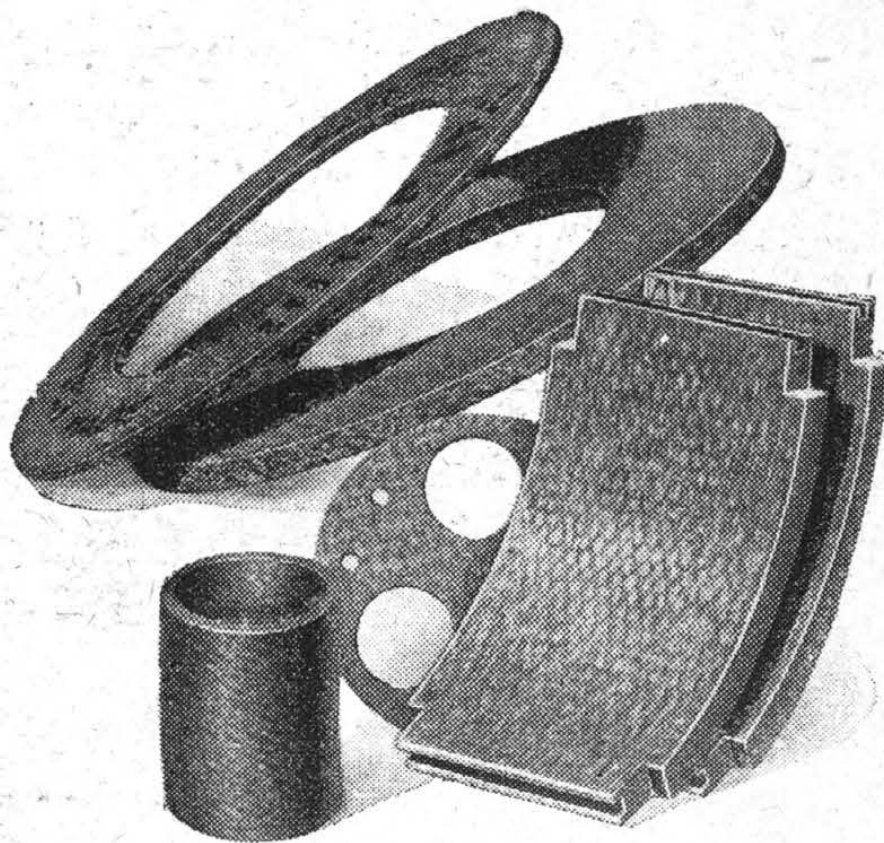
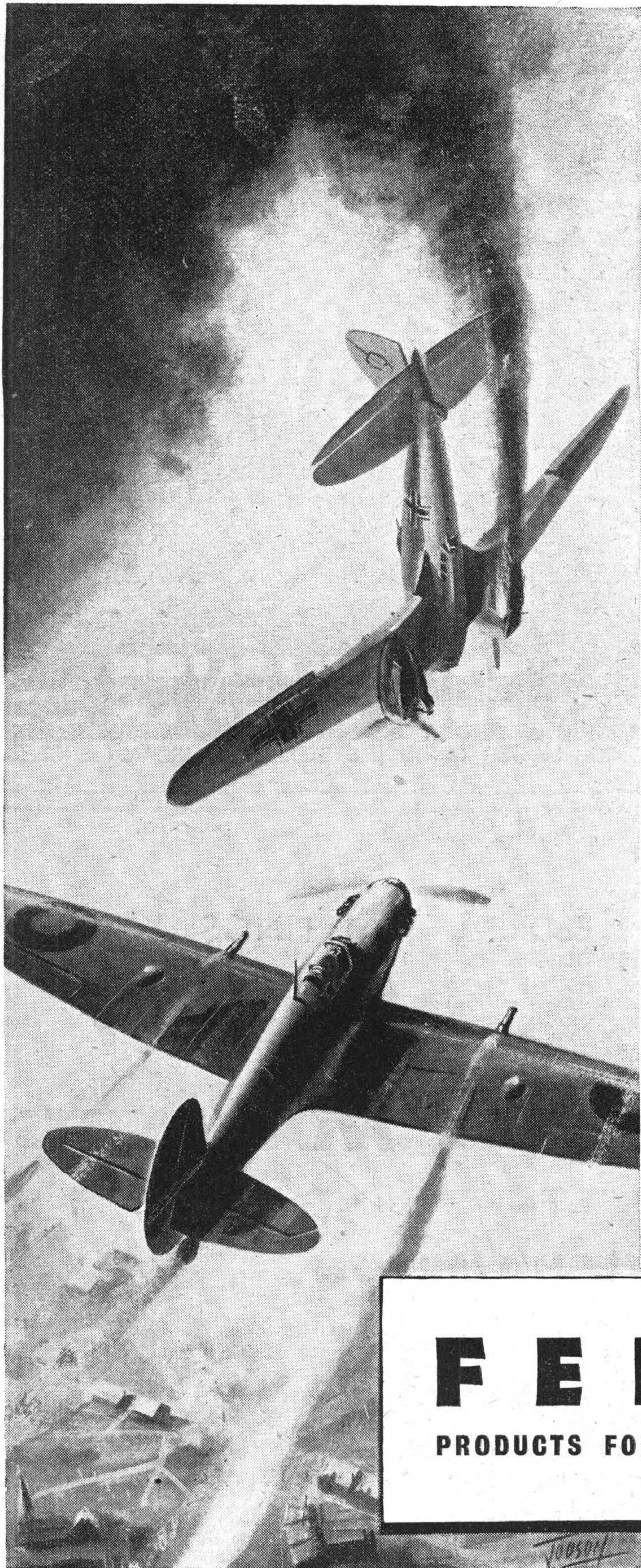
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The Outlook

Weapons and Tactics

WHEN the Germans rapidly overran Poland and France the belief became widespread, at least among civilian observers, that for the future two new weapons, the tank and the dive-bomber, had become the dominant factors in military tactics.

Among thinkers on military subjects there is always a contest between the ultra-conservative mind and the ultra-radical mind. The professional fighting man tends to be ultra-conservative, and one recalls the story of the stout old knight in the Middle Ages who declaimed against "villainous saltpetre," which had spoilt the fun of war from the point of view of the armoured horseman. In a scientific age like our own the tendency is rather to acclaim the latest mechanical weapon just because it is mechanical and new, especially new. The campaigns in Poland and France put the radicals in a strong debating position.

However, in a long war like the present one, where campaigns are fought in many different forms of terrain, facile generalisations are apt to be upset. In the official story of *The Eighth Army*, recently issued by the Ministry of Information, after the retreat to El Alamein the writer speaks of new tactical truths, and continues: "What was the lesson? No less than that the character of fighting in the Western Desert must be changed. The gun, the mine, and the infantryman had come into their own, and the tank was no longer queen of the battlefield."

That applies only to the Western Desert. The dive-bomber aircraft—the boon companion of the tank in the Battle of France—had already been discredited, not only in the desert but elsewhere. For many forms of fighting the fighter-bomber had been proved better at the work for which the dive-bomber had been designed. Yet even

now it would be unwise to expect the fighter-bomber to be equally effective above each and every terrain. The special correspondent of *The Times* at Allied H.Q. in Italy has written a glowing account of how these aircraft can knock out gun positions which cannot be reached by artillery, and how enthusiastic the soldiers are about their work. Of course, every enemy gun knocked out helps our infantry, but it is obvious that the number of such successes is limited. Could every enemy gun be dealt with by fighter-bombers, General Alexander would have been in Rome long ago. In the hills, as in the desert, the infantryman has again come into his own, though he needs every bit of help which the other arms can give him. Different terrains may well give prominence to other tactical arms. Mud in Russia, for instance, has given renewed chances to horsed cavalry, which not long ago seemed to have been relegated to the past.

In the fighting still to come we must not be surprised if other combinations of arms come to the front. The air will always play its part, but too much must not be expected of it or any other arm.

Unfortunate Misunderstandings

THE civil aviation debate in the House of Lords on May 10th and 11th appears to have caused something of a stir in the United States and Canada. There appears little enough real reason for this, and probably the first excitement was caused by incomplete reports of what Lord Beaverbrook really did say. Certain American circles seem to have jumped to the conclusion that at the Anglo-American talks Mr. Adolph Berle had committed the United States and had promoted the views of the Administration in opposition to those of the Clark sub-committee of the Senate.

To those who have read the Official Report of the

debate in the House of Lords, this interpretation must appear far-fetched. There was no question of committing the United States in any way. The talks were purely exploratory, and the goal was not a hard-and-fast agreement between the two Governments but a basis, acceptable to both, upon which they could go to an international conference later.

In Canada the *Montreal Gazette*, according to Reuter, interpreted the position as being a turning-down by Great Britain of the Canadian Draft Convention. This was, of course, denied by Mr. Howe in the Canadian House of Commons, who said that the Canadian proposals had never been unacceptable to Great Britain. What did happen, and it was made very clear by Lord Beaverbrook in his debate speech, was that in the Anglo-American talks Great Britain subscribed to the Canadian plan but, as it was considered by Mr. Berle too rigid and too detailed to form a basis for the forthcoming international conference, it was agreed to waive the Canadian plan in favour of the principles agreed upon at the Imperial Conference last October.

Thus, so far from Mr. Berle having committed the United States, he succeeded in obtaining from us a concession as to the basis for further discussions. The whole incident shows how very easily misunderstandings can arise, and how important it is to rectify them before quite unwarranted mischief is done.

The "Chosen Instrument"

B RITISH OVERSEAS AIRWAYS CORPORATION came in for some searching questions in the House of Commons on May 17th, when Sir Oliver Simmonds pressed for a statement of the financial "health" of the Corporation. He pointed out that the information

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which the Secretary of State for Air had laid on the table for the past three years was not very informative. In fact, that dealing with the last year he described as a "scrappy document." It showed for certain that there was a loss of £2¼ million, but there was probably another million or two for obsolescence, and £x million "for all the other items which the report states have not been included."

Sir Oliver compared those figures with the results of American air lines which, he said, had relieved the American taxpayer to the tune of some £8 million.

While we have every sympathy with Sir Oliver Simmonds in his vain attempt to get at the "financial health" of B.O.A.C., we do think he was being rather unfair in comparing the Corporation with the American air lines. The Corporation is under the orders of the Air Ministry and the cost of its services is borne by the nation, as is that of the fighting services. The commercial revenue of the Corporation must be negligible.



DOMINION EFFORT : A line of Mosquitoes coming through in the final assembly shop of the De Havilland Aircraft Company's Canadian factory.



TARGET OVER THE TARGET: A Marauder of the U.S. 9th A.A.F. drops its bombs as it flies through a flak barrage over Northern France.

WAR in the AIR

Combined Success in Italy: Capture of Myitkyina Airfield: Another Carrier Raid off Norway: Air Armaments Developed

ALL last week the troops of General Alexander pressed forward steadily in Italy against stubborn resistance and great difficulties of terrain and fortifications. The French contingent, consisting mainly of Moroccans, Algerians and Senegalese, led by French officers, made a great name for themselves by the success of their advance on the front of the 5th Army; while in the 8th Army the Indians did some great feats of mountaineering against determined resistance. Every day the Mediterranean Allied Air Force did everything which aircraft could do to help the ground troops. In the main, this was attacking back areas and hampering the movements of enemy reinforcements and supplies, but the fighters and fighter-bombers constantly flew over the battle lines, seizing every opportunity to knock out guns and centres of resistance. German prisoners complained loudly that they got no help from the *Luftwaffe*; but that is a common attitude of ground troops, even when most effective air help is being given beyond their range of vision. Medium bombers of the Allies concentrated on railway centres, and so did the heavies when they were able

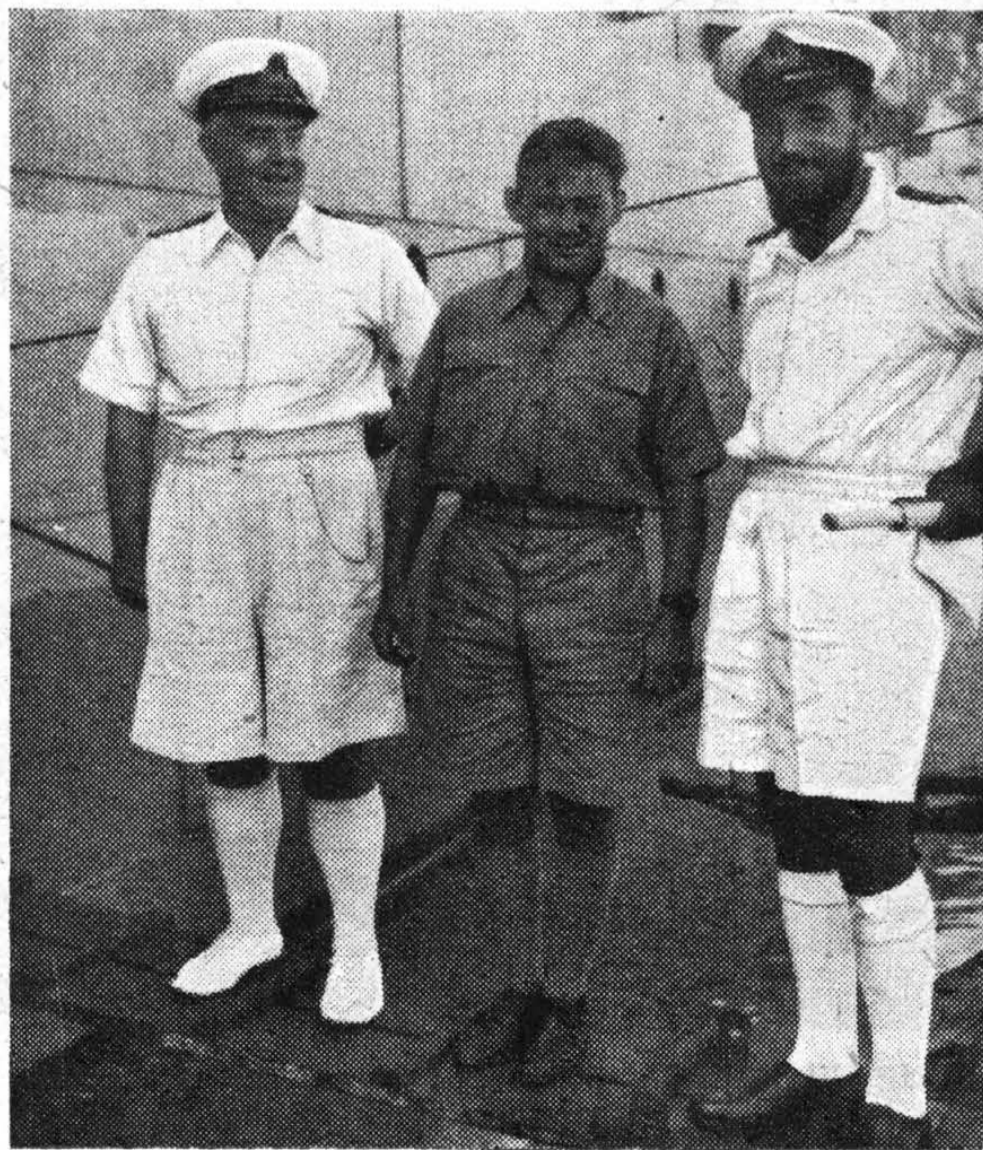
to fly, but on several days the weather kept them on the ground.

Without doubt the Austers, flown by pilots from the Royal Artillery, continued to spot for the guns, though these useful little aircraft seldom get mentioned in reports. Neither the Army nor the R.A.F. seems to take a really paternal interest in them; and yet they must be helping materially, and they probably point the way to a new line of organisation of our fighting forces.

Then, in the middle of the week, came the glorious news that Cas-

sino had fallen to British troops, while Poles occupied the ruins of the Monastery above it. It may have been chance, or it may have been de-

UNDER SEA/AIR RESCUE: Lt. Cdr. A. Collett, D.S.C., R.N., (right) with the U.S. airman Lt. D. C. Klahn (centre) whom he rescued by surfacing his submarine under fire off Sumatra. On the left is Capt. H. M. C. Ionides, R.N.



WAR IN THE AIR

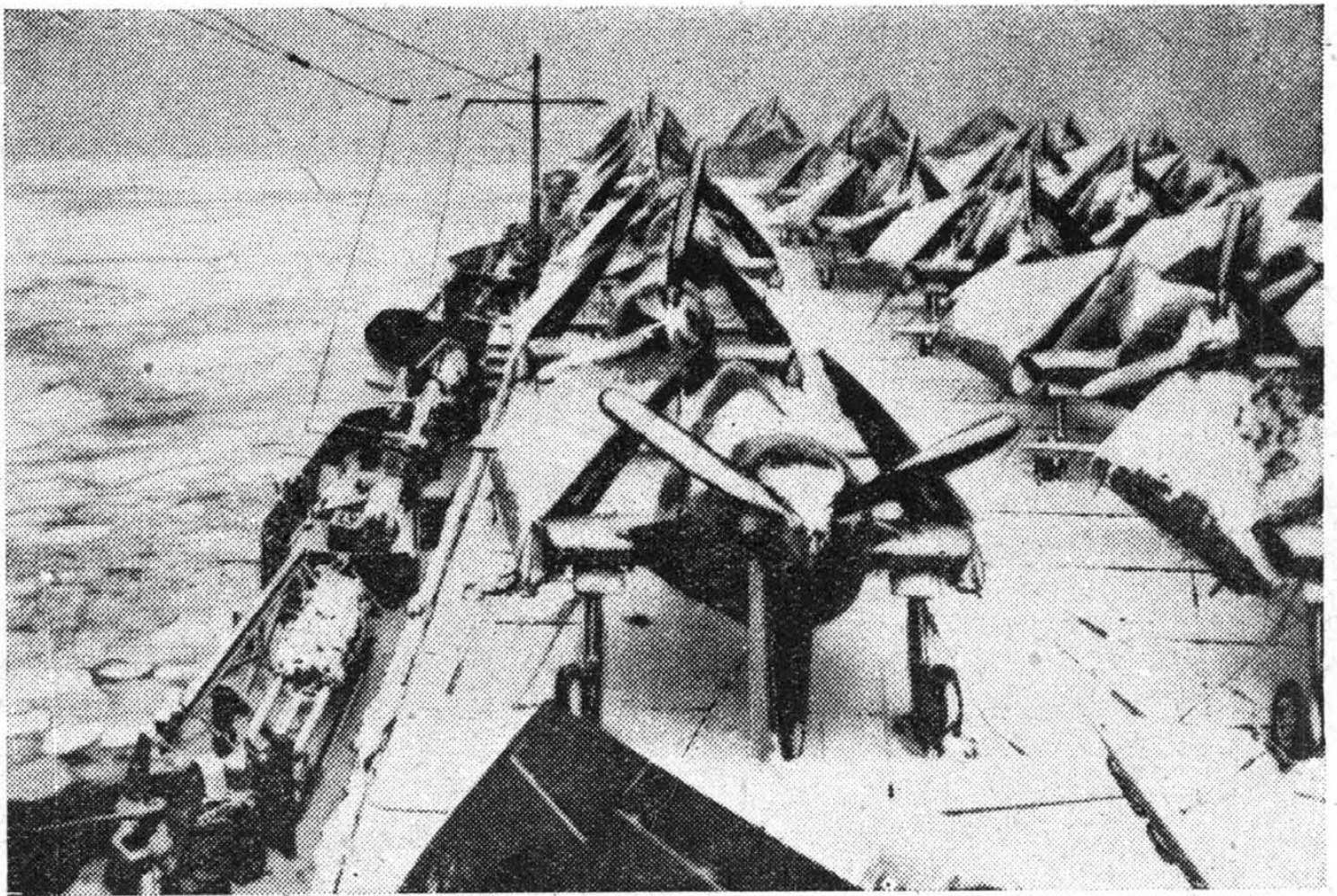
sign, but it was appropriate that the Monastery should fall into the hands of Poles, who are mostly Roman Catholics.

This success, and also the advance of the 8th Army and the general collapse of the so-called Gustav line, made up a combined operation in which the air went full out but could not expect to play a dominant part in the operations. The Army is very grateful to the whole M.A.A.F., but the aeronautical commentator can draw but few lessons from the operation.

A Burma Airfield

OF more interest from the air point of view is the capture of the airfield of Myitkyina (pronounced "Mitchinar") by the American and Chinese forces of Gen. Merrill. Actually the capture was a ground operation, but shortly after it had been effected American engineers flew in in gliders and set to work.

It is sometimes said that this war is mainly a struggle for airfields. That, perhaps, is an exaggeration; but airfields must be at the disposal of any attacking force, and this was a case where the possession of an airfield is likely to prove of prime importance. Burma, of course, must be reconquered for its own sake, just as Malaya must be brought back into British hands. In addition to that object, it is ardently desired to establish a good route for getting supplies into China. The gallant troops of Generalissimo Chiang Kai Shek have suffered grievously from the superior equipment of the Japanese invaders since the Burma Road was lost. Lately a certain



NOT ON HOT BRICKS: A cargo of Hellcats for the Fleet Air Arm on the snow-covered deck of a baby "flat-top" ploughing its way through the ice floes off Newfoundland.

amount of useful equipment has been flown into China over the "Hump" by American pilots. It was a hazardous business, and the loads which could be carried were all too light to meet Chinese requirements. From Myitkyina a better air route into China can be established. Moreover, and this is still more important, the capture of the town will provide a base from which it is hoped that the old Burma Road may be again thrown open to convoys of lorries.

That development cannot be achieved this summer. Already the *chota bursat*, or little monsoon, as it is called in India, has commenced, and the *burra bursat*, or big rains, must be

expected to set in soon. During the monsoon campaigning is impossible in Burma, and it is very important that British and Indian troops should be able to pass the time in healthy quarters. These can be found in the town of Myitkyina.

Preparation

IN other respects the week was largely a repetition of several previous weeks, with bombers from Great Britain, from the Mediterranean (including the Middle East), and from Russia striking without respite at the enemy's centres of communications. Just occasionally the Americans have varied the proceedings by attacks on oil installations and refineries, but the main plan of campaign has been to paralyse the enemy's power of movement rather than to try to reduce his reserves and production. It may be taken for granted that the Germans have reserves, and they cannot all be bombed out of existence in a short time. But if he cannot get them up to the battle fronts, they might just as well not exist. To prevent them reaching those fronts must be the main object of air power on the eve of an invasion of the Continent.

Carriers Again

ONE can only guess at the intensity of the work which preparing for the invasion puts upon the Navy; but none the less it felt free to send part of the Home Fleet off on another raid to the coasts of Norway. It was another carrier attack, the other warships forming the escort. It was noticeable that Rear-Admiral La Touche Bisset, who was in command, flew his flag in a cruiser, H.M.S. *Royalist*, and not in a battleship. Since the sinking of the *Scharnhorst* and the bombing of the *Tirpitz*, it

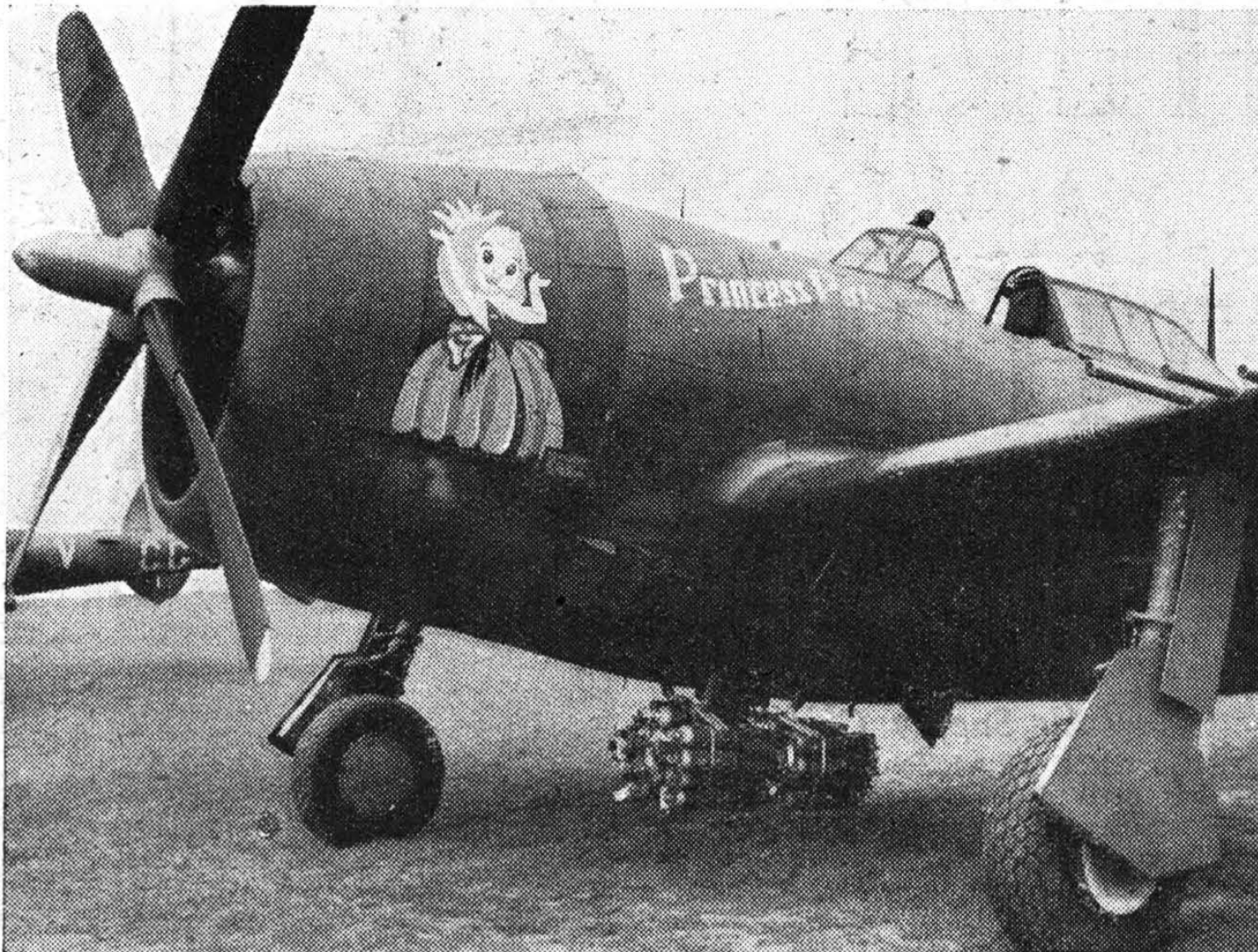


FOUR FLAMERS: Siebel 204 transports burning on the ground after a low-strafting attack by the 8th U.S.A.A.F.

does not now seem necessary to send battleships as escort for carriers in that part of the world.

The attack was carried out by Hellcats carrying bombs with a protective cover of Hellcat fighters and Wildcats. This is the first time that mention has been made of Hellcats as fighter-bombers. It was not claimed that any enemy ships were sunk; but two supply ships and two armed trawlers were hit by bombs, and other vessels were possibly damaged. Oil tanks and a fish oil factory were also hit. The naval aircraft could afford to make these attacks on supplies, as they did not imply neglect of any centre of communications. Nine enemy aircraft were shot down and others were driven off by the fighters and the guns of the ships. Our loss was five machines.

Another development in air armament, this time in the S.W. Pacific, has also been announced recently.



BOLTS FROM THE BLUE: Bundles of fragmentation bombs beneath the fuselage of a Thunderbolt fighter-bomber.

This was the use of rocket-guns by Airacobra fighters and Dauntless dive-bombers.

A Division by Air

A VERY interesting and significant incident of the fighting in Manipur State has just been revealed. The 5th Indian Division, equipped with guns, mules, jeeps, ammunition, and food, was moved by air from Arakan to Dimapur and Imphal. The actual time of transit was two hours; whereas by road and rail the movement would have taken several days. If time had not been a factor, the move by ground would doubtless have had advantages, for the equipment carried in the transport aircraft was all of the lighter category. The guns must also have been something less than what Tommy Atkins in South African days called Long Toms. The time is not yet when monsters of that sort can fly to the battle front. But this movement of a whole division, even though lightly equipped, must have achieved that priceless asset—surprise.

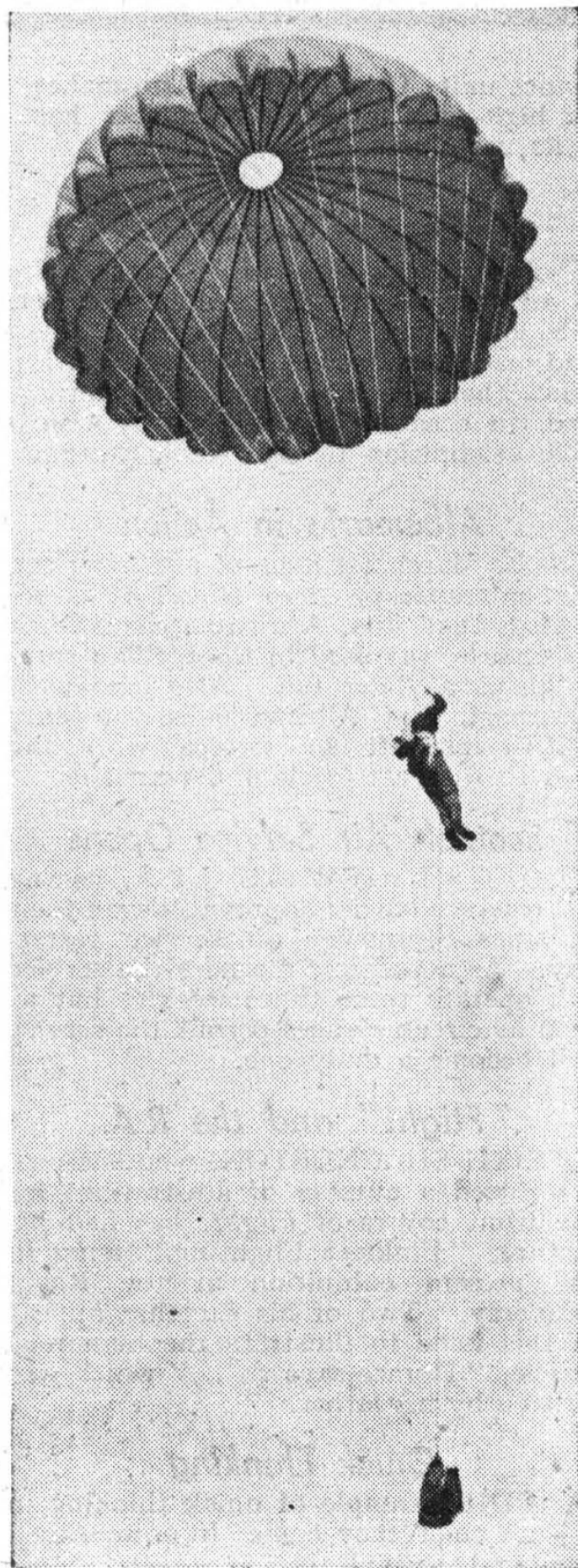
Another surprising event (surprising to us at home as well as to the Japanese) was the attack on Surabaya, the great naval port on the northern coast of Java. A carrier force, strongly escorted, played the chief part in the attack, and nearly 100 aircraft bombed the shipping in the harbour, sank ten ships, damaged two floating docks, and also went for oil refineries and airfields. The surprising feature of the attack was that naval forces from the South East Asia Command combined with those from the South West Pacific and the Central Pacific area, and the American

warships were assisted by Australian, French and Dutch vessels. Details could not be published at once for security reasons; but it is very significant to see the various Allied Commands in Asia and the Pacific joining together in one operation. It was surely the shadow of coming events.

Last Saturday nearly 5,000 Allied aircraft took off from Great Britain for the Continent—a new record, but it may not stand for long. In these days a record set up one day may be surpassed before the description of it is published. Among other damage done to the enemy, 35 military supply trains were attacked, and a large number of locomotives was shot up. Airfields were also bombed. The *Luftwaffe* offered only slight opposition.

It is hardly to be hoped that even the immense air effort now launched by the Allies will completely put all the railways in Western Europe out of action before the invasion takes place (again we must put in a proviso that this may have taken place before these words are published), but such destruction must hamper the German movements enormously.

Some observers see in the absence of German counter-attacks of any size in Italy evidence that the work of the M.A.A.F. on the roads and railways has had a tangible result. Clever though the Germans are at movement by night, such expedients can hardly be expected to meet the needs of such a position as General Alexander's assault has set up on the Apennine front. The bad weather which grounded the heavy bombers on more than one day did not affect the medium and light aircraft, and they did the work of immediate importance.



WITH LUGGAGE: A paratrooper dropping with a bag of gear. This reaches the ground first, and the parachute, relieved of its weight, slows down before the man touches the earth.

HERE AND THERE

Growth of the R.C.A.F.

A RECENT statement from Ottawa discloses that the R.C.A.F. has been expanded from a pre-war strength of 4,000 personnel to a present-day total of 191,500 plus 15,000 Canadian "Waafs."

New Air Supply Chief

BRIG. GEN. CLARENCE P. KANE has arrived in Britain to take up his duties as Director of Administrative Service of the U.S. Strategic Air Force Air Service Command. He succeeds Brig. Gen. Myron R. Wood, who is to assume a new command.

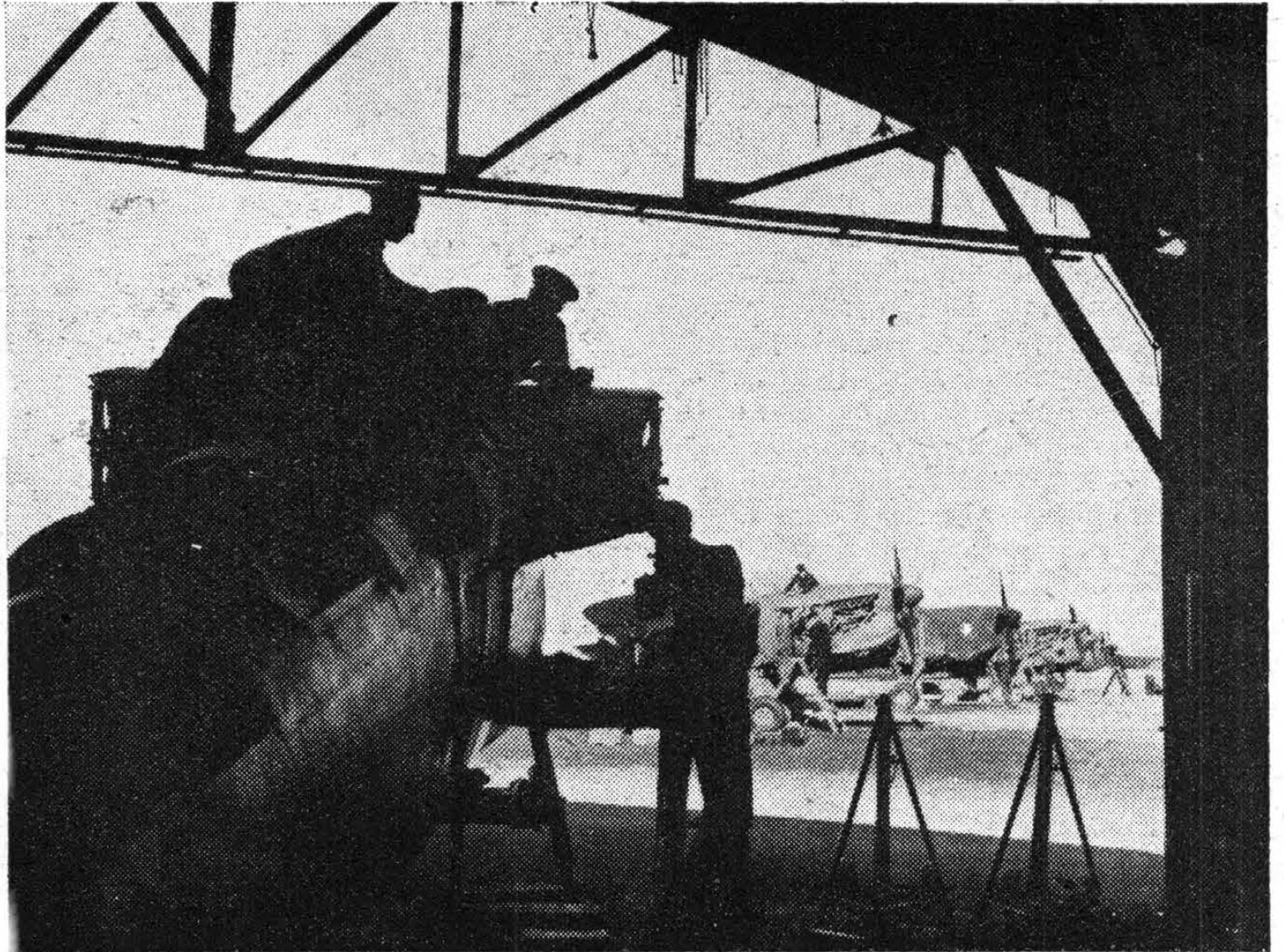
"Jet" Talk

L T. COL. PHILIP JOHNSON, C.B.E., D.S.O., has been elected president of the Maudsley Society (an engineering society formed to perpetuate the memory of H. Maudsley, inventor of the slide-valve, etc.) in succession to Mr. Walter T. Dunn, M.I.Mech.E.

On May 6th Mr. Dunn delivered his presidential address, his subject being "A Review of the Whittle Jet Propulsion Gas Turbine and its Possibilities."

D.S.O. for U.S. Major

MAJOR WILLIAM H. TAYLOR, of the U.S.A.A.F., who organised and led the glider unit which landed airborne troops behind the Jap lines in Burma,



SEABIRDS' NEST: A shore-based maintenance unit of the Fleet Air Arm makes ready a few more Barracudas. This latest high-wing torpedo-dive-bomber has already demonstrated its usefulness.

has been awarded the D.S.O. It was recently presented to him by Air Chief Marshal Sir Trafford Leigh-Mallory, C.-in-C. of the Allied Expeditionary Air Force, at his headquarters.

Airport Appointment

MR. B. L. WATSON has been appointed acting station manager for the British Overseas Airways Corporation at the Shannon Airport, replacing the Marquess of Headfort, the recently appointed station manager, who will be absent for some time on official business.

Century Completed

IN last week's issue we gave a picture of the veteran R.A.A.F. Lancaster, "S for Sugar," which, at that time, had made ninety-nine operational sorties. Since then she has topped the century, and the occasion was marked by a suitable celebration by the whole station.

Albemarle in Action

IN the March 1st issue of our American contemporary *Aero Digest* it is revealed that the Armstrong-Whitworth Albemarle was used in the Sicilian campaign as a glider tug. Also used as a transport, the Albemarle is the only British aircraft in service with the R.A.F. with a tricycle undercarriage.

Scottish Air Service Opens

SCOTTISH AIRWAYS, LTD., having received official approval, began their Inverness-Stornoway air service yesterday. As a wartime measure the service will operate three times weekly, but as soon as circumstances permit the service will become a daily one.

"Flight" and the R.A.

KEITH SHACKLETON, who has produced a number of illustrations for the front covers of *Flight*, has had his picture, "Pinkfeet Flighting," hung in the present exhibition at the Royal Academy. Two of his sketches appear in this issue to illustrate the humorous article, "Horace says . . .," which was written by his father.

Quick Thinking

A FINE example of quick thinking in an emergency comes from an Allied bomber base in Italy.

A crippled Liberator, returning from a raid, had its hydraulics damaged, and though the landing gear was lowered by hand it was realised that the wheel brakes were inoperative. The co-pilot, who had taken over when the captain



WINGS TO FOLLOW: Looking anything but aeronautical in this "upstairs," view of a corner of a U.S. Ninth Air Force station, the fuselages of CG-4A gliders await their wings.

was killed by *flak*, ordered two members of the crew to secure parachutes at the waist windows and pull the rip-cords when the wheels touched the runway. These improvised air brakes did the trick.

Hawker Siddeley Contribution

MORE than 25 per cent. of the 90,000 aircraft built in Britain from September, 1939, to December, 1943, have been produced by the Hawker Siddeley group of companies. These include the Armstrong Siddeley, Armstrong Whitworth, Gloster, Hawker, A. V. Roe, and Hawksley concerns.

Losses Over-estimated

ATTRITION figures for U.S. Navy fighter aircraft are only two-thirds of the estimate set early this year, and are reported to be dropping steadily as the relative air superiority over the enemy rises.

For this reason, among other military considerations, the U.S. Navy announced a reduction in the overall production of fighters.

Canadian Research

AIMED at keeping an uninterrupted stream of bombers over enemy targets, the winter adaptation programme of the R.C.A.F. test and development station at Rockcliffe, Ontario, is reported ahead of any country in the world. Many of the developments in the course of experimentation are secret, but it can be said that one of the most important—electrically heated airscrew blades—may provide the antidote to hazardous icing conditions which often keep bombers on the ground.

Details of the new de-icing equipment cannot be given, but the blade, heated by electricity, is said to prevent ice from forming even in the most treacherous weather.

Stainless Steel Cargo Aircraft

A NEW transport aircraft, the Budd Conestoga, which is claimed to be the first large-size aircraft of stainless steel construction ever to go into production, has been accepted by the U.S. Navy, and the first example is already in service with the Naval Air Transport Service, under the designation RB-1.

Product of the Edward G. Budd Co., Philadelphia, the Conestoga has a wing span of 100ft. and a length of 68ft. It is powered by two 1,200 h.p. Pratt and Whitney Twin Wasp engines, cruises at 165 m.p.h., and can carry 10,300 lb. of cargo.

Instructional Films

THREE short films illustrating the working of the Minneapolis-Honeywell electronic automatic pilot fitted to bombers of the U.S.A.A.F. and R.A.F. Coastal Command were shown recently in London. These films, part of a series of eleven being used in the training of Air Force personnel, were produced by Walt Disney in collaboration with the makers and the U.S.A.A.F., and they show with admirable lucidity not how the device functions, but the correct way to employ it in the air.



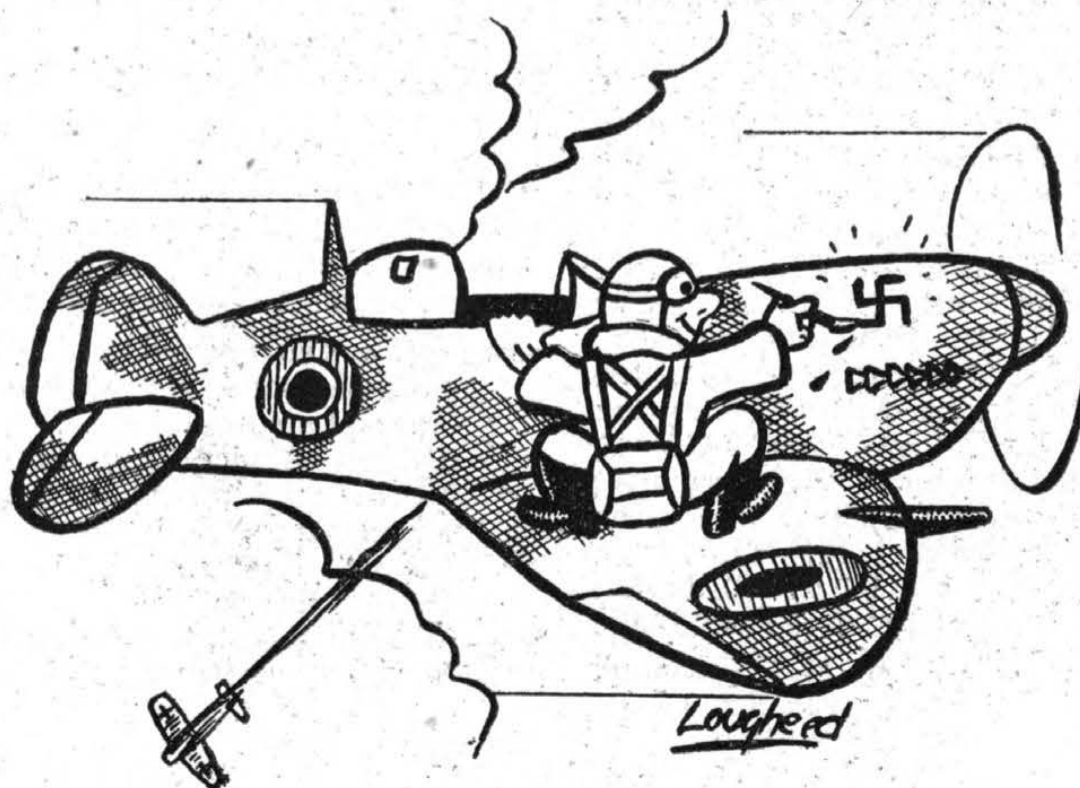
COMBINED ADMIRATIONS: When General Montgomery visited the Home Fleet recently he met, aboard an aircraft carrier, the Barracuda crews who successfully attacked the *Tirpitz*. Here he is seen congratulating some of the pilots on their very gallant effort.

Employing a system of electrical balance, this autopilot can be adjusted in flight to suit varying flying conditions, and its degree of responsiveness regulated according to whether it is required to hold the aircraft rigidly to its course for accurate bombing or merely to relieve the human pilot on a long flight. In the former case the bomb-aimer himself operates the autopilot.

Beauforts Down Under

FLYING from an advanced operational base in New Guinea, a Beaufort squadron of the R.A.A.F. has flown 1,500,000 operational miles during the past six months and dropped nearly 2,000,000 lb. of missiles on Raboul and other enemy bases in New Britain.

Despite the fact that the greater part of their flying has been over the sea, the squadron's losses have been only 0.7 per cent., which speaks volumes for the tough qualities of the aircraft and their crews, but says little for the Japs in those parts.



First victory.

Pictorial Progress

AN interesting exhibition of *Flight* photographs is now on show at the new showrooms of the Bristol company in Piccadilly.

Flight (1909) and Bristol's (1910) have grown up together. This exhibition shows the progress of aircraft and their engines as it has come from Bristol design departments, and been recorded by the cameras of *Flight's* photographers over the past thirty-four years. It might be described as "From 3 lb. to 50 lb. per sq. ft. wing-loading in pictures."

The exhibition will remain open until June 6th.

Them's 'Ard Woids!

SIR OLIVER SIMMONDS does not pull his punches in the House, especially when attacking the Government on their civil aviation policy—or lack of it.

He estimated that B.O.A.C., as the Government's "chosen instrument," had lost £2,250,000 of the taxpayers' money last year, not counting obsolescence, and he contrasted this with civil aviation in the U.S., where, he said, private enterprise was relieving the American taxpayer to the tune of some £8,000,000. "It is a wretched story," he added, "but it is time the Government was frank and told us what this corporation is costing us."

Then when Capt. Balfour replied that security reasons forbade details of costs being given, Mr. Austin Hopkinson with similar outspokenness, retorted that the suggestion that security reasons had any validity was just ridiculous, and he characterised the Under-Secretary's answer on this and other points as "totally and utterly unsatisfactory."

The Prevention of Wars

A Scheme for Scotching the Axis Snake

By Major F. A. de V. ROBERTSON, V.D.

IT is now universally accepted that no nation can win a great war unless it has at least a rough parity in air power with its opponent. A nation which attempted to fight when hopelessly inferior in the air would be like a duellist whose sword arm was strapped to his side. Examples which seem to prove the contrary can be easily explained away. The cases most likely to be remembered and quoted against this general proposition are those of Rommel in Africa and of Kesselring in Italy. Rommel was badly inferior to the British in air power when he drove them back to El Alamein; but then the British had not established proper co-ordination of land and air efforts, and, moreover, they were beaten on the ground by superior German armour. In Italy, Kesselring was able to hold up the Allies for months because the fighting was in the mountains, where air power shows to the least advantage. Despite these special cases, the proposition set forth above will not be disputed.

The Scheme

This need for at least comparable air power must always be borne in mind when the prospects of ensuring a lasting peace after the defeat of the Axis are under consideration. All the Allies are agreed that Germany and Japan must be immediately disarmed, and kept disarmed for a period which at present cannot be defined. Some people talk about splitting up the Reich into small States. Others put their trust in a lengthy process of educating the youth of Germany until the ideas connected with the Nazi party have died a natural death. As Prussia has been an aggressor nation ever since the reign of Frederick the Great (A.D. 1740-86), and as a desire for revenge after a defeat is a natural instinct of the human bellicose animal, we must take it that the educational process is likely to be a long one. We must question whether the British, Americans and Russians would be willing to maintain armies of occupation in Germany until it was certain that the change of heart had been completely effected. How, then, can any guarantee be secured that a third world war is to be avoided?

The little pamphlet* which is the subject of this article is an attempt by Mr. R. A. Chadwick, sometime Whewell Scholar of International Law at Cambridge, McMahan Law Student, and Solicitor of the Supreme Court, to find a solution of this problem. The danger which he foresees is that Germany, though forbidden by the peace

treaty to own or build warlike aircraft, will strive to obtain the nucleus of another *Luftwaffe* by means of civil and commercial flying. Therefore he advocates that no German or any citizen of any of the ex-enemy nations shall be allowed to make, own or fly any aircraft, make or own an engine or parts of an aircraft, or operate a civil air-line, or own, occupy, manage or be employed on any airfield. In addition, all air bases and landing fields in Axis territories shall be transferred to the Allied Powers who should have extra-territorial rights. Aircraft and air-lines in these territories should be owned and operated by the Allies, and ex-enemy subjects should be allowed to travel by air as passengers only. Further, to prevent ex-enemy nationals from entering into foreign employ and so gaining knowledge and experience of construction and operation, Mr. Chadwick proposes that the Allies should draw up a "black list" of countries and firms who employed them, and deny such parties all facilities on the lines and bases under Allied control.

Mr. Chadwick considers it essential that the air-lines in ex-enemy countries should be run by the Governments of the U.S.A., the British Empire, Russia and China, and not by private firms from those Powers.

"Ifs" and "Buts"

If this scheme could be made to work there is no doubt it would achieve the object of preventing Germany or Japan from preparing for another war. Criticisms can, of course, be made. Mr. Chadwick believes that working together for a common object would preserve the present unity of aim among the Allies. On the other hand, friction in the management of the Axis bases and air-lines is at least a possibility. Mr. Chadwick seems to hope that his scheme would lead to an international air authority controlling all commercial air transport. Not everybody believes that the elimination of private enterprise in this sphere would make for the future benefit of mankind.

But for some time, probably a time extending beyond the period of armed occupation, it will certainly be very desirable to keep Germans, Japanese and the rest of the guilty parties from having any share or part in civil flying; and Mr. Chadwick's scheme, if only regarded as a temporary measure, seems well worth trying.

* *World Peace Guaranteed.* By R. A. Chadwick, M.A., LL.M. Melcham & Son, Ltd. Storey's Gate, London, S.W.1. 6d. net.

SHOT AFTER ESCAPE

THE Air Ministry issues with deep regret the following list of 47 officers of the R.A.F., R.C.A.F., R.A.A.F., R.N.Z.A.F., S.A.A.F. and of the Allied Air Forces serving in and with the R.A.F. who, as announced by Mr. Eden in the House of Commons, have been reported by the protecting power to have been shot by the Germans after having escaped from Stamlager Luft 3:—

Royal Air Force (25):—Ft. Lt. E. G. Brettell; Flt. Lt. L. G. Bull, D.F.C.; Sqn. Ldr. R. J. Bushell; Flt. Lt. M. J. Casey; F/O. D. H. Cochran; Sqn. Ldr. I. K. P. Cross, D.F.C.; Flt. Lt. B. H. Evans; Flt. Lt. W. J. Gisman; Flt. Lt. A. D. M. Gunn; Flt. Lt. C. P. Hall; Flt. Lt. A. R. H. Hayter; Flt. Lt. E. S. Humphreys; Sqn. Ldr. T. G. Kirby-Green; Flt. Lt. T. B. Leigh; Flt. Lt. R. Marcincus (Lithuanian); Flt. Lt. H. J. Milford; F/O. H. A. Picard; Flt. Lt. C. D. Swain; P/O. R. C. Stewart; Flt. Lt. J. G. Stower; Flt. Lt. D. O. Street; Flt. Lt. A. Valenta (Czech. in the R.A.F.); F/O. G. W. Walenn; Sqn. Ldr. J. E. A. Williams; Flt. Lt. J. F. Williams.

Royal Canadian Air Force (6):—Ft. Lt. H. Birkland; F/O. G. A. Kidler; Flt. Lt. P. W. Langford; Flt. Lt. G. E. McGill; Flt. Lt. J. C. Wernham; Flt. Lt. G. W. Wiley.

Royal Australian Air Force (3):—Sqn. Ldr. J. Catanach; W/O. A. H. Hake; Flt. Lt. R. V. Kierath.

Royal New Zealand Air Force (2):—Ft. Lt. A. G. Christensen; F/O. P. R. J. Pohe.

South African Air Force (3):—Lt. J. S. Gouws; 2nd Lt. F. C. A. N. McGarr; Lt. R. J. Stevens.

A.T.A. BENEVOLENT FUND

SINCE our last statement appeared this fund has been enriched by a donation of £1,000 from the British Service Charities Committee, which has brought the total of outside contributions to £9,724 7s. 1d. up to May 12th.

	£	s.	d.
Already acknowledged	8,677	3	7
Subscriptions by A.T.A. and B.O.A.C. members	2,775	17	1
British Service Charities Committee	1,000	0	0
Morrisons Aircraft Services	19	10	0
Essex Aero, Ltd.	10	10	0
Messrs. Easterbrook Allcard	5	5	0
F. C. Lunn	5	0	0
Websters Metal Works, Ltd.	3	3	0
Vickers-Armstrongs, Ltd.	1	14	6
Airwork General Trading Co., Ltd.	1	1	0
Anonymous	1	0	0

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EVEN I CAN UNDERSTAND—20.

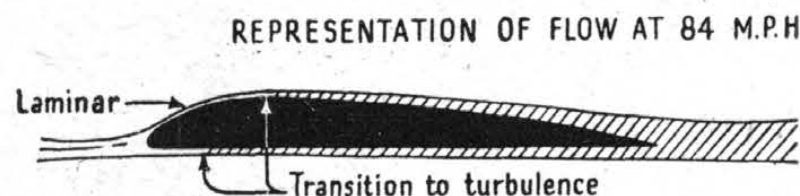
Q. What is boundary layer?

A. In former notes it has been shown that lift and propulsion are obtained by intentionally setting masses of air in motion with wing and propeller. In doing this a loss has to be taken represented by the energy left in the residual air movements, but the object of sustaining and propelling the aeroplane has been achieved.

Another loss has to be considered—the Profile Drag—which covers that caused by skin friction and eddies. Unlike the induced drag which is the payment incurred for getting the lift, the Profile Drag is wholly wasteful and is relatively large in amount.

The fluid which is in contact with a surface may be said to stick to it as can be seen on a dusty aeroplane wing or a motor car, but at a very small distance out it will be streaming past at full speed. There is thus a layer of fluid which graduates from zero speed at the surface to full air speed a little way out. This is called the Boundary Layer and is the seat of the Profile Drag. Much mathematical and experimental work has been expended on this subject since Froude (ship resistance) and Tower (bearing friction) made their important contributions in the middle of last century to the knowledge of the laws of fluid friction.

It was early found that the conditions in the boundary layer were not simple, and that there are two different kinds of flow in the boundary layer—laminar and turbulent—the friction due to laminar flow being very much less than that due to turbulence and with a smaller rate of increase as speed is increased. The two names describe the types of flow well enough. In laminar flow each layer of fluid slides smoothly over the next—like treacle slowly flowing past a smooth object. In turbulent flow the layer is full of little eddies which ride over a very thin laminar sub-layer.



From measurements on full scale by Stüper Adapted from Melville Jones on "Profile Drag"—Journal R. Ae. Soc.

Fig. 1

Laminar flow only occurs when the surface and the air being met are both smooth. It will also only occur when the speed is low or the surface short. It is sensitive—a little roughness at the leading-edge will convert it to turbulent flow. An unfavourable pressure gradient along the chord—i.e. pressure increasing (and therefore speed decreasing, see No. 17) as the chord is traversed which happens quite early with an ordinary wing section—will do the same.

If laminar flow could be preserved right across the chord the profile drag might be something like 1/5th of the turbulent or ordinary value. Attempts are being made with more or less success to design wing sections in which the change from falling pressure and rising speed to the opposite takes place further aft of the chord. With a smooth surface the transition point to turbulent flow will then be encouraged to move in the same direction with beneficial effect on the drag.

It is very difficult to get much laminar flow at high speeds or on long surfaces. In any given medium, say air at ground level, speed multiplied by length of chord, or Vx , is a criterion of similarity, so that doubling the chord and halving the speed gives the same kind of flow and drag coefficient. To cope with, say, high-altitude air, or water, or other medium, Vx has to be multiplied by the ratio of

the density to viscosity of the medium, the viscosity being the resistance to shearing of the fluid. The result is then called the Reynolds Number and is a criterion which can be applied to any size of object in any medium.

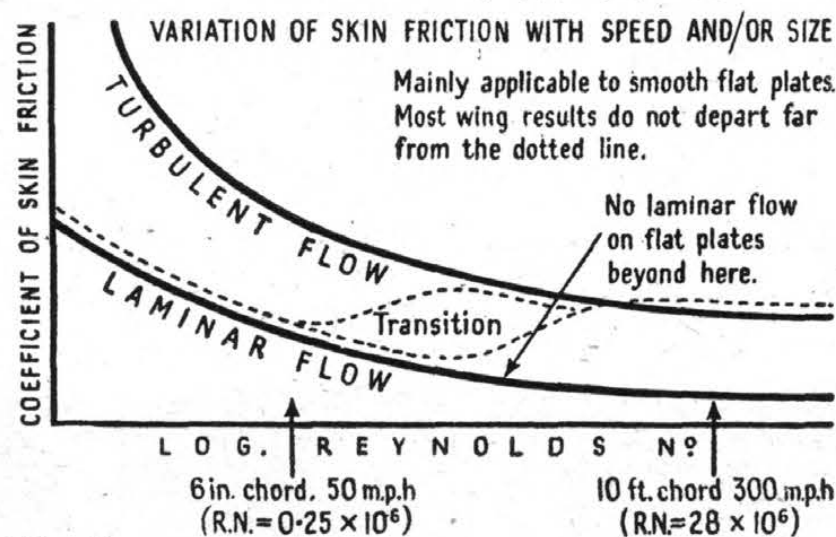


Fig. 2

Numerous experiments have shown that a lower resistance coefficient may be used as the Reynolds Number (or Vx in any given medium) increases, that laminar flow is more easily obtained at low R. numbers and that there is an unstable region where either flow may predominate—a region which has sometimes affected model tests in the past. It is easier to get laminar flow where the speed is increasing—and pressure therefore decreasing—as on the arched leading portion of a wing and with smooth surfaces it seems possible to get this portion laminar even at very high speeds. Both types of layer are getting thicker as they travel aft and the laminar layer cannot persist beyond a certain thickness (in relation to its density/viscosity ratio). The laminar layer completely separates from the surface more easily than the turbulent and it has been possible in certain cases, such as a wing at high incidence, actually to reduce drag by converting the layer to turbulence by means of a projection near the front which delays separation.

To give a rough idea of the thickness of these layers at cruising speed on a 10 ft. chord the laminar layer would

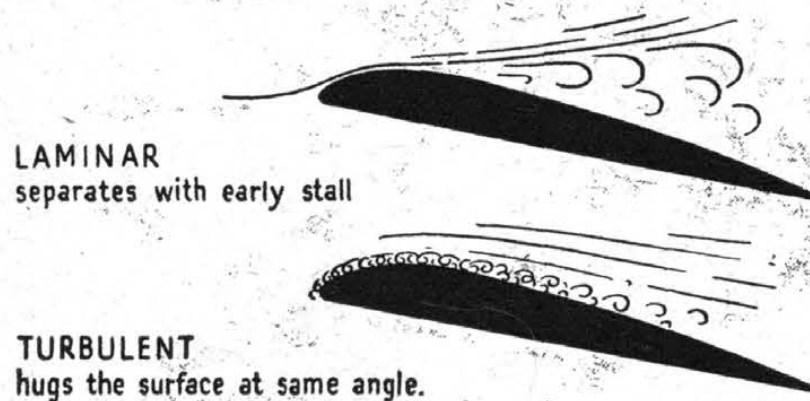


Fig. 3

remain less than, say, 1/10th inch up to the transition point while the turbulent layer might reach 2 inches thick at the trailing-edge.

An important point is that roughness of the wing surface will add to the drag only when the roughnesses are large enough to stick up through the laminar or sub-laminar layers. This, however, leaves the permissible height of the roughnesses exceedingly small on fast aeroplanes, particularly near the leading-edge where the boundary layer is very thin.

The drag of a modern aeroplane consists to such a considerable extent of skin friction that a great advance in performance would be secured if it were possible to have mainly laminar flow over it.

This is one of a series of articles on technicalities sponsored by The de Havilland Aircraft Co., Ltd., in the belief that they will prove of interest and use to students and others in the Services and the aircraft industry.

PERFECT CO-ORDINATION . . .

Not far below is a special objective—a factory—a very important factory. Partly hidden in a forest, a true picture of the location of its buildings can only be obtained by fairly close up shots. It's a terribly risky job getting those pictures—just part of the preliminary work which is only completed when that factory is reduced to a splintered smoking ruin.

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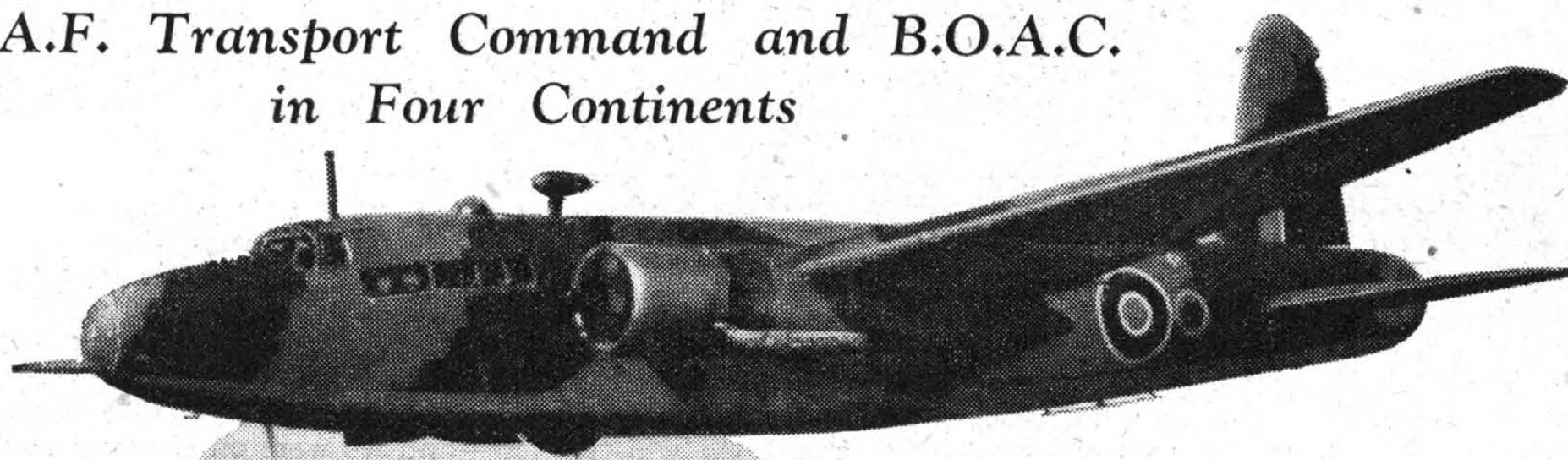
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Britain's Overseas Air Services

Diary of a 26,000-miles Wartime Tour :
R.A.F. Transport Command and B.O.A.C.
in Four Continents



The Vickers-Armstrongs Warwick which is in service with B.O.A.C. and the R.A.F. Transport Command.

By EDWARD C. BOWYER

SIX weeks before my date of departure on a tour which was to take me into four continents, across both Atlantics, and over a total distance equal in length to the Equator, Royal Air Force Transport Command headquarters produced an itinerary planned to carry me from London back to London in thirty days.

At the bottom of the document was printed the following "Important Notice":—Owing to frequent change of timetable at short notice it is recommended that the day and time of departure for the next stage should be ascertained at each point of arrival.

Wise advice, indeed. I thought back on various incidents which had interrupted my flying journeys during the years of peace, and privately decided that I would be lucky to be back in two months.

In the upshot, the itinerary won through. I was back in London on the thirty-fifth day—and three of those days were consumed by unserviceability at Montreal of the transatlantic machine. During my absence I flew on twenty days, on some of them only for a small part of the day. Four times I flew all through the night. The total distance flown was 25,600 miles, and total flying time (take-off to touch-down) was 144½ hours, making an average speed in the air of 177.5 m.p.h.

In war conditions, such speed and certainty of travel is impressive, reflecting great credit on Royal Air Force Transport Command and the British Overseas Airways Corporation, who between them carried me for 23,600 miles. For the remaining 2,000 miles I flew with United States Army Air Transport Command—a brief experience which

nevertheless provided thought for comparison and contrast.

Not least impressive is the evident scope for acceleration of my schedule, by use of some or all of the fifteen days which were spent on the ground and the coming into service generally of faster and longer-range aircraft. Assuming that the haste were justified or necessary, it will certainly be possible ten years hence to complete a similar journey in less than a fortnight.

Longer flying hours will become more bearable with improved comfort for passengers. Wartime does not encourage luxury—which one does not expect—and a stern atmosphere of austerity was breathed for most of the trip. On reference to the log I find that I travelled nearly 10,000 miles either sitting or lying on the floor, or, as in the South

Atlantic ferry, on a shelf above the bomb-bay. In such circumstances long hauls become trying, and the noise inside the aircraft, which are virtually stripped of internal padding of furnishings, adds considerably to fatigue. Ventilation is also uncertain in converted bombers.

These three drawbacks of wartime flying were particularly noticeable on the longest sustained flight of the journey—6,450 miles from West Africa to the Bahamas, accomplished in 38½ elapsed hours, including

two nights' flying. Such conditions will not afflict the post-war traveller. They must be accepted for the time being as inseparable from war, though Transport Command and the Corporation are constantly engaged on improvement of the accommodation. South Atlantic and North Atlantic ferry aircraft are being fitted with seats as supplies and labour become available, and the ventilation—in particular the heating—now supplied on the northern

THE AUTHOR

MR. BOWYER is Chief of the Information Department, Society of British Aircraft Constructors. He has held that position since 1930, when he left the world of Fleet Street journalism to organise the Information Department, which conducted a world-wide news service on behalf of the British aircraft industry till the outbreak of war. During Sir Charles Bruce-Gardner's tenure of office as Chairman of the Society, Mr. Bowyer was his Principal Assistant, and last year, when Sir Charles was appointed Controller of Labour Allocation and Supply at the Ministry of Aircraft Production, Mr. Bowyer was promoted to joint responsibility for the chief executive work of the Society.

The present series of articles, however, are not to be read as statements by the Society. They embody the author's personal views and experiences only.

run marks a great amelioration of the truly Arctic conditions in which the crossing was made in the early days of the service.

I flew in seven different types of aircraft—three British and four American. Type mileages were approximately as follows: Vickers-Armstrongs Warwick, 2,530 miles; Short "C" Class, 5,800 miles; D.H., 89,340 miles; Douglas C.54, 2,030 miles; Douglas C.47 (Dakota), 4,900 miles; Lockheed Hudson, 300 miles; Consolidated Liberator, 9,600 miles. In British aircraft, 8,700 miles; in American, 16,830 miles. The Liberator, as the type engaged on the long transatlantic hauls, tops the type mileage.

In many ways, there was advantage in making the journey during the northern winter. Even West Africa was bearable; the Harmattan wind, which was blowing, reduced visibility but dried the air and Lagos was not the customary Turkish bath for the newly arrived traveller. Experienced flyers will not be surprised to learn that the roughest trip of the journey was the first hop over southern England from Wiltshire to the airfield in the far south-west, whence we began the night flight to Gibraltar. We dodged a terrific storm in Northern Brazil, and experienced some icing on the North Atlantic crossing. Otherwise, the journey was free from weather worries.

Shear Luck!

Aircraft troubles were few. Difficulty in engine starting once or twice, a leaking oil cooler, and then a variety of servicing troubles at Montreal—these were all. At one stage, a nasty-looking crack in the port engine cowling called for earnest examination and discussion every half hour or so, but it did not develop. Certainly the luckiest occurrence of the trip was when Captain Norman Williams, skipper of the Liberator *Gremlin's Grandpappy*, decided to dodge a storm lying immediately on our normal course over Brazil by turning 30 degrees starboard, which took us nearer the coast and out of the turbulence. When the aircraft was serviced at Nassau, the mechanics found that scores of rivets had sheared in the outer wing section, and that some of the main panels were attached most tenuously. As the

flight-sergeant said to me: "A good thing you didn't run into any rough weather."

The story of the journey itself is best told in extracts from my personal diary. I shall try to choose the highlights only, and where details are lacking—even perhaps the precise locality uncertain—that must be attributed to the demands of security.

When one lives in the heart of London the most enthralling journey must begin prosaically. It was bleak and dark in Grosvenor Street at 08.00 on January 8th, and not a hope of a taxi-cab. Wearing a heavy greatcoat, and carrying a bulging parachute bag, I walked to the nearest bus stop in Oxford Street. An R.T.O. at Pad-

dington put me in the train, with eleven other Transport Command passengers. A few minutes after nine o'clock the whistle blew—and we were on the way to Wiltshire.

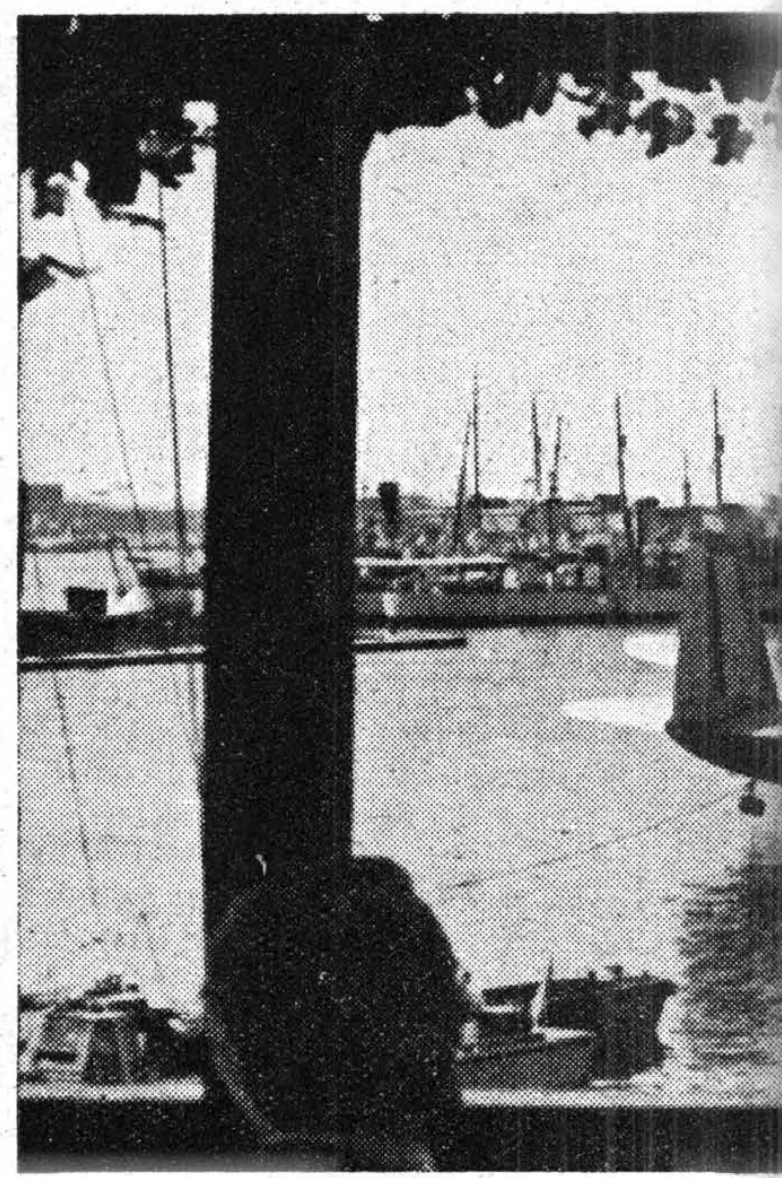
In spite of smooth and efficient handling, and the inherent stability of the Warwick, the journey westwards from Wiltshire was exceptionally rough. Heavy cloud, wind and rain, and the need to fly low contributed to the discomfort of several unaccustomed passengers. At the Cornish airfield we were instructed in the proper use of Mae Wests and parachutes, issued with flying clothing, and taken into a comfortable Royal Air Force mess in which to pass the time till just after midnight.

January 9th.—A moonlit flight south over the Bay of Biscay, and the Atlantic well west of the Iberian peninsula. A cold and bitter night, but clear, and without cloud cover. We flew completely blacked out—a wise precaution. At dawn the cloud-banks were piling up to the south-west and south. The Rock was at hand, and we dawdled till daylight should make our identification easy and sure. Anti-aircraft guns of ships in convoy are controlled by men with light trigger fingers.

An "aircraft carrier" landing—that is the impression of alighting in the shadow of the Rock. The runway is literally carved out just below the mountain, and has the sea at either end. A smooth descent, after several circles while the runway cleared. An austerity breakfast of the bleakest sort, and we were to be off again eastwards.

A leaking port-side oil cooler decided otherwise. Three

BRITAIN'S OVERSEAS AIR SERVICES (Cont.)



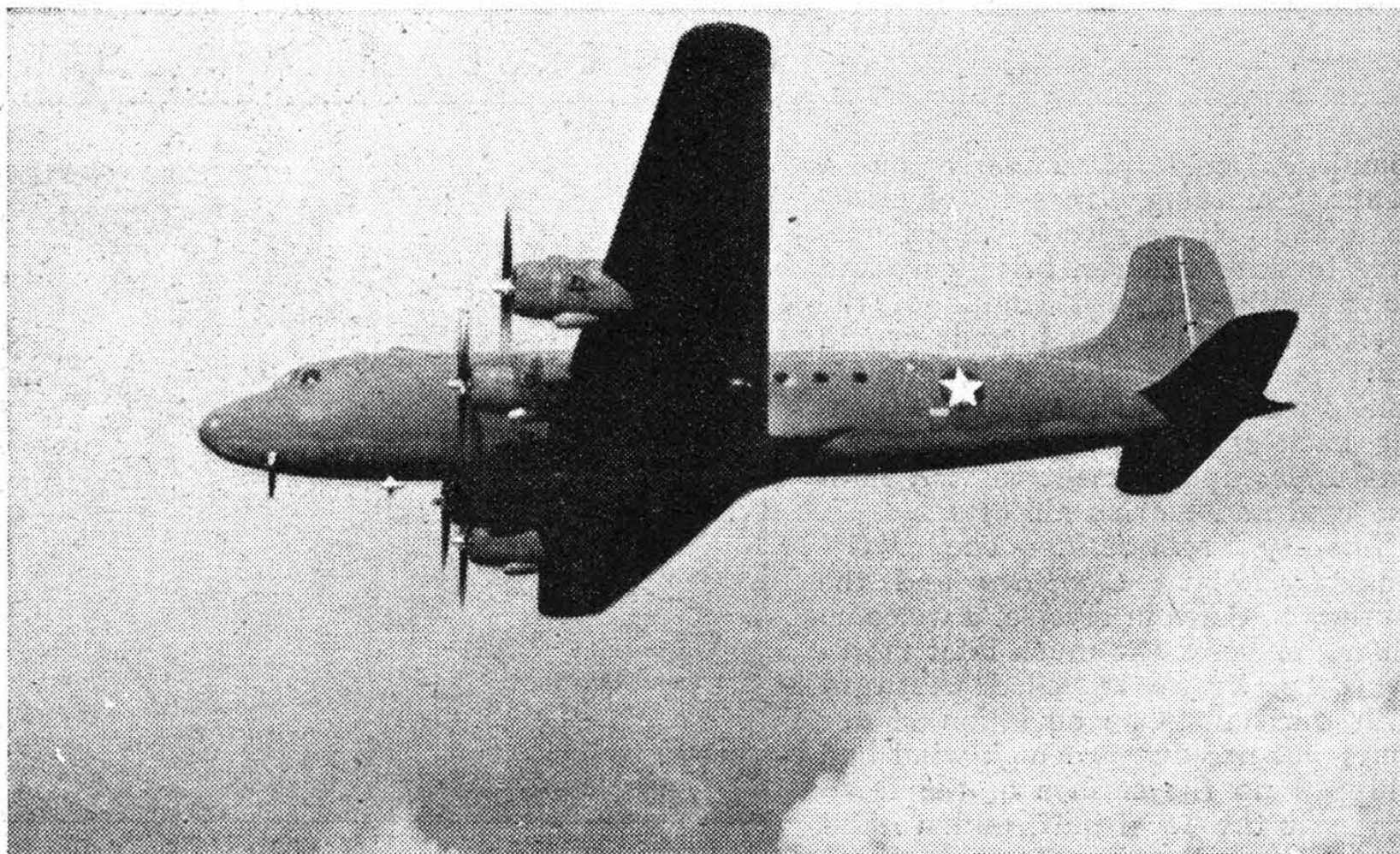
The absence of cross-bracing in the geodetic construction of the fuselage makes the Vickers-Armstrongs Warwick particularly adaptable to a passenger aircraft. It enables a good streamline form to be used in a most efficient manner.

hours elapsed before a spare had been discovered and installed, and we landed near Algiers just as dusk was thickening.

The Warwick is a highly efficient aircraft, and its crew spoke admiringly of its performance. Its maximum economic cruising speed is impressive, and takes only 630 h.p. from each of the Pratt and Whitney 1,850 h.p. engines.

January 10th.—An American day in the air. The Douglas C54 (four Pratt and Whitney 1,350 h.p. engines) is a commodious and exceptionally smooth-running aircraft, with 28 comfortable, though not fully-adjustable, seats, and plenty of room. Normal cruising speed is approximately 200 m.p.h.—probably the minimum which is necessary for post-war operation on main-line routes. Again we travelled in the bright moonlight on the long haul from Tunis to Cairo. The aircraft was not blacked out, in sharp distinction to the British insistence on black-out flying all the way to Cairo. Undoubtedly the British method is the more conducive to peace of mind. The thought of a possible Ju88 on long-range Mediterranean reconnaissance was never far from one's mind. A glimpse of the "Green Belt" and the Pyramids, and down at Cairo soon after midnight.

January 12th.—I was called long before dawn for embarkation in the well-remembered and well-liked Empire boat. What a difference from the peacetime craft! For war the *Cordelia* and her sisters have partially stripped cabins. The seats, including side bench seats where the promenade outlook used to be, now number 29



Known for military transport purposes as the Skymaster, the Douglas D.C.4 is in service with the U.S.A.A.F. Transport Command. The engines are four 1,350 h.p. Pratt and Whitney Twin Wasps.

against the pre-war maximum of 18. Pay-load has gone up to more than 8,000 lb., with all-up weight 43,500 lb.

Nevertheless, here, within measurable distance, is pre-war flying comfort. The excellent adjustable seats, the efforts of the purser to cater to the travellers' needs, the ready and prompt attention at all halts—these may be expected to go far to compensate for the numerous ascents and descents and the wretchedly early calls in the excellent hotels along the route. Figures quoted to me show what a magnificent wartime job these veterans are doing. Each is flying on an average more than a million miles a year.

January 13th.—Airborne from the Euphrates at Basra just after 04.00. It was exceptionally cold, and for some hours I wore my thickest clothes, a greatcoat, two blankets, pullover and gloves. A long but interesting day's flying, with three intermediate halts, closed with a magnificent view from a low height of the astonishing and weird formations of the Baluch coast, and a warm welcome at Karachi from the B.O.A.C. staff.

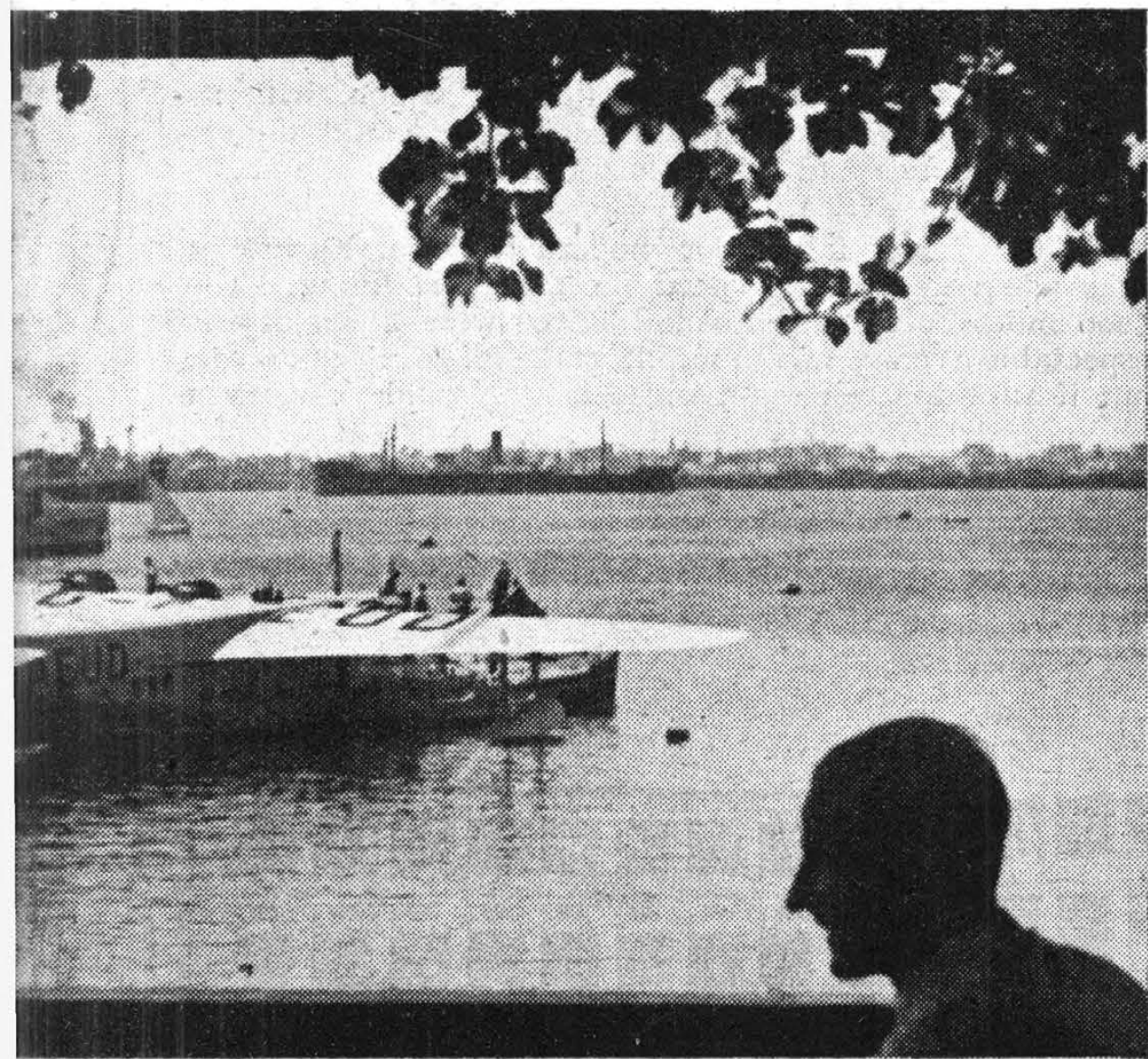
Censorship Precautions

A well-founded worry over my documents—the censorship at Karachi is among the world's strictest—was soon dissipated on landing. However, travellers to India should expect trouble, and prepare against it by carrying the smallest possible number of documents, and by arranging for those they *must* carry to be sealed by competent authority before they reach the port of entry.

January 14th.—Another very early start. By this time it was clear that the slogan "spend every night in a comfortable hotel" was a little misleading; in fact, on the eastward run the traveller never gets time to spend more than a third of the night in a comfortable hotel before the pre-dawn awakening knock on the door. Part of the solution is the use of much faster and longer-range aircraft, while the flying-boats, which need launches for refuelling and must tie up to moorings for that process and for disembarkation of passengers, undoubtedly need much more time than a landplane, which can taxi up into position before the disembarkation office immediately on touching down.

Comfort disappeared with arrival at Gwalior. The 130 miles to Delhi were traversed on the floor of a ropey Hudson of R.A.F. Transport Command. The Command's welcome at the capital, however, more than compensated for the trip.

January 17th.—Willingdon airport, Delhi, is a con-



One of the earlier Short "C." Class boats, *Cordelia*, in which the author flew from Cairo to Gwalior, first went into service with Imperial Airways on Oct. 15th, 1937.

BRITAIN'S OVERSEAS AIR SERVICES

foundedly cold place early on a January morning. In spite of great-coats and pullovers we found it necessary to walk and run briskly up and down while the port engine of the Warwick decided whether it would start or not. Lunch at Jodhpur's splendid State Hotel, and in the evening back again at Karachi, where I was under appointment to visit both the land and marine airports.

January 19th-20th.—The "C" class flying-boat *Cleopatra* and the journey to Cairo in reverse, a welcome difference being the much later morning calls, as we travelled westward with the sun. One deviation of our route was necessary; a high wind had whipped up the surface of the Dead Sea near the usual halt, and we had to get down at a smoother place some 90 miles farther south. One minor result—no lunch.

January 24th.—Almaza airport, Cairo, on a cool dark morning, and the aircraft—a Douglas C.47 (Dakota)—a black mass on the tarmac. Four passengers only for the run to West Africa—three Arabs and myself.

Cairo to Lagos

I had had the opportunity of taking the more picturesque flying-boat run by way of the central African lakes and the Congo, but the time element—and my exigent schedule—obliged me to choose the quick two-day journey to Lagos by Dakota. Undoubtedly this semi-martial version of the DC.3 is an excellent transport aircraft. Even the stripping of most of the interior furnishings has not made it unduly noisy. There are 21 seats, 16 of them with adjustable head-rests. For the non-stop flight to Khartoum 650 gallons of fuel—20 gallons less than the maximum—had been put into the tanks. Our all-up weight was approximately 27,000 lb., which is the gross loading adopted by B.O.A.C. for African operation. As the maximum permissible landing weight is 26,000 lb., we had excellent one-engine performance at all times—a very reasonable and admirable equality.

One night halt (El Geneina) was unexpectedly attractive. The evening was hot, but not humid, and I was told there was good hunting right up to the airfield boundaries, including big game. With every sympathy for airport personnel marooned so far from home, I had already seen many worse places, and the contented atmosphere



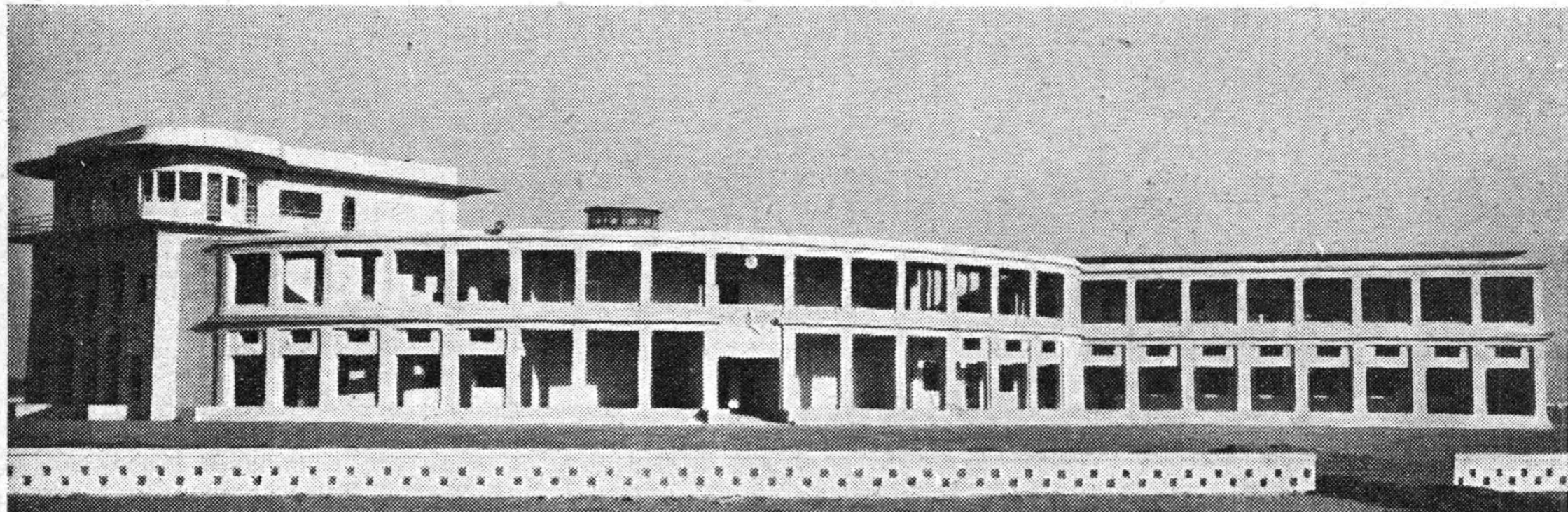
An air view of Basra airport showing the proximity of the flying boat alighting area on the Euphrates to the airfield.

among B.O.A.C., Royal Air Force and American personnel was evident.

January 25th.—Visibility at Maiduguri was said to be only 200 yards, because the Harmattan was blowing. This hot dry wind from the north causes a curious milky opalescence of the air which resembles mist, but is not typically damp. Its advantage is that it dries the air, and the humidity which is the main drawback of West Africa is greatly mitigated. The captain was prepared, therefore, to by-pass Maiduguri and fly non-stop 950 miles to Kano. In fact, the air had cleared and there was a thousand yards' vision in every direction at Maiduguri, where accordingly we set down to pick up two passengers for the run to Lagos.

In spite of the dry wind the descent at Lagos resembled arrival in a steamy bathroom—at least for a traveller making his first visit. For the first time since leaving England my greatcoat seemed entirely redundant; it was, indeed, the subject of good-humoured if ribald comment on the way to the B.O.A.C. rest-house, which, with its all-enclosing exterior mosquito netting, splendid dining-room, bar lounge and other amenities is one of the show-places of West Africa.

The C.47 must fall under modern criticism because it lacks adequate cruising speed for main-line flying. The 3,200 miles between Cairo and Lagos were flown at the respectable average of 156 m.p.h. (take-off to touch-down), but, if anything, we were helped by the wind. (Later in



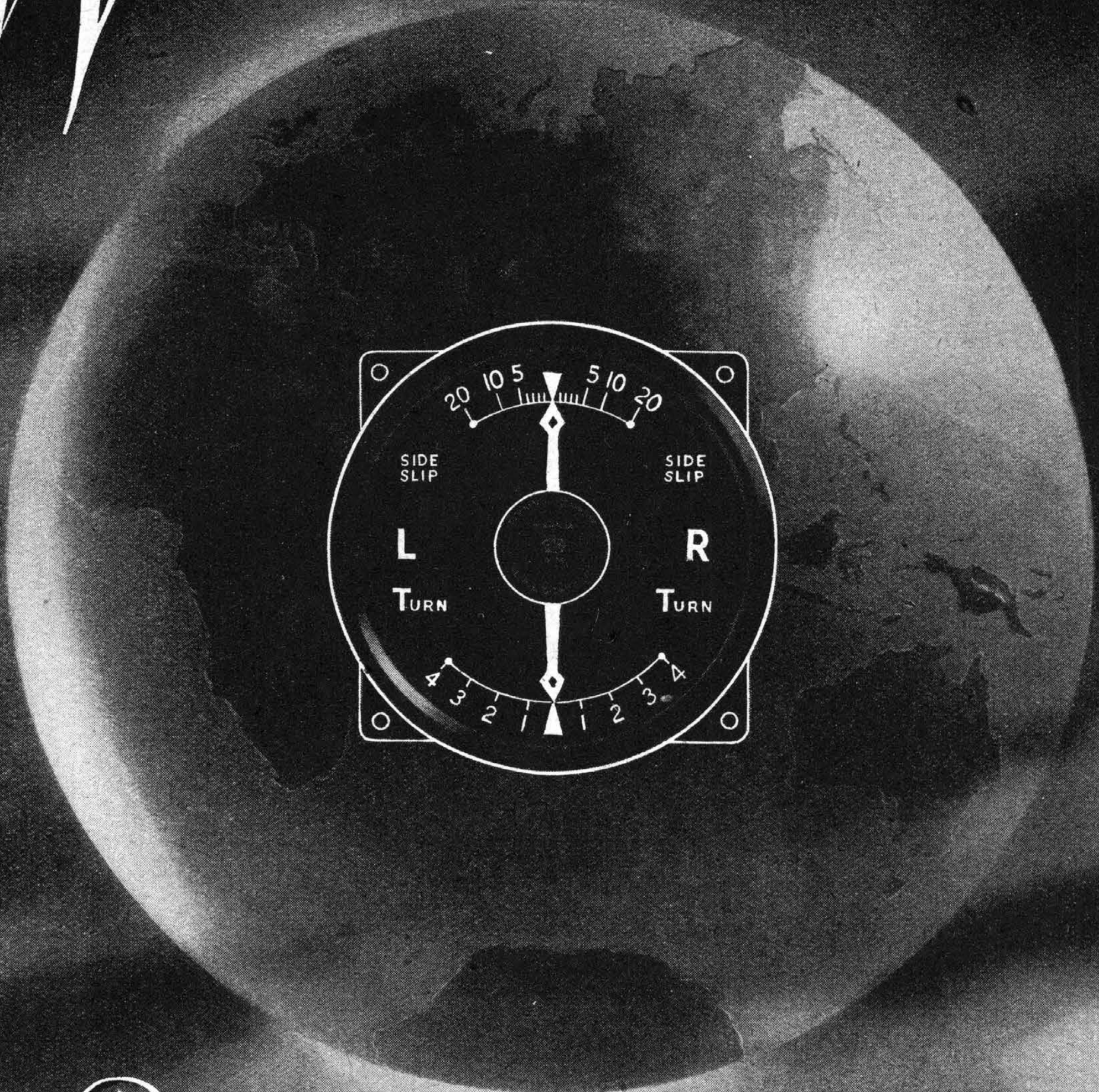
The imposing airport buildings at Karachi. It is here that censorship regulations are very strict.



Cheetah Engines

are operating for 1,200 hours between overhauls—a flying distance of 150,000 miles, equivalent to six times round the world.

WHEREVER MEN FLY



Reid & Sigrist

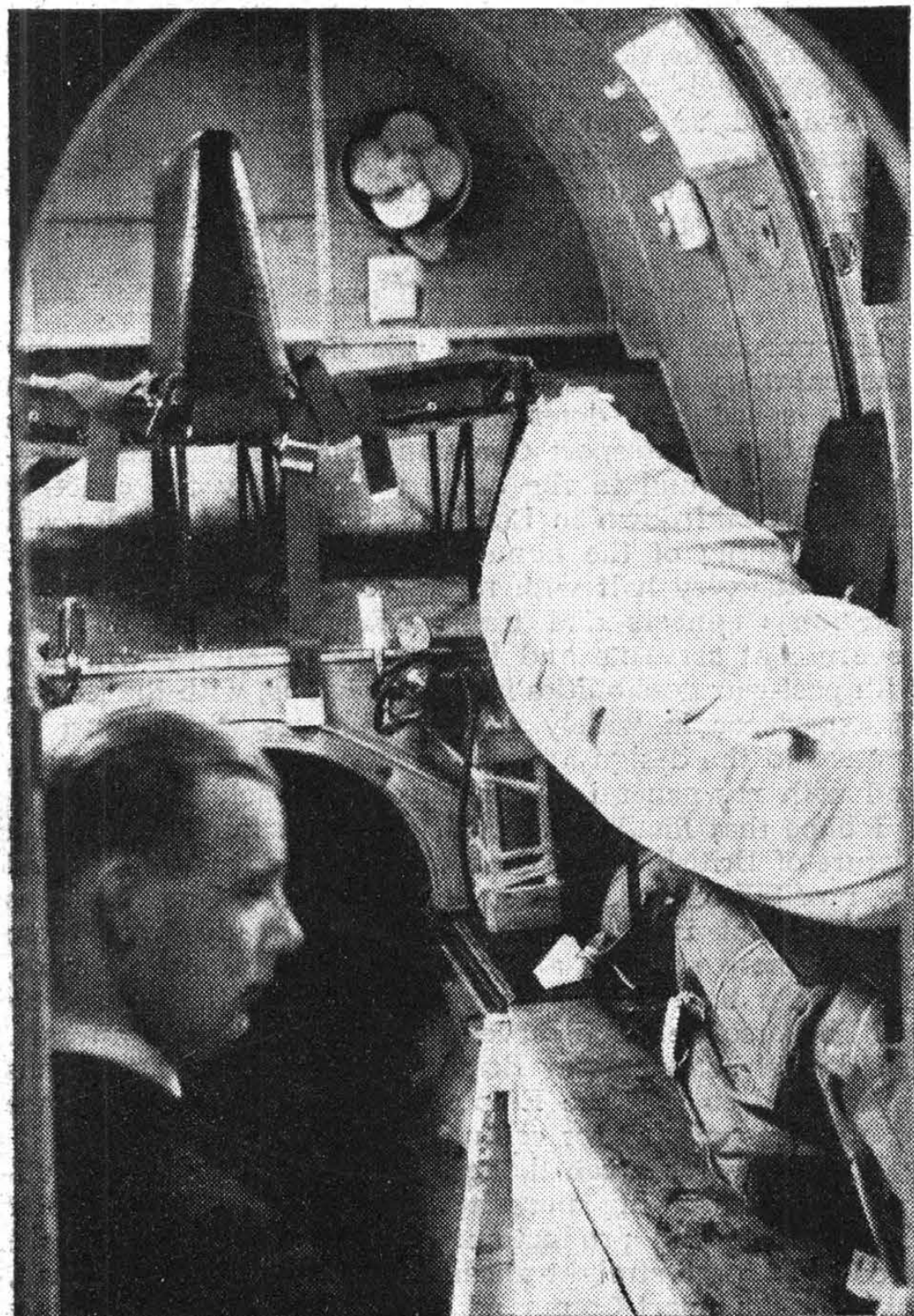
FINE PRECISION INSTRUMENTS

BRITAIN'S OVERSEAS AIR SERVICES

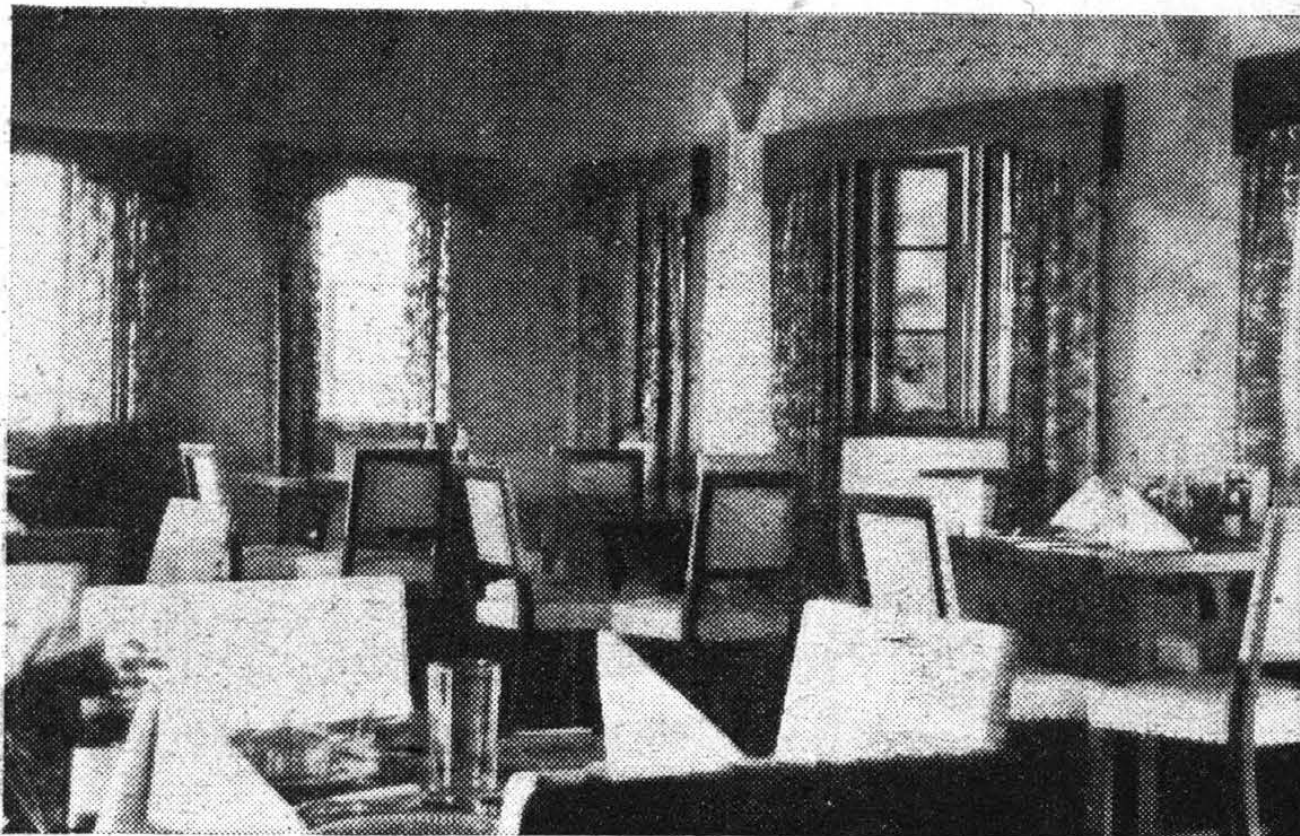
my journey, in the United States, the headwinds forced an unscheduled night halt which would have been avoided by a machine capable of cruising as fast as does the Warwick.)

January 26th.—A comparatively short (250 miles), hot and exceedingly sticky run to Accra, in a Transport Command C.47 fitted with side-bench seats. Accra station was deserted by most of the senior personnel. A station funeral was in progress. The previous night a C.54 of the American A.T.C. had crashed immediately after take-off for the South Atlantic crossing, and everybody on board had been killed. The engines were found some 150 yards from the main planes. There were the usual eye-witness stories about the aircraft being seen on fire in the air, but I could get no official confirmation of it, and when I left Accra the cause of the accident was still unknown. How far we have yet to go to secure 100 per cent. safety in aircraft operation!

January 27th.—No journeying, so I put in an hour in a Marauder, piloted most efficiently by a Royal Air Force squadron leader. I had heard—who has not?—much of the terrifying attributes of this aircraft, and welcomed the chance to estimate them for myself. At the end of the trip I was convinced that the Marauder has been maligned—at least, when flown light and expertly. Undoubtedly the approach speed is unusually high, and the pilot has a great deal to do in the last few seconds before touching down. But the controls appeared positive and



Passenger accommodation in the Liberators on the Transatlantic service from Montreal to Britain.



The restaurant in the British Overseas Airways rest house at Lagos on the West African coast.

sure at all speeds, and the expected long run on landing did not materialise. Deliberately and by agreement, the pilot did not touch the brakes after contact with the runway till nearly all speed had been lost. The process took less than 1,000 yards. There was no wind.

January 28th-29th.—My longest, fastest and most arduous flight since my first airline journey in 1921 began fifteen minutes after midnight. Liberator FK240, *Gremelin's Grandpappy*, was 48 hours late on the westward run. Early the previous afternoon the captain had asked me if I would mind the swiftest possible flight through to Nassau. I had examined my ambitious itinerary, had ascertained that I was 24 hours late myself, and had agreed to the high-speed run, without further thought. (The regret was to come later.)

In the "Bridal Suite"

Eighteen passengers were on board. There were side seats in the aft portion of the fuselage, a few bunks in the bomb-bay, and a shelf—usually known as the Bridal Suite—above the bomb-bay. The nuptial compartment, as providing the most "comfortable" accommodation, was assigned to me, the only civilian passenger—with three Canadian air crew officers in close and sometimes embarrassing contiguity.

Our cruising height for most of the transatlantic run and onwards was about 10,000ft., at which the Liberator settled down to cruising at an indicated 172 m.p.h., manifold pressure 30½ in., and 2,100 r.p.m.

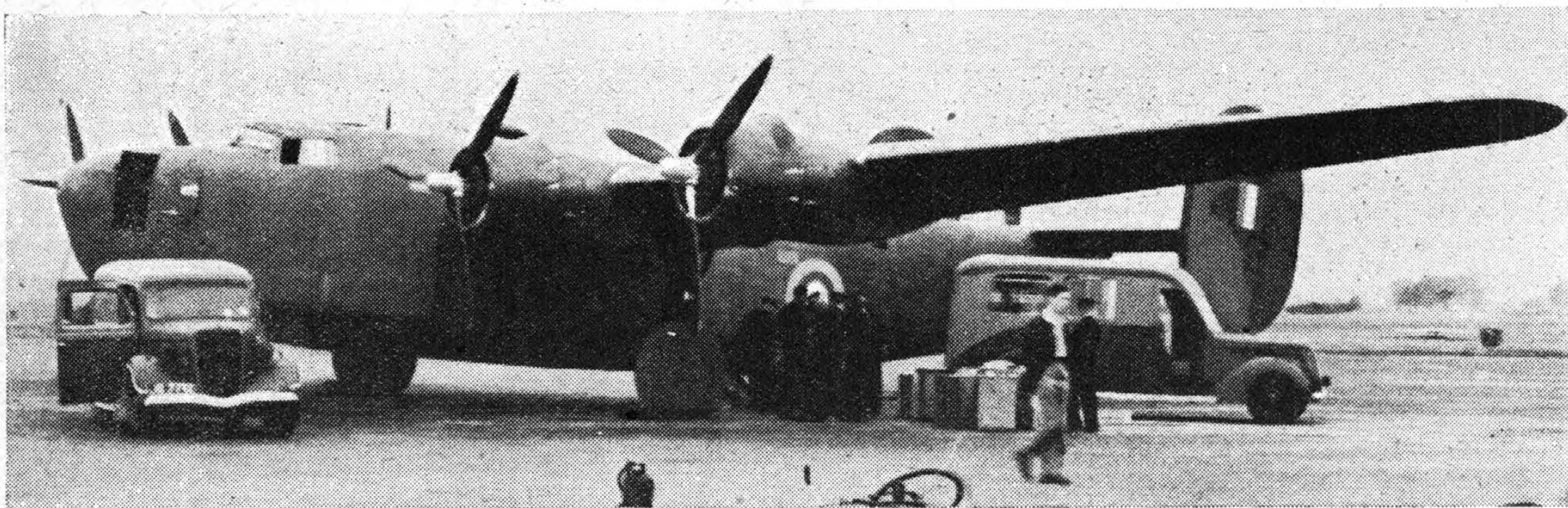
We made four halts on the way to Nassau, averaging little more than an hour at each. My chief recollection is of the incredible jungle around the Amazon—hundreds of miles without a break in the appalling pullulation of green growth below. Aircraft which are forced down here are rarely found. They are swallowed up by the trees and undergrowth, and cannot be seen even from a low height.

The landing at the fine new Windsor field, Nassau, was made at 9.40 in the morning, local time. I had had a wretched night's flying, due to a bitter and untraceable draught which invaded my side of the Bridal Suite and chilled me through.

The 6,450 miles from West Africa to the Bahamas had occupied 38½ hours' elapsed time. Average flying speed was 192.5 m.p.h., and average speed overall, including all halts, 167.5 m.p.h. One has only to think back a very few years to a time when such a journey would have made the world's headlines; it is now a commonplace.

February 1st.—Back to the C.47 for the flight to Montreal, but with a difference. Royal Air Force Transport Command loads the aircraft to 31,000 lb. in the kindlier atmospheric conditions of the Bahamas and the eastern

BRITAIN'S OVERSEAS AIR SERVICES



A Transatlantic Liberator being unloaded after a direct flight from Montreal to Britain.

United States, as compared with Africa. Navigation is simplified by use of the United States "continental" airline radio ranges, but a stiff head wind forced an unscheduled alighting to refuel, and a night spent in North Carolina.

February 2nd.—Montreal just after lunch. Here is one of the lungs of Transport Command—a chief point of departure on the North Atlantic Ferry and reinforcements delivery runs, and the home of a large and well-equipped servicing and repair installation. It is the headquarters of the Command in the Western Hemisphere, with jurisdiction over the North Atlantic and South Atlantic Wings and group units elsewhere. Its passenger list now totals in the thousands monthly, with tens of tons of mails and many hundreds of tons of freight—in addition to the control of delivery of combat aircraft over the Atlantic.

The weather contrast to West Africa and the warm and sparkling Bahamas was striking. Snow lay deep everywhere, and the morning temperature, I was told, was around 10 to 12 deg. below zero. Not cold by Canadian standards, but I was again glad of the heavy greatcoat.

February 10th.—Our transatlantic Liberator had behaved badly. She had gone through many servicing troubles, and circumstances did not help. Ready for a test flight one afternoon, she was kept with engines ticking over at the end of the runway for forty-five minutes because "delivery" aircraft were congesting the airfield. The result was as expected: five hours had to be spent that evening changing every sparking plug.

Homeward Bound

Several times during four days we received the summons to attend the airport for take-off, only to be told later that the trip was cancelled. A hard and trying time for everybody—passengers, mechanics and airline officials!

Finally, with the engines running sweetly and everything in order, we left Montreal. It was half-past five in the afternoon and we were to fly non-stop to Scotland.

The aircraft, AL.614, had no seats and the twelve passengers were accommodated on mattresses on the floor. We had been provided with oxygen masks, flying suits, flying helmets and gloves. Warm air was admitted through vents in the main bulkhead, but it was not circulated, with the result that the air at the top of the fuselage got very hot, while on the floor the temperature stayed below freezing point till late the following morning.

A seasoned B.O.A.C. crew was in charge, and there was accordingly no need to worry. A steady climb to 12,000ft., and then a smooth run as far as the point of Newfoundland, where we climbed again and the oxygen supply was started. At 15,000ft. the aircraft levelled out for the ocean crossing. An hour after midnight we approached a

"front" which obliged us to climb to nearly 21,000ft., where we remained for about half an hour before gradually descending again to the 15,000ft. level.

Sleep was difficult, if not impossible. There is a risk of kinking the tube of the oxygen mask, which—if unnoticed by one's fellow passengers—may mean suffocation, while the condensation inside the mask trickles down between one's face and the mask and freezes on the outside of one's flying suit.

My arrival back in Great Britain coincided with a perfect Scottish day, with warm sunshine and a magnificent panorama of Scottish hills and lochs. We had made no record flight—just a trip of 3,150 miles from Montreal in 13½ hours. The skipper, I believe, was disappointed. He had estimated 12½ hours, but the possible "front" materialised, and put him 45 minutes out!

Censorship, security, medical officer, Customs, and lunch. A D.H.89 to take four of us back to London. For the first time, biplane wings and struts on either side.

Lessons to Come

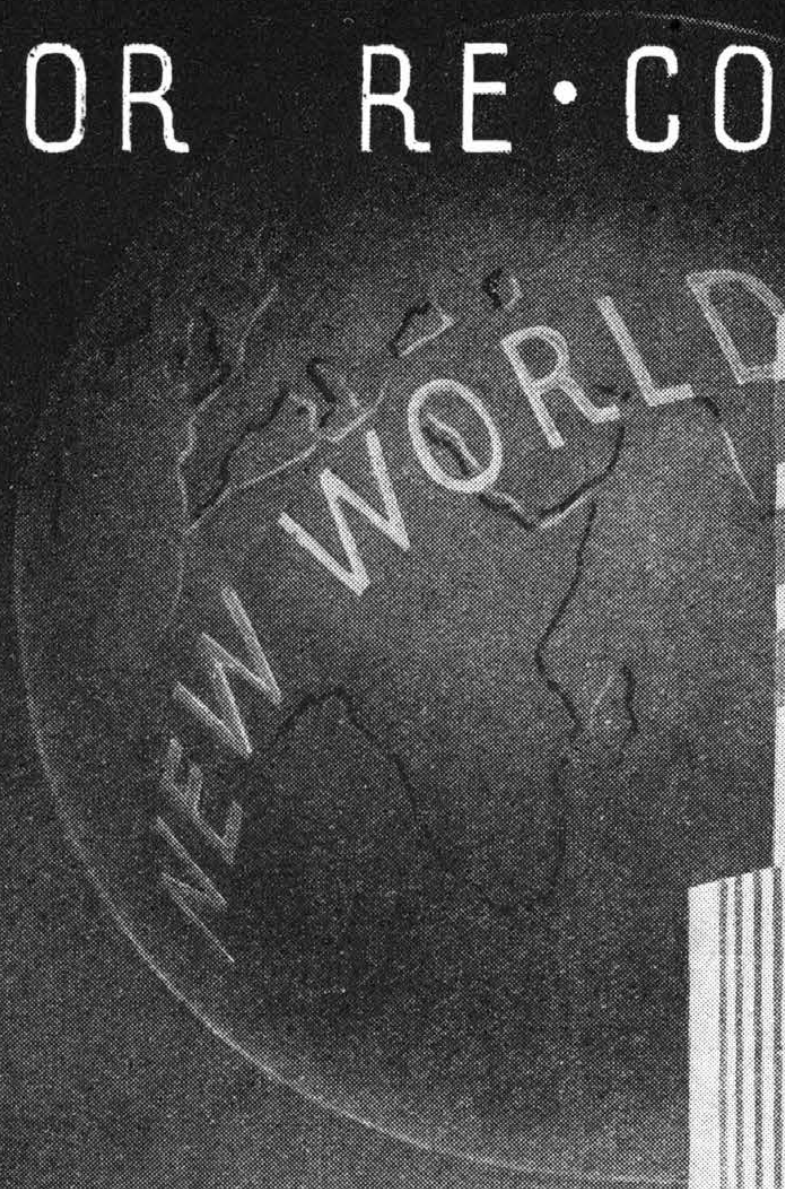
My purpose in quoting in this first article from my personal diary will be served if readers retain an impression of the speed and determination with which the whole organisation—Transport Command and British Airways—pushed me round in the effort to abide by the exacting time-table laid down in London. Subsequent articles will tell something of the numerous discussions which I conducted at every halt with responsible Command and Corporation engineers and traffic officials, as well as with government servants and industrialists. They will deal with post-war possibilities in many regions, with the lessons of experience in widely varying climates which must be applied to the design and construction of efficient aircraft, and with my general impressions and conclusions.

I hope that finally there will emerge a fair and truthful picture of British overseas air transport as it is to-day, and its possibilities of future development. One thing is obvious, but is often overlooked. Already from these islands there radiates an immense air transport network, flown over by British air crews, staffed on the ground by British personnel, and served partially by British aircraft. On that structure Great Britain and her sister Dominions must build so that the Empire assumes her rightful place in air transport, as for centuries at sea.

It will involve much thought and determination, including the unswerving pursuit of airliner and airfreighter development and production, but the way is clear. We need only forge straight ahead along lines now laid down, and the Transport Command and British Airways services of the present day will grow into a veritable world-wide system of interlocking airlines.

HYDULIGNUM

THE NEW CONSTRUCTION
FOR RE-CONSTRUCTION



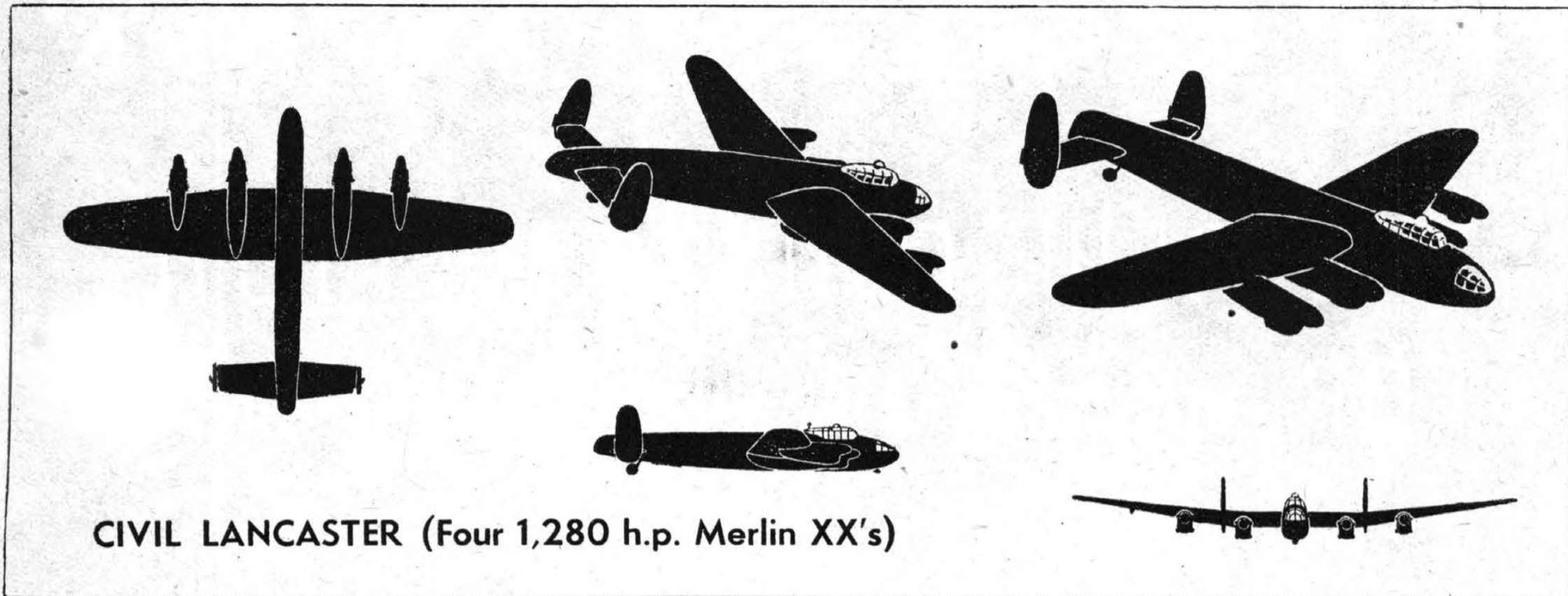
British Manufacture. INVENTED AND DEVELOPED BY

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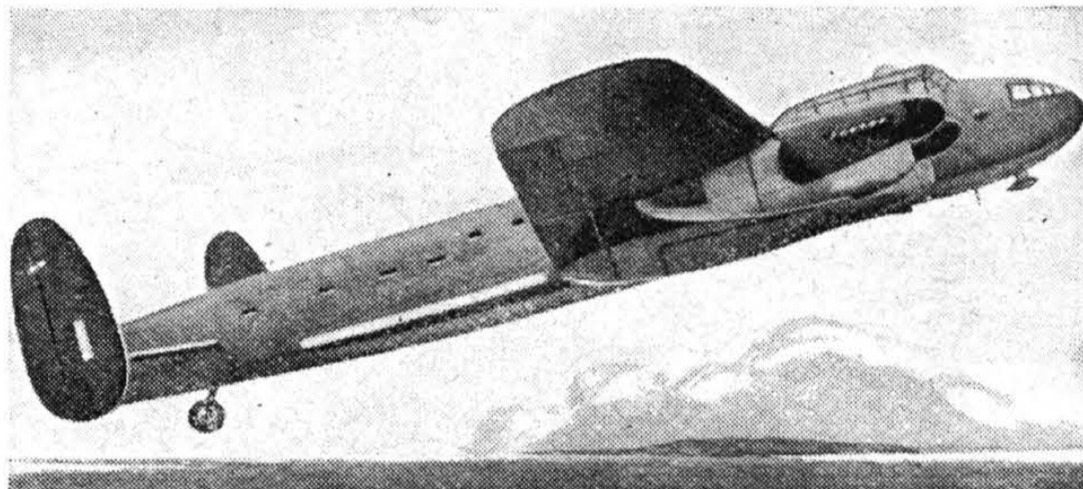
Studies in Recognition

Aircraft in Flight

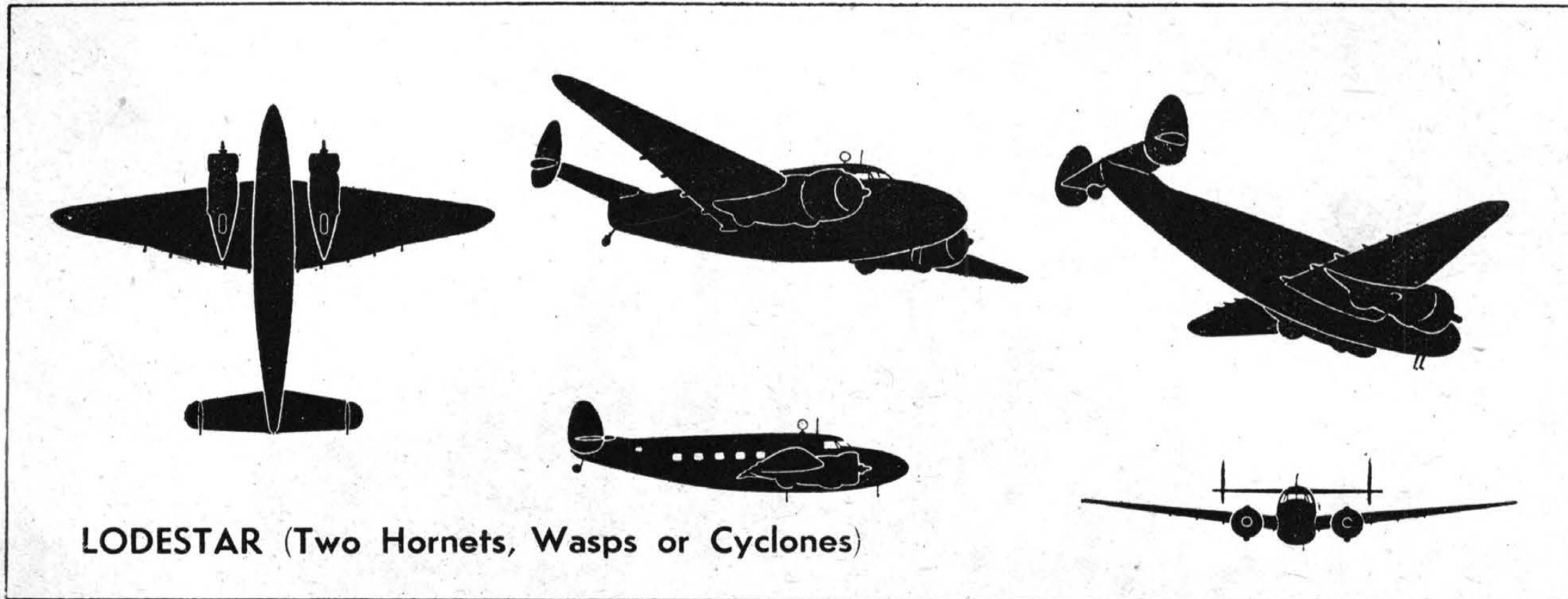


THE Avro Civil Lancaster is a transport version of the Lancaster I bomber, and differs from it only in having no military equipment. It must not be confused with the Avro York, which retains the Lancaster wing and engine assembly, but mounts it in the high position on an entirely different fuselage. Removal of the gun turrets gives the civil Lancaster a somewhat modified outline, especially to the nose, which is streamlined and has windows in its upper half. The rear extremity of the fuselage has been faired over with the disappearance of the tail turret, and the absence of the dorsal turret leaves a straight, smooth, top line. Several small windows have also been added to the sides of the fuselage.

Four 1,280 h.p. Rolls-Royce Merlin XX engines are fitted, and top speed is about 296 m.p.h. The type is in service with T.C.A. for transatlantic mail and freight. Dimensions: Span, 102ft.; length, 69ft. 4in.; height, 20ft.; wing area, 1,300 sq. ft.



Avro Civil Lancaster.

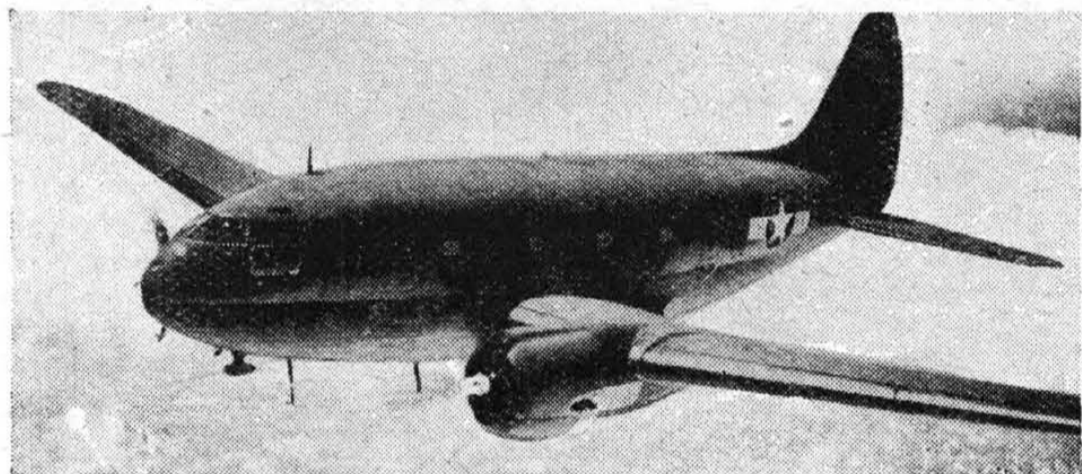
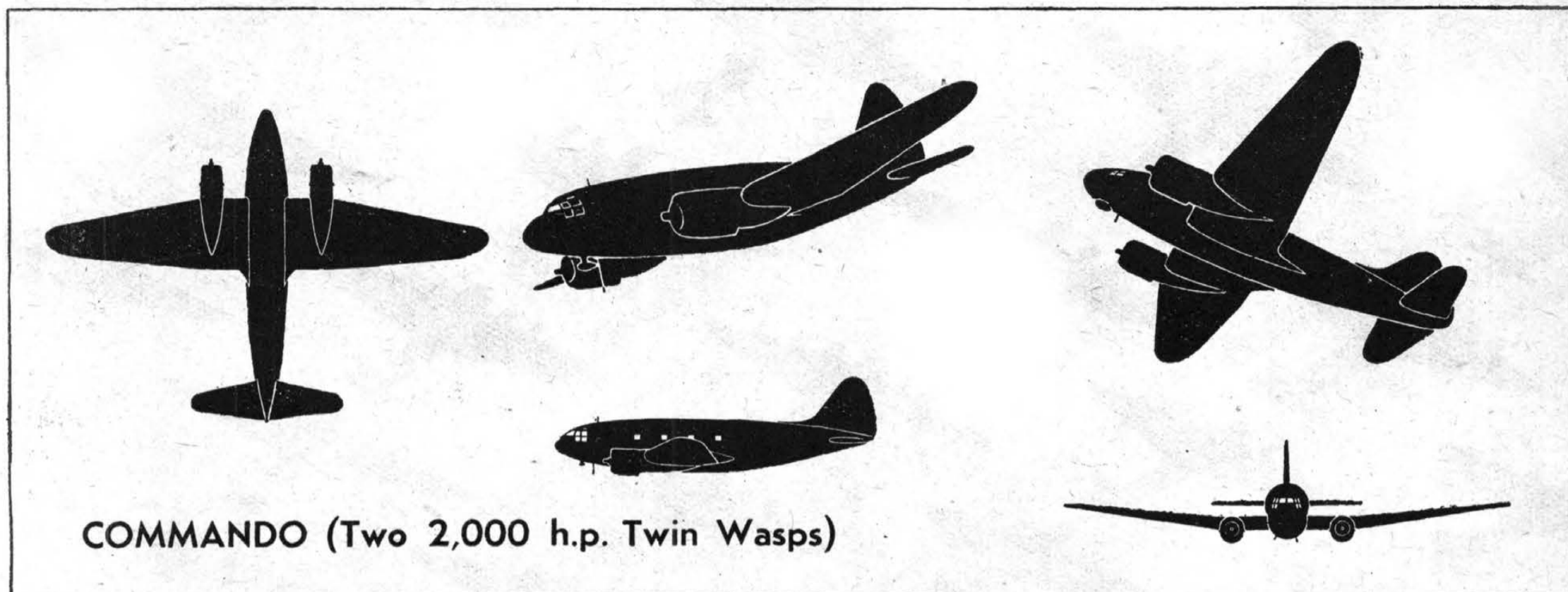


Lockheed Lodestar Transport.

THE Lockheed 18 "Lodestar," known in the U.S.A.A.F. as the C-56, -57, and -60, according to the duties for which it is equipped, and in the U.S. Navy as the R50-1, is the Service adaptation of the commercial transport and may be variously fitted with six different engines ranging from the 750 h.p. Pratt and Whitney Hornet to the 1,050 h.p. Twin Wasp or the 1,000 h.p. Wright Cyclone. Top speed varies between 236 m.p.h. and 277 m.p.h. according to the power units. Its duties include personnel and cargo carrying.

Recognition points are similar to the Ventura except for the obvious absence of armament. They include sharply tapered wings with dihedral from roots, and wide tailplane with egg-shaped twin fins and rudders set in from the round tips. Streamlined oval fuselage is deep and upswept at the tail. Dimensions: Span, 65ft. 6in.; length, 49ft. 10in.; height, 11ft. 11in.; wing area, 551 sq. ft.

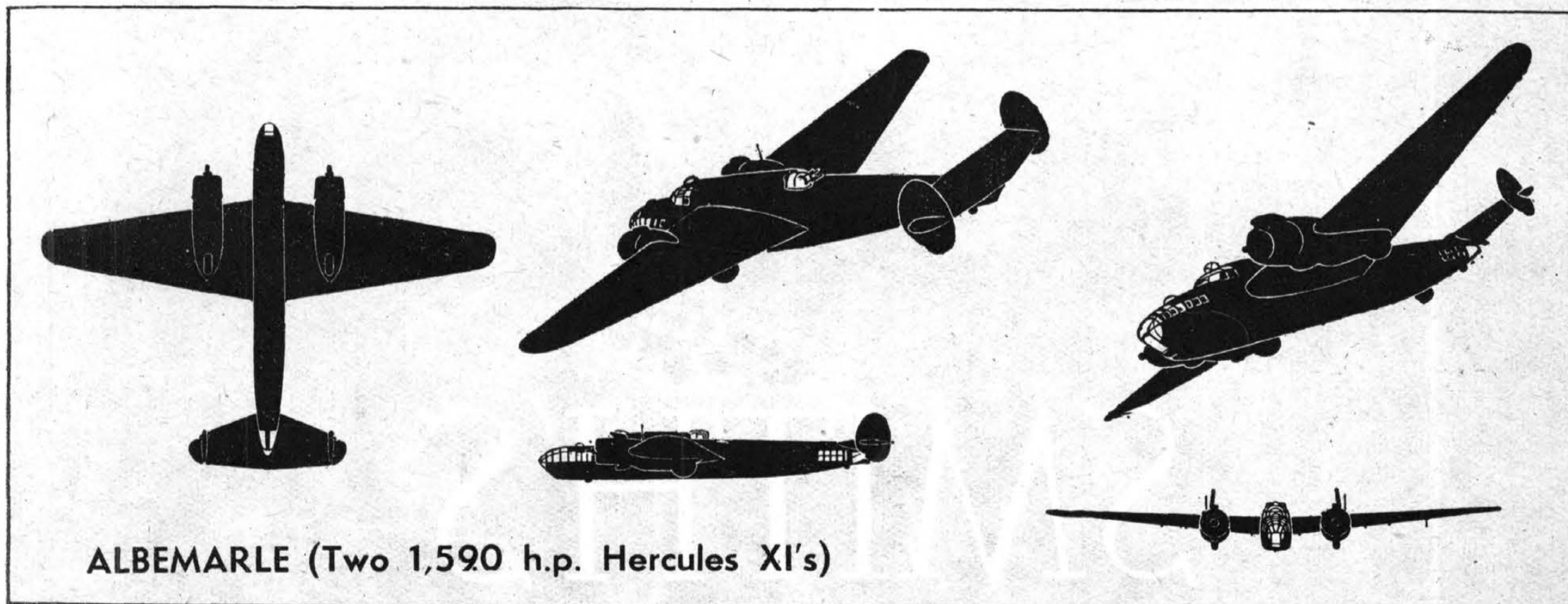
ving Attitudes



Curtiss Commando Transport.

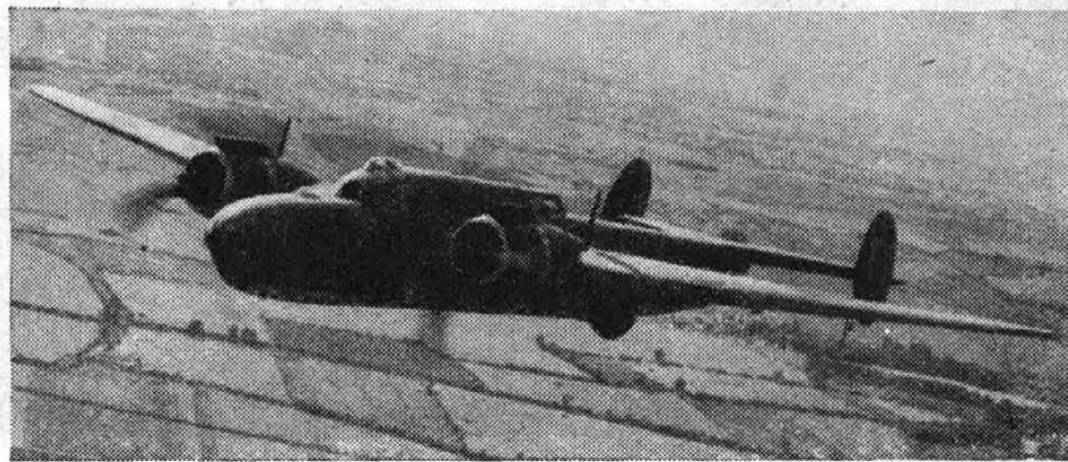
TROOP-CARRYING and cargo version of the Curtiss Wright CW-20 commercial 36-seater airliner, the Curtiss Commando, C-46, is powered by a pair of 2,000 h.p. 18-cylinder Pratt and Whitney Twin Wasp engines and can accommodate about forty fully equipped men or their cargo equivalent. Numbers of these aircraft are in service with the U.S.A.A.F. Transport Command.

The biggest twin-engined landplane in the world, the Commando can be recognised by its large but beautifully streamlined fuselage, even the front screen and windows of the cockpit being faired flush into the lines of the nose. The low mid-wing has a flat rectangular centre-section and backswept leading edge to the outer panels; the tailplane tapers symmetrically, and the large single fin and rudder has a curved trailing edge and small dorsal fillet. Dimensions: Span, 108ft.; length, 76ft. 4in.; height, 22ft.; wing area, 1,360 sq. ft.

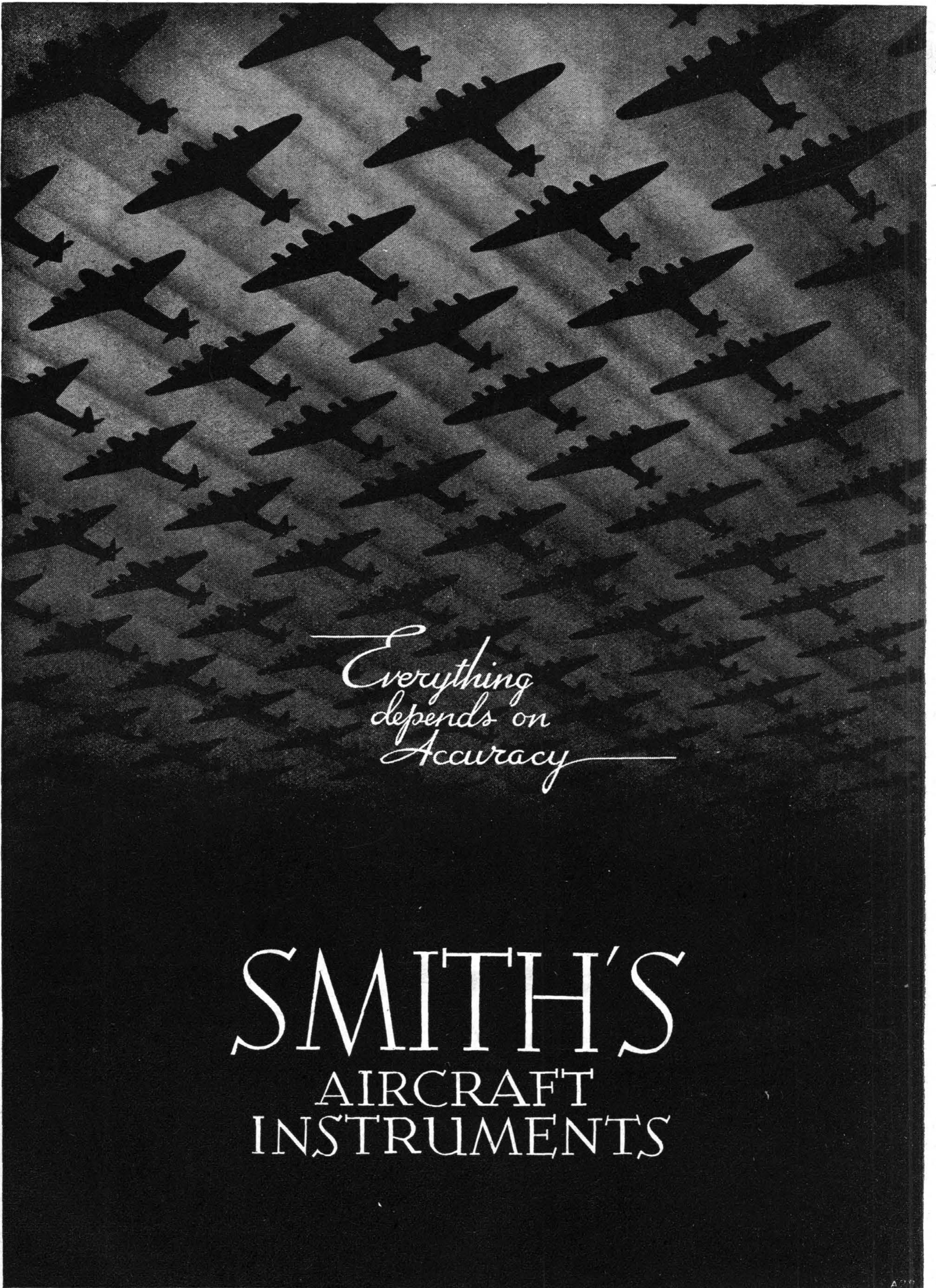


THE heaviest and only operational British aircraft fitted with a tricycle undercarriage, the Armstrong-Whitworth Albemarle was originally designed as a reconnaissance bomber, but was modified into a transport and its four-gun dorsal turret replaced by a hand-operated two-gun installation covered by a sliding hood. Its chief duty to-day is that of glider tug. Power is supplied by two 1,590 h.p. Bristol Hercules XI sleeve-valve engines, and top speed is more than 250 m.p.h.

Recognition points include an almost completely glazed nose, glazing near tail, and a reduced section aft of the dorsal gun position or turret (when retained); mid wings symmetrically tapered to small round tips; low aspect-ratio tailplanes sharply backswept on leading edge, and twin egg-shaped fins and rudders inset from round tips. Dimensions: Span, 77ft.; length, 59ft. 11in.; height, 15ft. 7in.; wing area, 803.5 sq. ft.



Armstrong-Whitworth Albemarle Transport.



*Everything
depends on
Accuracy*

SMITH'S
AIRCRAFT
INSTRUMENTS

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

The Me 210-R

SPANISH reports based on German sources say that the new version of the Me 210, the *Luftwaffe's* interceptor fighter, heavily armoured and equipped with long-range rocket-firing equipment, is designated Me 210-R.

Lufthansa Takes Over

GERMAN air courier traffic over Sweden between Norway and Finland is to cease by the end of this month as result of an agreement recently concluded between Germany and Sweden.

This traffic will be replaced by a service between Oslo and Björneborg, for which a concession has been granted to the *Lufthansa*. There will be one aircraft a day each way, with no intermediate landing in Sweden. The agreement also bans all passengers in uniform on these aircraft.

Preserving Strength

THE Berlin correspondent of the Stockholm newspaper *Aftonbladet* reported that Gen. Galland, who is apparently in charge of the fighter defences of Germany, has ordered his fighter force to avoid engagements with Allied fighters and to concentrate entirely on bombers.

"The Germans call the present Allied air tactics 'fleabite and hammerblow' since the Allies first send waves of fighters whose task is to engage German fighters, thus enabling the bombers to reach their objectives. Hence Gen. Galland's order," the correspondent added.

A Neutral Report

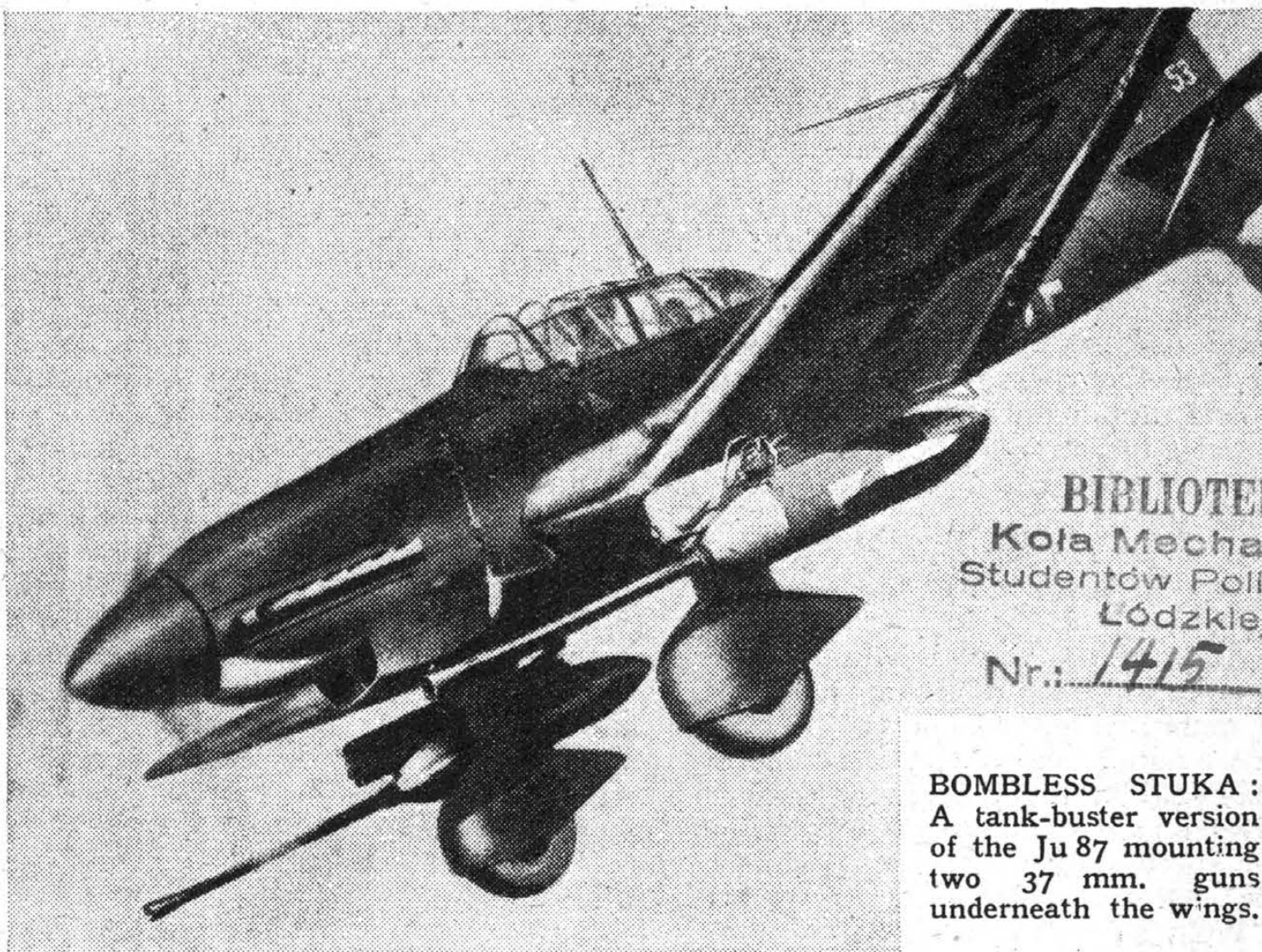
GERMANY'S aircraft production does not exceed 1,500 aircraft a month, according to the Swiss *St. Gallen Tageblatt* in a leading article on the *Luftwaffe's* strength.

The paper states:—

"Hitler ordered Professor Albert Speer, Minister of Armaments and Munitions, to quadruple production and give fighters priority. Panzer priority and even U-boat priority were therefore cancelled, but Speer never succeeded in more than doubling output for a few weeks, after which output declined.

"Air raids have hitherto cost Germany practically the total loss of over 20 main *Luftwaffe* production centres. They were transplanted piecemeal to the Polish Protectorate, Budapest, Belgrade and Prague. Moreover, factories making irreplaceable components have been repeatedly hit and bombing has caused whole chains of other factories to wait in vain for parts.

"In addition, matters have been complicated by personal quarrels be-



BOMBLESS STUKA:
A tank-buster version of the Ju 87 mounting two 37 mm. guns underneath the wings.

tween Messerschmitt and Heinkel. Messerschmitt possessed a monopoly and Heinkel were not allowed to produce better fighters than the current Messerschmitt types.

"Then, again, Goering neglected to form a maintenance corps of first-class engineers and the erection of repair shops able to cope with current work. In 1942, when Hitler was convinced that the *Wehrmacht* would beat the Russians, he made the irreparable mistake of transferring air personnel to the Army, and *Luftwaffe's* training centres were closed and the flow of new air crews was neglected. Petrol economy is a further deterrent in development of training.

For some time past the *Luftwaffe's* monthly losses have exceeded the monthly production. Airmen are so few that in Northern France—for example, at Lille, Roubaix and Courtrai, where 700 men are stationed—they are sent into action daily in and day out. Every expert knows what that means."

Rockets and Dive Bombers

A REPORT of a German correspondent gives this picture of the fighting in one sector of the Russian front:—

"German multiple rocket guns have appeared between the Carpathians and the Upper Dniester in massed formations never before seen in this war. Their effect is simply terrific. They literally pulverise their objectives. Heavy guns are being torn off their carriages some 30 yards from the actual point of impact and explosion. A thousand medium to heavy rocket guns firing make an indescribable bedlam.

"The gun crews lie in deep trenches behind their guns, which are fired by electric contact. The rockets swish off, leaving a fire trail for several hundred yards. Their trajectory is quicker than the velocity of sound, so that the roar of the firing actually follows the swish

of the rocket and the bang of its explosion. The Soviet counter-action is just as new as the German rocket gun tactics. They are bringing up masses of dive-bombers never before seen in close-combat support. These carry fragmentation bombs which explode in the air and scatter over a wide area."

Parachutists

LUFTWAFFE Gen. Student, Chief of German parachutist units, inspected formations of parachutists stationed at the Atlantic Wall and supervised their tactical exercises.

According to reports from Bratislava, the Slovak Army has formed a parachutist unit composed of volunteers, and now said to be 500 strong.

Large-scale manoeuvres were held on an airfield in Northern Italy by the newly formed parachutist division of the Italian Fascist Republican Army. According to Budapest Radio, these units are soon to be sent to the front in South Italy.

Lares

L.A.R.E.S. (Linile Aeriene Române Exploatate cu Statul), the Government-owned Rumanian air transport company, published the following summary of its activities in 1943: Aircraft kilometres 680,663 (673,629); Paying passengers 28,390 (43,416); Excess luggage 21,925 kg. (44,567); Mail 9,928 kg. (11,147).

Although no information is available as to regularity of services, etc., compared with the 1942 results (shown in brackets) a general reduction in the traffic volume can be noticed.

Lt. Gen. Scarlat Radulescu, of the Rumanian Air Force, is the Managing Director of the company, and I. Ceciasu its technical adviser.

HORACE SAYS . . .

By W. S. SHACKLETON

IN company with Horace, our Tame Stressman, we were watching the take-off of a 30-ton Lancaster.

You may have heard of our Horace. He is a triplet. One litter brother is an eminent Aviation Expert! The other holds up a high post in the Ministry of Labour and likewise does no work.

Mind you, we do not profess to understand things of that kind ourselves and therefore Horace was kindly explaining that the Lancaster is the military version of the Avro York.

And thinking of that, isn't it remarkable that when those gifted Lancastrians who designed the Lancaster decided to civilise it, they had to go to Yorkshire to find a suitable name for it!

It is, as Horace says: "What they do in Manchester to-day they will do in the rest of the world to-morrow—just as they did it in Yorkshire yesterday."

And, by the way, is not the Lancaster the only heavy bomber to be awarded in a recent competition 100 per cent. or more marks for being the best of its class in the world? If we remember rightly, the competition was held by Peter Masefield in the U.S.A., or somewhere, and marks were given on a very cunning points system—you know, so many for speed, bomb load, repairability, muzzle horse-power, etc. Or are we thinking of something quite different?

Well, as we were saying, we were watching the take-off of a 30-ton Lancaster and knowing nothing of these matters ourselves, we said to Horace, just as the wheels left the ground:

"Isn't it wonderful to think that the surface of the Earth has just been relieved of 30 tons of weight?"

And Horace said that were were talking sheer nonsense just like an Aviation Expert. He said that the 30 tons of weight had *not* been removed from the Earth's crust. Horace said that the Aviation Experts had always been the curse of the industry.

Built-in Headwinds

He said it had been the A.E.s who had proved—in the old days—that a biplane was better than a monoplane. Some of them indeed had proved mathematically that a biplane was twice as good, presumably because it had twice as many wings.

Then there was that famous Aviation Expert, M. A. Grobolkin, M.A. Horace always distrusted that man because he wore the same initials at both ends of his name. It was Grobolkin who proved, with the help of many brilliant assistants, that there is more volume *outside* an aircraft than *inside*. Therefore, argued Grobolkin, that was the logical place to hang all the accessories.

It will be remembered that the Grobolkin Special was described by Cy Caldwell as a "Built-in Head Wind." It was a successful attempt to design a monoplane with the same drag as a triplane.

Incidentally it was Grobolkin who invented rubber gloves for use with leaking fountain pens. And when that famous American aircraft designer, Bill Stout, expounded in his exquisite Olde English prose the three Aeronautical Virtues:—

1. "*Simplicate and add more lightness.*"

2. "*What you don't put into an airplane don't give no trouble.*"

3. "*An airplane must support itself financially in the air.*"

it was Grobolkin who replied with:—

4. "*A multiplicity of appurtenances portends portentous payloads.*"

Whatever that may mean!

It was just then that we broke in to ask Horace, our Stressman, why he said the ground had not been relieved of the Lancaster's weight when it had left it, and Horace said he would return to that later when he had finished with Aviation Experts. He said it was the A.E.s who had proved by means of diagrams and integration signs that a geared or even a counter-rotating airscrew made no difference to torque reaction. Surely you remember the correspondence?

Down-wind Dum-dums

And when Peter Masefield first invented "pursuit effect," which is the effectability of bullets fired up and down wind, those same fellows proved that it did not exist. But the air-gunners had known of this pursuit effect for some time and they, not being so mathematical and scientific as the Aviation Experts, had merely *known* it for a fact, whereas the Aviation Experts had *not* known it. So when Masefield first expounded his famous theorem, the A.E.s grinned with fiendish delight at his apparent simplicity and reached for their pens and slide-rules. Their scholarly articles provided comic relief for weeks.

Surely you remember the correspondence?

Years ago, Horace says, the Aviation Experts wrote about up-wind and down-wind turns, although most of them could not have made a turn in any pre-conceived direction. Then they had been dead against C.P. airscrews and retractable undercarriages. They had proved mathematically that they would not work and would be useless if they did. One of them had even obstructed the development of Gentlemen's Boudoirs on aircraft, recommending instead that the range should be cut down to 100 miles, which distance he explained would make things all right! Effect on payload would be cumulative.

Mind you, all this was long before the Aviation Experts proved that jet-propulsion engines press on the air and all that sort of thing in order to propel themselves forward.

Horace says that it is the *recoil* of a gun firing aft which helps an aircraft forward—not the air resistance of the bullet. But, mind you, that is only what Horace says.

And then Horace returned to the subject of Gentlemen's Boudoirs on aircraft which, he says, is a VIS (very important subject). He said that, speaking Historically, Anthony Fokker was the first man to design an aeronautical G.B. Also he was the first



. . . watching the take-off of a 30-ton Lancaster.

man to test one personally in flight. He performed this feat over New York, although why that great city should be selected for this signal honour must ever remain a burning question for Historians.

In any case, as we remember Anthony saying, the design was not an aerodynamic success. The airflow was in the wrong direction. This defect has also been noticed in certain Continental trains! And Horace said we must look to the design of these accessories in the Post-War World. If we do not do so, the Americans will beat us with a streamlined, air-conditioned, pressurised, plastic Gentlemen's Boudoir, fitted with tilting mirror, built-in electric shaver and endless towels, paper and liquid soap. A convenient press-button will operate the hydro-electric flushing system (pressure 10 kgs. per sq. cm.).

Mind you, we do not profess to understand things of that kind ourselves, so we reminded Horace that the 30-ton Lancaster had just taken off and that its weight had therefore been removed from the ground although he denied this most obvious of facts.

Inflexible Laws

And Horace said that we were still talking nonsense just like the Aviation Experts. He said it was the Aviation Experts who proved only a few years ago that the big aircraft was an impossible proposition. They said that the weight of an aircraft would increase as the cube and its wing area as the square of something or other, and that if you made a big machine it would have no payload and that if you made a still bigger one it would have no range either, and, indeed, would not require an Airworthiness Certificate at all.

"Now," said Horace, "all the Best People are going in for really big aircraft because they believe that is the way to get big range with high payload. It really is remarkable when you consider that all these Aviation Experts are still making quite good money, too!"

Well, as we were saying, we had just watched the take-off of a 30-ton Lancaster and we again reminded Horace that its weight had been removed from the Earth, and as he childishly denied this obvious fact would he kindly elucidate. And then Horace explained that the air we

breathe is really very heavy stuff indeed. He asked us how much we imagined a cubic mile of it would weigh and we said, "Oh! perhaps 15 or 20 ounces." And then Horace said that a cubic mile of air, as found on the beach at, say, Margate, on a fine, cold morning, would weigh no less than 5,000,000 (five million) tons! And he said that each square mile of the Earth's surface was supporting this colossal weight, and, indeed, very much more, and as the air was supporting any aircraft flying through it, the Earth was still carrying the Lancaster just the same. Of course, he said, the 30 tons wasn't concentrated on three points as it had been when the Lancaster was parked on the airfield but might by now be spread over an area the size of a county—say, Rutland or Yorkshire.

A Case of the Bird

We said we couldn't see this at all. So Horace said that if we put a closed bird-cage with a green linnet in it on some scales and weighed it, the weight of the ensemble would still be the same if the green linnet decided to leave its perch and hover for a short time. He said it need not necessarily be a *green* linnet or even a linnet at all. It would work with a canary or a bullfinch. He said it was just like that with an aircraft flying steadily through the atmosphere. It was reacting against the air and getting a dynamic lift, such as they say you get from some American cigarettes, and was producing a downwash, and finally the ground was still supporting it anyhow.

Of course, we do not profess to understand things of that kind ourselves, but if Horace is right, isn't it remarkable to think that when Bomber Command makes a big raid on Germany the weight on the Germans is increased by something like 30,000 tons!

We really must remember the weight of that cubic mile of air—5,000,000 tons! Horace says that a cubic mile is a very big volume indeed. He says that the total petroleum crude oil produced in the World up to 1942 is not equal to one cubic mile. And Horace says that the Earth contains very many cubic miles of matter. He says the figure is approximately $0.5236 \times 8,000^3$ cubic miles.

Now where were we? Oh, yes! We were watching the take-off of a —!

A.T.C. BOXING CHAMPIONSHIPS

THE Air Training Corps Boxing Association National Championships were held at the Royal Albert Hall on Monday, May 8th, and some 4,000 spectators were treated to a very fine exhibition.

There were 17 bouts in all, the first nine being devoted to juniors and the remaining eight to seniors, each individual fight being between Southern and Northern Champions. The *Flight* Cup for the Junior Midget-weight Championship was won by Cadet C. W. Booker, of 1061 (Southwark) Squadron, and was presented by Air Comdre A. D. Warrington-Morris, C.B., C.M.G., O.B.E.; in addition, Booker was awarded the "A. J. Elvin" Cup for the best performance in the finals. We must heartily endorse this award, for Booker held himself well, was collected and very cool, fought easily and cleanly and has, without doubt, a future in the ring.

The fighting throughout the evening was remarkable for the high standard of ring work shown, and although one or two contenders were warned by the referee for such things as holding, these were not frequent. There were no knock-outs, although once or twice the referees stopped a bout where one of the contenders was knocked groggy. One fight in particular, that between Cadet R. G. Hawkins (1825 Squadron, Finchley) and Cadet C. Free (969 Squadron, St. Helens) for the "Bailey" Cup, lasted only about 30 seconds. Hawkins dashed out of his corner and attacked his opponent in whirlwind fashion. We have never before seen such an intensive attack in the ring, and Free was knocked down and virtually out, the fight being stopped and awarded to Hawkins.

The first fight in the Senior Championships was heralded by a piper, who marched into the arena with a skirl and a swagger to pipe into battle Cadet Cpl. R. Muir (1174 Squadron, Edinburgh). Muir is the holder of the 1943 *Flight* Cup, and on this occasion he was fighting Cadet E. Collins (1060 Squadron, Southwark) for the "Lawley" Senior Flyweight Cup. Muir is a compact, red-headed little Scot, who fought with a good deal of humour; first his boot lacing came undone

and then, after having it retied, when it again came loose, he kicked the boot off and continued the fight in one boot and one sock. Collins, who fought coolly and had the advantage of longer reach, was the winner of the fight, and Muir, on hearing the decision, seemed so undismayed at his misfortune that one was all the sorrier he had lost.

A feature of the whole evening, which is as good a pointer to the British character exemplified by the youth of the country as could well be found, was that each loser received a louder ovation than the winner.

After each bout trophies were presented to the victors and prizes to the vanquished by such eminent people as Grp. Capt. the Duke of Hamilton, Air Comdre. the Most Hon. the Marquess of Londonderry, and the Director-General of the A.T.C., Air Marshal Sir Leslie Gorsage, whilst the Earl of Harewood presented his trophy to the London Command as being the Command gaining the highest number of points in the Championship Finals.

At the final award, the Director-General climbed into the ring and gave a short address.

ROCHESTER PLANS AHEAD

IN Rochester, centre of the Government-owned Short Brothers' aircraft network, a Full Employment Council for the district has been established to collect facts and proposals for providing work for all after the war. The management of Short Brothers is represented on the Council, together with factory owners, banks, local traders, the municipal authorities of Chatham, Rochester and Gillingham, and the engineering and other trade unions. Specialist committees will survey the existing and potential set-up of local industries and consider plans for their development. Since thousands of local workers found pre-war employment in the aircraft factories of the district, the maintenance of prosperity in the aircraft industry and its maximum expansion will be of the closest concern to the Employment Council.

Air Transport Charter?

The Claims for Fair Participation by European Nations in Future Air Traffic

By Z. CIOLKOSZ

THE author of this article is Director of the Aeronautical Department of the Polish Ministry of Commerce, Industry and Shipping. He is a well-known Polish technician and aircraft designer and has been closely connected with air development in his native Poland for nineteen years. Here he pleads the cause of the smaller nations and suggests bases upon which their claims to inclusion in the post-war air-line network might be founded.

PLANS for post-war civil aviation which hitherto have been made public deal with its organisational form and ignore the most vital problem—that of an equitable and reasonable division of the tasks, rights and obligations of the different nations of the world.

It is often suggested that if commercial aviation were to be wholly or even partially internationalised, this in itself would cure all troubles resulting from its present disrupted state and would remove so-called harmful competition. Alternatively, it is held by many that at least an international body should be set up, endowed with considerable authority and empowered to grant licences for air-line operation to aviation companies of national or mixed character.

All these plans, far-reaching as they are, do not suggest a basis for the just and proper participation of individual countries in Europe and elsewhere. Consequently, as the moment approaches for the final shaping of the coming organisation of the world's air traffic, it is per-

tinent to ask what should be the qualification (in the legal sense of the term) of those who seek entry into the air community of the world. Furthermore, if an international organisation is to be created, there must be a basis on which the needs of all nations, small or large, can be fairly assessed.

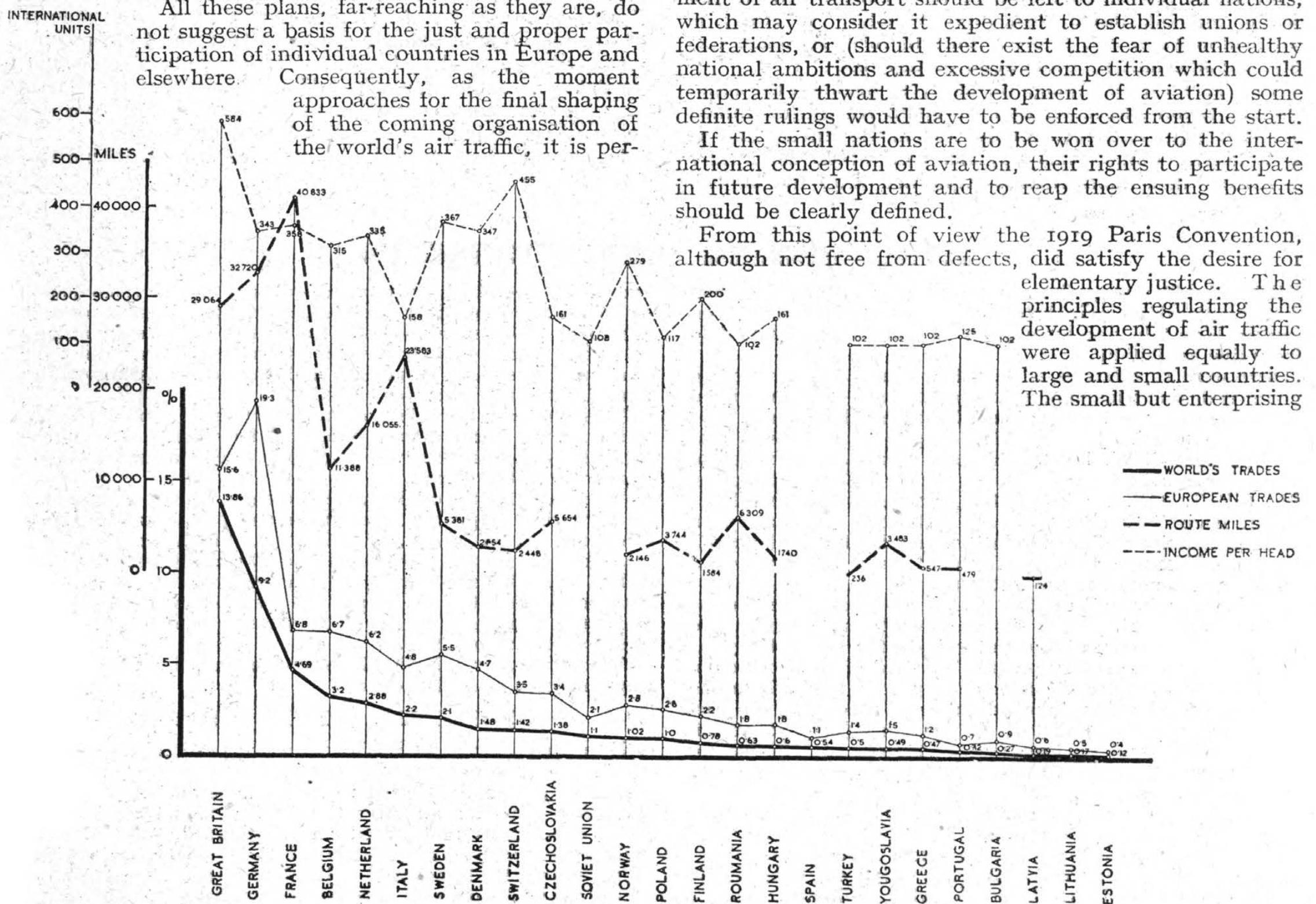
If post-war aviation is to become an instrument of progress and an important factor in bringing nations together, and above all, if it is to become a real carrier of the world's commerce, it is essential to establish *now* the fundamentals of its development.

Free or Controlled?

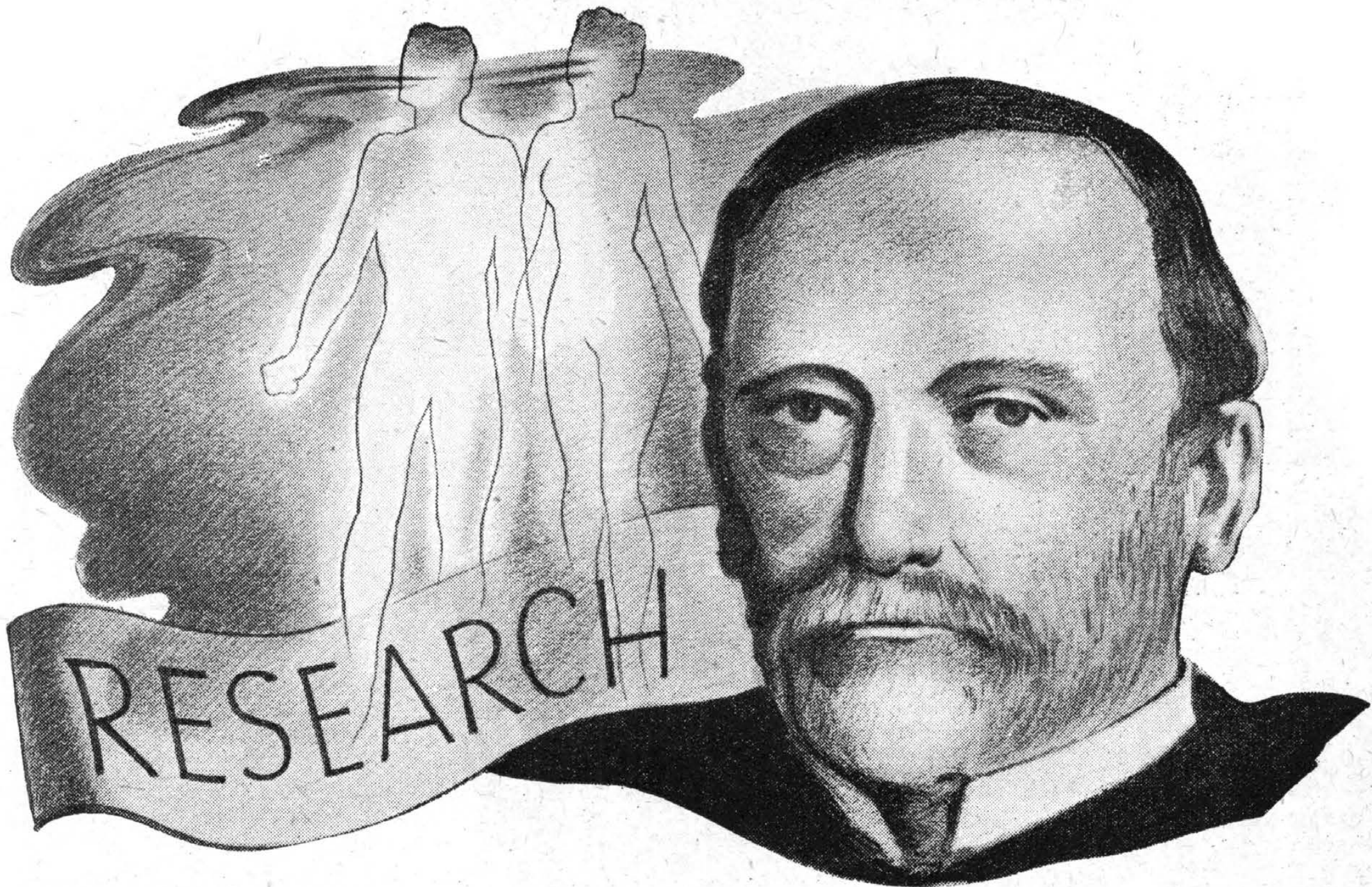
There appear to be two possibilities: either the development of air transport should be left to individual nations, which may consider it expedient to establish unions or federations, or (should there exist the fear of unhealthy national ambitions and excessive competition which could temporarily thwart the development of aviation) some definite rulings would have to be enforced from the start.

If the small nations are to be won over to the international conception of aviation, their rights to participate in future development and to reap the ensuing benefits should be clearly defined.

From this point of view the 1919 Paris Convention, although not free from defects, did satisfy the desire for elementary justice. The principles regulating the development of air traffic were applied equally to large and small countries. The small but enterprising

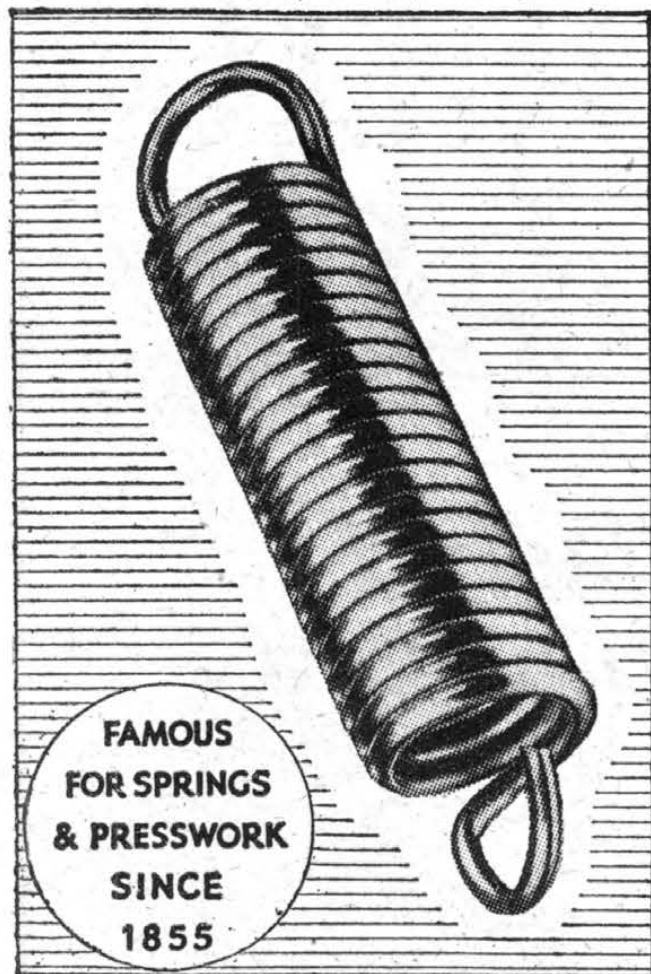


This comparative diagram of route miles with reference to the share in European and World trade, and the income per head of population in 1938, shows clearly the general interdependence of air traffic and economic factors. The figures were based upon the following sources of information: "International Air Transport," by Sir Osborne Mance; "Civil Aviation Technical and Statistical Review, 1938," British Air Ministry; "Europe's Trade," League of Nations, Geneva, 1941; "The Economics of 1960," by Co. in Clark, M.A.



LOUIS PASTEUR (1822-1895).
Great French scientist whose Researches into the causes of diseases have done so much to protect mankind from the ever-present invisible enemies of the bacteriological world. The famous Pasteur Institute was founded in 1888.

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AIR TRANSPORT CHARTER?

nations which had some assets to offer to the world's markets had the chance to develop their commercial air transport.

Accusations that this convention slowed-down the progress of air transport have often been exaggerated or quite inaccurate. Air traffic before the war was only beginning to expand, and initial development could not take place without considerable material contributions from the countries concerned. It would be quite meaningless to attempt to ascertain a justifiable rate of subsidies provided by various countries in the pre-war period. Only nations preparing for war spent in excess of their actual civil aviation needs, while others, having no aggressive tendencies, built up their aviation only to the extent of their cultural and economic needs.

Air-space Rights

Frequently suggestions for improvements of the alleged defects of the Paris Convention amount really to a demand for sacrifices and concessions from the smaller countries, whose only protection against elimination by world competition is their sovereign rights over their air space. The most conclusive evidence of this is the pre-war practice of air agreements based on reciprocity. Although not all nations could make use of the bargaining power bestowed upon them by the Paris Convention, they *could* turn it into an instrument of economic policy.

Needless to say, the pre-war status arising from the provisions of the Paris Convention would have to be drastically revised if proposals either for the internationalisation of aviation or for the establishment of a superior air authority were to be adopted.

In the absence of any reliable indications as to the conditions and principles of international collaboration in the future, we are likely to meet more and more often with the opinion that there should be no limitation of the principle of air sovereignty without the provision of definite machinery which would compensate the smaller nations for their voluntary contributions, and which would confer upon them the right to participate in international air transport.

It would not be enough for the future conference on international air traffic merely to abolish certain regulations of the Paris Convention. In addition, a plan would have to be adopted providing either for the internationalisation of air transport on specific air lines, or laying down the principle for the allocation of air lines by a world authority, should one be created.

The right to free development of inland air traffic in particular European countries does not, of course, solve the problem of their participation in international air communications. Because of political geographic conditions of Europe, the problem of air communications can only be solved on an international basis.

International Licensing Board

Without anticipating the organisational framework of post-war civil aviation, let us assume that an international body, empowered to grant exploitation licences for air lines, will be established, or that certain international air lines will be created. Upon what basis could individual nations participate in such an international network?

The qualifying factors can be divided into four classes, given below in order of importance:—

- (a) Contribution of a particular country to the common war effort and its faithfulness to the Allied cause.
- (b) Previous contribution to the development of air communications, considered in the light of the country's potentialities and its pre-war air transport requirements.
- (c) Participation in world economy and the need to link the Mother Country with overseas possessions or bigger settlements abroad.
- (d) Natural conditions favourable to the development of communications, such as the geographical situation of a country, its topography, atmospheric conditions, etc.

It follows from this classification that (a), (b) and (c) are

either achieved by the war effort of the State and its citizens, or by their contribution to the world at peace, while on the other hand (d) is a factor independent of any effort and is rather a "gift of nature."

Consideration of Factors

Although the last is to a certain degree a chance factor, it cannot be omitted because, in the case of two nations competing for a certain air line over their territory and otherwise possessing identical qualifications, this question should be decided by considerations of technical expediency such as distance, flying safety, etc.

Point (a) should be easy to establish and should not give rise to any difficulties. From the point of view of historical justice it is clear that countries which have had to pay for their rights to freedom with endless sacrifices must have some guaranteed right to peaceful development and progress. The greater its voluntary contribution towards the victory of the democratic ideal, the more enduring should be the confidence won by that country in the society of free nations. Naturally this contribution must be measured in proportion to the practical potentialities of the nation.

Factor (b), somewhat more complicated, should be defined as the right of nations qualified under (a) to the use of, or collaboration in, those air lines to the existence of which they contributed before the war. If we take it for granted that only the aggressor states created air lines before the war for hidden purposes of political and economic expansion, and that these states have to be eliminated from participation in future air transport, then the right to fly on lines established by them expresses another fundamental condition of justice.

Economic Interdependence

More difficult will be the definition of factor (c), i.e. the participation of a nation in the economy of the world in general and of Europe in particular. Here it should be borne in mind that it will not be always possible to take pre-war standards as a basis. The rehabilitation of the small and non-industrial countries of Europe in order to render them independent of Germany will substantially affect their share in future international economic collaboration. Among other factors an important change in the direction of the flow of goods and traffic is to be expected.

For this reason it will be difficult to assess post-war economic interdependence until the economic structure of the whole world, and especially that of Europe, has been settled. Nevertheless, there is little doubt that, apart from some special considerations such as that of strategy, it will be the economic factors which will determine the line of development of future air lines and the share of individual nations in their exploitation.

It can be observed that before the war air lines of a number of countries extended in the same direction as their foreign trade and postal turnover. It may also be of interest to note that the total network length, one of the characteristic features of air-line development of some countries, was formed in definite proportion to the part played by these countries in the world's trade.

The diagram on p. 562 shows clearly the almost general interdependence of air traffic and economic factors. Although such comparison could be made on some other basis, the network length was chosen because it represents the most constant value over a specific period. The consideration of this interdependence, together with such alterations as may result from the taking over of Axis aviation, will most certainly contribute towards a reasonable assessment of the economic interests of individual nations in international air transport.

Because of its conquest of time and space, civil air transport can be a vital factor in the collaboration of the whole of humanity for its own good. Yet one should realise that such collaboration—even in the limited field of air traffic—can only be the offspring of good will based upon the understanding of mutual needs. If, in the name of progress, the weaker nations should be asked to renounce certain recognised privileges, the future organisational form must be replenished with some new contents, if it is to remain at

AIR TRANSPORT CHARTER?

all effective. The conception of such genuine collaboration should, therefore, be based upon an undertaking to respect the rights of weaker nations—rights won in the present war or in pioneering work in expanding civil aviation.

If only to commemorate those few to whom we owe so much and who have given us the highest example of international collaboration, world aviation should be granted its own "Charter" embodying the following principles:—

(1) All members of the United Nations' family who have contributed and are contributing to the winning of the

peace through their efforts are to be granted the right to a proper and just participation in peacetime aviation.

(2) The pre-war achievements of individual Allied Nations in building up and developing aviation for peaceful purposes are their undisputed assets towards participation in post-war aviation.

(3) Aviation as an instrument of progress and as a means of bringing nations closer together must be for the common good of all Allied Nations, and participation in it should correspond to the vital needs of the nations concerned.

Such a Charter should be adopted by the first international aviation conference of the United Nations and it is in this spirit that its further deliberations should be conducted.

ARMS OF THE WORSHIPFUL COMPANY OF FERRY PILOTS

The A.T.A. Goes All Heraldic

MAYBE the inspiration came while having a quiet "quick one" in the bar of the R.A.F. Club, whose walls are well-nigh obliterated by squadron badges, but the fact remains that the Air Transport Auxiliary has, to quote that genial veteran, F/Capt. Keith Jopp, "gone all heraldic," and the result is to be seen in the adjacent photograph.

Fortunately, the ranks of the A.T.A. at headquarters include the artist-pilot Stanley Bradshaw, and to him was entrusted the emblazoning of their escutcheon; Messrs. Jopp and Bradshaw, it seems, formed themselves into a committee of two, and sought lots of expert advice in order to dodge at least the major pitfalls of an excursion into the tricky business of heraldry. And while they report that the experts disagreed on a number of points (as experts always do), it is claimed that the "Arms of the Worshipful Company of Ferry Pilots"—light-hearted as it may appear to the uninitiated—is as near being heraldically correct as a belly-landing is to pranging.

The final lettering leaves little need to explain that the device has been produced as an inn sign for certain A.T.A. premises.

There is, alas, no space in which fully to enumerate all the details in official heraldic terms as supplied by "the committee," but the following may be noted: St. George's cross composed of the flags and emblems of the nations serving in the A.T.A.; Royal Crown debruised by a baton sinister sable (meaning that the A.T.A. is nobody's baby!); three Spitfires volant; three Spitfires prangant (accidents will happen!); an Ethiopian's head erased (*à la* Cheshire Cat and meaning that the R.A.F. never forgets a black!); and what is termed "an inescutcheon of pretence" in the form of the 1939-43 Star and four Service chevrons, which the A.T.A. does not expect to get.

Finally, there is the crest in which the winged sword of the R.A.F. is held aloft in spite of forms and red tape, and the two supporters, pilots male and female, "disregardant, habited and accoutred proper," the former "having in his dexter hand a mug of ale proper."

SOCIETY OF LICENSED AIRCRAFT ENGINEERS

THE recently formed Society of Licensed Aircraft Engineers made a good start with its first meeting, for it was attended by more than 250 engineers of the aircraft industry. The society's offices are at 356-366, Oxford Street, but the meeting was held at the premises of the Royal Aeronautical Society at 4, Hamilton Place, London, W.1. Incidentally, the word "licensed" was not previously in the society's title, but it was decided at the meeting to insert it.

Chief business of the meeting consisted of establishing the conditions ruling membership and electing a council. Five membership categories were decided upon, as follows: (a) Associate membership open to any aircraft engineer who is a British subject and who holds at least one current licence issued by a competent authority. All persons join the society in the first place as associate members. (b) Full membership to which associate members may be elected by the society on the strength of their contributions to the profession. (c) Associateship which can be applied for by any holder of a Flying Training Command Approval Certificate during the war with Germany and for such period afterwards as may be approved by the Council. (d) Service membership open to potential licensed aircraft engineers serving with the Forces. (e) Honorary membership to which the Council may elect, for life or any less period, any person of any nationality who, by reason of distinguished service, shall be deemed to be suitable.

Only associate members and full members will have votes; honorary members will not be called upon to pay subscriptions

but they may attend and may speak at general meetings.

The following twelve members were elected to the Council: Messrs. J. H. Willans and A. C. Lambert, of B.O.A.C.; Messrs. W. J. Williams and W. J. Brant, of de Havillands; Messrs. W. J. Andrews and W. W. Gilham, of Air Service Training, Ltd.; Mr. H. Woodford, of Short Bros.; Mr. A. E. Clifford, of the Bristol Aeroplane Co.; Mr. A. C. Jack, of A. V. Roe; Mr. A. W. Webb, of No. 16 E.F.T.S.; Mr. H. Bexley, of No. 24 E.F.T.S.; and Mr. J. C. Corlett, of Short and Harland, Belfast.

Three co-opted members were also elected, namely, Mr. S. T. Weeden, of de Havilland; Mr. N. Luke, of Air Service Training, Ltd., and Mr. F. W. Hopkins, of Scottish Aviation, Ltd.

CONTROLLING BODY NEEDED

THE Irish Aviation Club in its annual report submitted recently expressed the view that a controlling body for air sport should be formed in Eire, adding that international conferences were being held at the present time, but Eire could not be represented as it had no central body.

The record of work for the past year included the delivering of a large number of lectures to club members, at schools, and to the general public.

Among the officers elected for 1944-45 was Mr. Sean Lemass, Minister for Industry and Commerce, who becomes a vice-president of the club.

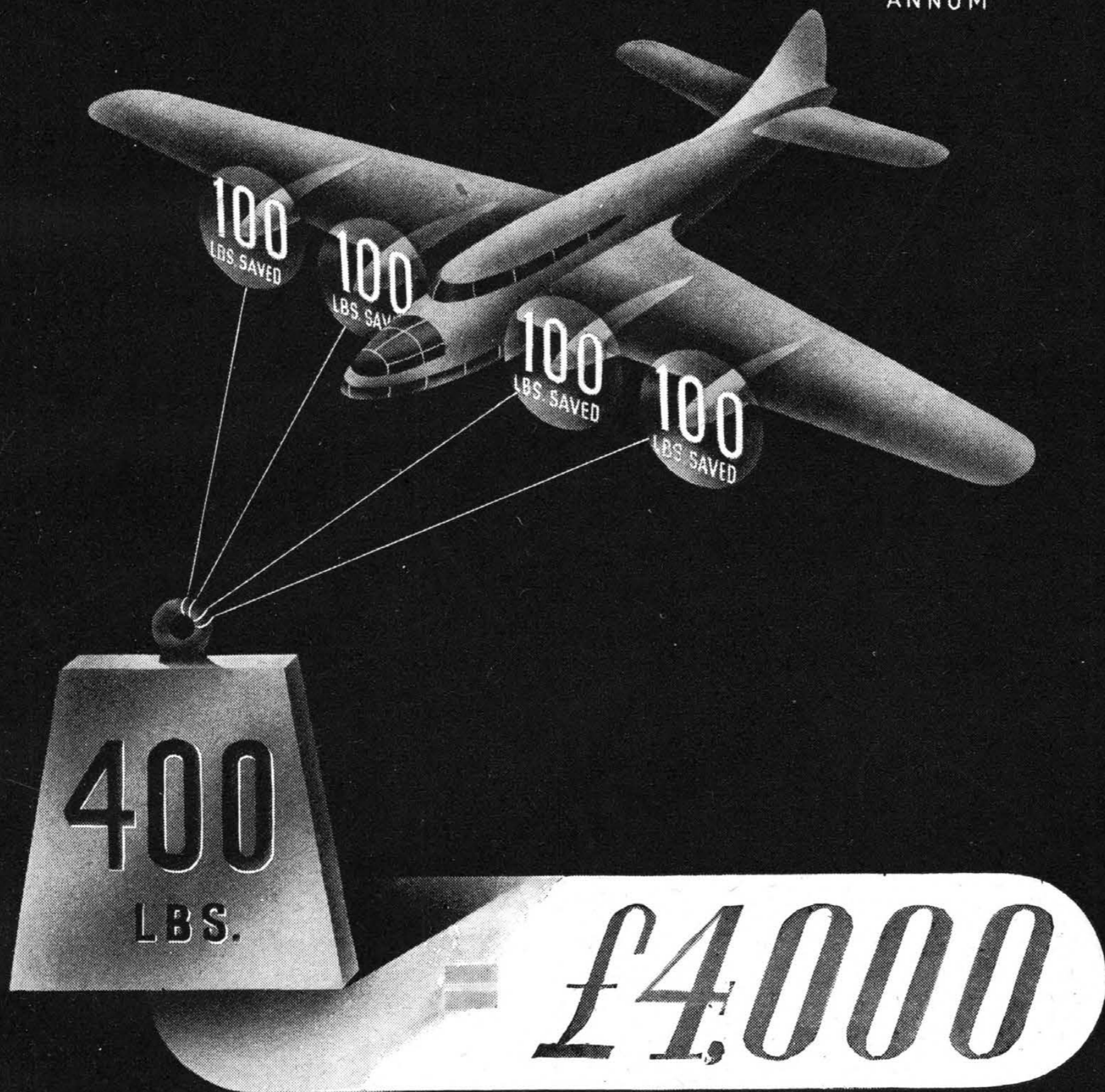


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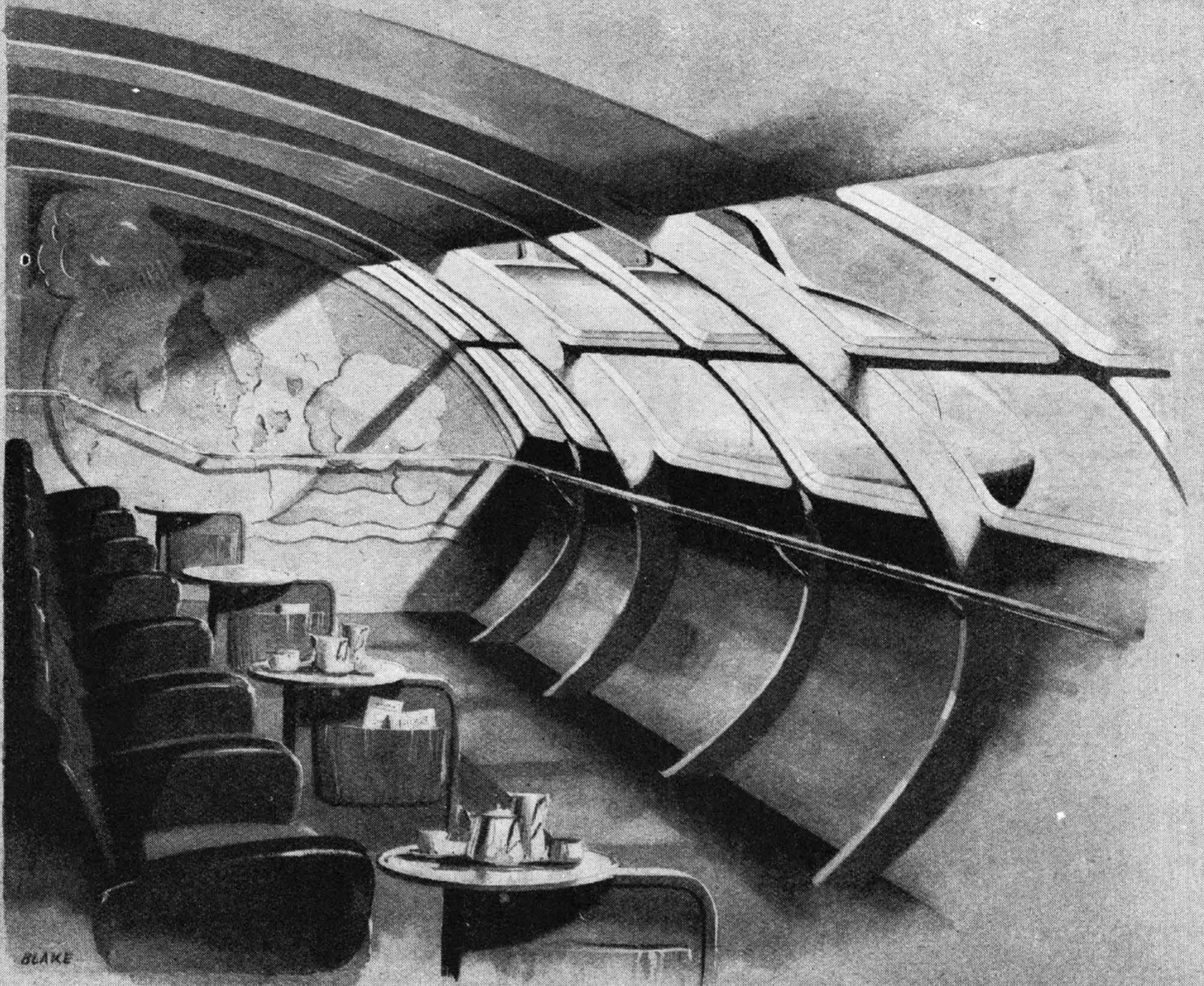
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*A suggestion for
the promenade deck
by*

RUMBOLD

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The skill and manufacturing capacity of the Rumbold organisation in light alloy manipulation, acoustic and thermal insulation and furnishing are at present tied to the war effort but the project department is ready to investigate and submit to manufacturers and operators schemes for the passenger arrangements in aircraft of any category.

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Throughout the British Aircraft Industry the name of Rumbold is associated with comfort, with attractive and durable schemes of decoration for aircraft from light aeroplanes to giant air liners and with the skilful utilisation of every cubic inch of space made available by the designer to the furnisher and stylist.

Rumbold has been responsible for the design, layout, decoration, furnishing and equipment of the passenger accommodation in most successful British civil aircraft during the past 16 years, including the Avro York, the Short Empire flying boats, all de Havilland models from the Puss Moth to the Flamingo, the Armstrong-Whitworth Ensigns, the Airspeed Couriers and Envoyes, the Miles and the Percival ranges and scores of other types.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

FLYING DESPATCH RIDERS

Increased Chances of Getting Through

IN the training of despatch riders they are told that communications always break down in actual warfare and it is left to the D.R. to get through. This is usually when the enemy either surrounds the position or his exact position is unknown, and I cannot help feeling that the D.R. (who must follow more or less established routes and advertise his course with the noise of his machine) stands a poor chance against an enemy determined to stop him.

It therefore became an obvious answer to me that the time has long since arrived when we should have flying D.R.s. But where are they? Are we waiting for Germany to adopt the idea? I am sure that many a commander must already have wished he had such a man under his command, and, personally, I would prefer ten journeys of the above nature in an Auster to one on any motor cycle. The modern method of positioning H.Q.s would also favour the flying D.R.

The slogan is, "Modernise the D.R.s."

C. G. HUTCHINS.

IDENTIFICATION DIFFICULTIES

Apathy and Ignorance in the H.G.

I READ with alarm your editorial of May 4th about the loss of 44 transports and 2,500 men due to fire from our own naval guns. That such a thing could happen shows a serious lack of either training in aircraft recognition or fire control. If that can happen in our active services, what on earth will happen if and when the Home Guard is mustered? These men have always had (commendably enough) itching trigger fingers and desperate ideas, besides which they are well armed with automatic weapons and other assorted destructive instruments. The apathy and ignorance of aircraft recognition in the Home Guard is far greater than in the other services (I speak from experience). It is true that here and there are small bodies interested, but there is nothing official or widespread.

I suggest that an order from the High Command should be issued to make aircraft recognition an optional subject for the proficiency test, and, secondly, that one or two of those who qualify should be allotted to each platoon, or section if possible, and made responsible for the detection of enemy aircraft and recognition of our own. Surely this is not unreasonable?

However, it seems as though accidents have to happen personally to people to make them realise these things, and until a General gets shot down in error, I fear nothing will be done. But let us hope differently.

E. B. (L.D.V. AND STILL H.G.).

[We suggest aircraft recognition should be made a compulsory subject for the proficiency test.—ED.]

LEAKAGE OF INFORMATION

Restriction a Good Deal Overdone

THE recent letters in *Flight* on the subject of leakage of information do not agree with my experience. We, in the A.T.C., at least in this squadron, do not receive our silhouettes and amendments to A.P. 1480 ahead of the R.O.C. We always get ours a matter of weeks behind; maybe that is our misfortune.

My experience is that most of my up-to-date information comes from the cadets themselves. I am quite certain that the greatest source of leakage is in the Services. A.T.C. cadets are often far more up-to-date (or even a bit ahead) with information than they would be if they depended on official sources, even supposing we gave them all we receive. In my opinion they come by a good deal of this on their visits to R.A.F. stations (official, or in passing by them, being observant lads) and a good deal of it from relatives and friends on leave. I am repeatedly being asked for details of aircraft of which I have sometimes never heard, have to deny all knowledge of them, and then receive the official silhouettes a week or two later!

The R.O.C. in my opinion is on the whole very discreet, but I know of one instance of a cadet who was always bursting with hot "gen" and who lorded it over his more ignorant brethren. His father was in the R.O.C.!

As to the wisdom of the restriction of information, is it not a good deal overdone? It is absurd, for instance, to have to emphasise the secrecy of an aircraft that the boys see almost daily, and in which many of them have actually flown, as was the case here recently.

AN A.T.C. INSTRUCTOR.

POST-WAR PRIVATE FLYING

Flight Strips and Soaring Sites

WITH regard to the many plans which are now being made for civil aviation after the war, might I make a suggestion concerning light aircraft landing grounds?

The idea is to have short runways of a few hundred yards laid parallel to main roads in places where few airfields exist or where these might not be convenient to the individual. Most light aircraft can use roads when required (subject to wind direction, of course), but even infrequent traffic on a road would make this practice undesirable except in emergency. Runways could be kept a short distance from the edge of the road and could provide limited refuelling facilities and also a place to "park" one's aircraft safely for a few hours.

By placing such landing strips near roads, reasonably level ground and accessibility would be assured.

One aspect of post-war sporting flying which appears to have had little attention is soaring (or gliding as it is unfortunately often called). No one can say exactly what the economical factor will be for sporting flying after the war, but in this respect it is obvious that sailplanes, if produced in any quantity at all, could be sold for much less than the price of a car.

Sites for this sport could be chosen, tentatively, so that immediately things begin to happen in aviation no undue delay would result. The A.T.C. has probably discovered some new areas suitable for sailplanes, and experience gained by some of their experiments will be useful.

J. H.

STATUS OF DRAUGHTSMEN

A Charter to Protect Their Future

MR. SHORT'S views in *Flight* of May 11 on the "Status of Draughtsmen" have come a little late to have much effect on draughtsmen who have been the backbone of the profession for the past thirty years, as such similar views were promulgated when I was a young and ambitious apprentice and nothing has since come of them.

As times and methods have changed the engineering profession out of all recognition as a remunerative occupation for the naturally gifted as well as the fully trained type of person, the draughtsman's job has been the last straw to which so many of the unsuccessful engineers have clung, because they thought it would at least lead to some other and better job. But they never cared one jot about "draughtsmanship" and all it implied as a profession and as a craft to be proud of; their only thoughts being what it would lead them to. Therefore, draughtsmanship fell into bad repute, and to-day is just a trade, to be used as and when the industry is in need of such service. It is my view that the status of the draughtsman should have been aired before this war, when we all should have gone fully out for a charter instead of higher wages, because when once such status had been obtained, the increase in wages would have followed. Where to-day doctors, engineers, dentists, etc., are "chartered" practitioners, we draughtsmen and designers are just hired servants to be had as and when required. Having been engaged in the aircraft electrical equipment industry for 23 years, as draughtsman and designer, and after serving an electrical apprenticeship in all phases of the industry, I can testify that there is a need to protect the specialists qualified in designing and creating this or any other such equipment. As it is to-day their services are being extensively used in the war effort, only to be quickly neglected in the aftermath of war.

Such a charter, if it existed, would be a protection for their future, and it is timely that the formation of such a professional body should be launched. I would suggest that the title be "The Institution of Engineering and Allied Industrial Technical Designers," because that is what we are, whereas draughts-

CORRESPONDENCE

manship is only a means of expressing that ability. Without the training, experience, etc., behind us, a drawing conveys but little conception of the ability of us who are seeking recognition and security in our employment. As a body of earnest workers striving for the benefit of our race, we have shown by all the creations that go to make up a modern war machine what can be done in a national emergency. These things have had to be planned out on the "board" before they could be put into production. Therefore, it is up to industry after this war to see that we shall be fully employed on plans for things befitting the better world we have been promised after the peace has been won.

G. M.

POST-WAR AIR FARES

Cost More Important Than Speed

COLUMNS and columns have been written and will, one supposes, continue to be written about the incredible (and useless to the man-in-the-street) speed of post-war air services. Who cares a cuss if the trip between Nairobi and London takes twenty-four hours, as Cobham suggests, or four days?

Only one word have I read about the cost of fares, and that is across the Atlantic—£100. That figure does not interest one person in ten thousand.

If the London-Nairobi cost is going to stand at £116 (that is, say, £500 return for a married couple), who, here in Kenya, is going home by air?—only high Government officials, one or two business men (when the cost is debited to the firm), and a few others. At around £40, yes; that would give some of the poor devils who have not been home for years an interest in life, and we should then get the white settlers we so badly want. What Englishman to-day is going to live in the blue out here and then have to spend two months on the journey alone, away from his farm?

Could you not take this matter up in your journal—it is the only thing that interests the ordinary person—and get some of the transport people to give some idea of what their post-war fares may be? I cannot see any airline with services, home and out, being a success if the fares are beyond the normal man's reach.

J. GRAHAM DAWSON.
(Nairobi.)

JET PROPULSION FOR AIRCRAFT

Rate of Change of Momentum

MAY I butt into your very interesting correspondence on jet- and rocket-propelled aircraft?

It seems that the old ghost that a jet must push on something before it can produce a thrust is still worrying some of your readers. It has been laid to rest several times in the last 20 years or so, but it will keep bobbing up. In the words of the old song: "It's dead, but it won't lie down" (with apologies to Gracie Fields). I think it was Prof. Goddard in America who first carried out an actual experiment of firing a rocket first in air and then in a vacuum chamber. It was found that the reaction was slightly greater in a vacuum than that experienced in air.

I carried out some experiments on this myself about eight years ago, using water forced through a nozzle. The reaction was measured with the jet running in air. Then the jet was immersed in water and there was a large drop in the reaction, even though there was the water to push against. Of course, the flow through the jet dropped also; when this was raised to normal the reaction was practically the same as in air. This gives a practical demonstration that it is only the rate of change of momentum in the jet that is effective in producing a thrust. For a rocket-engine running in a vacuum the thrust would be slightly greater because the gases would issue at a higher velocity, thus giving a greater rate of change of momentum.

Now as to this "rate of change of momentum" business. There are very few people (if any) who can visualise directly how a rate of change of momentum can produce a thrust on a rocket. The real question is: Where does the force act? How does it act, etc., etc.? Here is a very easy method by which it can be explained, and I have not come across anyone who has not been able to understand it first shot. I should say straight away that this is not an exact explanation, but it does give one a correct idea of how the thrust is obtained. For calculation purposes it is easier to use the rate of change of momentum, though the method is better for examining the performance of thrust augmentors.

In Fig. 1 is shown a box with an opening at one side. By some means or other a pressure is maintained in it, and hence a jet of gas will issue from the opening. Now let us examine the pressure conditions inside the box. The pressure p acts equally in all directions (very nearly) and we have forces P_1 and P_2 on the walls balancing each other (top and bottom), also P_4 and P_5 , and P_3 and P_6 balance at the ends. But P_7 is not balanced because there is a hole at the other end. Hence P_7 causes the reaction to the left.

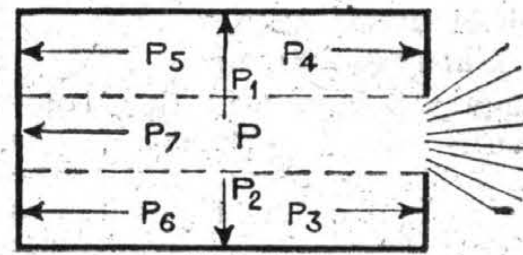


FIG. 1.

Now let us put a diverging (Laval) nozzle on the opening, as in Fig. 2. When a jet of gas issues from an orifice or parallel-sided nozzle the maximum velocity which can be attained is the speed of sound in the gas at the temperature and pressure of emergence. This means that if the pressure p is more than about 14 lb./sq. in. the gas will issue with pressure to spare and will spurt in all directions. If a diverging nozzle is put on, this excess pressure will act on the nozzle and will vary along it as the gas increases in velocity. Let us call this varying pressure p' . The pressure p' will give a resolved thrust, P_8 , on the nozzle to the left and will add itself to P_7 . This shows that a diverging nozzle increases the thrust. It should be noticed that the outside atmosphere has not been mentioned and is not necessary for producing the thrust.

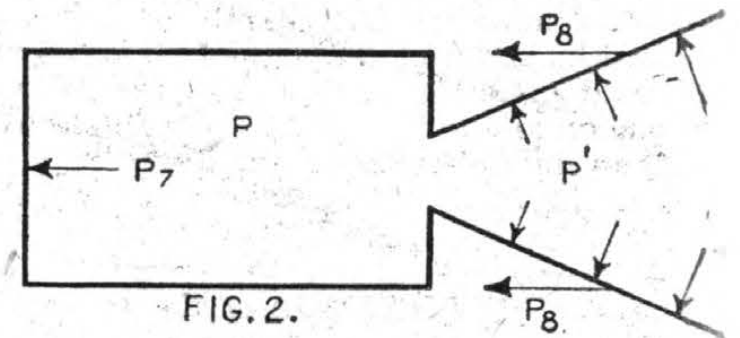


FIG. 2.

Now for the thrust augmentor. A simple form is shown in Fig. 3. A thrust augmentor is, of course, of use only when there is an atmosphere around it. The motor delivers a jet into the throat of the thrust augmentor and draws air through due to entrainment. This causes a rush of air from the outside into the left-hand converging portion. Since the air accelerates as it gets into the converging portion there is a drop of pressure. Let the total push on the inside of this portion of the augmentor be P_{10} and the outside push of the atmosphere on the same portion be P_9 , both resolved along the axis of the augmentor. It is easily seen that P_{10} is less than P_9 , and there will be a resultant push which is added to P_7 and P_8 . It may also be seen that we cannot possibly expect very large

gains in thrust by using this device.

Here is something for the real "jet bug"; a list of books which covers this form of propulsion very thoroughly. I do not claim that it is complete, and the enthusiast can add to it. There are also papers in a number of technical journals which I have not mentioned.

L'Astronautique, by R. Esnault-Pelterie, 1930, 248 pp. *L'Air et la Vitesse*, by R. Lorin, 1919, 94 pp. *Liquid-Propellant Rocket Development*, by R. H. Goddard; pub. Smithsonian Institution, Wash., 1936; 22 pp. *Rockets through Space*, by P. E. Cleator; pub. Allen, London 1936; 246 pp. *Stratosphere and Rocket Flight*, by C. G. Philp; pub. Pitman 1935; 106 pp. *The Conquest of Space*, by D. Lasser; pub. Hurst and Blackett; 288 pp. *Gas Turbines and Jet Propulsion*, by G. Geoffrey Smith; pub. Flight 1943. *Wege zur Raumschiffahrt*, by H. Obert, 1929, 431 pp. *Die Möglichkeit der Weltraumfahrt*, by W. Ley, 1928, 344 pp. *Raketen Fahrt*, by M. Valier, 1928, 252 pp. *Raketen Flugtechnik*, by E. Sänger, 1933, 222 pp. (contains a treatment of aerodynamics at supersonic velocities). *Die Rakete*, by A. B. Scherschewsky, 1929, 134 pp. *Männer der Rakete*, by W. Brügel, 1933, 144 pp. *Das Problem der Befahrung des Weltraums—der Raketen-Motor*, by H. Noordung, 1929, 188 pp. *Die Erreichbarkeit der Himmelskörper*, by W. Hohmann, 1925, 88 pp. *Weltraumschiffahrt*, by G. Biermann, 1931, 43 pp. *Die Fahrt in's All*, by W. Ley, 1929, 83 pp. *Grundriss einer Geschichte der Rakete*, by W. Ley, 1932, 16 pp. *Die Rakete zur Höhenforschung*, by V. Mandl, 1934, 16 pp.

E. BURKE,
M.Sc.(Eng.)Lond., A.C.G.I., D.I.C.,
A.M.I.C.E., F.P.S.

FIG. 3. A thrust augmentor is shown in cross-section. It has a converging inlet on the left and a diverging outlet on the right. A jet motor is shown on the left, injecting a jet into the throat of the augmentor. The jet is labeled P_{10} . The pressure in the throat is P_9 . The pressure in the diverging portion is P_8 . The thrust on the left wall of the converging portion is P_7 . The thrust on the right wall of the diverging portion is P_8 . The thrust on the right wall of the converging portion is P_9 . The thrust on the left wall of the diverging portion is P_7 .



X-Rays

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He — and his colleagues of the research and development laboratories — have made it possible to see deep into the heart of the metal of vital things like aero engines and gun barrels, to make sure that no hidden flaws exist; they have given to doctors and

surgeons an ally of ever-increasing power and scope for diagnosis and cure; to them belongs much of the credit for the part which mass radiography will play in the final elimination of the scourge of tuberculosis.

He and his colleagues have contributed greatly to Philips leadership in the field of X-rays. Their knowledge and experience are of vital importance to the nation today.

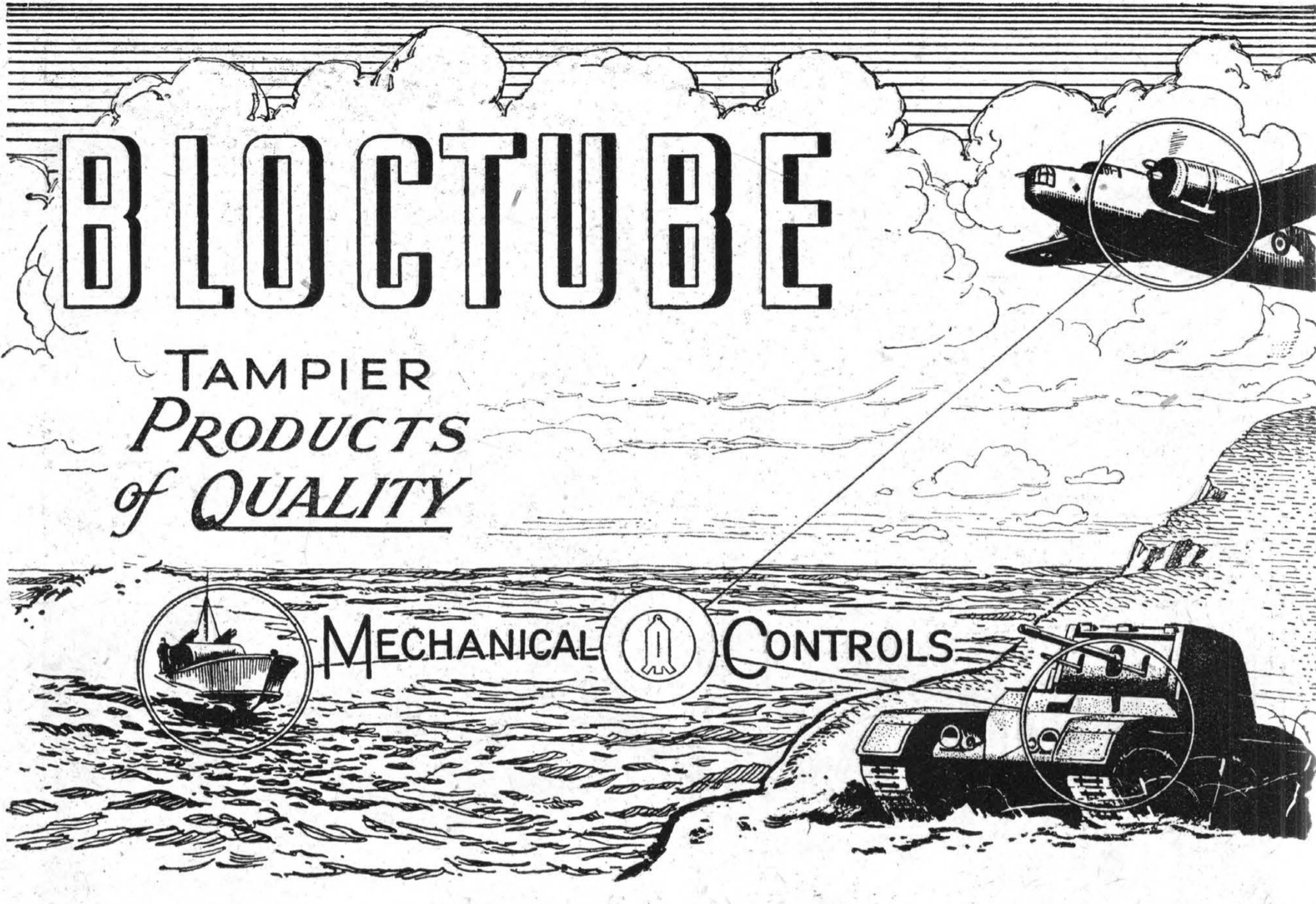
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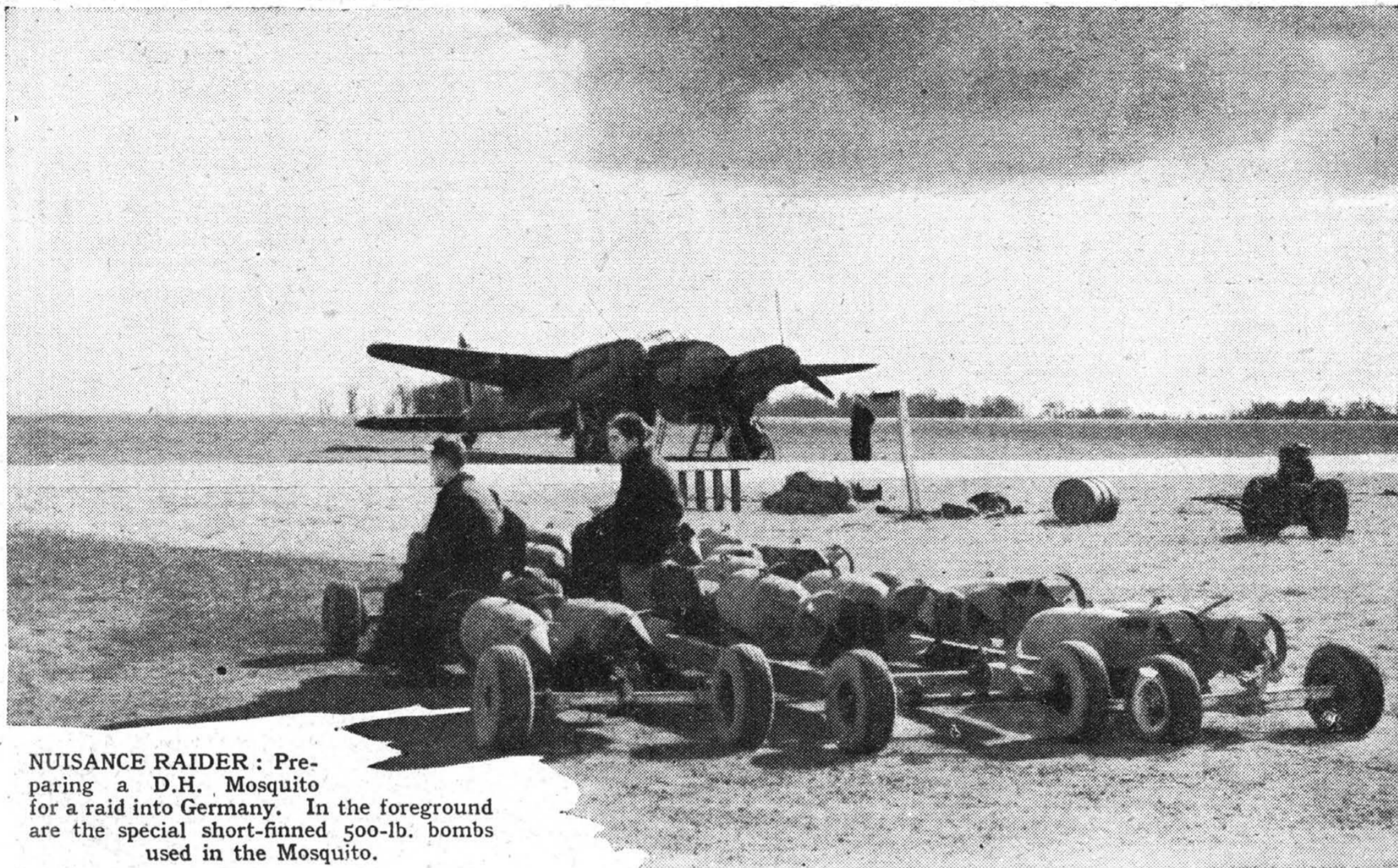
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NUISANCE RAIDER: Preparing a D.H. Mosquito for a raid into Germany. In the foreground are the special short-finned 500-lb. bombs used in the Mosquito.



SERVICE AVIATION



Royal Air Force and Fleet Air Arm News and Announcements

Appointment

AIR COMDRE. G. A. H. PIDCOCK to be Vice-President, Ordnance Board, Ministry of Supply, and to be Air Vice-Marshal. Air Vice-Marshal Pidcock has been Director of Armament Development, Ministry of Aircraft Production, since February, 1942. He was previously on the special duty list as a member of the Ordnance Committee.

Promotions

GENERAL DUTIES BRANCH.

Air Commodores are granted the rank of Act. Air Vice-Marshal:
T. M. WILLIAMS, C.B., O.B.E., M.C., D.F.C., December 15th, 1943.
G. E. GIBBS, M.C., March 1st, 1944.

Retirement

GROUP CAPT. (temp. Air Comdre.) G. S. GODDIE, D.F.C., A.F.C., is placed on the retired list and retains the rank of Air Commodore. April 26th, 1944.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Distinguished Service Order

Act. Sqn. Ldr. E. J. WIGHT, D.F.C., R.A.F.O., No. 224 Sqn.—Since being awarded the D.F.C., Sqn. Ldr. Wight has continued his duties as flight commander of his squadron. He has taken part in attacks on a further two submarines, one of which was destroyed. On this occasion he was flying on an anti-submarine patrol to meet a very important convoy which was being threatened. In appalling weather, Sqn. Ldr. Wight made two attacks on the U-boat in the face of heavy and accurate anti-aircraft fire, until through his excellent directions the Navy arrived and were able to complete the destruction of the submarine. Now on his second tour of operational duty, this officer has constantly displayed outstanding drive, courage and keenness and, by his excellent leadership and training, has been largely respon-

sible for the high operational efficiency maintained by his squadron.

Act. Wing Cdr. H. C. GODEFROY, D.F.C., R.C.A.F.—Since being awarded a bar to the D.F.C., this officer has completed many further sorties. Despite adverse weather, the wing under his leadership has destroyed at least 28 enemy aircraft and damaged many others. He has himself personally destroyed at least one enemy aircraft during that period. At all times Wing Cdr. Godefroy has displayed outstanding leadership and

a fine fighting spirit, setting an example of the highest order.

Act. Wing Cdr. R. W. MCNAIR, D.F.C., R.C.A.F.—Since being awarded a second bar to the D.F.C., Wing Cdr. McNair has completed many further operational sorties and destroyed another enemy aircraft, bringing his total victories to at least 16 enemy aircraft destroyed and many others damaged. As officer commanding his wing he has been responsible for supervising intensive training in tactics. The results achieved have been most satisfactory, the wing under his leadership destroying at least 13 enemy aircraft. Throughout Wing Cdr. McNair has set a magnificent example by his fine fighting spirit, courage and devotion to duty. Both in the air and on the ground he has inspired his pilots with confidence and enthusiasm.

Act. Wing Cdr. J. F. SUTTON, D.F.C., A.F.C., R.A.F.O., No. 10 Sqn.—Since being awarded the D.F.C., this officer has participated in numerous successful sorties. He has at all times displayed the greatest determination to inflict loss on the enemy, and his achievements have been impressive. He is a splendid leader, whose sterling qualities have contributed greatly to the fine fighting qualities of the squadron he commands.

Act. Sqn. Ldr. C. R. MACDONALD, D.F.C., R.A.F.V.R., No. 78 Sqn.—This officer has completed a very large number of sorties and has successfully bombed some of the most heavily defended targets in Germany. He has set the highest example of bravery and devotion to duty, which, together with his great skill, have inspired all. His record is worthy of the greatest praise.

F/O. M. R. HEAD, R.N.Z.A.F., No. 9 Sqn.—In air operations this officer has displayed skill, courage and fortitude of the highest order.

Flt. Lt. H. B. HUNT, D.F.C., R.A.F.V.R., No. 117 Sqn.—These officers were pilot and navigator respectively of an aircraft detailed to attack an enemy airfield far distant from base. The objective was successfully located and, despite fierce fire from the ground defences, a determined attack was pressed home. In the operation, the aircraft was hit by shrapnel. A fragment pierced the oil system of the port engine which caught fire. The flames subsided but the engine became useless. The aircraft lost considerable height and, for more than 100 miles on the homeward flight, Flt. Lt. Hunt was forced to fly over valleys and through ravines, owing to the surrounding mountainous ranges. Aply directed by Flt. Lt. Clark, however, Flt. Lt. Hunt reached open country and eventually landed at an airfield after a flight of



Sqn. Ldr. Anthony Spooner, D.F.C., who has been awarded the **D.S.O.** for his excellent anti-U-boat work with Coastal Command.

SERVICE AVIATION

several hundred miles with one engine useless. These officers displayed great skill, courage and fortitude.

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. H. A. S. JOHNSON, D.F.C., R.A.F.V.R., No. 165 Sqn.—This officer has commanded his squadron since June, 1942, and has been an outstanding leader, both in the air and on the ground. His squadron has destroyed eight enemy aircraft, and damaged several others during this period. These successes can be, in a great measure, attributed to Sqn. Ldr. Johnson's leadership. On December 31st, 1943, his unit destroyed four enemy aircraft out of a force of five; one of these was destroyed by Sqn. Ldr. Johnson. He has devoted the utmost energy and enthusiasm to perfecting his squadron as a fighting unit.

Act. Wing Cdr. E. L. PORTER, D.F.C., R.A.F.V.R., No. 9 Sqn.—One night in March, 1944, this officer participated in an attack on a target in Southern France. Much of the success achieved can be attributed to Wing Cdr. Porter's brilliant leadership and exceptional ability. This officer, who has completed a very large number of sorties, has displayed great courage, keenness and determination.

Act. Flt. Lt. I. WHITTAKER, D.F.C., R.A.F., No. 617 Sqn.—In February, 1944, this officer was the flight engineer of an aircraft detailed to attack a target in Southern France. Whilst over the target the aircraft was repeatedly hit and sustained much damage. Flt. Lt. Whittaker was wounded in both legs, but, in spite of this, he coolly made a detailed examination of the aircraft and gave his captain a full report of the damage sustained. He displayed great fortitude and devotion to duty, and his efforts were of much assistance to his captain, who flew the damaged bomber to an airfield where a safe landing was effected.

Act. Sqn. Ldr. J. S. R. MULLER-ROWLAND, D.F.C., R.A.F.V.R., No. 211 Sqn.—This officer has participated in very many sorties since being awarded the D.F.C., and his continued excellent work has merited high praise. On a recent occasion he led a formation of aircraft detailed to attack targets at Moulmein. The attack was pressed home with great vigour and accuracy. Industrial premises, much rolling stock and a railway installation were bombed with damaging effect; a small pier was set alight, a large barge was hit and other damage was inflicted. In this

spirited action Sqn. Ldr. Muller-Rowland displayed skill, courage and leadership of a high order.

Distinguished Flying Cross

Flt. Lt. L. A. CLARK, R.A.F.V.R., No. 117 Sqn.—For citation see Flt. Lt. Hunt, D.S.O., D.F.C.
P/O. S. WILSON, R.A.F.V.R., No. 418 Sqn.
W/O. K. G. CAMPBELL, R.A.A.F., No. 541 Sqn.
W/O. J. R. VINCENT, R.A.F.V.R., No. 209 Sqn.
W/O. E. WOODWARD, R.A.F.V.R., No. 216 Sqn.
Flt. Lt. J. D. HILL, R.A.F.V.R.
Act. Flt. Lt. H. F. EWER, R.C.A.F., No. 103 Sqn.
F/O. U. D. H. HORNE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. L. H. M. HADLEY, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. K. MACVICAR, R.A.F.V.R., No. 28 Sqn.
Flt. Lt. J. C. PARE, R.A.F.V.R., No. 204 Sqn.
Flt. Lt. L. W. SILBURN, R.A.F.V.R., No. 95 Sqn.
F/O. A. B. CATIP, R.A.A.F., No. 95 Sqn.
W/O. G. H. F. HUTCHISON, R.N.Z.A.F., No. 162 Sqn.
P/O. J. D. COTTER, R.A.F.V.R., No. 640 Sqn.
Act. Wing Cdr. G. H. GOODMAN, R.A.F.O., No. 151 Sqn.
Act. Sqn. Ldr. D. B. BENNETT, R.A.F.V.R., No. 227 Sqn.
Act. Sqn. Ldr. I. M. CAMERON, R.C.A.F., No. 401 (R.C.A.F.) Sqn.
Flt. Lt. J. NIBLETT, R.A.F., No. 198 Sqn.
Act. Flt. Lt. C. C. SHERF, R.A.A.F., No. 418 (R.C.A.F.) Sqn.
F/O. J. T. CAINE, R.C.A.F., No. 418 (R.C.A.F.) Sqn.
F/O. W. M. DAVIES, R.A.F.V.R., No. 227 Sqn.
F/O. E. L. WILLIAMS, R.A.F.V.R., No. 605 Sqn.
Act. Flt. Lt. C. N. HAMMOND, R.A.F.V.R., No. 166 Sqn.
P/O. J. H. J. ENGLISH, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. B. F. G. H. MILLER, R.A.F.V.R., No. 103 Sqn.
Act. W/O. K. R. LEE, R.A.F.V.R., No. 103 Sqn.
Act. W/O. D. H. LOOP, R.A.F.V.R., No. 103 Sqn.

Distinguished Flying Medal

Flt. Sgt. J. R. ANDREW, R.A.F.V.R., No. 93 Sqn.
Flt. Sgt. I. M. THOMSON, R.A.F.V.R., No. 70 Sqn.
Flt. Sgt. R. S. WILLIAMS, R.A.F.V.R., No. 260 Sqn.
Flt. Sgt. C. R. MARRIOTT, R.N.Z.A.F., No. 626 Sqn.
Sgt. J. V. BREWER, R.A.F.V.R., No. 626 Sqn.
Flt. Sgt. G. C. KING, R.A.A.F., No. 619 Sqn.
Sgt. J. A. HARRIS, R.A.F.V.R., No. 166 Sqn.

Sgt. R. S. PARLE, R.A.F.V.R., No. 630 Sqn.
Sgt. G. R. PIKE, R.A.F.V.R., No. 463 (R.A.A.F.) Sqn.
Sgt. J. PETSCH, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Flt. Sgt. W. M. CASHMAN, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
Flt. Sgt. B. W. WINDSOR, R.N.Z.A.F., No. 514 Sqn.
Sgt. F. L. DOLAMORE, R.A.F., No. 514 Sqn.
Sgt. C. McRAE, R.C.A.F., No. 115 Sqn.
Sgt. A. G. MANUEL, R.A.F.V.R., No. 166 Sqn.

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in the field:—

Distinguished Flying Cross

Lt. (temp. Capt.) W. McNINCH, Royal Regiment of Artillery.
Lt. (Act. Capt.) R. H. BERNSTEIN, Royal Regiment of Artillery.

THE KING has been graciously pleased to approve the following awards:—

Air Force Cross

W/O. G. ROBERTSON, R.A.F.V.R.

Air Force Medal

Flt. Sgt. A. S. CLARKE, R.A.F.V.R.

Roll of Honour

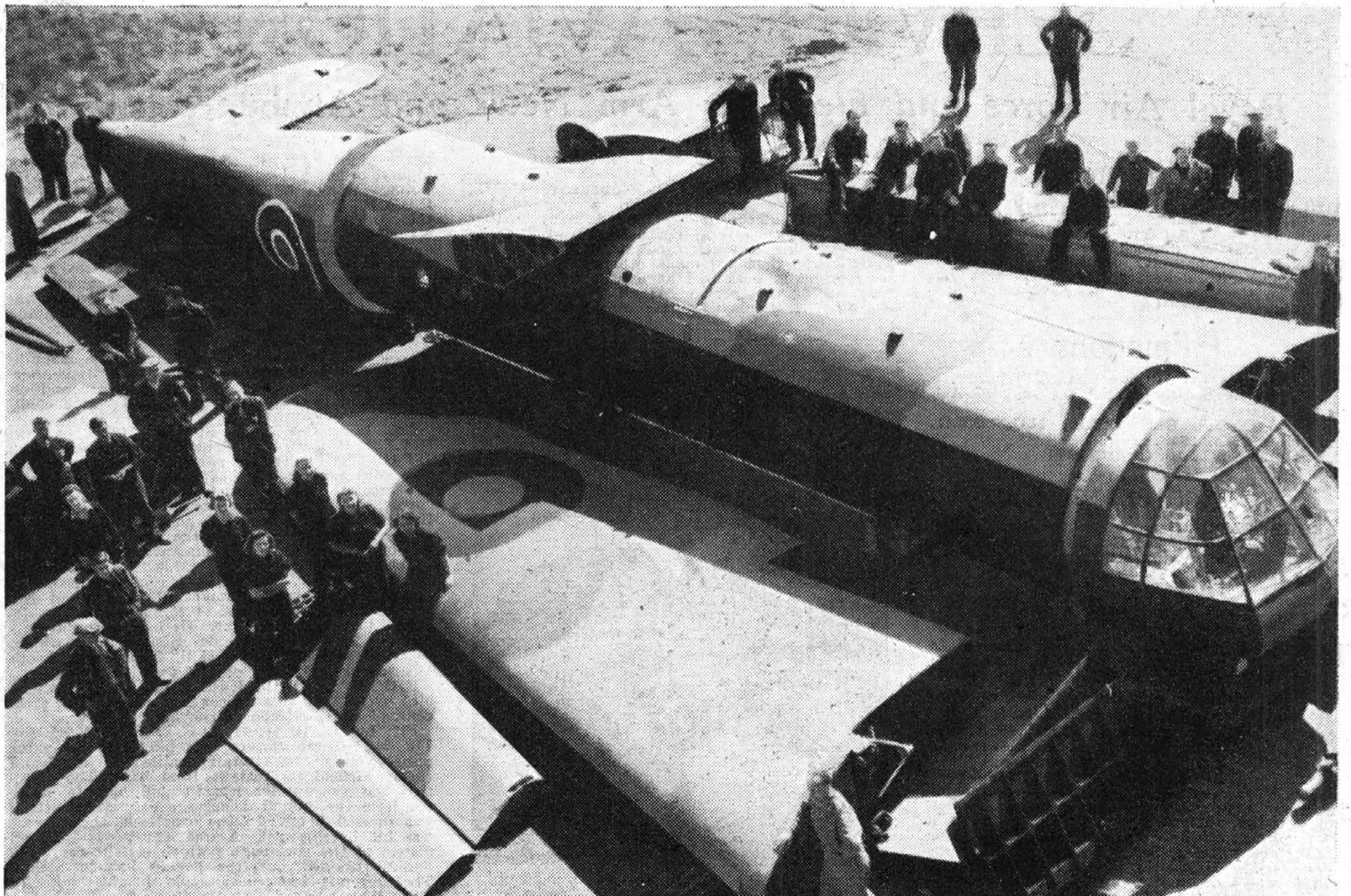
Casualty Communiqué No. 386.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 100 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. F. C. Churcher; Flt. Lt. F. Hall.
PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. G. Rowan; Sgt. M. K. Smith.
PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. Archibald; Sgt. R. G. Armsworth; F/O. R. C. Arthur; Sgt. A. Baldwin; P/O. W. L. Ball; Sgt. M. Bates; Flt. Sgt. L. L. Bernthal; Flt. Sgt. E. F. Bramley; Sgt. G. J. Cairncross; Sgt. J. A. Carpenter; Sgt. J. C. Cochran; Sgt. D. H. Cockram; Sgt. R. D. E. Codd; Act. Flt. Lt. D. Cramp; Sgt.



GLIDER ASSEMBLY: The 30 production units of an Airspeed Horsa ready for final erection. The Horsa is mainly of wooden construction and weighs some 7,000 lb.



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Those who plan the Air Services of the future should take note of this gentleman. There are still millions like him. A 'plane to them is a 'chancey' thing. Speedy? Yes. Exciting? Yes. Safe? No, not by long chalks. What will change their attitude? Not faster 'planes, or longer flights, or even 'planes with cocktail bars. They will accept flying as natural when a 'plane journey is as certain, as regular, as 'safe' as a train journey.

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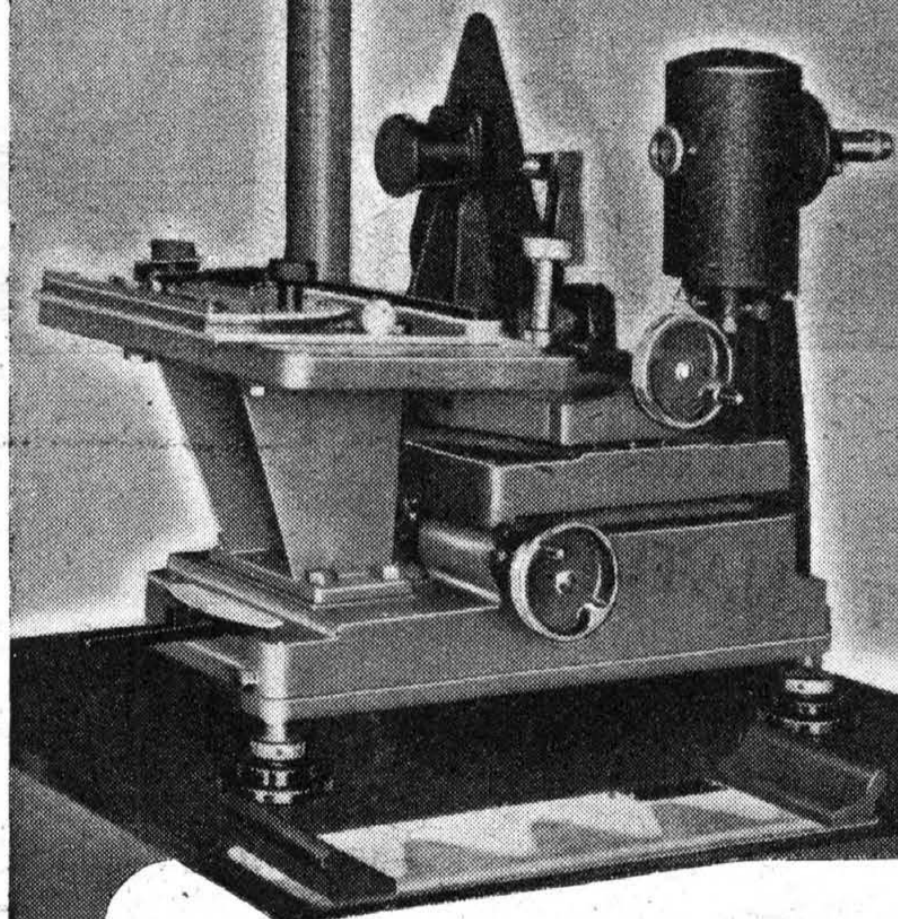
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PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—W/O. D. B. Brown; Flt. Sgt. R. A. C. Burnett; W/O. D. S. Coutts; Flt. Sgt. D. J. A. Mitchener; F/O. A. E. Moule; Sgt. R. A. Senior; Flt. Sgt. J. Stones; Flt. Sgt. J. Wilson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. A. Hayes.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. E. W. Chapman; Sgt. A. Dean; F/O. J. Penley; Flt. Sgt. J. A. T. Griffith; Sgt. J. W. Griffiths; Act. Flt. Lt. A. Hilton; Sgt. J. L. Howell; P/O. F. W. Janes; Sgt. W. Lawson; P/O. M. S. Lynch; Sgt. H. F. Moroni; Flt. Sgt. H. Morral; Sgt. F. A. Paskell; Sgt. J. Ratcliffe; Sgt. D. G. Whittaker; Sgt. G. W. Yates.

MISSING.—Sgt. B. S. J. Akehurst; P/O. J. M. Alexander; Sgt. B. J. Allen; F/O. K. L. Atkins; Flt. Lt. R. R. S. Ballantyne, D.F.M.; Flt. Sgt. F. W. Bartley; Sgt. D. E. Barton; Act. Flt. Lt. K. H. Berry, D.F.M.; Sgt. E. B. Blair; Sgt. C. A. Brown; Sgt. L. F. Carr; Act. Flt. Sgt. W. J. Catchpole; Sgt. A. B. Chester; Sgt. P. L. Colman; Sgt. S. C. Cook; F/O. F. W. Cosens, D.F.C.; Sgt. B. Coughlin; F/O. C. D. Croxford; Flt. Sgt. A. C. J. Curley; Sgt. H. Daggett; Sgt. R. Dent; Flt. Lt. A. G. Dickenson; P/O. J. D. Dill-Russell; Flt. Sgt. G. Dixon; Flt. Sgt. L. J. Donaldson; P/O. A. F. Dowding; P/O. J. A. Downs; Flt. Sgt. L. H. Dunlop; Act. Flt. Sgt. T. R. Dutton; W/O. A. F. Edmonds; Sgt. L. A. Field; F/O. F. G. Gains; Act. Flt. Sgt. L. G. Glaus; Sgt. C. Glen; P/O. G. W. Goult, D.F.M.; Act. Flt. Sgt. J. L. Gurton; Sgt. A. Hatfield; Flt. Sgt. E. T. Helps; Sgt. W. J. Hill; Sgt. D. A. Hopper; Sgt. A. E. Jacks; Flt. Sgt. W. F. Johnson; Sgt. W. Johnstone; Flt. Sgt. J. J. O'N. Kennedy; Sgt. E. Kenyon; P/O. A. Kulartne; Flt. Sgt. R. J. Lerner; Flt. Sgt. M. J. Litchfield; F/O. R. E. Lomax; Sgt. S. Lucas; Flt. Sgt. J. MacPherson; W/O. W. E. Mitton; Sgt. A. G. Owen; Flt. Sgt. R. J. Paige; F/O. R. T. Peace; Flt. Sgt. J. J. Peacock; Sgt. M. K. Piper; Sgt. R. G. Potter; Sgt. H. J. Prouten; Sgt. J. L. Powell; P/O. J. W. Ralph; Flt. Sgt. T. H. Redgate; Flt. Sgt. R. N. Ross; Flt. Lt. A. J. Sayer; Act. Flt. Sgt. N. B. Sefton; Sgt. K. W. Sherlock; Sgt. R. B. Shuttleworth; Flt. Sgt. E. B. Smith; Sgt. G. W. Smith; Act. Flt. Sgt. W. H. Smith; F/O. J. C. Southey; Act. Flt. Lt. M. C. Stimpson, D.F.C.; Sgt. H. Stollar; Sgt. C. Tattersall; Flt. Lt. A. F. Taylor, D.F.C.; Flt. Sgt. J. Taylor; P/O. R. W. Theobald; Flt. Sgt. R. W. Tudor; Sgt. C. O. Tyler; F/O. E. L. Walker; Flt. Sgt. R. W. Wheeler; Sgt. R. Whitaker; Sgt. E. White; F/O. K. Wilcock; Sgt. W. R. Williams; P/O. G. A. Woodcock-Stevens; F/O. J. H. Wright, D.F.C.; Sgt. P. W. Wright; Sgt. D. J. Young.

KILLED ON ACTIVE SERVICE.—P/O. F. R. Bedford; Sgt. J. W. Bell; L.A./C. A. W. Edmonds; Sgt. R. T. G. Loughrin; P/O. R. H. Mason; F/O. P. Milner; Flt. Sgt. J. M. Morris; Sgt. D. W. Tindell; P/O. R. W. J. Towle; Sgt. R. W. Tunnicliffe; Sgt. C. R. Whisk.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. I. D. Milne; Cpl. P. Rhodes.

DIED ON ACTIVE SERVICE.—A/C.2 D. F. Call; W/O. J. S. Dee; Cpl. A. S. Doylend; Flt. Lt. E. Gallimore; L.A./C. H. Gregory; A/C.2 F. R. Hamilton; Cpl. C. Jackson; L.A./C. A. Matthews; Flt. Sgt. E. W. Moody; Cpl. B. C. Porter; P/O. W. O. Simpson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. J. W. Brace; Sgt. J. Bruce; A/C.2 J. A. France; Sgt. G. E. Lloyd; Sgt. G. F. Thomas; Flt. Lt. M. H. G. Wilson.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. G. D. V. Howard; F/O. V. T. Rutter.

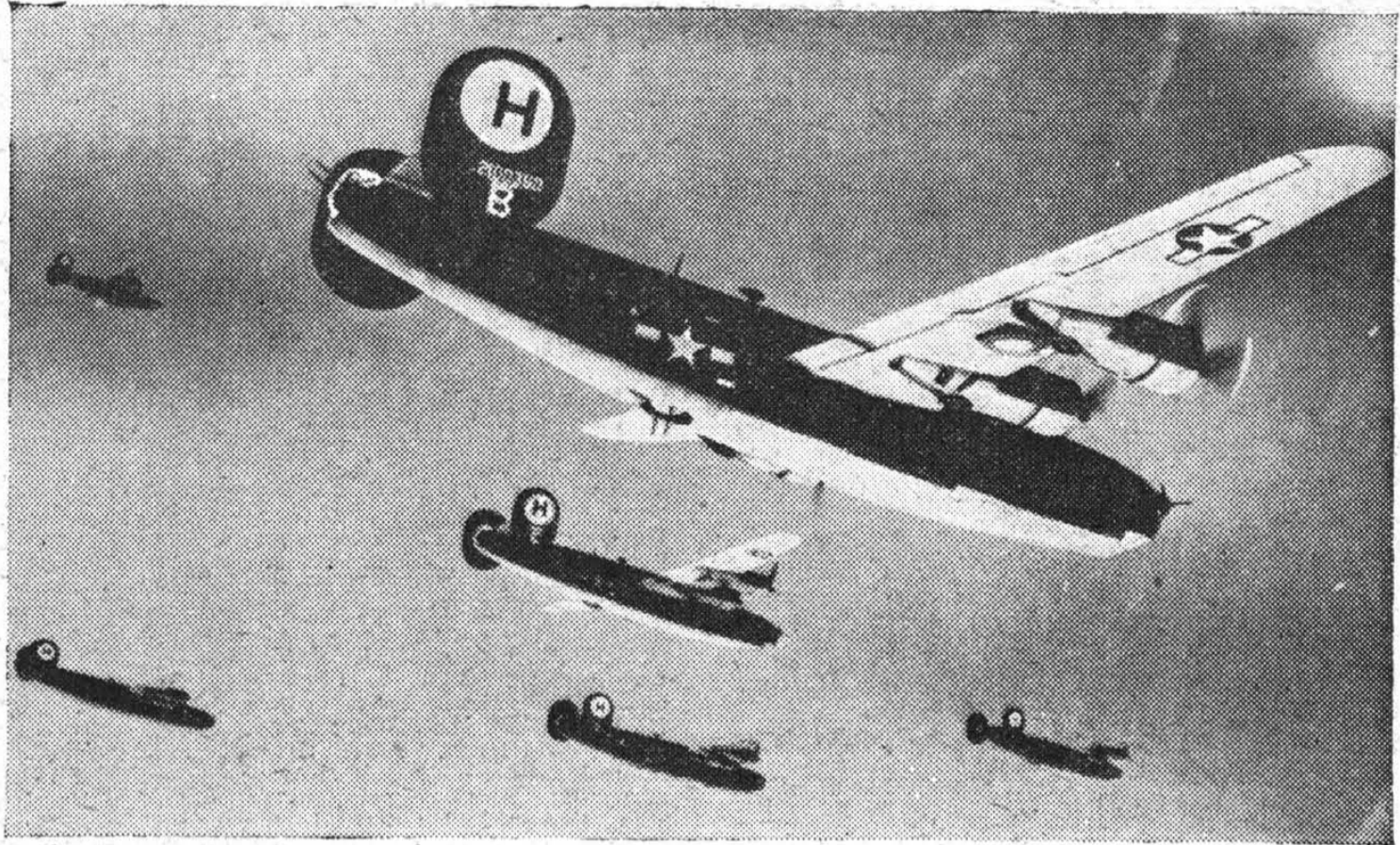
PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. L. G. Knight; Sgt. G. F. Regan.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. R. J. Hudson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—P/O. K. A. McIver.

MISSING, BELIEVED KILLED IN ACTION.—F/O. B. Foskett; Act. Flt. Lt. T. L. Griffiths; W/O. J. B. Horgan; P/O. M. J. Hurley; Flt. Sgt. G. McMaster; Flt. Sgt. A. McI. Woodford.

MISSING.—Flt. Sgt. R. M. Baker; P/O. J. W. Fisher; Flt. Sgt. P. G. Gotto; Flt. Sgt. R. R.



LIBERATION: Consolidated Liberators of the U.S. 8th A.A.F. on their way to bomb a Me 110 factory at Gotha. Note the retracted under-turret.

Kelley; Flt. Sgt. N. L. Newell; P/O. A. J. Stapleton.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. N. H. Koetsveld.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. R. J. Plath.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. B. S. Haines.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. N. Cruik; Flt. Sgt. A. B. Lewis; F/O. G. A. McClintock; Flt. Sgt. R. McNeil; W/O. C. A. Nash; P/O. J. G. A. Patry; P/O. R. F. Worthington.

MISSING, BELIEVED KILLED IN ACTION.—F/O. F. L. Chalmers; Flt. Lt. W. E. Culcheth; W/O. M. N. MacDonald; W/O. W. A. Park; Sqn. Ldr. A. V. Reilander.

MISSING.—Sgt. A. Carlson; W/O. J. L. Donald; F/O. J. M. W. Filmer; Flt. Sgt. M. A. G. Fournier; F/O. F. Hartnett; W/O. W. Hawkins; Flt. Sgt. L. W. Hicks; Sgt. O. W. Hicks; P/O. H. N. Jackson; W/O. P. Labach; Sqn. Ldr. H. L. Lindo, D.F.C.; W/O. J. Lindsay; W/O. W. K. M. Love; P/O. W. M. M. Manser; F/O. H. J. Miller; F/O. R. E. Padget; P/O. J. A. Parker; W/O. B. W. Pattle; Flt. Lt. R. H. Penalagan; Flt. Sgt. L. T. Prosser; Sgt. H. T. Raine; W/O. R. F. Sykes; F/O. R. C. Taylor; Wing Cdr. A. Wheeler, D.F.C.

KILLED ON ACTIVE SERVICE.—F/O. J. B. Eaton; W/O. J. M. Healey; F/O. G. L. Muskett; F/O. J. Sigurdson; Sgt. F. E. Wilt; Sgt. P. Zayets.

Royal New Zealand Air Force

MISSING, BELIEVED KILLED IN ACTION.—P/O. C. S. Benson.

MISSING.—Flt. Sgt. G. H. Reid.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. E. W. D. Hunt; Flt. Lt. S. M. Hunt; F/O. A. F. Lissette.

South African Air Force

MISSING.—2/Lt. W. R. Allison; Act. Air Sgt. R. B. Bell; Lt. B. D. Classen; Flt. Sgt. G. L. De Wall; 2/Lt. C. J. B. Haggett; Flt. Sgt. I. E. Humpries; 2/Lt. R. E. Ireton; 2/Lt. A. E. Lallyett; Flt. Sgt. L. Lurie; Lt. A. M. Milbee; Capt. F. Ribbink; Lt. C. H. I. Rood; Lt. D. Smith; Lt. E. J. Thornhill-Cook; Lt. L. Van Bergen; Lt. T. U. B. Van Der Riet; Flt. Sgt. E. Viveros; Lt. L. C. Wessels.

DIED ON ACTIVE SERVICE.—Sgt. C. Werner.

Casualty Communiqué No. 387

Of the names in this list 101 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. J. D. Eaton; P/O. A. H. Hullah; Sgt. W. P. Martin; Sgt. E. L. Parrish; Sgt. G. B. Partt; Sgt. A. Pybus; Sgt. J. W. Simpson; Flt. Sgt. I. J. Williams; Sgt. A. J. Wolfe.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. A. R. Baxter; F/O. J. S. C. Campbell; Sgt. V. G. Green; P/O. J. Saxon; Sgt. A. L. Thomas; Sgt. O. W. Wood.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. G. Amos; Sgt. T. Armstrong; P/O. G. Ashplant; Sgt. M. Atkinson; Flt. Sgt. A. W. Baines; Sgt. D. R. Baird; Sgt. A. J. Bishop; Sgt. R. V. Boyd; Sgt. I. H. Bradley; Sgt. V. T. Bradley; Sgt. N. J. Brokenshire; Sgt. J. L. Burnside; Sgt. G. T.

Causar; Sgt. L. Cervi; Sgt. G. L. A. Deasley; Sgt. W. B. Donner; Sgt. C. Easton; Sgt. T. E. Edmondson; P/O. T. B. Forbes; Sgt. R. A. Fox; Sgt. M. H. Galt; Sgt. J. S. Gaston; Sgt. R. Gilbert; Sgt. J. R. Fradley; Sgt. A. Hales; P/O. J. Hickling; F/O. K. Holme; P/O. F. W. Holmes; Flt. Sgt. A. E. Jeffery; Sgt. T. Kerr; Sgt. C. A. Land; Sgt. S. Leigh; Sgt. O. McCoo; Sgt. T. G. Moore; Flt. Sgt. A. H. Oldham; Sgt. D. G. J. Powell; Sgt. E. A. R. Preston; P/O. H. J. A. Reid; Sgt. L. A. W. Sanders; F/O. W. E. Sawdy; Sgt. A. E. Simmonds; Sqn. Ldr. A. C. L. A. Stuart; Sgt. D. A. A. Tayler; Sgt. W. F. Thomas; Sgt. G. E. Trowsdale; Sgt. E. P. Watson; F/O. N. B. Weatherston; F/O. A. R. Welch; Sgt. A. G. Wells.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Sqn. Ldr. R. N. Todd-White.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. C. Butler; Sgt. N. H. Lerigo; Flt. Sgt. T. J. Lightfoot; Flt. Sgt. F. Lloyd; Flt. Sgt. P. G. F. Redstone; Act. Flt. Sgt. R. Yates.

MISSING.—Sgt. F. J. Aberly; Sgt. F. C. Barker; Sgt. R. L. Bates; Sgt. I. Bell; Sgt. B. Bolt; F/O. T. E. Bolton; Sgt. P. R. Bourne; Flt. Sgt. R. E. Bowler; Flt. Sgt. J. F. Brown; Sgt. J. W. Brown; Sgt. P. G. Burgon; Sgt. H. S. Cammish; Act. Flt. Lt. W. M. Carruthers; Flt. Sgt. L. C. Casper; Sgt. A. F. Challinor; Sgt. R. J. Colley; Flt. Sgt. A. Collins; F/O. J. B. Colhurst; P/O. F. Crofts; Sgt. R. G. Dennis; Wing Cdr. J. F. Dilworth; F/O. P. Dormand, D.F.C.; F/O. D. P. Doyle; Sgt. S. J. Eden; F/O. N. R. Gamble; Sgt. C. E. W. Gardner; Sgt. R. P. Gigg; Sgt. K. E. Gilson; Sgt. J. E. Glanville; Sgt. M. Goldman; Flt. Sgt. F. A. Greenwell; Sgt. D. J. Halke; F/O. N. Harland; Flt. Sgt. J. C. Harthill; Sgt. J. Hewitson; P/O. K. K. Hignett; Act. Flt. Lt. J. C. Hornby; P/O. D. Jackson; Flt. Lt. F. N. Jenkin; Flt. Sgt. P. L. Jones; Sgt. H. H. Kendall; F/O. R. M. King; Act. Flt. Lt. T. Leithead, D.F.M.; Sgt. D. G. Lloyd; Sgt. P. Luscombe-Armstrong; Sgt. H. A. M. Lyons; Sgt. A. D. MacGillivray; Sgt. A. J. H. Merricks; Sgt. E. R. Metcalf; P/O. A. C. Middleton; Flt. Sgt. J. Miller; Flt. Lt. J. R. G. Milton; F/O. P. R. Mitchell; Sgt. K. Morley; F/O. J. G. Moxham; F/O. R. F. Niece; Sgt. J. Peers; Sgt. A. Porritt; P/O. H. Rankin, D.F.M.; Flt. Lt. A. M. Rhodes; P/O. F. R. Rohrer; Flt. Sgt. P. H. Savage; Sgt. M. R. Singer; Flt. Sgt. J. Slack; F/O. D. Smith; Sgt. E. H. V. Smith; W/O. K. McL. Smith; Sgt. R. F. Smith; Sgt. R. G. Styles; Sgt. T. J. Taylor; P/O. W. F. Taylor; F/O. F. J. Thompson; Sgt. J. J. Tobin; Flt. Sgt. F. Wadge; Sgt. W. Walsh; Sgt. J. W. Wastney; Sgt. F. C. Willis; Sgt. W. A. Wood; Sgt. F. Woodward; Flt. Sgt. J. Woodward; Flt. Sgt. N. Woodward; Sgt. M. L. Worth.

KILLED ON ACTIVE SERVICE.—Sgt. W. S. Beevers; Flt. Sgt. L. E. Bignall; Sgt. A. C. Brown; F/O. P. N. Brown; F/O. J. W. Christie; Sgt. R. W. Cottrell; A/C.2 J. D. Gibb; Act. Flt. Lt. G. P. Irvine; Flt. Sgt. P. A. Lucha; F/O. W. B. McLaren; Flt. Sgt. W. T. Martin; Sgt. A. P. Reid; P/O. M. Sharp; W/O. J. J. M. Ward; Sgt. M. H. Widdows; Cpl. J. Wright.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.2 W. G. C. Brown; Cpl. K. Davies; L.A./C. G. B. Lamb; Sgt. W. Smith; Sgt. R. M. Stevenson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. E. R. Bailey; Sgt. G. Hamilton; Flt. Sgt. J. M. Hewett; Sgt. N. J. M. McLeod; F/O. J. E. F. Wright, D.F.C.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. K. W. Radford.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—A/C.1 A. S. Berryman; A/C.1 R. Collins; Cpl. E. A. Howes; A/C.2 D. J. Hunter; L.A./C. A. E. Kitch; Sgt. S. V. Parker; L.A./C. R. J. Rochford; A/C.2 A. Rylands; L.A./C. W. Smith; A/C.2 L. S. Stallworthy; L.A./C. A. Storey; A/C.1 J. Varley.

SERVICE AVIATION

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. A. E. D. Davey.
MISSING.—Flt. Sgt. J. A. L. Carmichael; Flt. Sgt. J. G. L. Glazebrook.
KILLED ON ACTIVE SERVICE.—F/O. P. W. Hart; Flt. Sgt. M. C. Simpson.

Royal Canadian Air Force

KILLED IN ACTION.—W/O. G. A. Andrews; P/O. A. I. Gregg; W/O. J. D. Morgan; W/O. J. J. P. A. Rodrigue; W/O. A. Stalker; W/O. G. E. Stringer.
PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. R. G. Allan; Sgt. J. McK. Bradford; W/O. W. H. Calder; F/O. R. R. Dunphy; Flt. Sgt. E. R. Ferris; P/O. A. F. Hakala; F/O. T. F. Hall; Sgt. J. Hooper; Sgt. L. M. Horahan; Flt. Sgt. J. C. A. Laberge; F/O. J. P. Laurin; P/O. R. A. Livingston; Sgt. H. G. Machell; W/O. R. V. Millar; F/O. R. V. Milne; P/O. A. W. Nichols, B.E.M.; Flt. Sgt. J. P. G. E. Richer; Sgt. D. S. Ritchie.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. T. L. Connolly.
MISSING, BELIEVED KILLED IN ACTION.—P/O. D. J. Eastham; Flt. Sgt. O. L. H. Harding; Flt. Sgt. S. Kay; Sgt. C. A. Lavery; Sgt. G. R. Machesney; F/O. A. R. Mark; W/O. D. A. Price; Sgt. D. R. Robinson.

MISSING.—Sgt. J. Achim; F/O. F. A. Arnston; F/O. E. H. Barbet; P/O. L. S. Beer; W/O. G. H. Bentinck; Flt. Sgt. G. MacM. Bessette; F/O. L. F. Blakeney; F/O. A. W. Bockus; W/O. W. L. Bourdat; Sgt. E. R. Burns; Sgt. L. L. N. Decelles; P/O. C. O. Draper; Flt. Lt. J. W. Einarson, D.F.C., D.F.M.; Flt. Sgt. P. E. Fillion; Sgt. M. E. Hodgins; W/O. E. C. Howey; F/O. H. L. Kemp; Sgt. F. L. Kennedy; W/O. J. A. R. W. Lalonde; P/O. F. G. Langford; Sgt. L. J. Lemoal; F/O. P. G. McGuire; Flt. Sgt. J. Metka; Sgt. A. M. G. Munro; Sgt. A. C. Neville; Sgt. H. C. Oswald; F/O. E. D. Patterson; F/O. C. F. Ridgers; W/O. S. J. Rogers; F/O. A. W. Shirley; Flt. Lt. W. R. Smith; W/O. G. E. Stevenson; Sgt. D. G. Strachan; W/O. J. E. Strain; Sgt. S. Thorvardson; Sgt. G. L. Ward; Sgt. L. T. Wardell; F/O. E. K. Williams; F/O. R. B. Wright.

KILLED ON ACTIVE SERVICE.—W/O. E. T. Bell; F/O. J. G. Broder; P/O. J. M. Cooley; Sqn. Ldr. H. Elsey; F/O. E. G. Finch; Flt. Sgt. J. K. Goodfellow; Sgt. C. W. Gugins; Flt. Sgt. W. P. Hamilton; W/O. R. C. Herod; Sgt. R. F. Hodges; F/O. H. D. Merkley; F/O. W. T. Robinson; P/O. A. I. Sinclair; W/O. J. G. Stewart; W/O. R. W. Taylor.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. J. C. Eyre.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. A. C. Bowes; P/O. P. J. Lalonde.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. H. C. Campbell; Cpl. H. C. D. Ellis.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. E. L. Guertin; Sgt. I. R. MacDonald; Flt. Sgt. H. K. Scott.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. G. A. Fisk; P/O. G. V. Helm; P/O. D. C. Henley; Flt. Sgt. I. H. R. Smith; Flt. Sgt. D. M. Stewart; F/O. C. A. Watson.
MISSING.—Flt. Sgt. L. N. Atkinson.

Casualty Communiqué No. 388

Of the names in this list, 98 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. P. C. Bates; Sgt. D. G. Browne; Sgt. C. F. Davy; P/O. F. C. Flitcroft; Sgt. G. H. Hawkins; Sgt. W. D. Hazeldine; Sgt. G. K. Kirk; Sgt. J. Shoolbread; F/O. E. R. Stannard; Sgt. R. Tipaldi.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. S. W. Anderson; Sgt. W. E. Caudell; Sgt. P. Crow; Flt. Sgt. W. Findlay; Flt. Sgt. J. F. King; Flt. Lt. J. H. Manley; Sgt. R. H. Reay; Sgt. J. C. D. Riddell.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. S. R. Ablett; P/O. E. F. Allwright; Act. Flt. Lt. R. Bakewell; Sgt. R. W. Ball; Sgt. D. J. Banks; Sgt. H. R. Barnes; Sgt. G. Batey; Sgt. R. W. Baybut; Sgt. A. Bell; F/O. R. J. Boyd; Sgt. E. Bracken; F/O. D. C. Bradshaw; P/O. E. J. Burnett; Flt. Sgt. J. W. Buxton; Sgt. D. A. Chisholm; W/O. G. R. Cobby; Sgt. R. J. Coggins; Sgt. F. J. Edwards; Sgt. A. G. Elcox; Sgt. J. Emerson; F/O. H. T. Etienne; P/O. E. Fenwicke-Clelland; Sgt. K. Foster; Sgt. J. Galloway; Flt. Lt. R. W. A.

Karigi, a 12½ year old partisan messenger, demonstrates his Sten gun to R.A.F. officers serving in Yugoslavia.

Gibbs; Sgt. H. McN. Gill; Sgt. R. C. S. Golding; F/O. W. V. Gregson; Flt. Sgt. L. Harrop; Sgt. A. R. Harris; P/O. W. J. Herrington; F/O. O. Hill; F/O. W. J. Hills; Sgt. R. Hobby; P/O. A. J. Holloway; Sgt. E. Horton; Sgt. T. I. Hughes; F/O. W. T. H. Jennings; F/O. J. Johnston; Sgt. A. Jones; Sgt. C. V. King; Sgt. F. M. Lamb; F/O. W. E. Leddeman; F/O. J. E. Lewis; Sgt. A. McKechnan; Sgt. H. W. Millar; Act. Wing Cdr. J. D. Nettleton, D.C.; Sgt. H. J. J. Neve; F/O. J. F. Newman; F/O. S. G. Norris; Sgt. T. L. Ormerod; Flt. Sgt. J. H. Page; F/O. H. W. Parry; F/O. R. B. D. Palmer; F/O. J. E. Pearce; P/O. A. F. J. Perrott; Sgt. A. B. Radcliffe; Sgt. K. G. Rathbone; Sgt. S. H. Rayner; Sgt. W. R. Rodger; Sgt. E. A. Roper; Flt. Sgt. C. T. Rudman; Sgt. M. J. R. Ryan; Sgt. W. A. Speller; P/O. T. Stenhouse; Sgt. J. A. Suffield; Sgt. J. Swinton; P/O. S. O' C. Tate; Sgt. A. N. Taylor; Sgt. R. V. Turner; Sgt. J. T. Vadden; Sgt. P. J. Wenmoth; F/O. W. J. Wheeler; Sgt. E. W. White; Sgt. G. R. White; Sgt. J. T. Wilson.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. R. W. Airey; Sgt. J. McL. Campbell; Sgt. C. W. L. Tongue.

MISSING.—Flt. Sgt. R. B. Basford; Sgt. H. G. Basten; Sgt. G. Beal; Flt. Sgt. V. Bennett; F/O. W. E. T. Bladen; F/O. J. D. Blencowe; Sgt. B. R. Bowditch; Sgt. P. Brosnan; F/O. E. G. Brown; W/O. J. E. Bunyan; Sgt. D. R. A. Burgess; Flt. Sgt. A. R. Burn; Sgt. J. Burns; Sgt. J. M. Charlier; P/O. B. Clifton, D.F.M.; Act. Flt. Lt. A. V. Collins; P/O. A. Colvin; Sgt. W. H. Cooksey; Sgt. J. G. Cowans; Sgt. L. E. Crick; P/O. H. N. Cunliffe; W/O. P. S. W. Daniel; F/O. E. C. Davies; Flt. Sgt. H. T. Davies; Sgt. F. K. Dench; P/O. G. J. Denson; Sgt. A. Drake; Sgt. C. D. Driscoll; F/O. I. R. M. Douglas-Pulleyn; F/O. A. G. C. Eason; Sgt. R. Edgeworth; Sgt. F. J. Everett; Sgt. A. Fenwick; Flt. Sgt. J. H. D. Fenwick; F/O. C. Gibson; Sgt. J. W. Gilbert; Sgt. F. A. Goodwin; Sgt. G. W. Green; P/O. P. W. Green; Sgt. G. D. Greenhill; Flt. Sgt. G. R. S. Halliday; Sgt. R. Harrison; Flt. Sgt. G. T. Haynes; Sgt. A. Hodgson; Flt. Sgt. A. M. Irwin; Flt. Sgt. C. W. Jackson; Sgt. W. Johnstone; Sgt. H. W. Jones; F/O. R. F. Jowett; Flt. Sgt. A. Kay; F/O. W. L. C. Kirkpatrick; Sgt. J. H. S. Leak; Flt. Sgt. K. J. Macey; Sgt. J. P. McCormick; Sgt. C. H. McFadden; Flt. Sgt. J. J. McKeown; Sgt. G. J. Macpherson; Sgt. E. G. Marchant; Sgt. D. W. Marshall; Sgt. H. A. Masters; Sgt. L. E. Mears; Sgt. G. P. Nicolson; Flt. Sgt. R. S. Nurse; Sgt. R. Openshaw; Sgt. L. E. Parker; Flt. Sgt. R. E. Pearson; F/O. P. J. Piggins; Sgt. G. A. C. Plant; Wing Cdr. E. F. Porter; Flt. Lt. R. H. Pugh; P/O. G. T. Raymond; Sgt. N. W. Reeve; Sgt. G. F. Reynolds; P/O. H. Sherlock; Sgt. F. R. Simmons; Sgt. J. Smith; Sgt. A. E. B. Stout; Sgt. R. S. C. Taylor; Sgt. C. B. Todd; Sgt. W. Walker; Sgt. G. A. Weddle; Sgt. P. S. White; Sgt. L. W. Whitefield; Act. Flt. Sgt. V. E. Whitehall; Act. Flt. Sgt. J. Williams; Flt. Sgt. K. G. Wilson; Sgt. C. O. Wing; Sgt. J. Yates; F/O. P. H. W. Young.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. A. Bowker; Sgt. D. T. Portch.

KILLED ON ACTIVE SERVICE.—Sgt. R. Bell; Sgt. H. Cohen; Sgt. J. E. Dix; Sgt. A. Draper; Sgt. R. C. Gibbs; Sgt. L. J. P. Hampson; Sgt. W. F. Hudson; Sgt. W. J. Mabey; A/C.1 J. T. Payne; Sgt. J. Speight.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—LA/C. J. J. Renwick.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. E. Dexter; P/O. L. G. Phillips.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. J. Graham.

DIED ON ACTIVE SERVICE.—LA/C. K. D. Dickie; A/C.2 G. Hambleton; Cpl. P. E. Middleton; A/C.1 A. Olney; A/C.1 C. J. Palmer.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—LA/CW. R. Greenfield.



Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. H. S. McGill; Flt. Sgt. C. A. Rye; Sgt. A. G. Wilson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. N. E. Bellman; Flt. Sgt. R. T. Gregory; F/O. S. T. J. Rundle.

MISSING.—Flt. Sgt. J. Ansell; Flt. Sgt. A. E. Arnold; Flt. Sgt. D. T. Balmanno; F/O. D. L. Boyd; Flt. Sgt. W. D. Carlile; P/O. A. J. Collins; Flt. Sgt. R. T. Gill; P/O. B. R. Greatrex; Flt. Sgt. P. W. B. Gurdon; Flt. Sgt. W. J. Howiss; F/O. J. P. Hutchinson; P/O. R. C. Martin; F/O. C. E. Melin; Flt. Sgt. R. G. O'Neill; Flt. Sgt. J. G. Russell; Flt. Sgt. C. W. Sisley; P/O. D. B. Snape.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—W/O. A. E. Daley; Flt. Sgt. N. L. Ginn.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. F. I. Elliott; W/O. G. T. Jackson; Sgt. R. W. Moller; F/O. G. Mundell; P/O. J. L. Richards; P/O. J. M. Quinlan; Flt. Sgt. R. Sirluck; W/O. H. A. E. G. Smith.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. F. L. Vaupel.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. W. Horn; P/O. M. M. Meyer; P/O. R. Quevillon; Flt. Sgt. E. J. St. Germain; Flt. Sgt. E. L. Shuttleworth; Sgt. G. D. W. Tate; Sgt. J. White.

WOUNDED OR INJURED IN ACTION.—F/O. H. B. Date; F/O. M. Soble.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. J. McA. Brodie.

MISSING.—Flt. Sgt. N. Bergland; Flt. Sgt. B. W. Bergquist; W/O. H. F. Binder; F/O. W. D. C. Boyd; W/O. R. G. Cassidy; W/O. J. A. Castle; P/O. R. B. Charters, D.F.M.; W/O. E. M. Coulter; Flt. Sgt. M. L. Davis; Flt. Lt. P. H. Doig; Sgt. A. J. Emerson; Sgt. H. E. Gammon; Sgt. G. T. Gibson; P/O. L. E. Goodkey; F/O. J. G. Hillman; Sgt. S. A. Loftson; W/O. B. J. Long; W/O. W. E. McDougall; W/O. G. D. Pettes; W/O. E. A. Powell; W/O. M. E. Schwartz; Flt. Sgt. A. H. Waite.

KILLED ON ACTIVE SERVICE.—Sgt. J. H. T. R. Bertrand; Sgt. E. C. Bousquet; Flt. Lt. K. A. Buckley; P/O. R. G. Calder; Flt. Sgt. W. W. Campbell; Sgt. C. E. Cote; P/O. J. P. Gervais; Sgt. J. J. L. Goudreau; Sgt. D. N. Hay; W/O. F. J. Leech; P/O. P. A. Olson; Sgt. J. H. E. Peltier; Sgt. J. Simms; Sgt. R. J. Trudel.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. H. Crow; Flt. Sgt. J. O. L. Houle.

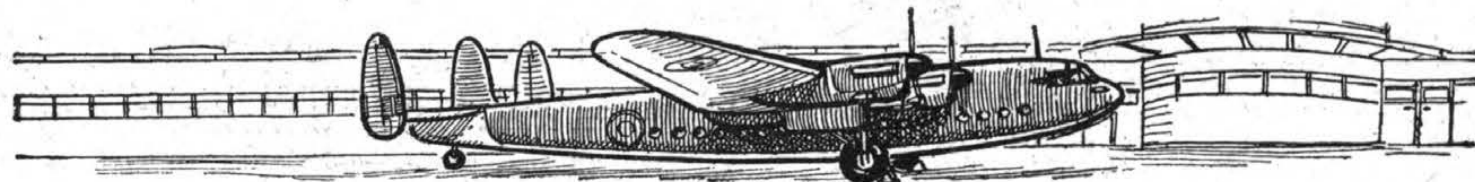
DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—W/O. R. C. S. McGee.

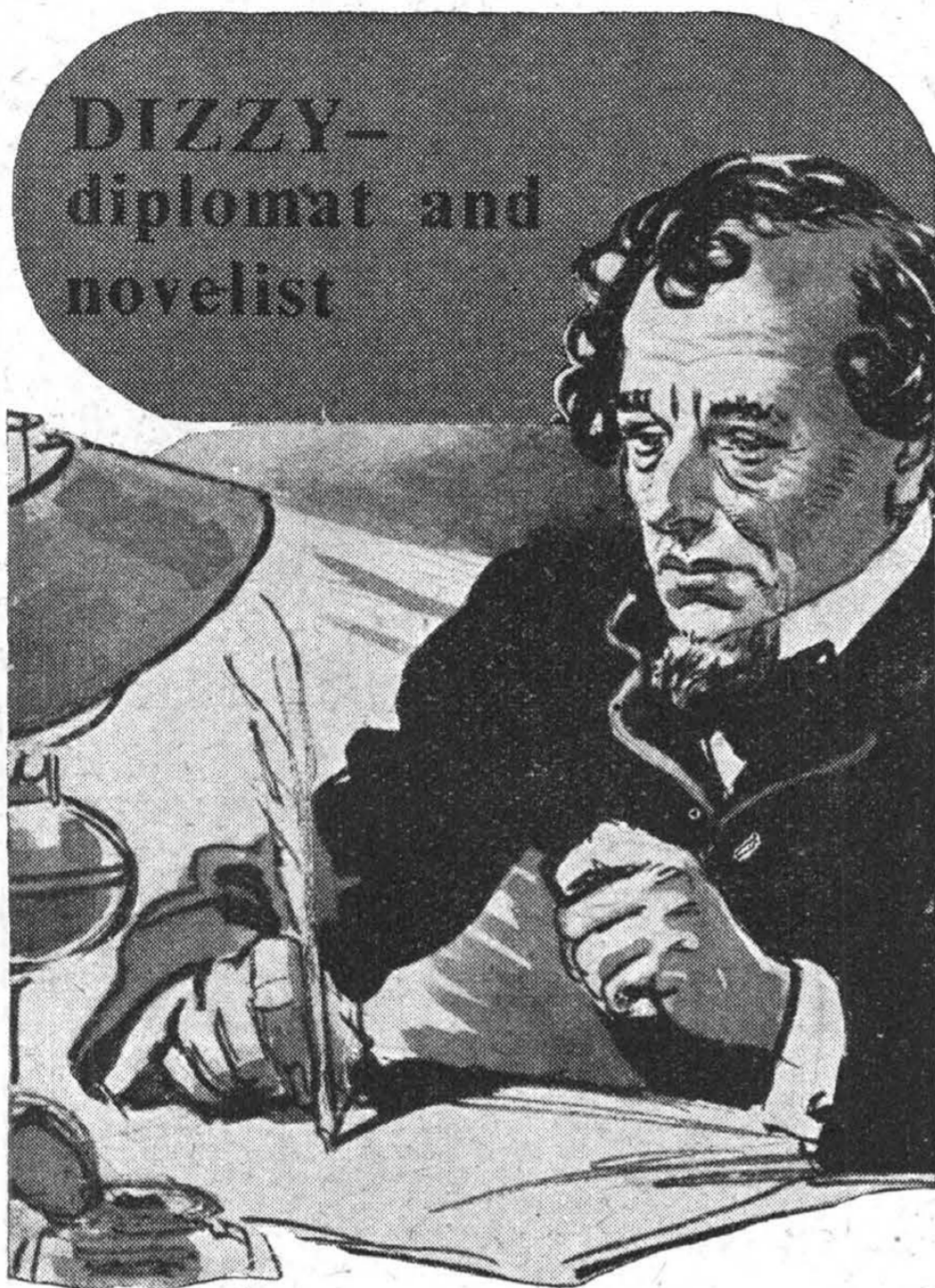
Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. J. A. Hannan.

MISSING.—Flt. Sgt. D. A. Chisholm; P/O. A. P. Chisholm; Act. Flt. Lt. K. B. O'Connor.

KILLED ON ACTIVE SERVICE.—F/O. J. D. McMillan; P/O. R. G. C. Payne.





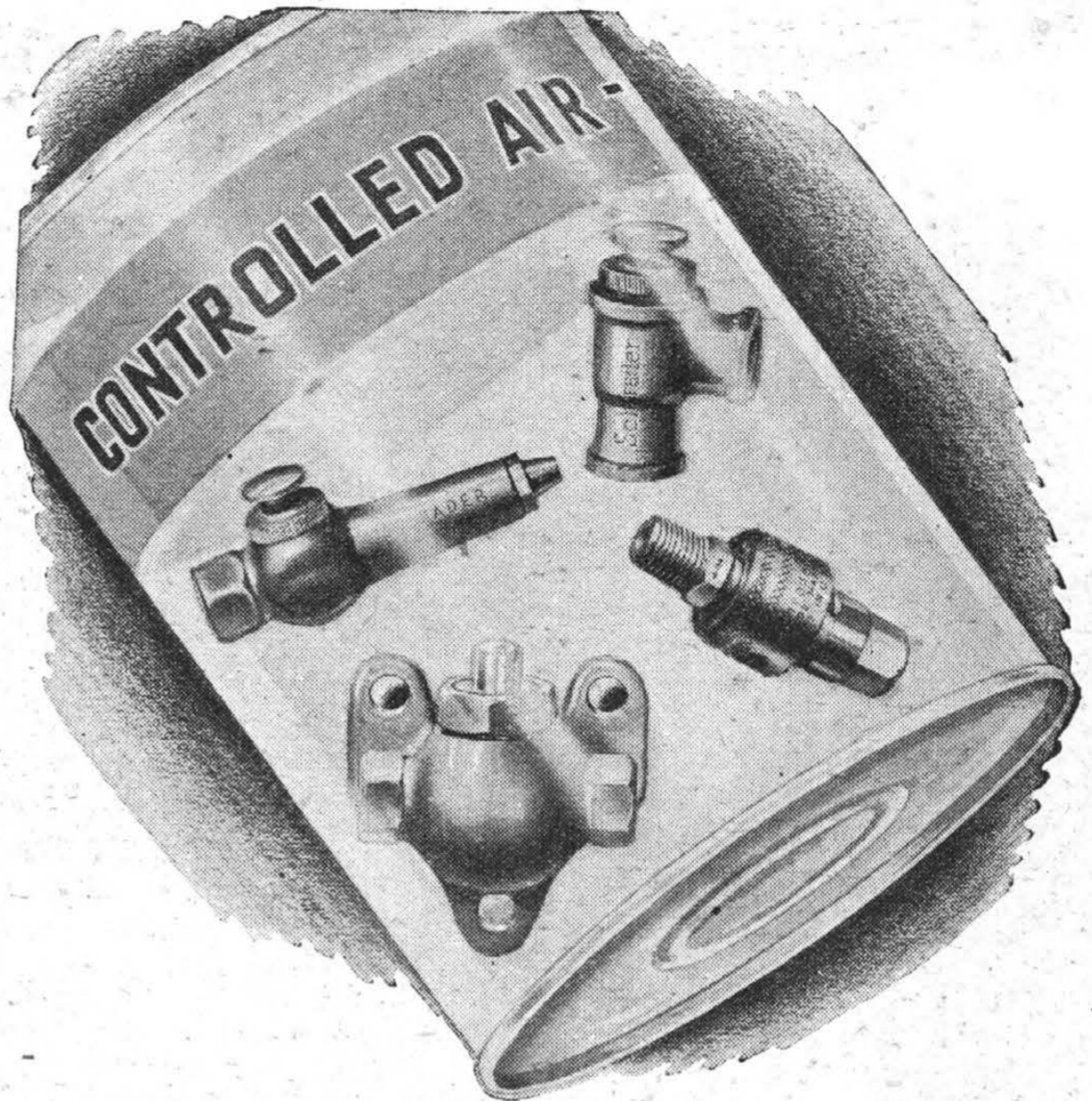
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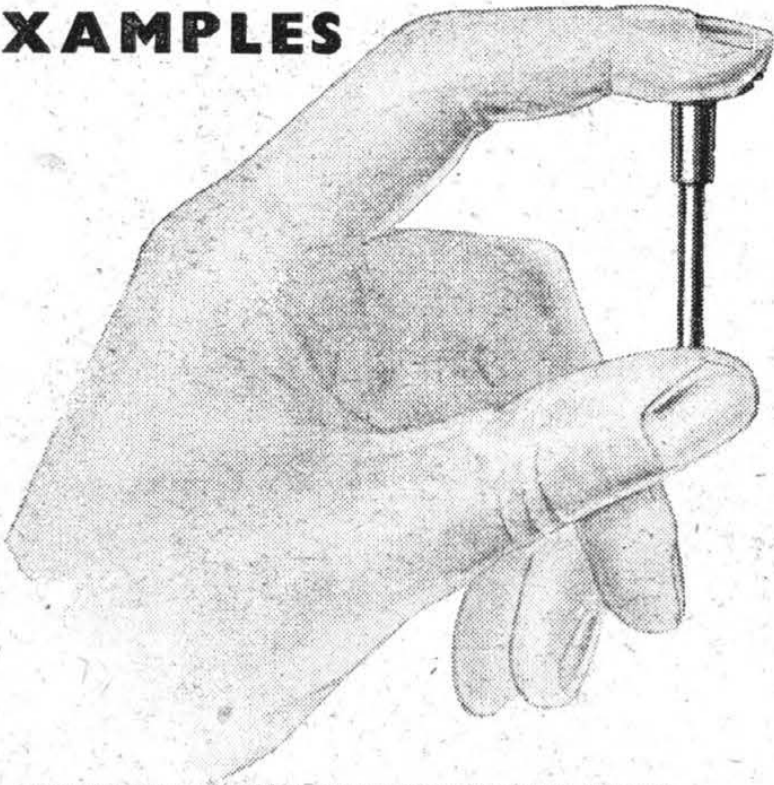


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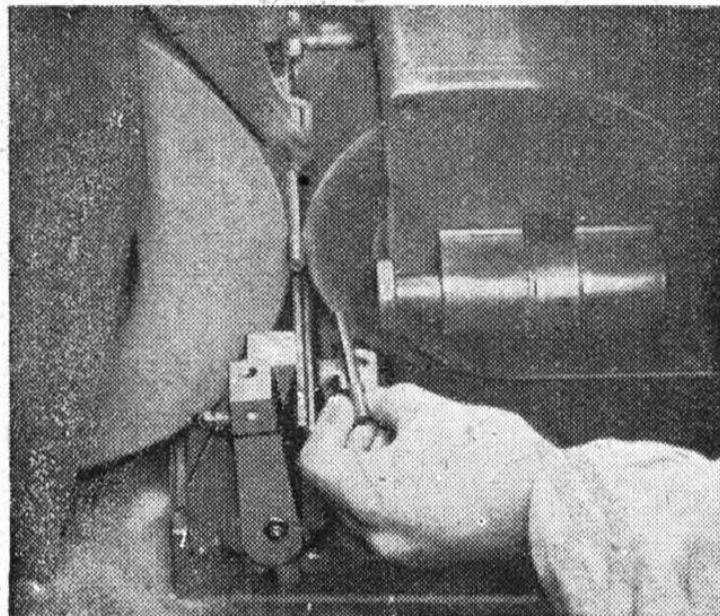
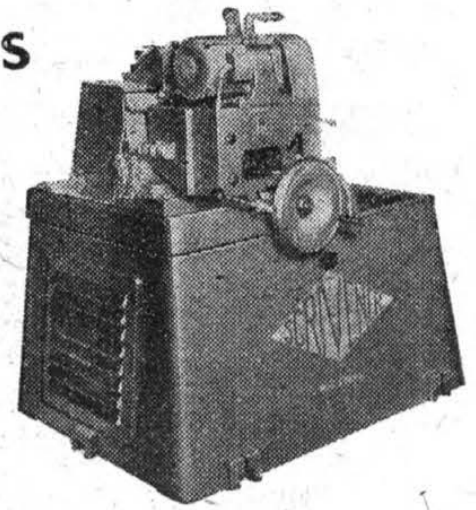
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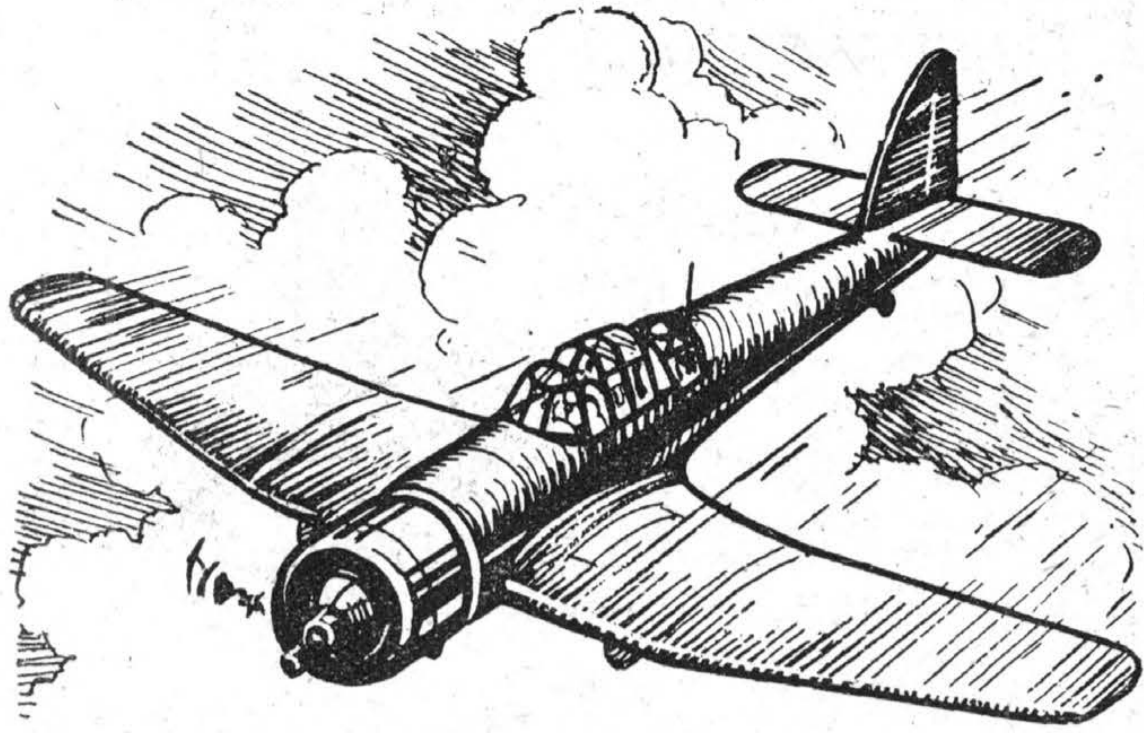
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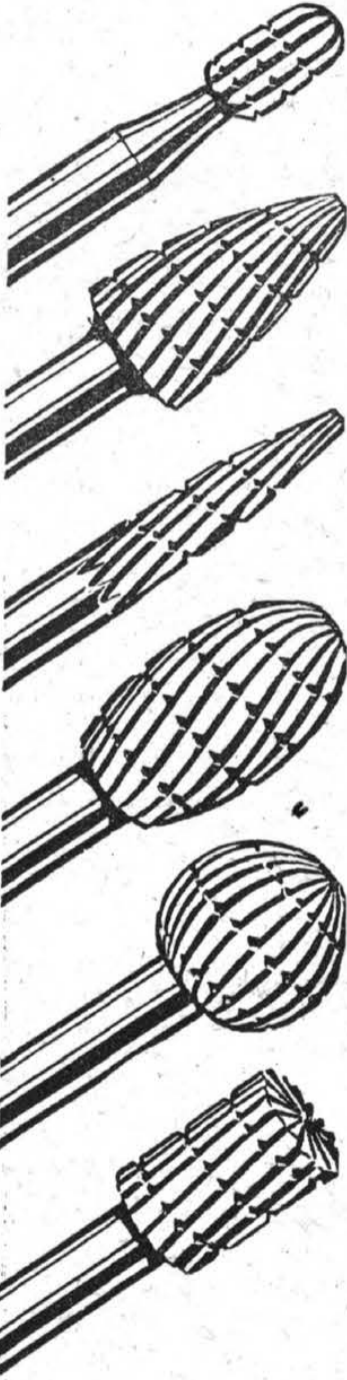
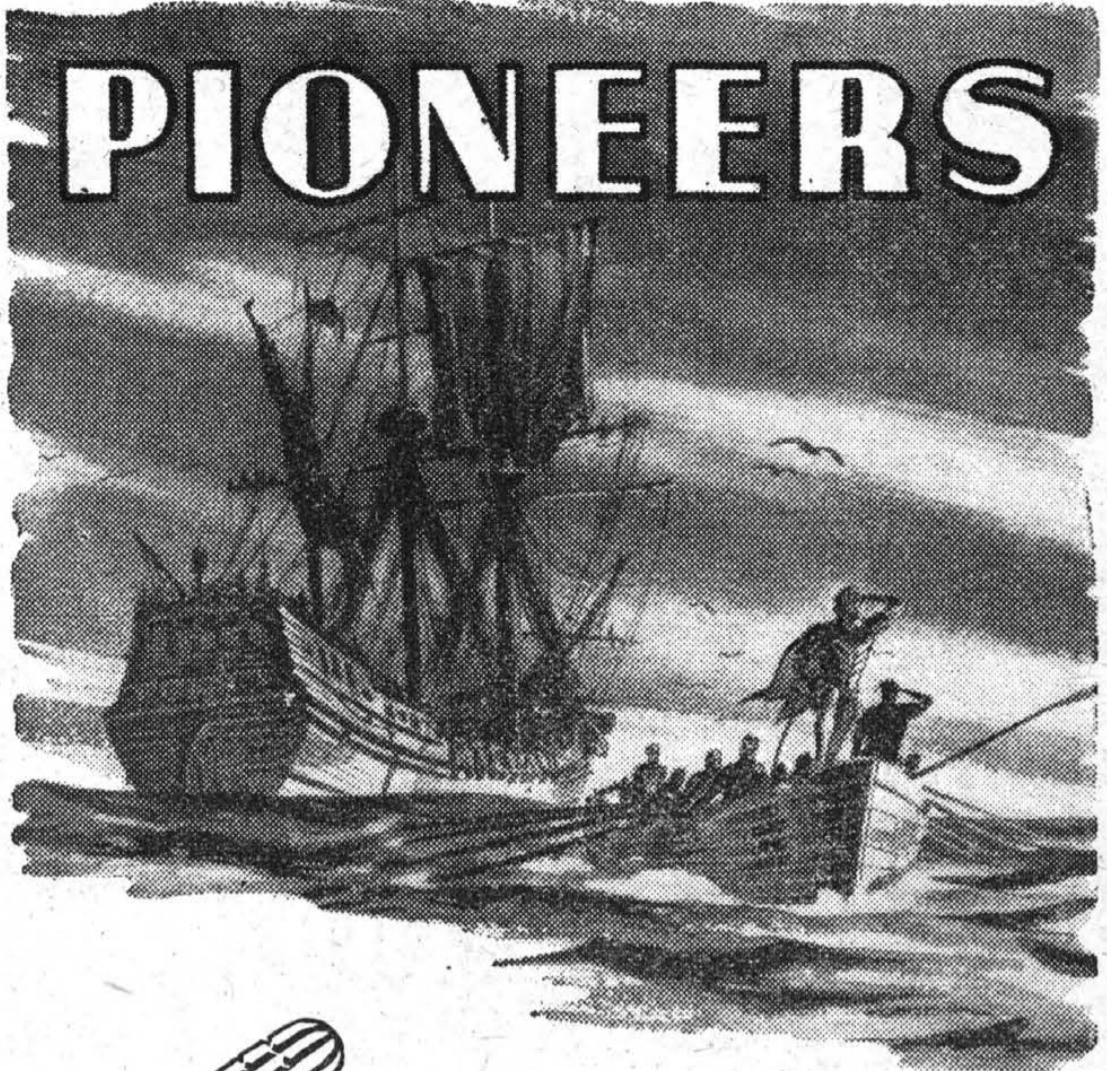
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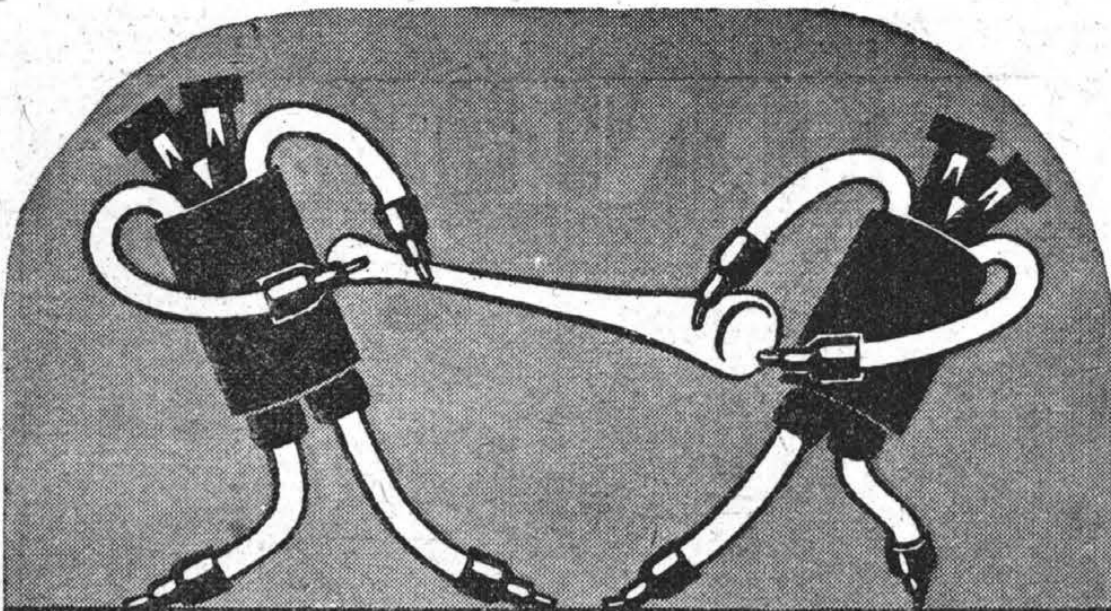


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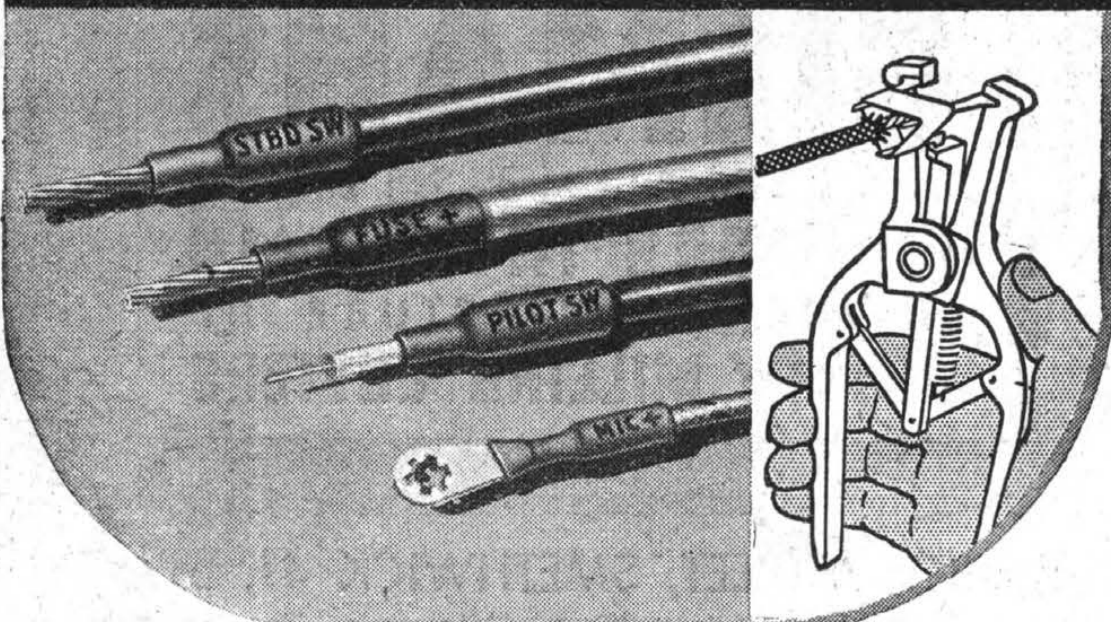
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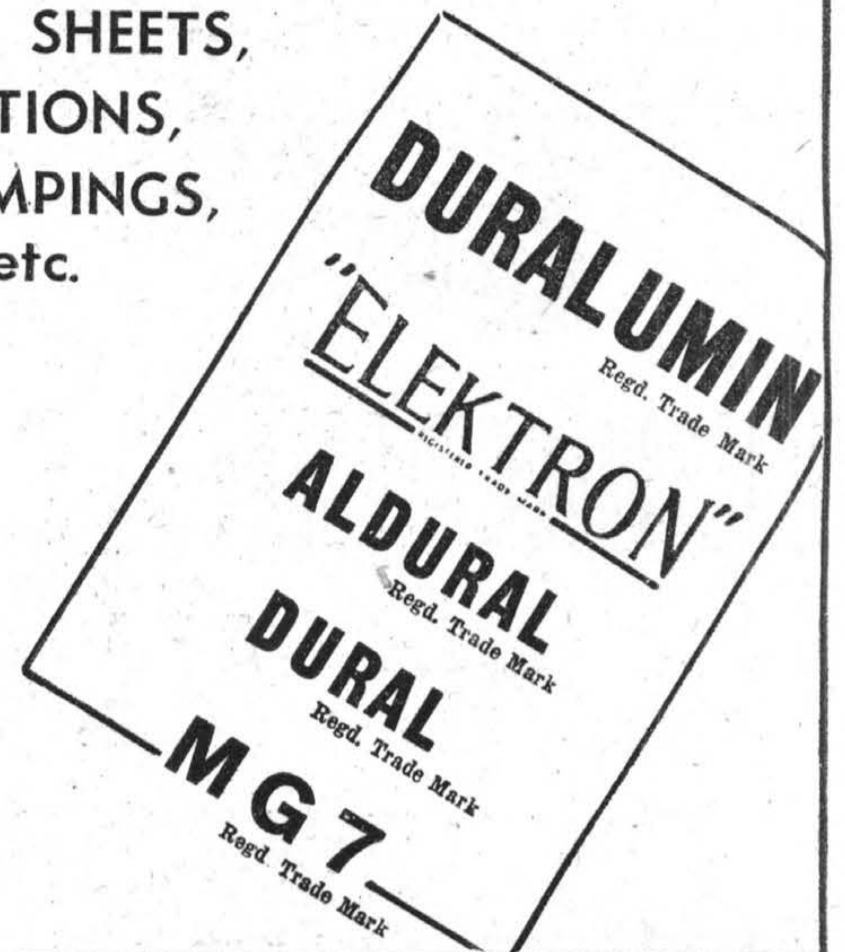
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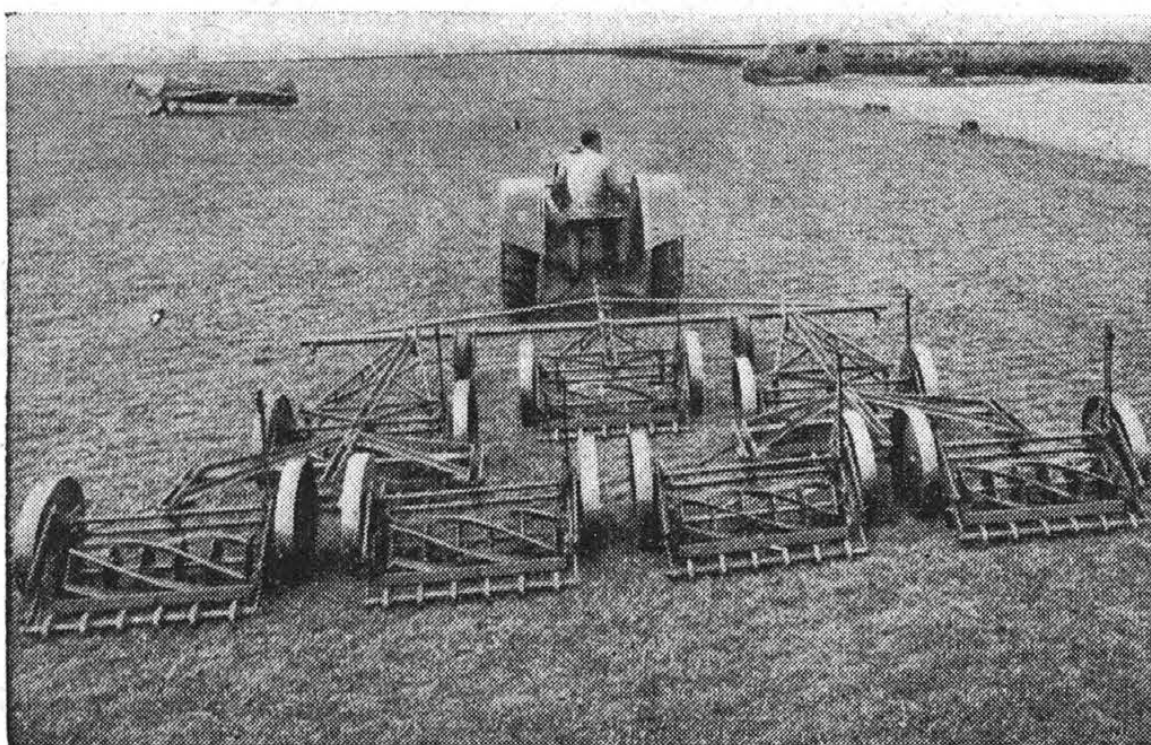
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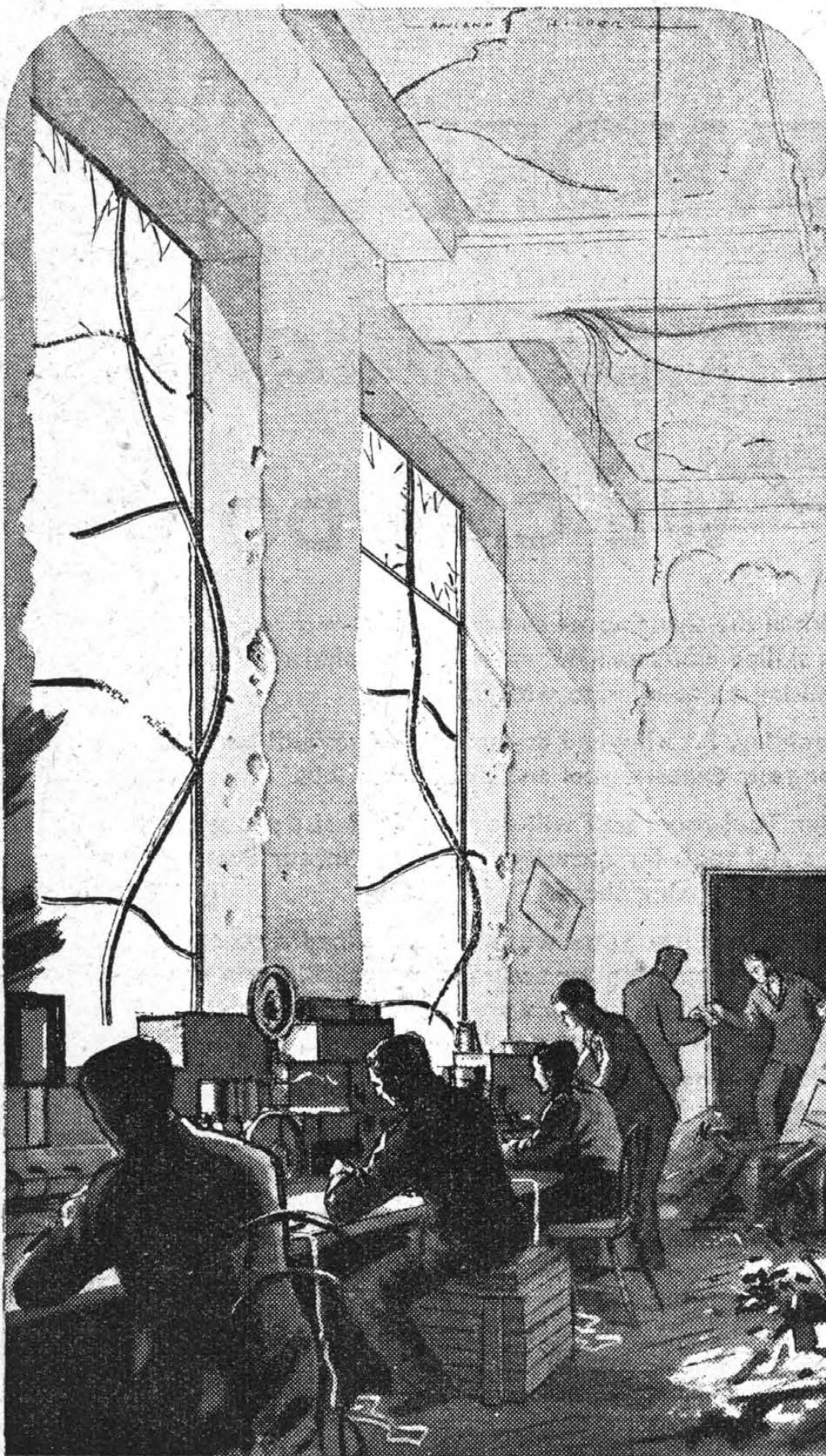
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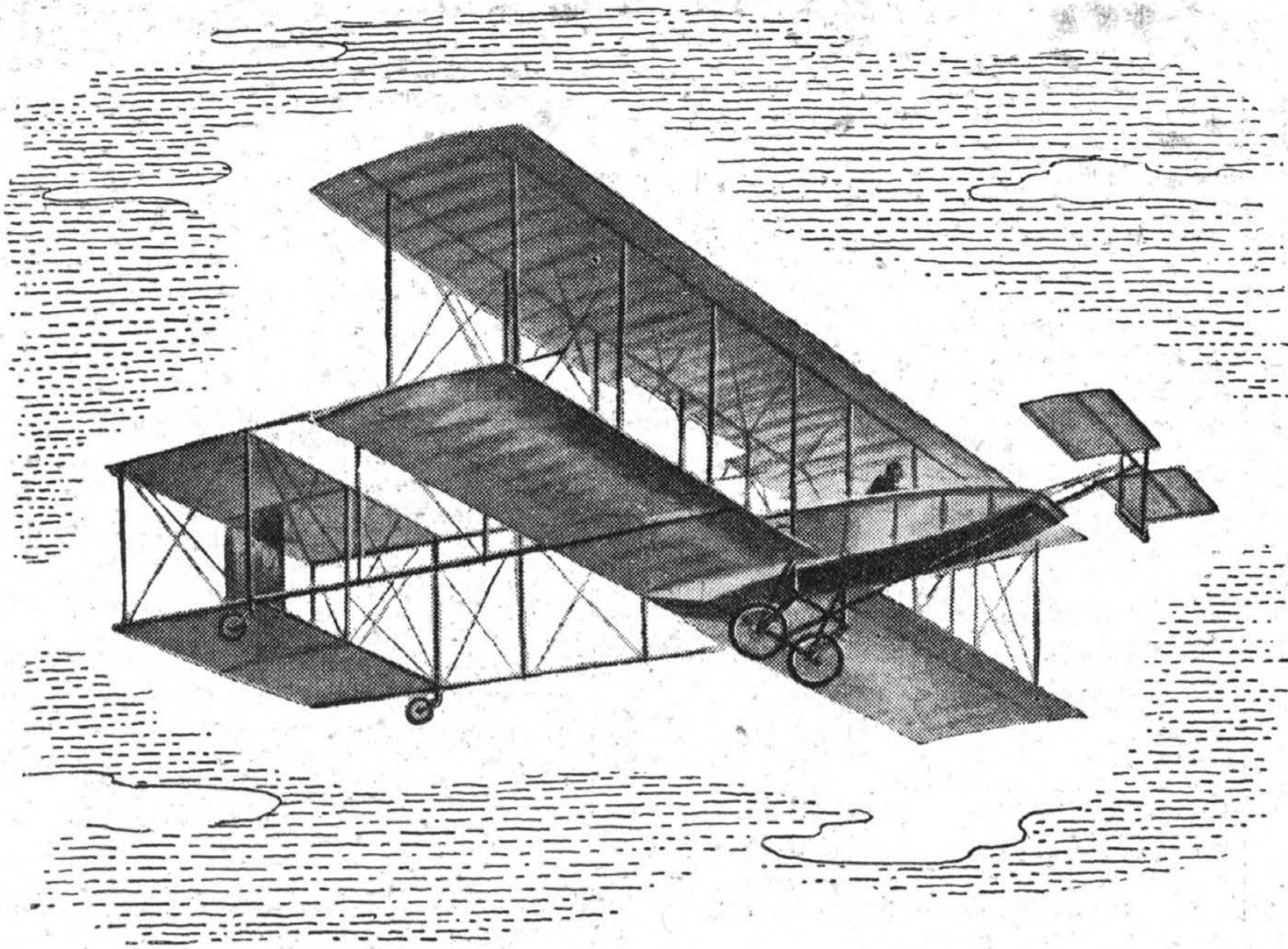
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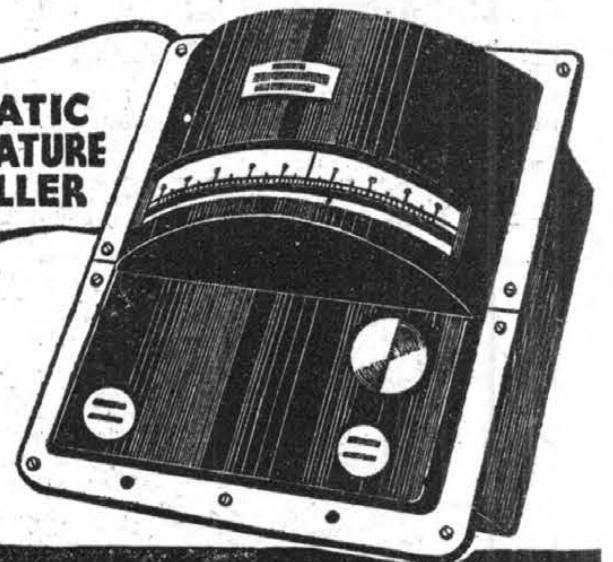


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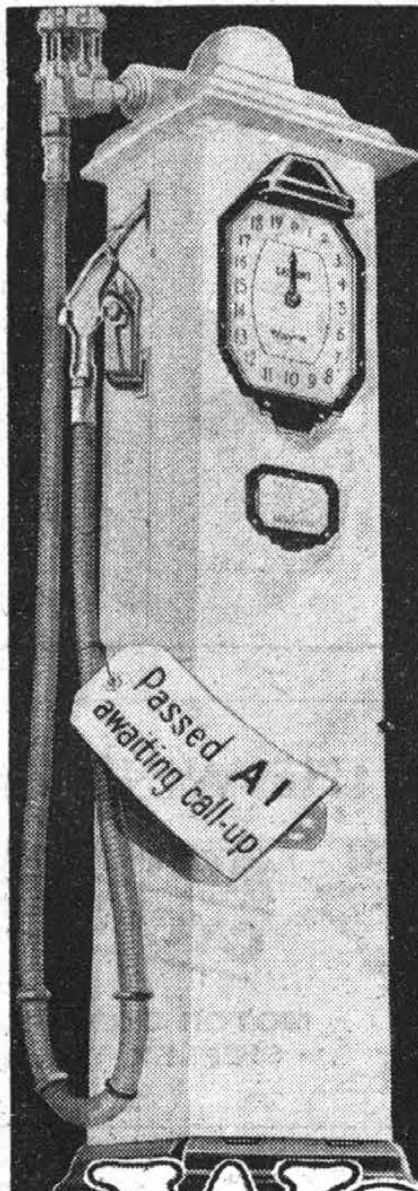
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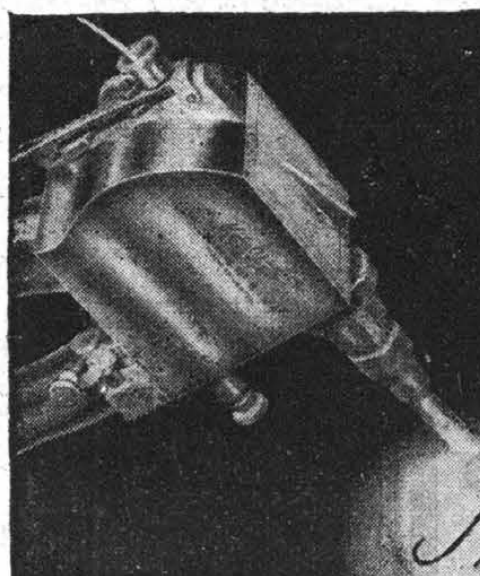
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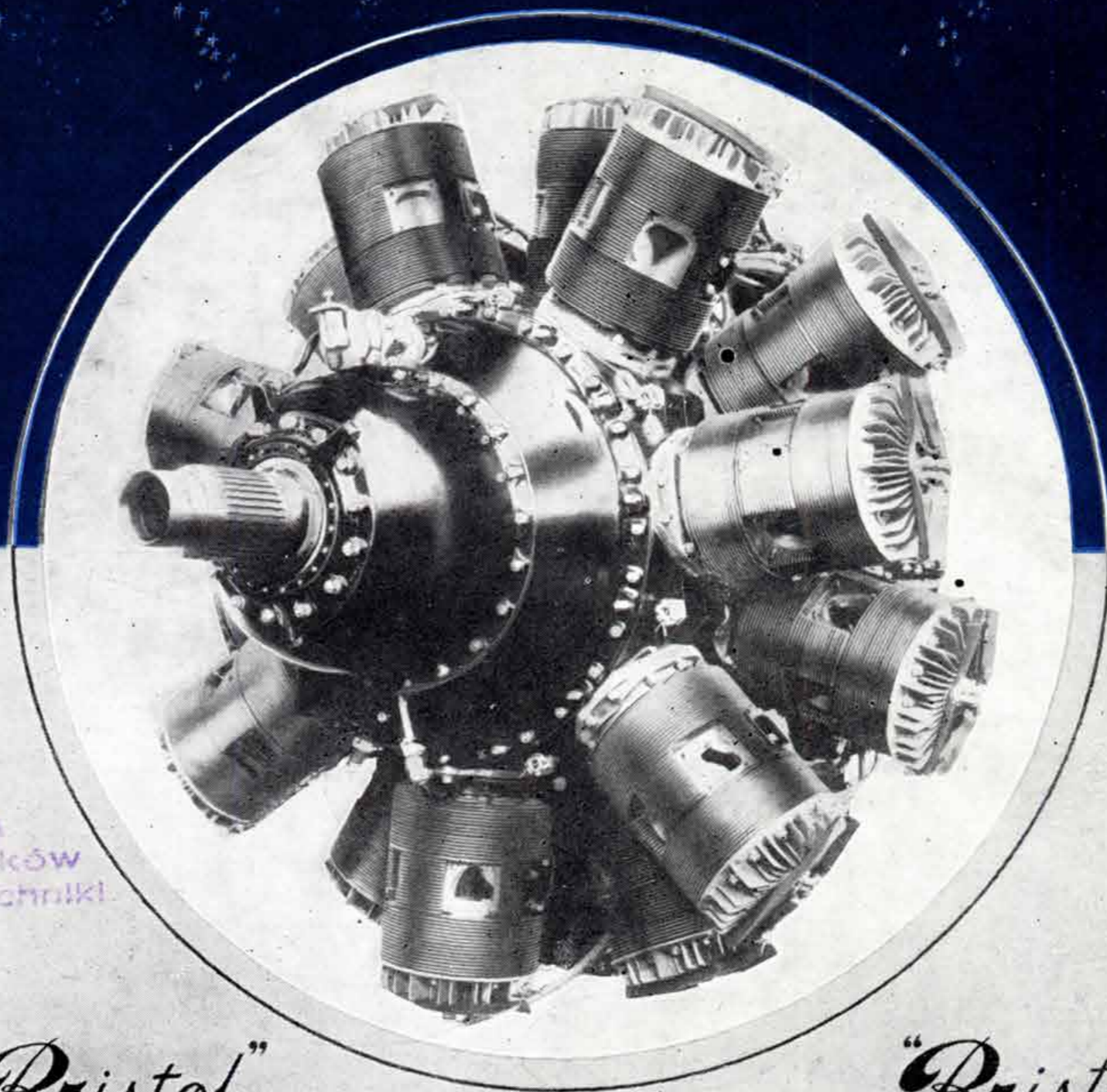
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