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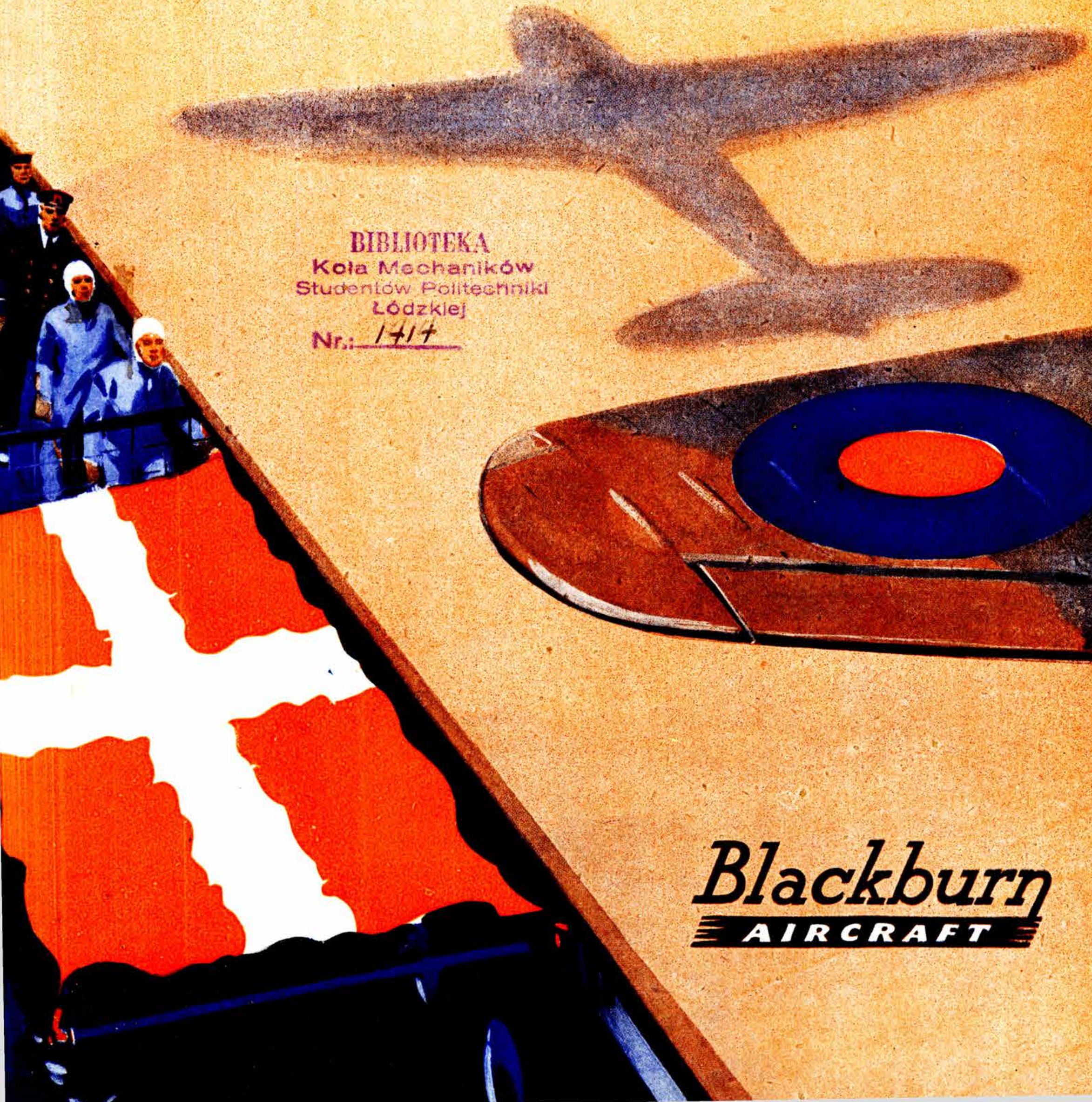
FEBRUARY 10th, 1944



"In the round"

When we make a sketch, we are conscious of the demands on our minds and the control of our muscles. Even though we have paper of perfect flatness, and know just what we are trying to put on it, we still experience difficulties. Consider then the skill needed to model a portrait 'in the round,' to be viewed from every angle. Modelling in the clay—perhaps to be cast in metal as in this 18th century lead bust—the artist has quite enough difficulties, compensated by being able to add as well as take off. But when the material is marble or other stone, then he can only remove material, and if he takes off too much he has to start again.

We—working 'in the round' in steel—experience exactly the same restriction plus the need for extraordinary accuracy, a circumstance which, no doubt, accounts for our high-minded sympathy with our fellow artists.

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THE DAILY SKETCH, MONDAY, NOVEMBER 8, 1943.—Page 5

The British Commonwealth—No. 6

FUTURE OF EMPIRE COMMUNICATIONS

By SIR FRANCIS JOSEPH, Bart., K.B.E.

THE first and vital post-war need will be to re-establish communications between Britain and the Empire.

During the war transport of all kinds has had to be devoted to the Services.

War has claimed all our efforts. During the years of endurance the peoples of the Empire have tightened their belts and learned to do without those goods and services which made life so pleasant in pre-war days.

But with the end of hostilities—even though the peace may be long delayed—we shall be impatient to get back to our job of trading together, seeing and serving one another, and renewing friendships, the, existence of which has enabled us to [illegible] common peril and [illegible] fast and [illegible]

[illegible] Conference [illegible] concluded its deliberations. The representatives will report to their respective Governments, and later the agreed Empire policy will be submitted to our Allies.

An Imperial Air Transport Committee is a permanent need. It must plan with vision and boldness.

All British air transport linking Britain with the outer world is now owned by the State, and therefore under Parliamentary control. Whether this is the best solution remains to be seen. What is certain is that private enterprise, as expressed in design and initiative, must be encouraged.

Britain, with its numerous aerodromes, mostly built since the war started, and the magnificent pool of pilots and ground staff created during the war, has a chance second to none to play a leading part in world—and particularly Imperial—aviation.

Air transport is the most important development of this age, and we shall fail in our duty to the men and women who fought for our survival, and to posterity, if we do not ensure the well-ordered growth of this industry.

In spite of a heavy loss of shipping, Britain's power of production looks like providing us with a mercantile fleet which, freed from war service, will be of pre-war dimensions.

What the actual tonnage of British shipping will be when peace comes is an idle speculation, but the men who to-day control Britain's mercantile marine and who have kept the Red Ensign flying on the Seven Seas in spite of world slumps, unfair subsidies to foreign competitors and flag discrimination in many countries, can be relied upon to weather the post-war storm.

They are anxious [illegible] in air [illegible]

[illegible] wireless messages become cheaper and not dearer after the war. This may be made possible by the ever-expanding use we make of these facilities.

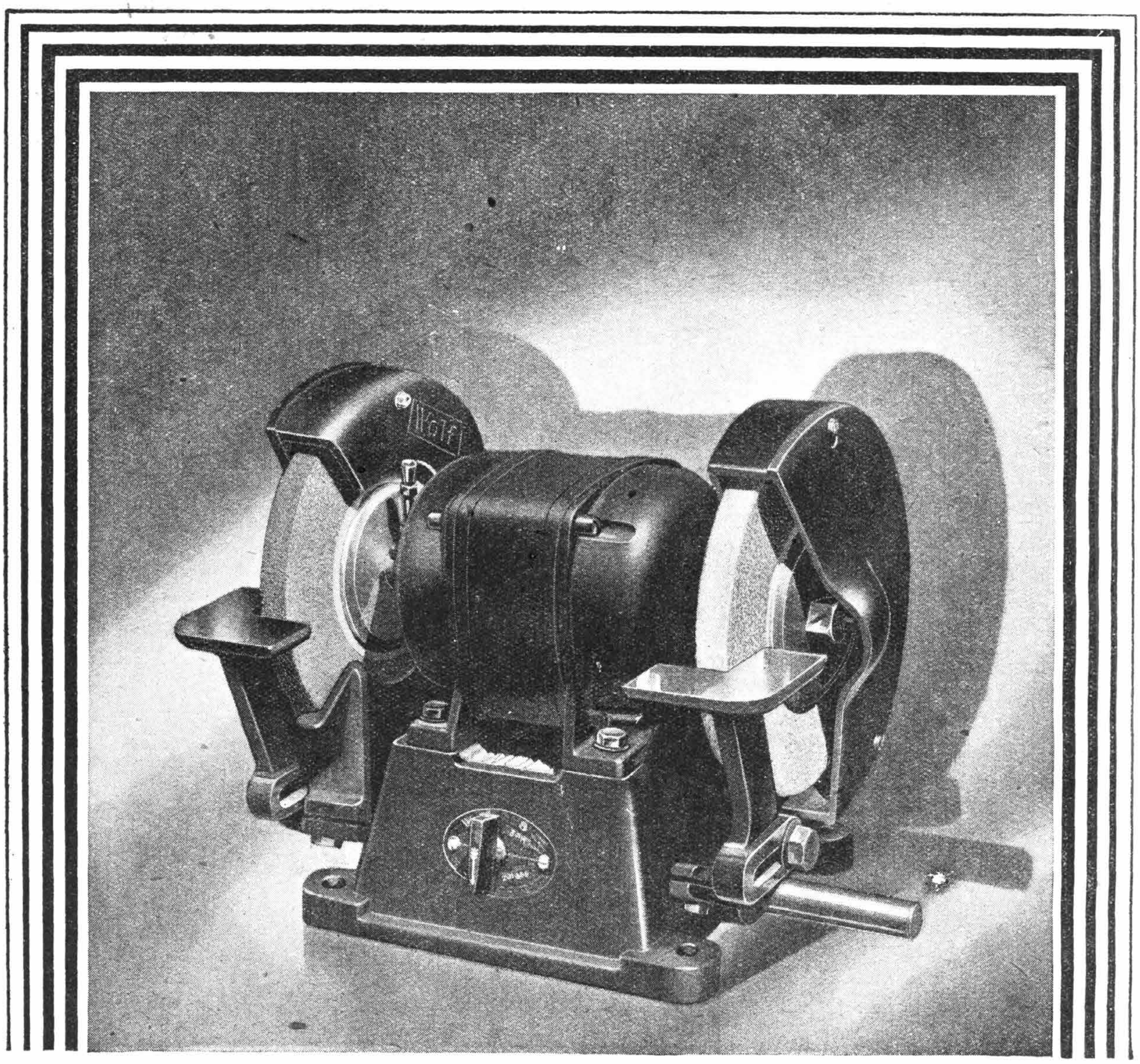
For a Better World

We all know what an encouragement it has meant to the men on land and sea to hear messages from wives and sweethearts on the radio. We know that thousands of homes have been helped by hearing the voices of men serving in the various theatres of war.

This has been done by the B.B.C. Their post-war policy will be to continue and develop talks from the Homeland to the Empire. They must have Imperial and not parochial minds.

We must know more about the Empire—its politics and social and economic ideals. If this is realised by personal contact and by letters, cables and telephones, we shall have done much to bind still closer, together the better world which the sufferings, endurance and sacrifices of the free peoples of the British Empire have made possible.

Monday next: Lifeline of Britain and the Empire, by Admiral Sir William Goodenough, G.C.B.



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At Vokes we have produced over 3,000 different models of our filters and, of course, supply the necessary housing and induction systems to maintain the Vokes standard of filtration efficiency which when necessary reaches 99.9%. It is impossible to detail here all the various types of Vokes Filters produced for every industry.

Perhaps the most widely known are Vokes Multi-Vee and Kompak Filters for air-conditioning of factories, public buildings, hotels, etc. Vokes Multi-Vee principle is also used in their Filters fitted to engines and machinery in order to eliminate dust and dirt that is a menace to "life" and efficiency. Vokes Protectomotor Filters are also suitable for use on practically all types of air-using machines. Vokes Pipe-Line Filters remove all filterable impurities from air or gas delivered by compressors. Vokes Air and Oil Filters for aircraft have been tested out under the most gruelling battle conditions and are in use on all types of British, Dominion and American aircraft.

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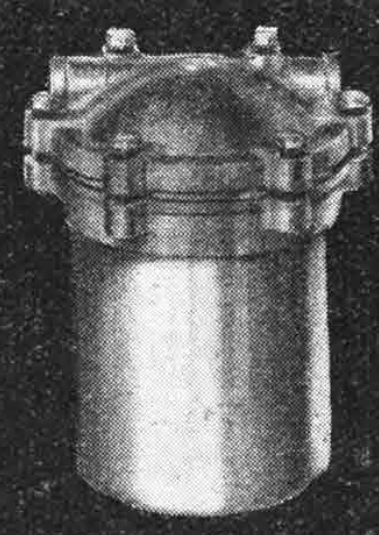
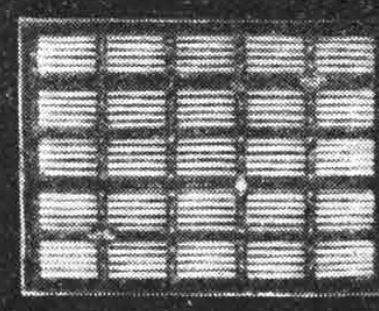


VOKES OIL FILTER FOR AIRCRAFT



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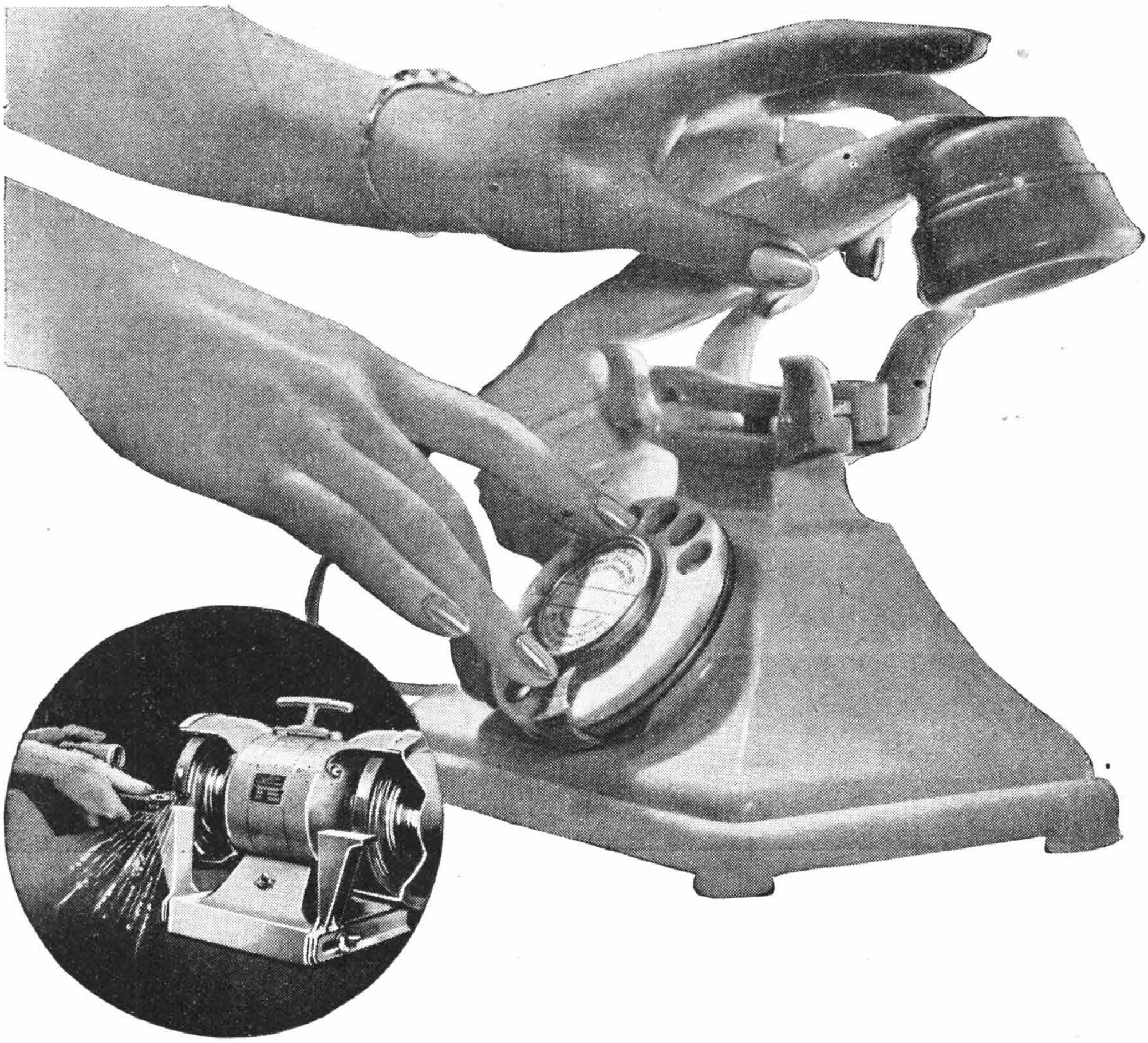

The same hands that lightly dialled a hundred and one social calls are now doing a hundred and one jobs in the factory. Because Van Dorn Portable Electric Tools are light and easy to handle they have proved the right tools for women war workers; just as they will prove to be the right tools for production in the future.

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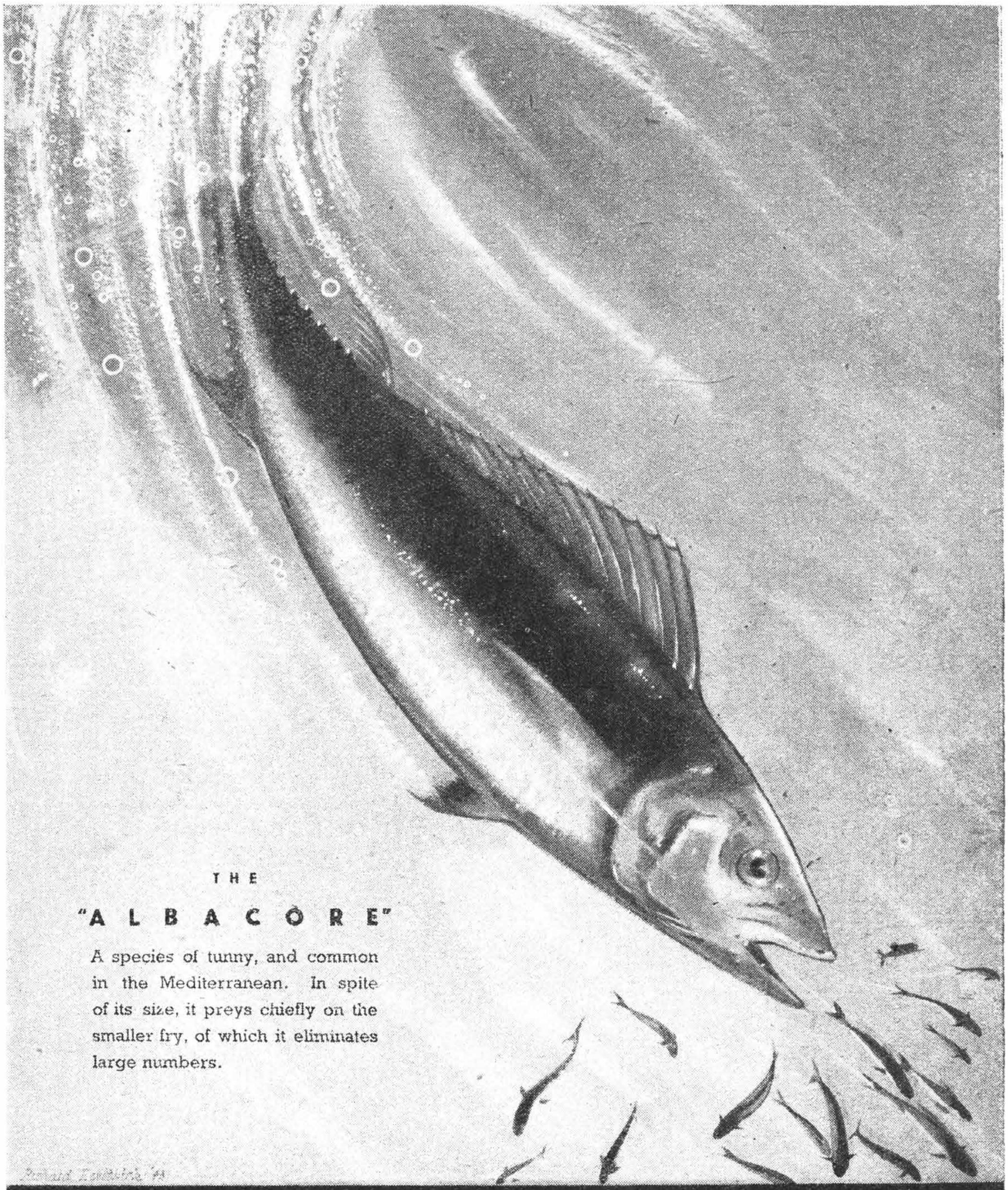

THE

"ALBACORE"

A species of tunny, and common in the Mediterranean. In spite of its size, it preys chiefly on the smaller fry, of which it eliminates large numbers.

FAIREY AIRCRAFT

FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

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The Outlook

The Attack on the Marshall Islands

AIRCRAFT carriers are playing an outstanding part in the American attack on the Marshall Islands. The number of these vessels engaged has not been published, but from all accounts they must be there in considerable strength, possibly in greater strength than has ever before been congregated for any battle. Battleships are there, too, for the United States Navy does not admit any rivalry between those two classes of warships, but uses them in combination, which is certainly the wisest thing to do.

There are good airfields on some of the islands, and it would not have been prudent to expose the American warships to air attack until those airfields had been themselves hammered from the air. This hammering, it appears, was the job entrusted to the carrier-borne aircraft, and as they proceeded with their work the capital ships closed in and subjected the Japanese defences on shore to heavy bombardment from their big guns. The way was then opened for Marines and detachments of the Army to land and occupy the islands.

Supporting attacks on neighbouring islands were made at the same time by a carrier "task force," and the Headquarters at Pearl Harbour has published the names of the forces engaged in these operations. They were units of Fleet Air Wing No. 2, and also units of the 7th Army Air Force. The Army aircraft seem to have flown over from the Gilbert Islands, and it is notable that all the shore-based aircraft on those islands are under the command of Rear-Admiral J. H. Hoover. The Americans have grasped the importance of unity of command, and as this is essentially a naval operation, the Army aircraft have been placed under naval direction.

The Japanese ought to have expected an attack of this nature, but evidently they were unprepared for it. If the Americans succeed in capturing the Marshalls, as seems probable, they will be in a strong position to interfere with the sea routes by which many of the overseas Japanese armies are supplied. Moreover, they will have edged nearer to the main Japanese naval base at Truk in the Carolines, where the enemy battle fleet is believed to be ensconced. If that can be brought to battle and beaten, then Japan will be strategically defeated, and it should be a straightforward task to deal with the enemy forces in the occupied islands. Land forces in China, Indo-China, Siam and Burma may hold out longer, but in the meantime the homeland of Nippon will lie open to attack by the Allies.

L'Armée de l'Air

WHEN one remembers Field Marshal Smuts' gloomy forecast that France would not be a great nation in the years just after the war, it is pleasant to hear news of steps towards recovery by that nation—the nation which for so many years stood by the side of Britain in upholding the cause of right and justice in Europe.

Capt. Cyril Falls, the military correspondent of *The Times*, who has returned from his tour of the Mediterranean and has broadcast and written about his impressions of that front, has brought us some welcome news of that kind, which it seems to have been the business of nobody else to make public. He writes of "the powerful French Army" which has now almost completed its equipment with American material. Also (and this more particularly concerns the readers of *Flight*) he tells us that the units of the Coastal Air Force which

keep watch round North Africa, Sardinia and Corsica are mainly French.

It was French troops which reconquered Corsica, and at the time comment was made in these columns that squadrons of Spitfires with French pilots worked with the ground troops. Now the waters of the western Mediterranean are mainly guarded by French aircraft, which continually send out anti-submarine patrols over wide areas, maintaining constant vigilance against an enemy who is always on the alert and constantly sending out reconnaissances.

World's Best Aircraft

SINCE it is to be supposed that but a very small percentage of our readers have an opportunity to see our American contemporary *Flying*, we are publishing in this issue an arresting article by Mr. Peter Masefield which appeared in the January issue of that journal. It purports to select the "best" aircraft in 22 categories, and the author comes to the conclusion that 16 bests out of the 22 are American, the other six British.

This result, while doubtless pleasing to our American friends, has already caused some surprise among British readers, the more so as Mr. Masefield does not give chapter and verse for the basis of his selection because actual performance figures cannot be published. "If," he says, "that puts into the estimate of results something of the atmosphere of the patent medicine advertisement whose prescription is a professional secret, then I must ask forgiveness and plead the unfortunate result of inevitable and essential wartime restriction."

Mr. Masefield's desire to evaluate the merits of different aircraft is understandable. A great many years ago we introduced to this country the Everling "high-speed figure," which had been suggested by the German professor of that name. That figure was based upon exact performance figures obtained in actual flight tests and did at any rate give a figure of merit for aerodynamic efficiency. But when the system is extended to take into account a large number of features, including performance, fire power, general offensiveness and handling qualities, and when, moreover, the estimator tries to imagine what verdict would be given at a conference of the C. in C. of air operations, the aircrew, the ground crew and the production engineer, then one feels that something rather more than a superman would be needed. The judgment of Paris was child's play by comparison. He only had three women from whom to select one as the "best." Mr. Masefield admits that an aircraft has completely incalculable qualities, and that in some ways it is essentially feminine. That being so, it might have been wiser of Mr. Masefield to bear in mind the fate of Paris and to have remained faithful to his Oenone.

Even when the prescription can be given on the bottle, such comparisons can lead to almost any desired results, and it may often happen that three months elapse between the writing and the publication, by which time any conclusion reached may be badly in need of revision. Moreover, it should not be overlooked that while our American friends are apt to talk a little ahead of achievement, the official habit in this country is to be months or even years behind in disclosing our actual achievements.

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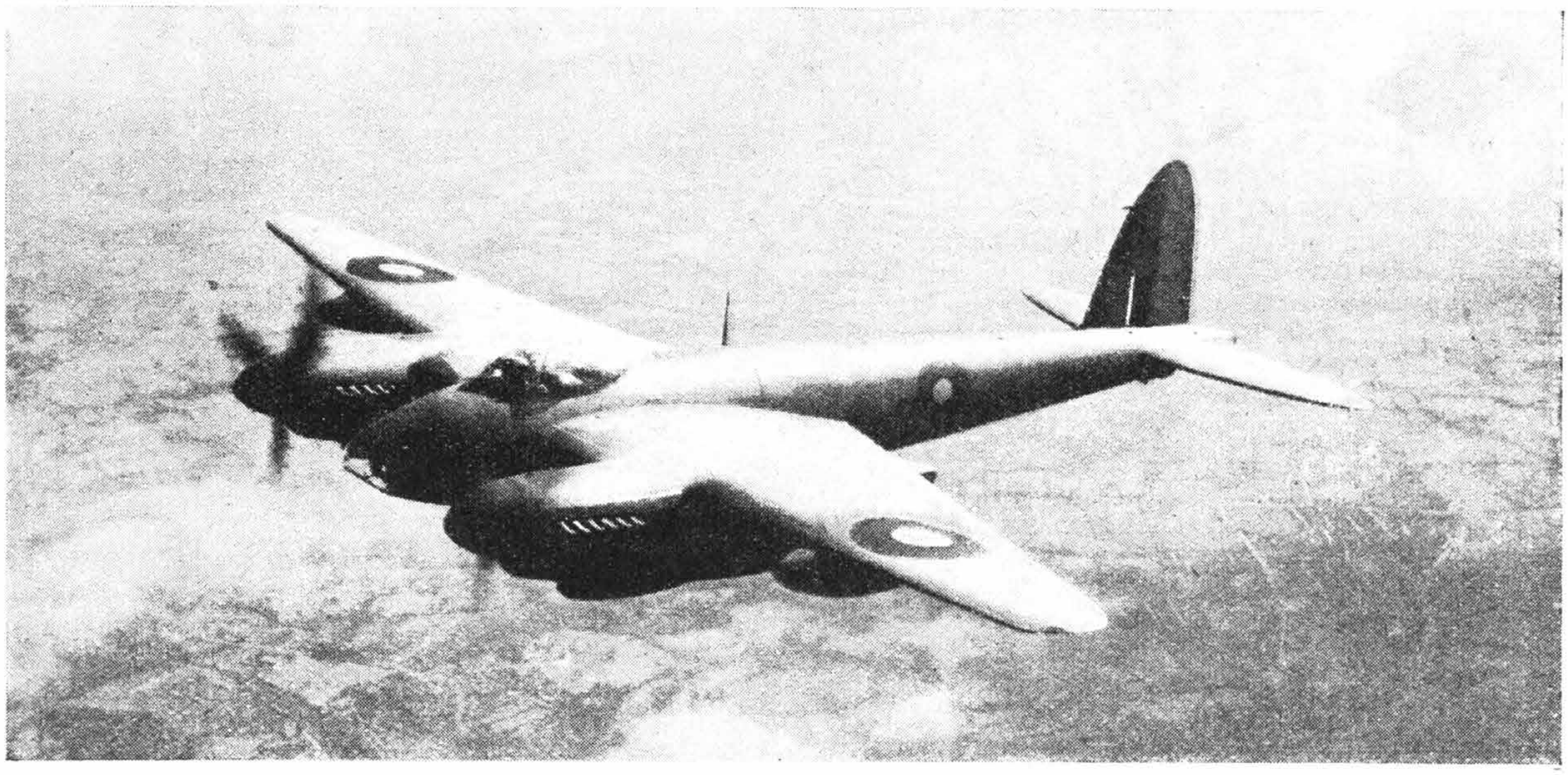
ON EXHIBITION



MOSQUITO SORTIE : One of the many excellent photographs now on show at the Camera Club. It was taken by Flt. Lt. R. E. Pilgrim. Details of the exhibition appear on page 144.

WAR in the AIR

Carriers at Marshall Islands : Strategical and Tactical Oil Targets : U.S. Bombing Methods on Wilhelmshaven

Scene at a Boston station as a Fighting French squadron return from operations over their homeland.

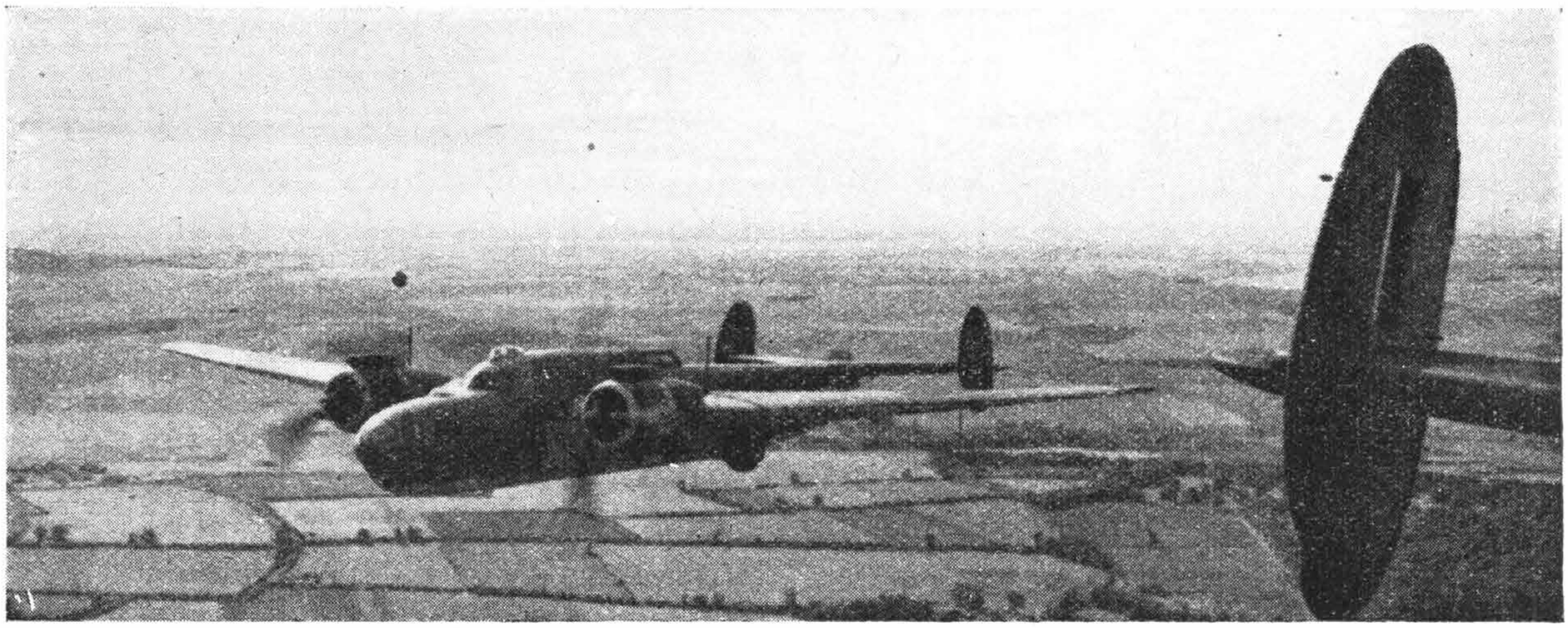
THE most important development last week was the American attack on the Marshall Islands, in which aircraft carriers played a very large part. It is a blow well to the rear of that front on which Gen. MacArthur has been steadily pushing forward for so many months, and if completely successful, it threatens the communications of the Japanese forces in the islands near to Australia. In such a vast ocean as the Pacific, it must be difficult to cut sea communications completely; but again carriers can reconnoitre far and wide across the waters, and they have a very long striking arm. Persistent harrying of the Japanese supply vessels is bound to have a great effect on the troops in the various islands. The Japanese soldier can live on the country, for rice can be got anywhere, but he must have munitions of war sent to him across the water. His weak spot is shipping, and the temporary command of the seas which Japan gained by its treacherous attack on Pearl Harbour has now faded away. The question is whether the Japanese battle fleet at Truk, in the Carolines, will come out and fight to regain that supremacy. It is to be hoped that it will.

In Burma the Japanese have also had many troubles with their communications, for many of the railway bridges have been bombed, and the river traffic has been ceaselessly harried by aircraft from India. Lately the British, Indian, and Chinese forces have commenced a cautious move forwards, but they have not yet attempted to strike crippling blows. For months past the whole weight of the attack on the enemy has been borne by the Air Forces, and in that country aircraft cannot intervene with much effect in jungle fighting. It is therefore very pleasing to learn that our troops have lately been supported by tanks and medium artillery, and their appearance came as a very unpleasant surprise to the enemy. Tanks, of course, cannot force their way through heavy tree jungle, but where they can operate they will be of immense help to the infantry. The enemy does not seem to have made any effort to get either tanks or medium guns up to the front, and perhaps the work of the aircraft in cutting the railways has been partially responsible for this.

THREE SPADES?: Bridge session in progress at a F.A.A torpedo-bomber training squadron in the U.S. during non-flying weather

The mystery of why there have been no further attacks on the Ploesti oilfields since the Allies have established secure air bases in Italy continues, but there have been some raids by heavy bombers on an oil refinery at Trieste. This may be regarded perhaps, as tactical bombing, for probably the German forces in Italy have been getting supplies from such a convenient spot. The Rumanian oilfields are a strategic object, as they are not concerned with any one campaign or battle so much as with the total German war effort.

There is general disappointment that the landing to the south of Rome has not produced more immediate and striking results, and it must also be admitted that, despite the efforts of the



TUG AND FREIGHTER: Air-to-air picture of the Armstrong-Whitworth Albemarle. This is one of the models which were fitted with two free machine guns instead of a four-gun turret.

WAR IN THE AIR

Mediterranean Air Force which have made movement by road or rail behind the German lines by day very hazardous, nevertheless the enemy has been able to move his reinforcements about and to keep them supplied.

Dr. Göbbels has really outdone himself. He has solemnly put it out that in the two raids on the nights of Jan. 21st and 29th over 900 German aircraft went into action, and that 750 of them attacked London, dropping 1,000 tons of bombs. Actually only 90 raiders crossed the coast on the first of those nights, and 60 on the second. In the whole of January only about 300 raiders crossed the coast by night, and nearly 10 per cent. are known to have suffered for their temerity. Not a single bomb was dropped by day on Great Britain during the month.

On the other hand, Bomber Command made six heavy attacks on Berlin during January, in which well over 9,300 tons of bombs were discharged on the German capital. Rather more than 200 aircraft were lost in those six raids. Berlin got a little over half the tonnage dropped on Germany during the month. There was an increase on the tonnage dropped on objectives in northern France, which were attacked on eleven nights, in addition to attacks by day by both the R.A.F. and the Americans. There is evidently some special object in these enlarged and continued attacks on northern France, which will doubtless become apparent in good time.

U.S. Send Over 1,000

THE American Army Eighth Air Force achieved a 1,000-aircraft raid for the first time last week. Actually they sent 1,100 machines out to raid Wilhelmshaven, but that figure included a strong escort of fighters, including Thunderbolts, Lightnings, and Mustangs. The precise number of bombers in the raid has not been stated.

It is a remarkable achievement for the Eighth Air Force to have mustered such a large body in Great Britain by this time; and of course the number despatched against Wilhelmshaven did not represent anything like the full number of American machines now in this country.

The Air Ministry came to regret having laid so much stress on the figure 1,000 after the first heavy raids on Cologne, Lubeck and Rostock, for the public rather imagined that we were moving backwards when that number did not become the usual thing. Such impressions are rather like lies, in that it is difficult for subsequent explanations to catch them up and counter their effect. As a matter of fact there have been a number of raids by Bomber Command since the days of the raids mentioned above in which a smaller number of bombers has dropped a heavier weight of bombs. By now the Air Ministry has established the weight of bombs dropped as a criterion of the effort put into a raid, and does not always publish the number of machines engaged.

The Americans are more or less debarred from falling back on this method of computation, for the Fortress does not carry a weight of bombs at all comparable to that of a Lancaster or Halifax. The American point is that the weight of bombs dropped does not signify so much as the amount of damage done to important targets, and they claim that when the weather is clear enough for them to see their targets their precision bombing does more damage to the enemy in proportion to the weight dropped than in the case of area bombing by night. When the target is obscured by clouds, they are obliged to use area bombing methods with the help of devices such as have been de-

THE CHIEF'S RIGHT-HAND MAN: Air Chief Marshal Sir Arthur Tedder with Gen. Eisenhower and Gen. Sir Bernard Montgomery at an invasion conference.

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are bearing a heavy responsibility on land, at sea, and in the air.

The concentrated energy of the whole organisation is now striving to serve the Services.

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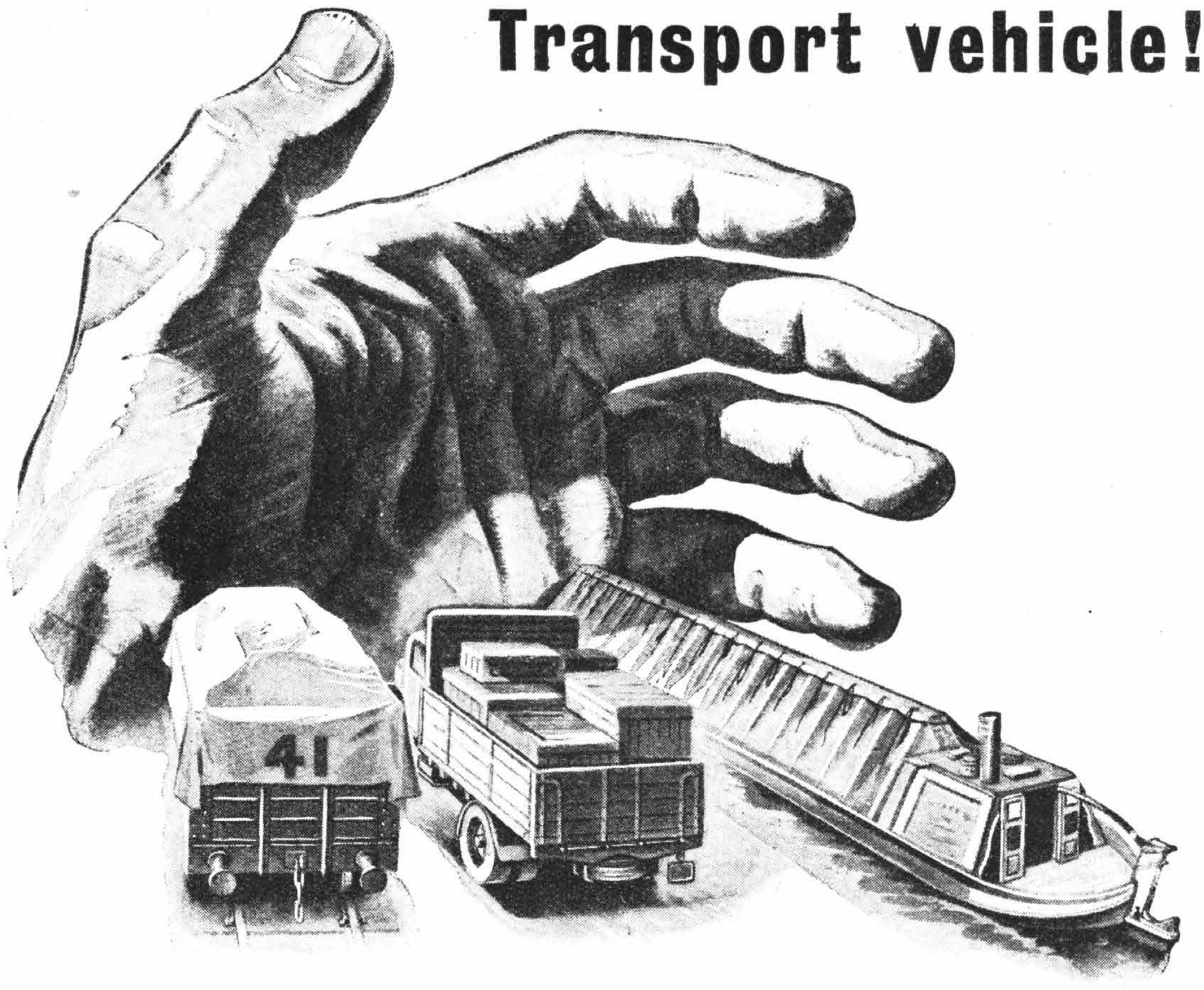


IMMENSE work has been done so that rails, roads and canals shall be able to handle the vast war traffic. But still the loads and cargoes grow.

Can you do **anything?** Yes! you can. You can give us more 'running time' from every **conveyance** that brings or fetches your goods.

When **you keep a wagon** or lorry or canal-boat even an hour longer than necessary you not only hold up a vehicle. You hold up war traffic. When you free a vehicle you send it directly to the help of our fighting men.

Remember *that* every time a vehicle comes to you.

You know your own problems best. Tackle them in your own way. But tackle them now. Plan, encourage ideas, improvise if needs be. Here's a starting-off agenda:

1. *CLEAR LABELS AND DOCUMENTS.*
2. *LABOUR SAVING DEVICES.*
3. *WORK IN BLACK-OUT AND AT WEEK-ENDS.*
4. *OPINIONS OF "MEN WHO DO THE WORK".*

QUICKER TURNROUND THAN EVER BEFORE

Issued by the Ministry of War Transport

ENEMY AIR LOSSES TO FEB. 5th

	Over G.B.	Con-tinent	Middle East	Italy
Jan. 30 ...	0	12	0	63
,, 31 ...	0	0	1	18
Feb. 1 ...	0	0	0	5
,, 2 ...	0	0	0	4
,, 3 ...	8	1	1	5
,, 4 ...	0	0	0	6
,, 5 ...	0	0	0	4
	8	13	2	105

Totals : West, 7,946 ; Middle East, over 5,768 ; N.W. Africa and Italy, 4,279.

veloped by the Pathfinder Force in Bomber Command.

One interesting feature about this raid on Wilhelmshaven was that for once the escorting fighters claimed more enemy victims than the bombers claimed, the figures being eight and one respectively. The enemy fighter opposition was said to have been weak, which is surprising. As a rule the *Luftwaffe* lays itself out to oppose heavy raids with all the resources at its command.

Ju 52s Again

WHETHER it was one of Hitler's intuitions or not we cannot say, but once again the Germans have left their withdrawal in Russia too late, as they did once before at Stalingrad, with the result that the Russians surrounded a large body. When that happens to a German force the Ju 52 always comes into the picture again. These machines are hurried up to take supplies into the surrounded area and to evacuate individuals whom the Germans feel that they must rescue at all costs.

Whether the German factories have been able to replace the large numbers of transport aircraft which were shot down off Tunisia and Corsica cannot be definitely stated, but the odds are against it. In their present plight it is unlikely that the Germans could devote much energy to the production of troop-carriers, when their most urgent need is for fighters, and after them medium bombers for use with the armies. However, what could be done by air transport in Russia the Germans have attempted to do.

The transporters which tried to ease the position of the German 8th Army in the neighbourhood of Shpola were escorted by fighters, which was a very necessary precaution. Russian fighters attacked them, and at the same time the Russian commanders used their best endeavours to restrict the use which the enemy could make of the airfields in the area which was surrounded. It is said that those Ju 52s which got through (and, of course, they did not all get through) were loaded up for the return journeys with German officers, presumably men of some importance. We may also presume, and likewise hope, that not all of the returning machines got clean away.

The Russians do not often indulge in strategic bombing, holding that their bombers can be better employed as the long-range artillery of their armies. However, there was a raid on Helsinki last week, and reports from Sweden say that it was a heavy one. This would doubtless be connected with the political position in Finland, where most of the Finns want to get out of the war as quickly as they can. At such a moment an air raid produces the greatest effect on *moral*. It increases the urgency with which the peace party presses its views, and discredits the cause of the pro-Nazis. The Finns have done little fighting for a long time past, and the recent relief of Leningrad by the Red Army has brought home to them the remoteness of Germany's prospects of victory. Bombs drive home the argument.

An Allied bombing raid on Toulon was aimed at the submarine base which the Germans have established there. But the bombers found the French battle cruiser *Dunkerque* in the harbour, and naturally attacked her. She had been scuttled by the French themselves, but only in the shallow water of the harbour, and had since been refloated. She was set on fire by the bombs, and a Vichy broadcaster described her as a "pathetic wreck." She has had a pathetic career, whereas she might have had a glorious one. Now, even if fit to put to sea, she could be little use to the Germans in the Mediterranean. One swallow does not make a summer, and one battle cruiser, without a proper complement of other warships, could make no difference to the Allied naval supremacy in the Mediterranean. Other French warships will soon, we hope, be fighting gloriously for the honour of France.

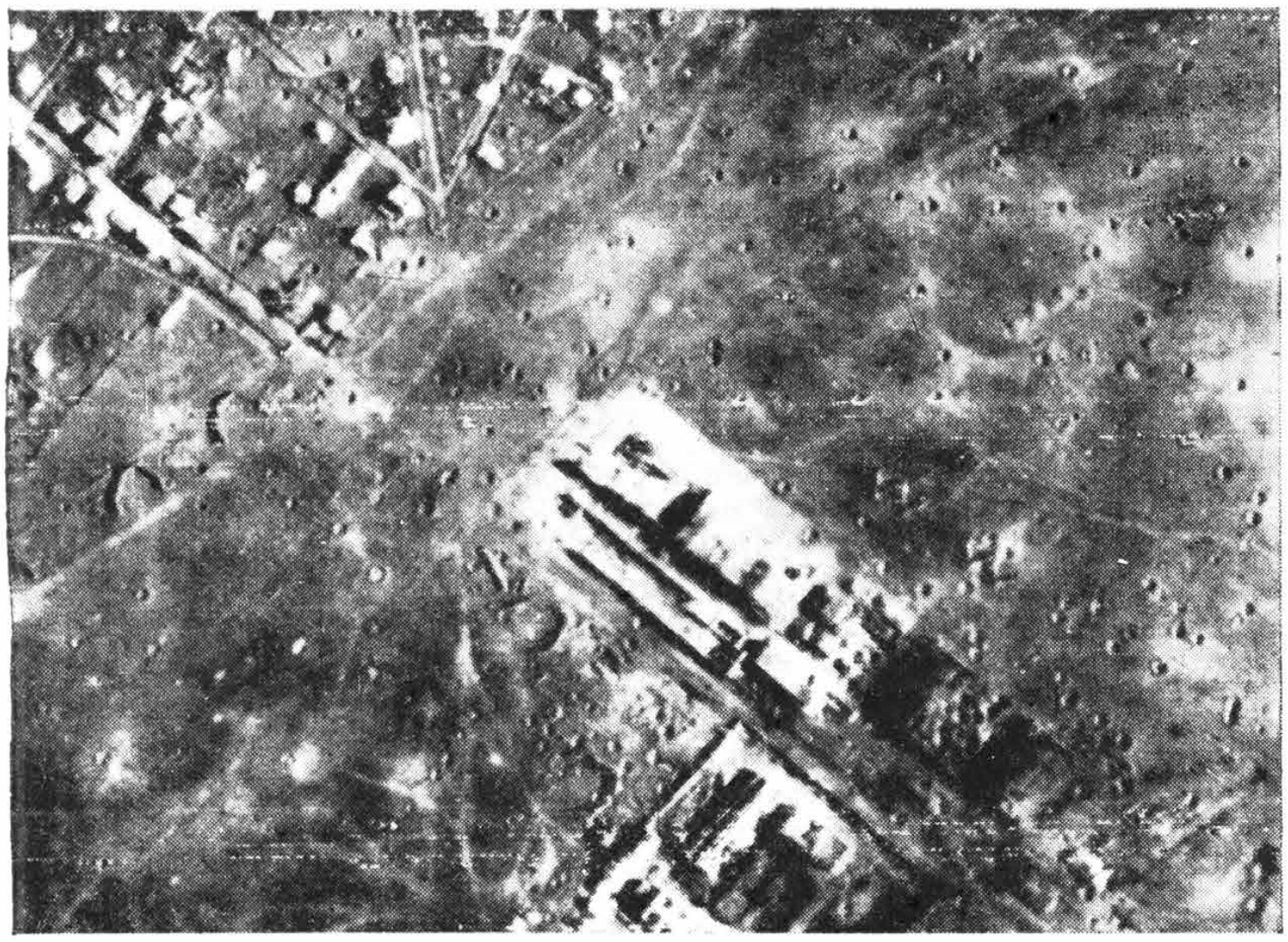
WAR IN THE AIR

ROCKETEE: R.A.F. guards looking after Flying Fortress "Hang the Expense," which had its tail turret shot away over Germany.

BRITISH & U.S. AIR LOSSES TO FEB. 5th

	Over G.B. A'cft.	Continent B'brs.	Continent F'ters.	Middle East A'cft.	Italy
Jan. 30	0	33	1	0	6
31	0	0	9	3	4
Feb. 1	0	1	0	2	0
2	0	2	0	0	1
3	0	4	11	3	2
4	0	21	2	0	3
5	0	8	4	0	0
	0	69	27	8	16

Totals : West, 9,604 ; Middle East, about 2,356 ; N.W. Africa and Italy, 1,585.



AIR STRATEGY : The German-held airfield at Campino, south of Rome, after a visit by the Strategic Air Forces based in Italy.

HERE AND THERE

R.O.C.

THE KING has approved that members of the Royal Observer Corps shall be eligible for wound stripes and chevrons for war service, states the Air Ministry.

They will be of the same pattern as those worn by the Armed Forces.

Flying Marines

ROYAL MARINE air squadrons to co-operate with the Fleet Air Arm have been advocated by Brig. H. T. Newman, R.M.

"Marine commando units should be waterborne and airborne," he said. "The whole arm of the Marines must be trained in amphibious operations."

It Did, Too !

A LIBERATOR bomber, on its way across the Channel with a full load of "eggs," went into a spin when the controls iced up, and pushed its A.S.I. round to 350 m.p.h. during a drop of 5,000ft., at the end of which its Californian pilot managed to regain control and level out.

The name of the Liberator was *Heaven Can Wait*.

A Present for Smuts

THE British Government is to give to Gen. Smuts what is described by the *Rand Daily Mail* (quoted by Reuters) as "a giant four-engined Avro" for his personal use. This gift is said to be a token of the Government's esteem and gratitude for his contribution to the Allied war effort.

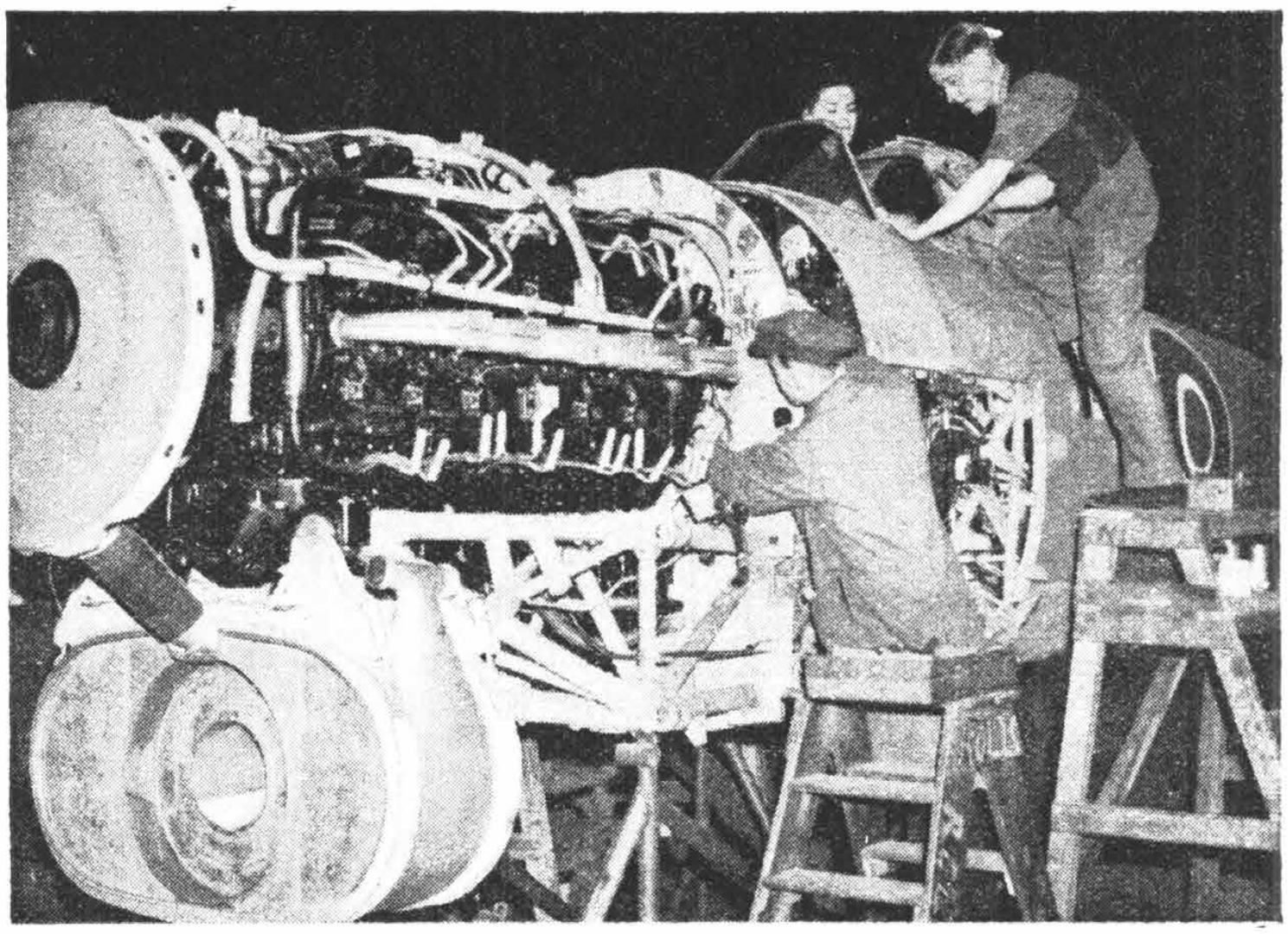
The aircraft is reported to have been especially designed internally and to have cost more than £100,000. An S.A.A.F. aircrew is stated to be now in England ready to fly the aircraft to South Africa.

Telling the Worker

THE excellent idea of letting the war worker see, by means of a factory exhibition, where the small part he or she makes fits into the general scheme of things seems to be spreading.

In *Flight* of January 27th we mentioned such an exhibition in a Rootes plant in the Midlands. Now another Midland war factory, the Standard Motor Co., Ltd., has organised one in which details of sub-assemblies and major components are displayed, including a sectioned Masquito, a Beaufighter fuselage, and a sectioned Hercules engine.

Sir Stafford Cripps, Minister of Aircraft Production, opened the Standard exhibition for the encouragement of "the man who makes the thing that oils the ring that works the thingummy-jig."



COMPACT POWER : This assembly line glimpse of a Hawker Typhoon nearing completion gives an admirable idea of the compact installation of the 2,200 h.p. Napier Sabre engine. Note the ignition harness and exhaust stacks of the port cylinder banks, and the combined radiator, oil-cooler and air-intake below the header-ring.

Good Show

MR. A. S. DRAKEFORD, Australian Air Minister, announced last week that over 18,000 members of the R.A.A.F. are now on active service in war theatres outside the south-west Pacific.

"They are contributing tellingly to the air war in Britain, the Middle East, Burma and India. Where three R.A.A.F. men were on overseas service when Japan declared war, there are now seven," he said.

"Since Japan's entry into the war, the R.A.A.F. in the south-west Pacific has flown over 400,000,000 miles in training and operations. Allied Air Forces in this theatre have destroyed 2,682 Japanese aircraft, probably destroyed 823, and have damaged 808 Japanese aircraft."

R.C.A.F.'s 1943 Mileage

THE Royal Canadian Air Force overseas during 1943 flew more than 12,000,000 miles on operations against the enemy. Canadian bombers dropped more than 13,000 tons of bombs on Germany, Italy and Occupied Europe. Some 3,000 tons were also dropped on Sicily and Southern Italy by R.C.A.F. Wellingtons based on North Africa.

Fighter squadrons destroyed more than 170 enemy aircraft, while R.C.A.F. Coastal Command successfully attacked U-boats in the Atlantic and the Bay of Biscay.

Real "Sky-pilots"

ACCORDING to Stockholm's *Tidningen*, several Russian parachutists have been arrested in Estonia. They had established their identities as pastors and had preached in several factories without permission.

Unfortunately for them, there is a decree under which religious services may not be held in Estonia without permission of the German authorities, and this evidently led to their discovery.

New Boots for Old

THOSE on essential war work, such as civilians employed on airfield construction, are reminded by the Board of Trade of the special scheme for the repair and reconditioning of knee-length rubber boots of British or Canadian make. Under this scheme they can exchange, without coupons, boots in need of repair for a good-as-new reconditioned pair at a cost of 14s. 2d.

Full particulars of the scheme are given on a leaflet obtainable by writing to the Board of Trade, Raleigh House, Dolphin Square, London, S.W.1.

Stratanalogy

WHERE definition fails, exemplification sometimes picturesquely succeeds, as the following anecdote, retailed by Dennis May, testifies:—

Two Doughboy hitch-hikers, engrossed in their host's *Daily Telegraph*, were taking the war news apart to see what it added up to.

"I see where it says here medium bombers of the Tactical Air Force carried out attacks over the battle area and Strategic Air Force Liberators went for industrial objectives near Mi-lan. Say, where do they get all this stuff about 'Tactical' and 'Strategic' Forces? The way I figure it bombing is bombing—call it all the fancy names you like and it's still only got one poipose—to sock Jerry in the —— teeth. Whaddy say, Red?"

Red drew deep at a Chesterfield and pondered uffishly before replying.

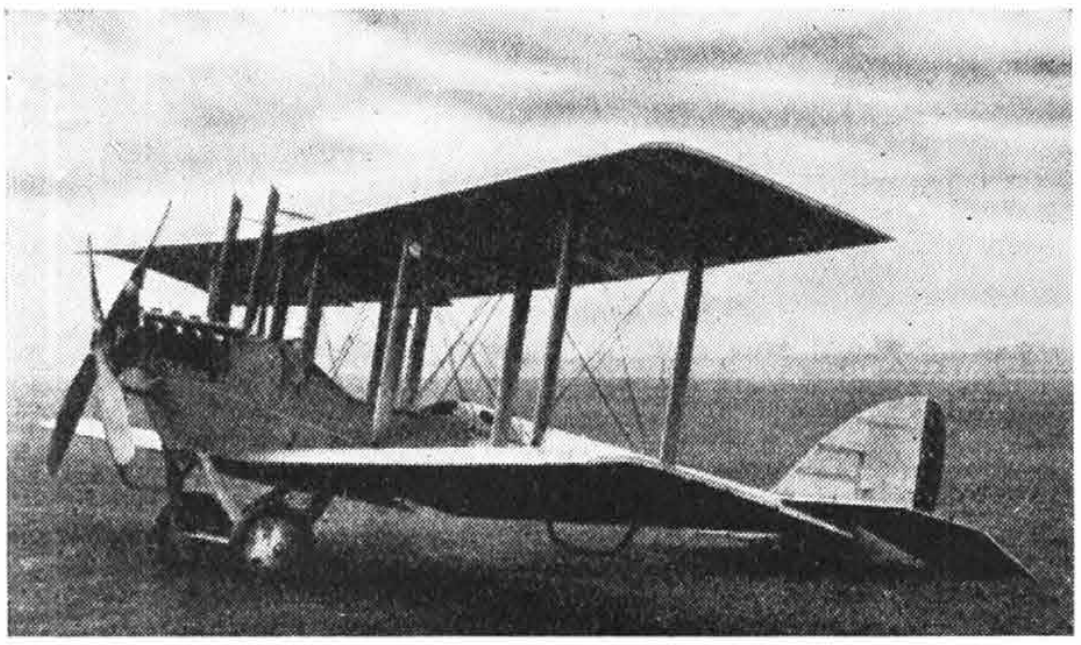
"Sure bombing's only for socking Jerry in the —— teeth, Bud, but they's ways *and* ways of doin' it. This Tactical Air Force, now—over she goes and slaps the —— dentures clean out of Kesselring's boys in the front line. That's tactics. Then what? Why,

TRAINING

27 YEARS OF PROGRESSIVE SPECIALISATION

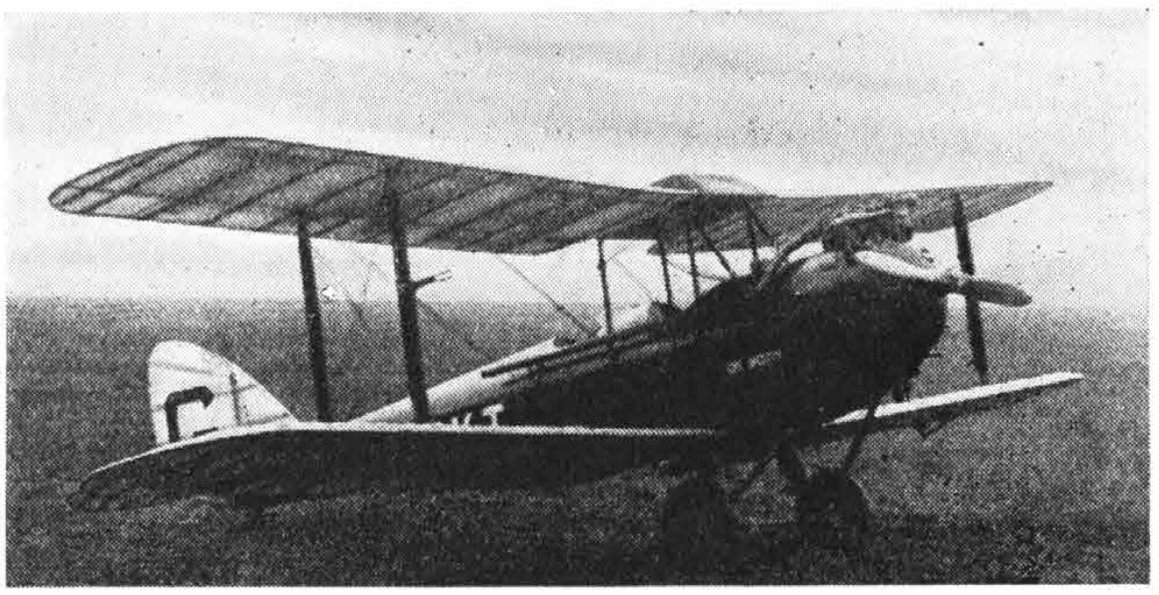
On a wintry afternoon in February, 1925, the first Moth flew from Stag Lane Aerodrome, Edgware, Middlesex, England.

In retrospect, it is now possible to assess the importance of that first short hop of a light aeroplane powered by a four-cylinder-in-line engine of only 27 h.p. Royal Automobile Club rating.



1917.—The D.H.6. Training aircraft of the last war—precursor of the Moth.

The Moth was at once recognised as the aircraft which was needed for the flying clubs then being formed and groping for suitable equipment.



1925—The first Moth two-seater light aeroplane—set a new world standard in trainers.

Its success was immediate. Delivery could not keep pace with the demand which the de Havilland trainer created for itself.

The Dominions, following the trend at home, clamoured for Moths for their training establishments. Then the Services, the R.A.F., the Dominions Air Forces and foreign Governments rapidly adopted the new economical, reliable Moth for their flying schools. Year by year the breed was improved—the de Havilland Gipsy engine was introduced to bring production under one control and to enable the manufacturers to shoulder the responsibilities of world-wide servicing. New features were added until 1931 when a modernised replacement, the Tiger Moth, came into being—a development specially designed for military instruction. Like its forerunner it filled the role to perfection. The new trainer was adopted first by the British Air Ministry, then, one by one, by the Dominions and Colonies. Before long all the Air Forces of the British Empire and many foreign governments were using the Tiger Moth exclusively for elementary training. Its straightforward, viceless flying qualities, its Gipsy reliability and its ease of maintenance and economy had earned it the confidence of instructors, pupils and engineers.

When the war started there were thousands of Tiger Moths in service, soon the numbers ran into tens of thousands. Today, most of the pilots of all categories in the Empire Air Forces owe their high skill to their early training on Tiger Moths.

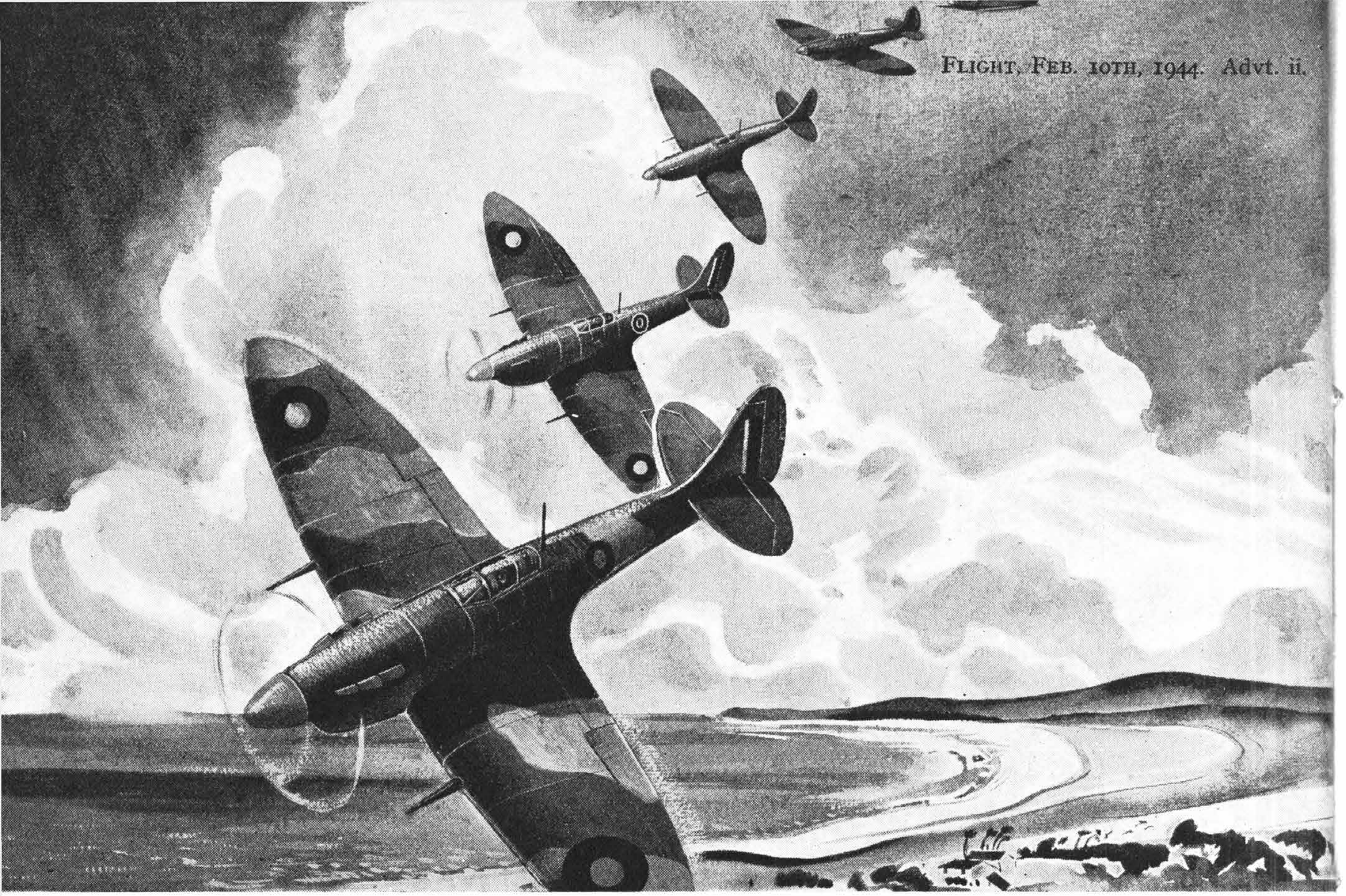
Through nearly two decades, de Havilland have *specialised* in training aircraft keeping pace with Service and civil requirements, accepting the complete responsibilities of servicing and upholding their reputation as the builders of the trainer of the Empire.

TODAY—The Tiger Moth—thousands in service all over the world.

DE HAVILLAND

AIRCRAFT · ENGINES · PROPELLERS

C



HIROHITO *here we come*

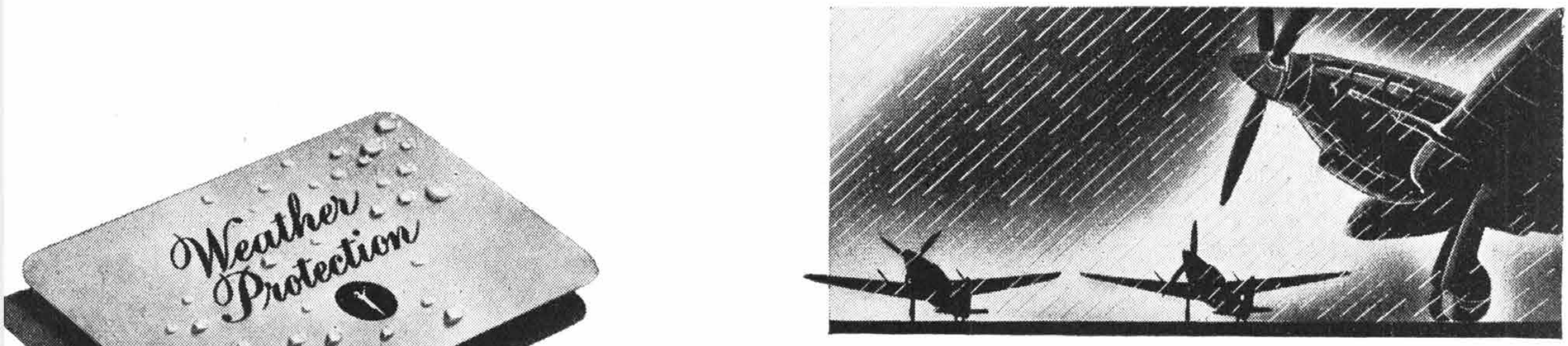
one . . . . two . . . three . . four . five — down on the target and out again almost quicker than the eye can follow them. Deadly little fighters strafing a Jap harbour. Small frames of immense strength flung through the air by engines of breathtaking power . . . every tiny detail perfect . . . then back to base to be petted and fussed to the peak of perfection again in readiness for the next action. Surely these wonderful planes are not allowed to stand out at dispersal in all weathers? Well, yes, I am afraid they are . . . but, of course, some *have* been tailored for Healthguard weather protection equipment . . . makes a big difference to performance . . . keeps them fighting fit!

H.G. LTD.

SBAC

MANUFACTURERS OF AIRBORNE AND GROUND EQUIPMENT FOR ALL TYPES OF AIRCRAFT

PARACHUTES AND BUOYANCY CLOTHING



HEALTHGUARD

WOODBRIDGE ROAD, LEICESTER

HERE AND THERE

then away go the Libs., hundreds of miles backstage, and pick out the biggest toothbrush factory inside Europe. Pretty soon, coupla years later maybe, when all the resoives is used up, you got the toughest —— toothbrush famine since way-back-when. No toothbrushes, bad teeth. Bad teeth, bad health. Bad health, bad mor-all. That's strategy. Get it?"

Appointment

THE Association of Scientific Workers announces that Professor P. M. S. Blackett, M.A., F.R.S., has been appointed as president of the association as from February 1st, 1944. Professor Blackett is Langworthy Professor of Physics at the University of Manchester, and was previously Professor of Physics at Birkbeck College, University of London.

American Accusation

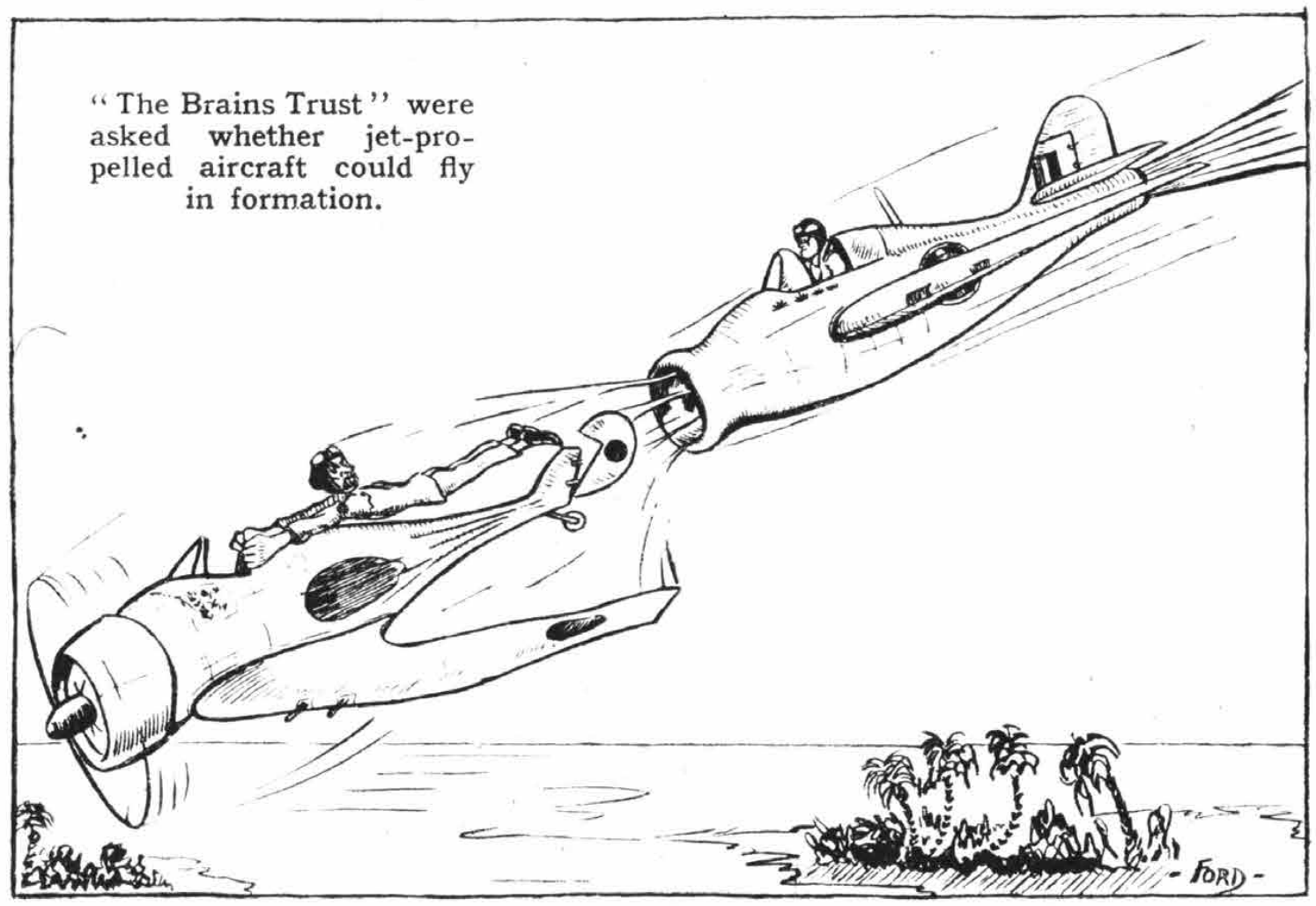
MR. HARRY R. SHEPPARD, Representative for California, alleged in the House last week that Pan-American Airways were attempting to obtain a monopoly in the air transport business.

He asserted that the company had enlisted the Government's aid, and added: "Several prominent Government officials either have business interests in Pan-American Airways or are related to one of its directors."

Death of "Jimmie" James

OLDER readers of *Flight* will be sorry to learn of the sudden death of Mr. J. H. James, who was at one time a famous pilot. With his brother, H. H. James, he was apprenticed to a Gloucester firm in 1910. When that firm went bankrupt the James brothers built their own biplane, on Caudron lines, which they flew in their native Wales.

In the war 1914-18 "Jimmie" James, as he was always called, became a test and demonstration pilot, notably of the R.E.8. After the war he became test pilot to the British Nieuport company, out of which grew the Gloster Aircraft Co. He took part in many races, including the *Coupe Deutsch* at Etampes. He gave up flying several years ago.



"The Brains Trust" were asked whether jet-propelled aircraft could fly in formation.

A Pioneer Passes

WITH the passing at his home at Bothwell, Lanarkshire, on January 24th, of Mr. Peter Burt, J.P., M.I.E.S., has disappeared the figure most prominently associated with the introduction of the single-sleeve internal combustion engine. The Burt-McCullum single sleeve, as it was generally called in the early days, was first built into an engine by the Argyll company, but development was delayed by the going into liquidation of that firm just before the outbreak of war in 1914. It remained for the Bristol Aeroplane Co., Ltd., to revive the sleeve-valve engine, this time in radial air-cooled form, with what success is sufficiently explained by the one word Hercules. Mr. Burt was in his 88th year.

Future Requirements

WHEN Lord Rothermere spoke recently in the House of Lords on civil aviation, he estimated America's post-war requirements at 7,500 aircraft—5,500 for domestic use and 2,000 for overseas use. These figures, it seems, have aroused some criticism.

It is claimed in some quarters that Lord Rothermere overstates future requirements. Yet his figures fall short of estimates coming from American sources.

Last April, Mr. W. A. Patterson, president of the United Airlines Transport Corporation, put American domestic requirements in 1950 at 5,250 aircraft, compared with 350 at the beginning of the war. Last June the U.S. Civil Aeronautics Administration forecast all American requirements at 15,000 machines, a figure twice as high as that given by Lord Rothermere.

It has been estimated that 15,000 aircraft will provide for 100,000 route miles, but it is likely that American projects will surpass this provision and possibly run to half as much again in route miles.

G.A.P.A.N. and B.A.L.P.A.

SOME time ago we announced that the Guild of Air Pilots and Navigators and the British Air Line Pilots' Association had decided to join forces in laying plans for post-war activities. Last Friday a general meeting was held, and in the evening a dinner at the premises of the Royal Aeronautical Society. Some 75 members and guests attended. A report will be published in next week's issue.

In Brief

MR. R. H. H. MACAULEY has been appointed Press Relations Officer to the Bristol Aeroplane Co.

* * *

MR. F. A. M. VINCENT, C.I.E., C.B.E., M.V.O., regional controller of M.A.P. for the East and West Ridings of Yorkshire, has been elected a Companion of the Institute of Mechanical Engineers—a unique distinction.

* * *

AS from February 1st the name of the Mallock-Armstrong Ear Defender Co. has been abbreviated to that of the Mallock-Armstrong Co., but the address remains unchanged at 39, Victoria Street, Westminster, London, S.W.1.

* * *

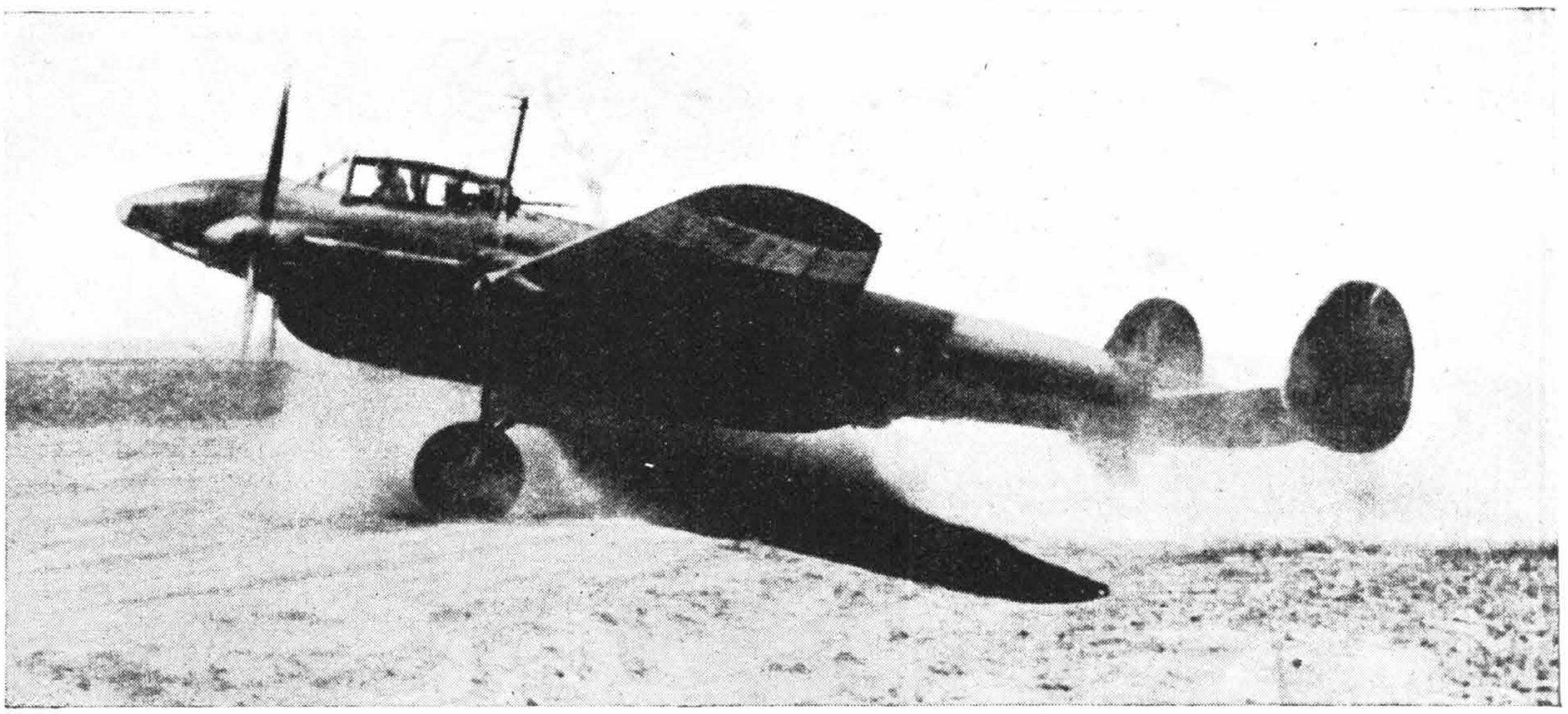
THE Discussion Group of the Luton branch of the R.Ae.S. will meet on February 16th at 7.15 p.m. under the leadership of Mr. W. E. Park, Principal of Luton Technical College. The subject will be aeronautics.

* * *

ROTOL, LTD., have acquired the controlling interest in Hordern-Richmond, Ltd. (formerly known as Hordern-Richmond Aircraft, Ltd.), producers of hydulignum from which modern airscrew blades are made.

P-38 REFINEMENT : A folding ladder is fitted to the tail of the Lightning's nacelle, which has a recess to accommodate it. The "handrail," seen behind the pilot's arm, also folds down and locks it.

D



A Russian Dive Bomber

The Twin-engined PE-2 Does 335 m.p.h. at 16,000ft. : All-electric Operation of Auxiliary Services

DOUBTLESS for reasons which seem good and sufficient to themselves, our Russian Allies are in the habit of maintaining a discreet silence about their military equipment. Consequently it is a matter of considerable difficulty to obtain authentic information concerning Russian aircraft. Why this should be so is not easy to understand. The Germans must have captured a considerable number sufficiently intact to give them all the facts and data which they require for a technical evaluation, and *Luftwaffe* pilots know all about the qualities of Russian aircraft in action.

Be that as it may, there is great interest among the English-speaking nations in Russia's contribution to aircraft engineering. That contribution is probably a good deal greater than is generally realised, and although traces of American and British influence are to be found in some of the types, Russian designers are certainly very far from being "copyists." A case in point is the PE-2 dive bomber, the details of which have been made available by the publication of a detailed examination and analysis by the Swedish aircraft engineer Nils Hultén, in our Stockholm contemporary *Flyg*. The large drawing of the machine is by Herr S. Sason, while other sketches have been prepared by *Flight's* artists from diagrams which appeared in the article. The following notes are in part a translation of Herr Hultén's article, which is the joint copyright of our Swedish contemporary and of the Swiss *Interavia*.

The Russian PE-2 is a twin-engined dive bomber, powered by two Russian vee-twelve liquid-cooled engines, type M-105 R, of 1,100 h.p. each. It is a mid-wing cantilever monoplane of all-metal construction and carries a crew of three, pilot, wireless operator (who also acts as bomb-aimer), and rear gunner. The general design is well shown in the illustrations. It is on orthodox lines, with clean aerodynamic forms and a twin-rudder tail.

RUSSIAN DIVE BOMBER PE-2
Two M-105 R 1,100 h.p. Engines

MAIN DIMENSIONS AND DATA

Length o.a.	12.66 m. (41ft. 6in.)
Wing span	17.16 m. (56ft. 3in.)
Wing area	40.5 sq. m. (436 sq. ft.)
Empty weight	5,870 kg. (12,900 lb.)
Normal loaded weight	7,700 kg. (16,930 lb.)
Max. loaded weight	8.520 kg. (18,730 lb.)
Wing loading (normal)	39 lb./sq. ft.
Wing loading (max.)	43 lb./sq. ft.
Fuel (95 octane)	1,500 l. (330 gals.)
Oil	180 l. (40 gals.)

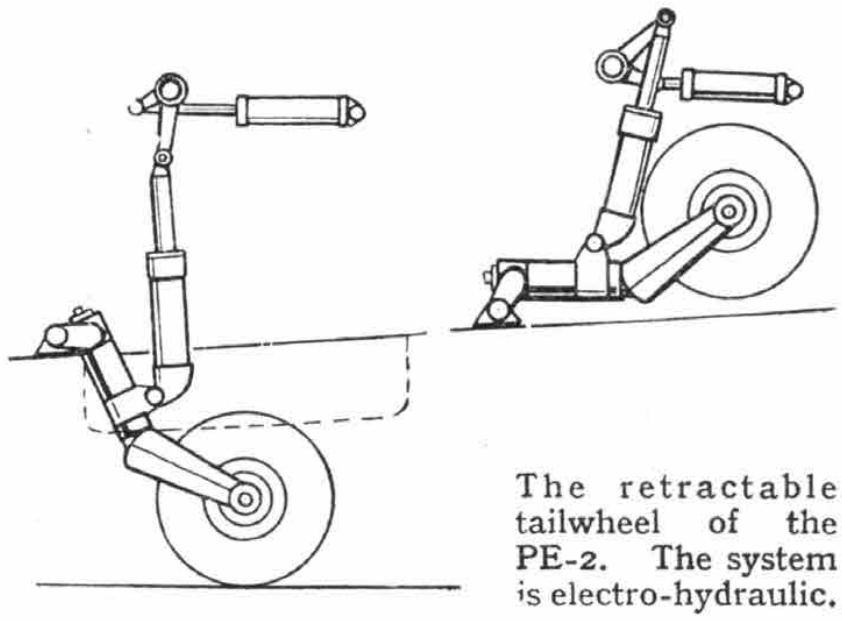
PERFORMANCE

Max. speed (at 16,400ft.)	540 km./h. (335 m.p.h.)
Max. speed (at 6,600ft.)	506 km./h. (314 m.p.h.)
Max. speed (at ground level)	460 km./h. (286 m.p.h.)
Cruising speed	428 km./h. (266 m.p.h.)
Single-engined speed at 5,000ft.	280-300 km./h. (174-186 m.p.h.)
Climb to 3,000 m. (9,800ft.) in 3.5 mins.	
Climb to 5,000 m. (16,400ft.) in 7 mins.	
Single-engined climb to 3,300ft. in 7 mins.	
Theoretical ceiling	10,000 m. (32,800ft.)
Practical ceiling	9,000 m. (29,500ft.)
Landing speed	140 km./h. (87 m.p.h.)
Max. speed with dive-brakes on	600 km./h. (372 m.p.h.)
Max. permissible speed	720 km./h. (450 m.p.h.)
Diving angle	50-70 deg.
Height lost in pulling out of a dive	600-900 m. (2,000-3,000ft.)
Duration	2.5-3 hours
Range	1,000-1,500 km. (620-930 miles)

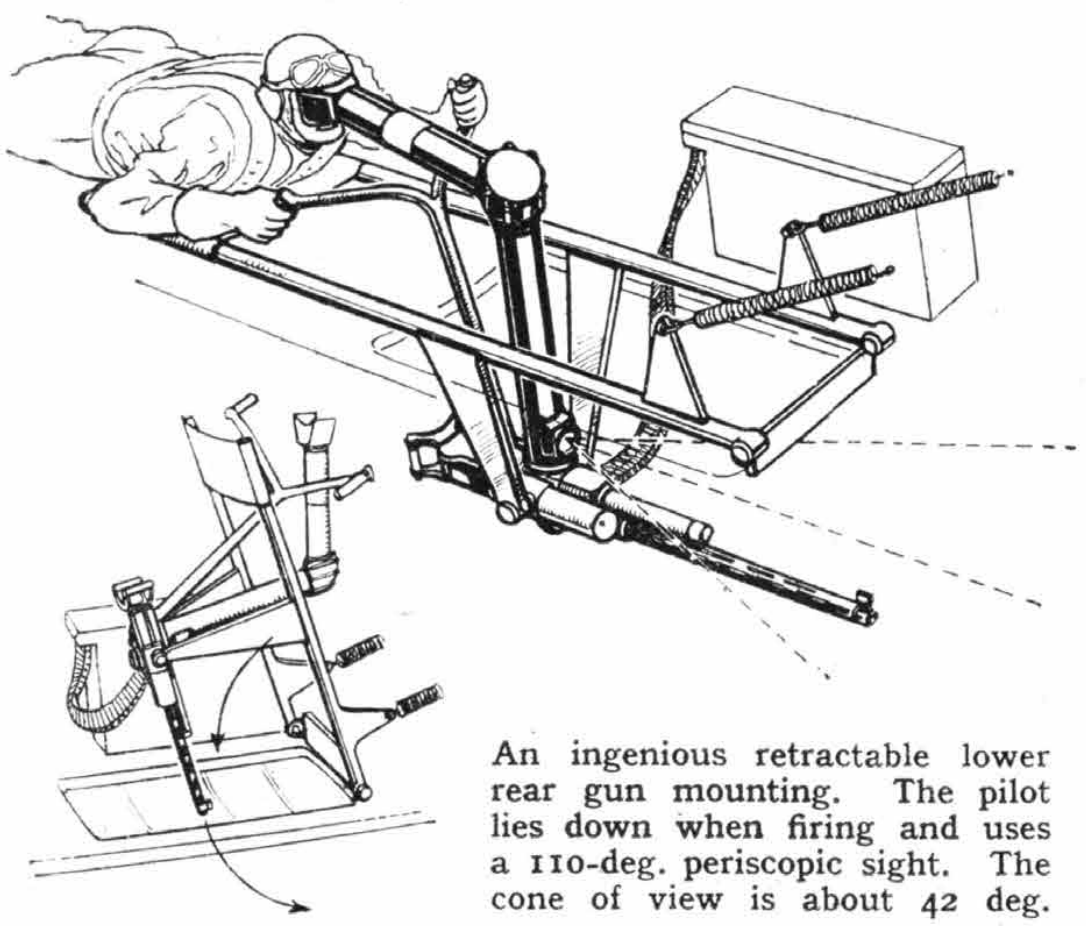
Periscopic Sight

Armament and bomb load vary considerably according to the particular duties on which the machine is engaged. As shown in the drawing, the defensive armament comprises four 7.62 mm. machine guns, of which two are fixed and mounted in the nose, while the other two are in upper rear and lower rear positions. Two alternative armaments are available: two 7.62 mm. machine guns and two 12.7 mm. cannon, or four 7.62 mm. and two 12.7 mm. guns. The last-mentioned arrangement includes two "blister" guns aft of the wing.

For the lower rear gun an ingenious mounting has been devised. It is designed to be raised and lowered, and in order to enable the gunner to aim the lowered gun use is made of a special 120 deg. periscope. The arrangement is well



The retractable tailwheel of the PE-2. The system is electro-hydraulic.



An ingenious retractable lower rear gun mounting. The pilot lies down when firing and uses a 110-deg. periscopic sight. The cone of view is about 42 deg.

illustrated by the sketches above and at the foot of this page.

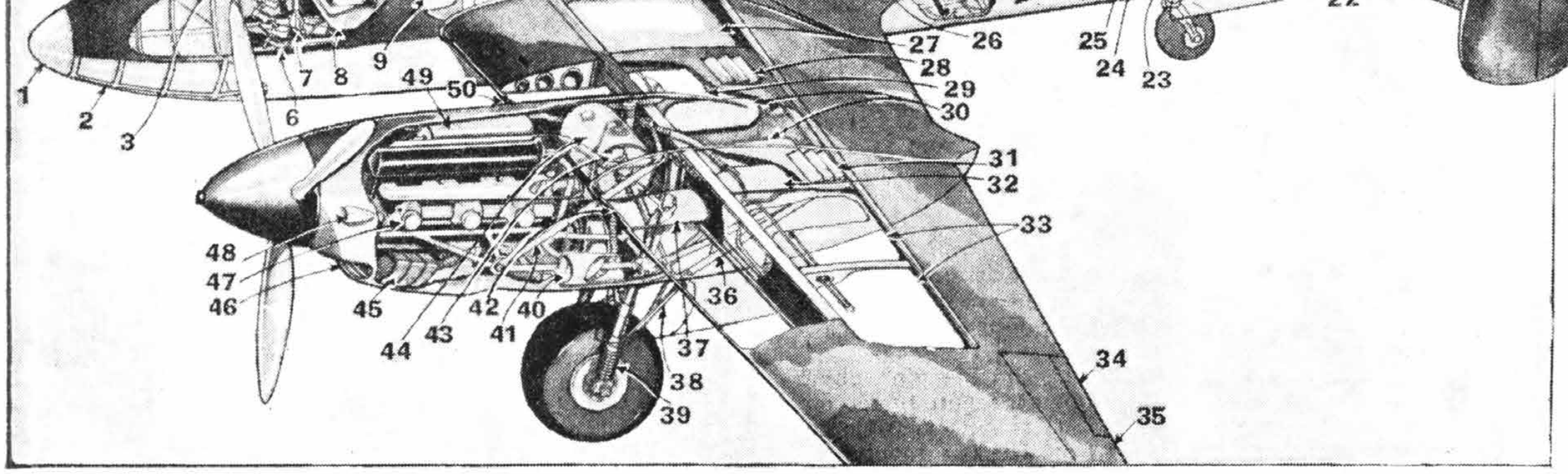
Normal bomb load is 600 kg. (1,320 lb.), but can be increased to a maximum of 1,000 kg. (2,200 lb.). Four bomb racks are provided under the inner wing portions, and in addition there is one in the rear portion of each engine nacelle, and a bomb bay with two racks in the fuselage. The latter is designed to take several bombs of various sizes. The external bombs may comprise two of 500 kg. each, four of 250 kg. each (total 1,000 kg.), or four of 200 kg. each or four of 150 kg. each. When some of the bombs are carried internally (in fuselage and engine nacelles) the bomb load may comprise ten 100-kg. bombs (six internal and four external), or half that weight in the same distribution.

Bomb release is by an electric control on a central panel, allowing for dropping bombs singly at any predetermined interval or in salvos. The actual release of the bombs is not, however, by electric solenoids but by electrically fired cartridges which operate pistons that in turn release the hooks. The mechanism is said to be very light and to be capable of removal in a moment. Bomb hoists are installed in the machine.

Accommodation and Power Plant

The crew of three are accommodated as follows: in front are pilot and wireless operator, normally seated back-to-back. The wireless operator can dive under the pilot's seat and lie down in a prone bombing position. When working the lower gun, the rear gunner lies down and sights his gun through the periscopic sight mentioned above.

Engine installation is orthodox in the PE-2. The two M-105 R (the R indicates reduction gearing) are of 12-cyl. vee type, liquid-cooled, with an angle of 60 deg. between the cylinder banks. The bore is 148 mm. and the stroke 170 mm., giving a capacity of 35 litres. Designed for 95-octane fuel, the compression ratio is fairly high (7:1) and the specific power is 32 b.h.p. per litre capacity. The overall length of the engine is 2,027 mm. (79.8 in.), the height 960 mm. (37.8 in.), and the width 777 mm. (30.6 in.). The weight is 575 kg. (1,265 lb.), and specific weight 1.15 lb./h.p. The take-off power is 1,100 b.h.p. at 2,600 r.p.m., and a boost of 1.29 atu (approximately 3.5 lb./sq. in.



In this drawing by Herr S. Sason the figures refer to the following items: 1, Plexiglass nose; 2, bomb aimer's optical flat; 3, starboard fixed 12.7 mm. cannon; 4, wheelbrake lever; 5, armour plate behind pilot; 6, rudder pedals; 7, elevator trimmer; 8, pilot's seat; 9, wireless operator's seat; 10, pitot tube; 11, aerial mast; 12, upper moveable machine gun; 13, window; 14, lower moveable machine gun; 15, ammunition box; 16, retractable gun mounting; 17, periscopic sight for 16; 18, tailwheel operating mechanism; 19, tailwheel jack; 20, elevator lay shaft; 21, elevator crank levers; 22, push-pull rod for rudder control; 23, tailwheel shock absorber strut; 24, elevator push-pull rod; 25, rudder push-pull rod; 26, cartridge belt guide; 27, fuel tanks; 28, radiator shutter; 29, radiator; 30, inert-gas cylinders; 31, radiator shutter; 32, radiator shutter; 33, fuel tanks; 34, aileron trimming tab; 35, aileron; 36, undercarriage radius rods; 37, radiator air duct; 38, undercarriage bracing; 39, bellows sleeve; 40, carburettor air intake; 41, engine mounting; 42, radiator air intake; 43, oil filler cap; 44, oil tank; 45, oil cooler; 46, air intake to oil cooler; 47. carburettors; 48, louvre; 49, tank for hydraulic fluid; 50, radiator air intake.

A RUSSIAN DIVE BOMBER

gauge pressure). At 2,000 m. (6,560 ft.), the maximum power is 1,100 b.h.p. at 2,700 r.p.m., and a boost of 1.235 atu (+2.9 lb./sq. in.); the continuous power at the same height is 900 h.p. at 2,600 r.p.m. and a boost of 1.24 atu (+3 lb./sq. in). The same figures apply when flying at a height of 4,000 m. (13,100 ft.), but the powers developed are then 1,050 and 045 b.h.p. respectively.

An unusual feature of the M-105 R engine is that it has six carburettors, three for each cylinder bank. They are of the pressure type, i.e., situated between the supercharger and the engine. The supercharger is of the two-speed type, with gear ratios of 1:7.85 and 1:10 respectively. The gear change is effected by an electric motor. There are three valves in each cylinder, one exhaust and two inlet. The exhaust valves are operated direct from the overhead camshaft, while the inlet valves are operated by T-shaped rockers. The airscrew reduction-gear ratio is 1.694:1.

Three-bladed Wisch-61 metal airscrews are fitted. They are electrically operated over a pitch range of 35 deg. and are of the constant-speed type.

Engine cooling is of the wing radiator type, each engine having a radiator on each side, with an air duct in the leading edge of the wing. The outlets for the cooling air are on top of the wing and are provided with shutters of the venetian blind type. Each engine has a single oil cooler, placed under the engine. The coolers are semi-circular and made of brass. Behind each cooler is a movable flap for regulating the amount of cooling. Operation is by small electric motors.

The fuel tank layout is somewhat complicated, with a total of no fewer than eleven tanks, housed partly in the fuselage and partly in the wings. All are rubber covered, and as a protection against fire provision is made for blowing inert gas into the tanks, above the fuel level.

Behind each engine there is a service tank into which the fuel flows from the main tanks. An ingenious arrangement, designed to reduce pipe lines as much as possible and thus the risk of damage and fire, is used in the fuel system. Well forward on each engine is a small oil tank from which a pipe line runs to a gear pump on the back of, and driven by, the engine. This pump forces oil through a flexible high-pressure pipe to a pump under the engine. The oil drives this pump as a motor, to the spindle of which is coupled a fuel pump of the eccentric type. A flexible pipe returns the oil to the tank on the front of the engine.

The hydraulic and electrical services are interesting. The former is used only for operating the undercarriage and tailwheel. Engine-driven pumps are not used; instead there is a pump driven by an electric motor. Of these latter, by the way, there are no fewer than 18, which must be nearly a record for an aircraft of this size. They are employed for the following purposes: four for operating the radiator shutters; two for the oil-cooler shutters; one each for the hydraulic pump, a hydraulic valve, the dive brakes, and the wing flaps; four are used to operate the various trimming tabs; two for airscrew pitch changing, and two for the gear change of the superchargers.

Pilots report that the PE-2 handles extremely well, but that it does not suffer fools gladly. For instance, it goes into a spin very readily if a faulty manœuvre is made. The machine is reported to be very stable in a dive and to give very good dive-bombing results. In spite of the high wing loading the PE-2 is said to be very easy to land. It is considered that such items as radiators and tanks are very vulnerable. Russian pilots are reported as saying that a new version is coming along which will have two 14-cyl. radial M-82 engines of 1,600 b.h.p. each.

EXHIBITION OF R.A.F. PHOTOGRAPHS

AT the Camera Club there is an excellent display of photographs taken by aircrews and official photographers in the ordinary course of their duties. Edited and arranged by Sqn. Ldr. Trubi, their artistic merit has been enhanced and the only criticism which can be made is that the selection is all too meagre. An exhibition of four times the wall area would still not do justice to the photographs available for selection. Apart from some spectacular air shots there are some striking portraits of the high command and, to be up to date, a full-face photograph of Grp. Capt. Whittle working out complicated jet propulsion calculations on a twelve-inch slide rule.

Two frames of direct colour transparencies show how much this branch of photography has advanced in recent years. The addition of colour throws the pictures almost into relief.

The exhibition, at 11, Grosvenor Street, New Bond Street, London, W.1, is open daily throughout February from 11 a.m. to 6 p.m., except Saturday afternoons. Sunday times of opening are from 2 p.m. to 6 p.m. Admission is free.

"GEN" ON THE PIAGGIO 108

MORE details about the unusual armament arrangements of the Piaggio 108, Italy's most recent heavy bomber and one of her very few ventures into the four-engined field, are now available.

As has previously been stated in *Flight*, the Piaggio's chief armament takes the form of a power-operated gun turret on each of the two outer engine nacelles. It is now possible to add that these are remotely controlled from the two revolving, power-operated "astrodomes" mounted approximately amidships on the fuselage.

Very few examples of the Piaggio 108 were built, only two or three going into operational service before the surrender of Italy, and the few isolated photographs of the type to reach this country were not accompanied by any descriptive data of a technical kind. In the pictures the twin domes from which the nacelle turrets are controlled had the appearance of being small gun-turrets themselves; they also appeared to be mounted in tandem. It is now known, however, that they are staggered to port and starboard and contain the master control and gun sights for their respective nacelle turrets. They are of light construction and have no internal bracing, being merely attached to the fuselage formers.

Another unusual feature of this aircraft is its hydraulically operated undercarriage, which retracts forwards into the extremely long nacelles.

R.Ae.C. CONFERENCE

TWENTY-ONE allied and neutral countries were represented at the recent conference held at the Royal Aero Club, London to discuss the future international control of flying and air touring. Lord Brabazon, president of the R.Ae.C, presided.

Prior to the war, international control was vested in the *Fédération Aéronautique Internationale*, with headquarters in Paris, now under German domination. It was unanimously agreed to form an advisory committee of delegates from the following countries to see how best the interests of private flying and air touring can be represented until the Federation can resume its duties: Belgium, France, Great Britain, Holland, Norway, Poland, Sweden and the United States.

AERO ENGINES, LTD.

THE chairman of Aero Engines, Ltd., Sir Maurice Bonham Carter, has announced that a plan of co-operation between Philco Radio and Television Corporation of Great Britain, Ltd., and Aero Engines, Ltd., has been arranged, and that Mr. L. D. Bennett is joining the board of Aero Engines, Ltd.

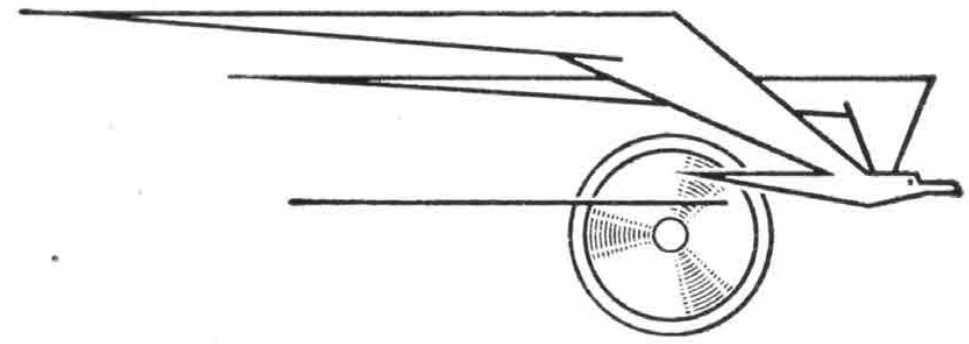
A statement is being issued to the shareholders of Aero Engines, Ltd., and will be made public in due course. No new issue by Aero Engines is contemplated.

CUNLIFFE-OWEN AIRCRAFT LTD.

CUNLIFFE-OWEN AIRCRAFT, LTD., wish to announce the resignation of the managing director, Mr. Rex Morley Hoyes, and the secretary, Mr. R. E. Chown.

Pending the appointment of a general manager, the company is under the control of Mr. W. Carrow-Fisher, A.F.R.Ae.S., director and chief designer.

Mr. W. Gordon Hill has been re-elected to the board, and Mr. J. G. White, A.C.A., has been appointed secretary of the company.



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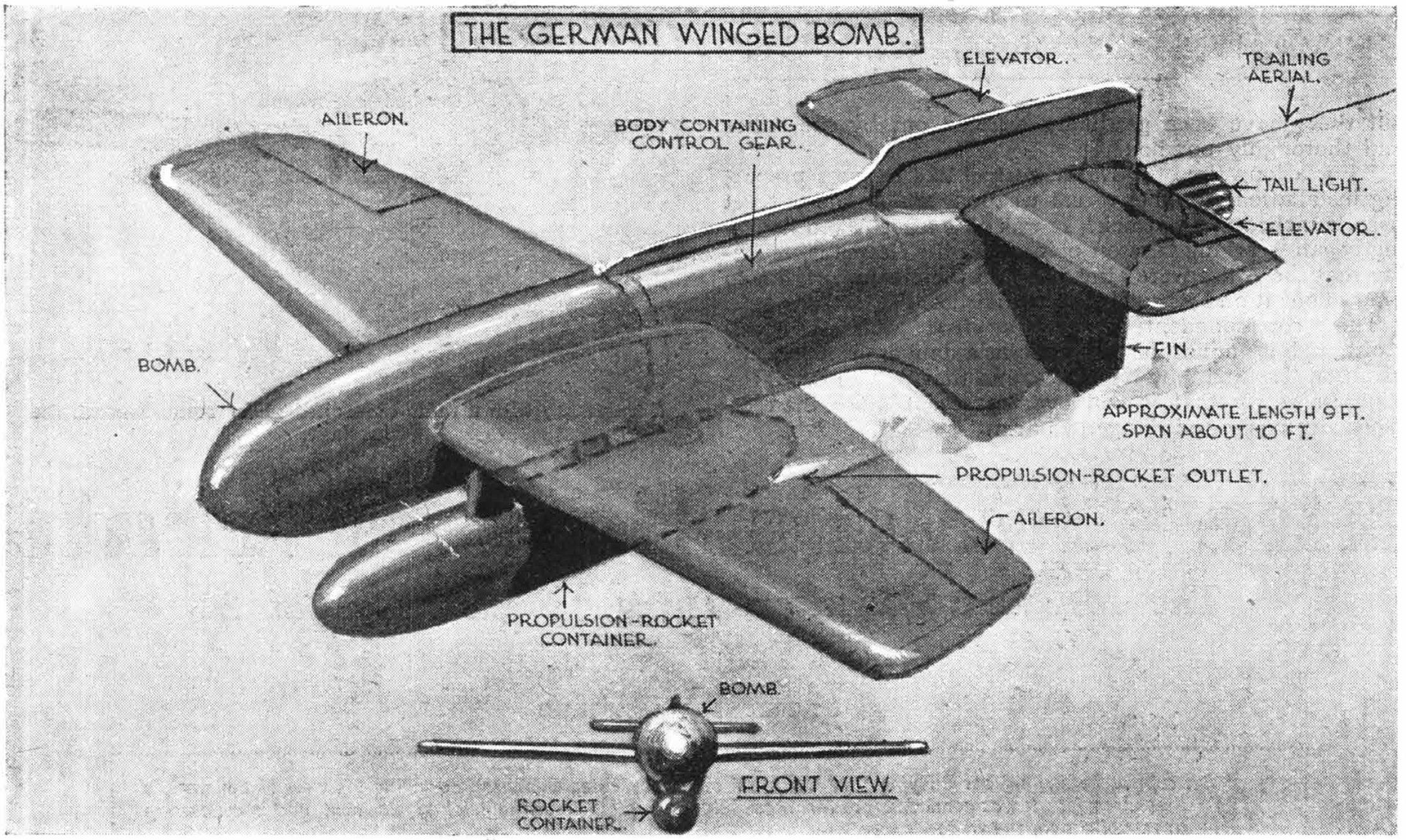


Germany's "Secret Weapon"

Crewless Radio-controlled Bomber Now Takes the Place of the Rocket Gun

Drawings by Courtesy of the "Illustrated London News"

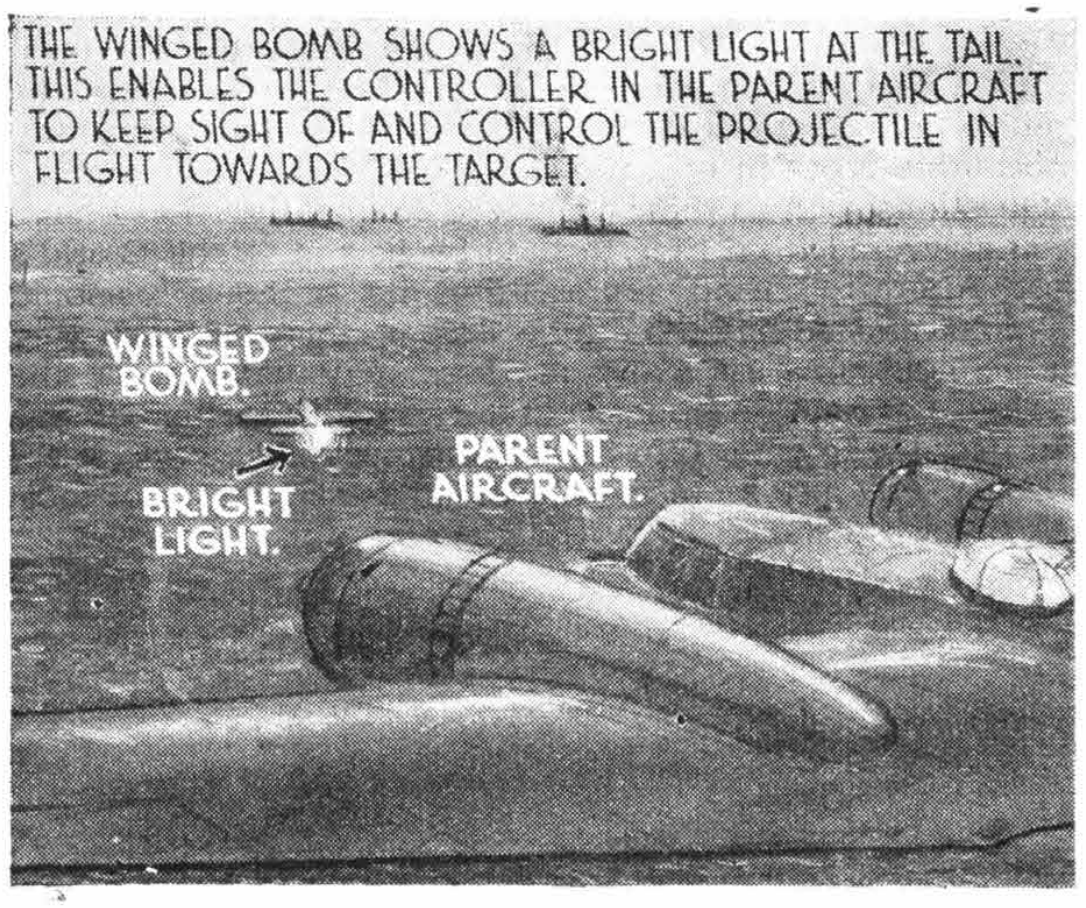
THAT the new frightfulness which Germany claims to have in store for us is not, as had been previously rumoured, a large number of rocket guns located near the coast of Northern France, but is a bomber without crew, guided by radio to its target, was reported by the New York correspondent of the *Daily Telegraph* on January 31st. His despatch read as follows:

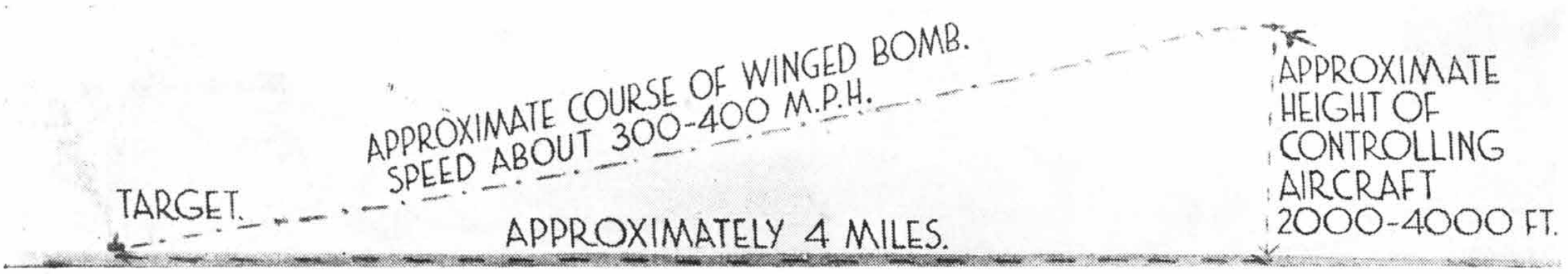
"There is ample evidence now that the Germans' secret weapon is actually a crewless radio-controlled aircraft, which, loaded to capacity with explosives, can be accurately directed to its objective," states a despatch published here, from a correspondent with the Fifth Army in Italy.

"The radio-controlled plane flying at high speed would be extraordinarily difficult to stop with either fighter aircraft or A.A. shell fire," says the correspondent.

"Nevertheless, Allied experts after studying the technicalities of the problem have located its primary weakness.

"The secret weapon needs an exceedingly complex launching mechanism. Many take-off points have been erected by the Germans along the western coast of Europe,





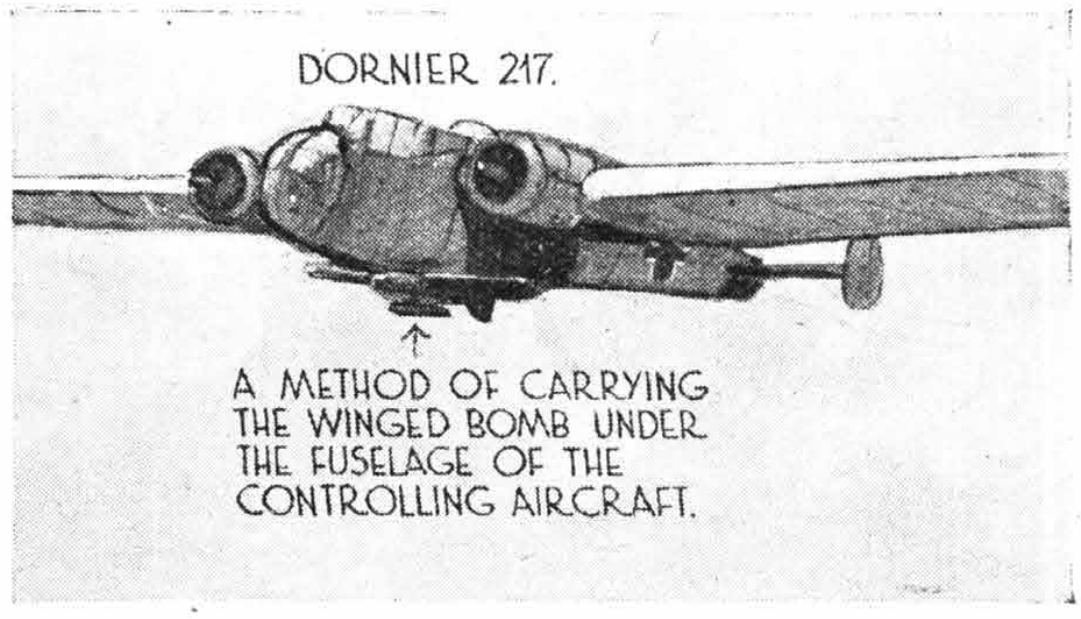
Diagrams showing the path taken by the crewless aircraft (or radio-controlled bomb) and the method of visual direction.

GERMANY'S "SECRET WEAPON"

but these have been gradually terreted out by the Allies and thoroughly bombed.

"For a long time the Nazis worked like beavers preparing installations for their great weapon, which has not yet been launched in an attack. It was only after Allied bombing began wrecking take-off points that the Germans, realising that the Allies were already in on their secret, began to brag about it and its terrific potentialities."

The correspondent concludes that this weapon, "although it unquestionably remains a dangerous menace," has been "spiked" by the Allies, and that "there is not the slightest worry that it will ever represent more than an especially nasty and dangerous arm."



Dornier 217 with a radio-controlled glider bomb beneath the fuselage.

The World's Best Aircraft

The Mosquito Awarded Three "Firsts" Out of 22 Categories : Point System Adopted

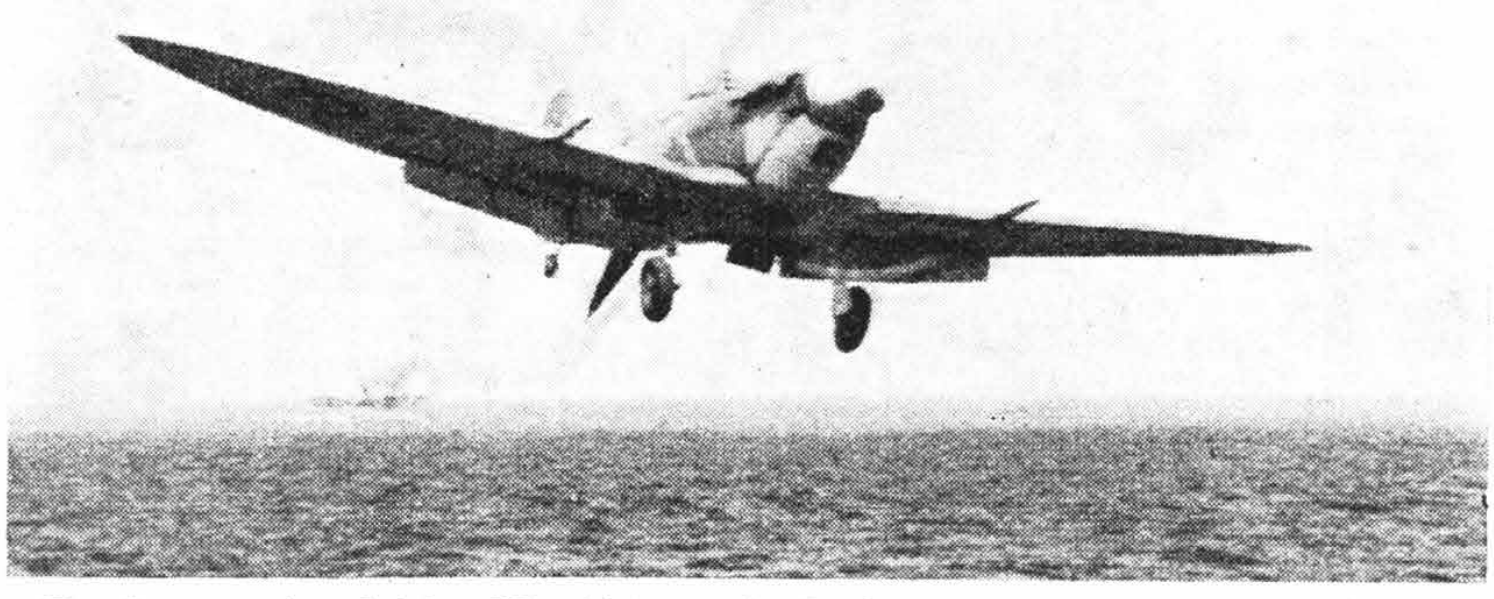
By PETER G. MASEFIELD

WE reprint herewith from "Flying" of U.S.A. an article by Peter G. Masefield giving his view of the world's best aircraft. It was penned before Mr. Masefield took up his present official appointment, and in concurring to republication, the writer observes—

"In making these statements one should emphasise that in all cases the comparisons are made only between aircraft which are in active operational service and about which details may be published. Thus in comparing the Mustang with the Spitfire, the latest Mustang is the T-51B Mustang III, and the latest Spitfire is the Spitfire IX. It is no secret that later versions of the Spitfire are flying which might modify the conclusions if details could be made known. Examples in other categories may appear to informed opinion. Further, the points taken into consideration in assessing qualities are not only those of performance and fire power but also of maintenance, vulnerability and ease of production, etc."

WHAT are the world's best aircraft in each of the more important military and civil categories? Is the Flying Fortress or is the Liberator the most formidable day bomber? Does the Mustang surpass the Spitfire as a single-seat dog-fighter? Has the enemy any unbeatable types in operation?

Questions such as these are posed frequently. They have been answered from time to time by lists of "The World's Best Aircraft," each representing its author's personal opinions and prejudices—mine among them. Interesting and enlightening as many of these may have been, the weakness of such selections is that personal preferences have had perforce to enter into them—and rarely have two selections agreed; any more than have similar selections of football or movie stars.



The Supermarine Spitfire IX which, as the Seafire, gets 95.2 per cent. marks as a naval interceptor-fighter. American pilots flying the Spitfire on operations give it full marks as a high-altitude fighter.

Before going further I am going to say that I believe that, provided there is sufficient basic information from which to work, comparative qualities of aircraft can be assessed in different categories on a basis which will eliminate mere opinion and prejudice. Further, working from a foundation of this sort, detailed calculations, practical research and experience of actual operations leads me to believe that, taken all round, the three most outstanding aircraft in the world to-day are:

1. The North American Mustang (Merlin engine) single-seat fighter.
2. The De Havilland Mosquito fighter-bomber.
3. The Consolidated Liberator day bomber.

Such a statement is seemingly mighty sweeping. The purpose of this article is to justify it and to try to show how an overall assessment can be made of the relative quality of other aircraft in the various categories required in modern air war. In such an assessment, each of the three aircraft singled out above for special praise comes out not only on top of its class in its specialised category, but also has the versatility to lead in other complementary categories. Thus the Mustang is supreme, according to my estimation, in land-based single-seat fighter categories; the Mosquito supreme as a high-speed day and night bomber and reconnaissance aircraft and also as a night intruder-fighter, while the Liberator leads both as a long-range day bomber and as an ocean patrol-bomber.

So much for generalities. When we come down to detail, we find that the characteristics which distinguishes the performance of aircraft from the performances of their human rivals for glamour, is that the aircraft is a mechanical being and its features can be calculated in

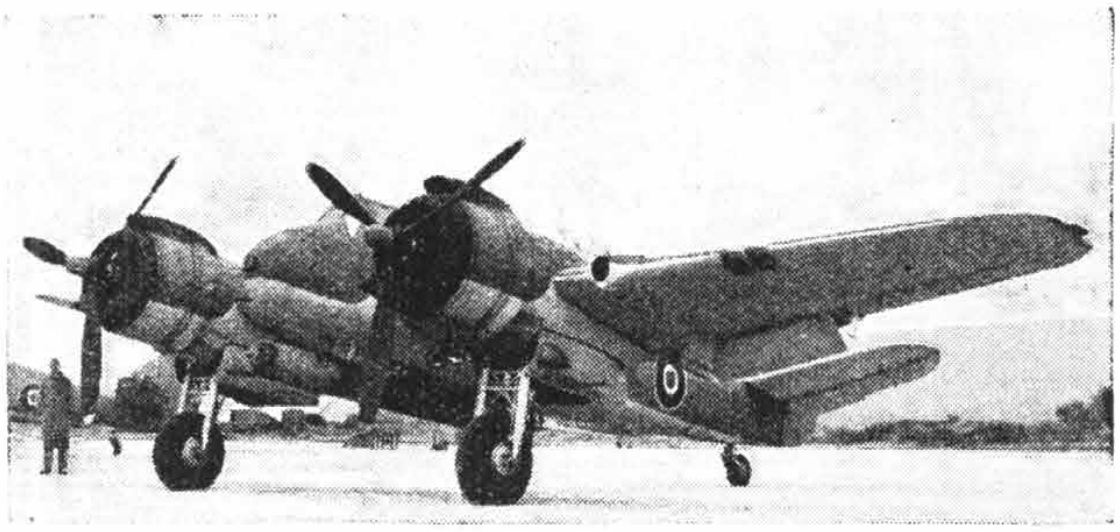
precise figures as such. That is not to say that an aircraft has not completely incalculable qualities of its own. In fact, in some ways aircraft are essentially feminine and, in the hands of a skilled and sympathetic pilot, can reveal almost human character and personality not possessed by any other man-made machine.

Be that as it may, the fact is that by assessing the combination of desirable features of any given type of aircraft in terms of an ideal, what may be termed a "quality factor" can be calculated for that aircraft as an overall percentage of the ideal.

If, for example, the maximum speed which any aircraft might hope to attain to-day were set at 500 m.p.h. and a certain type in fact attained 420 m.p.h., then its "quality factor" on that count would be 84 per cent. of the ideal 500 m.p.h. Similarly, if the maximum attainable rate of climb were set at 6,000 feet per minute and the hypothetical aircraft achieved 4,900 feet per minute, then its "quality factor" on that one feature would be 66.6 per cent. Combining the two together, the overall figure for the two factors would be 75.3 per cent.

Of course there is much more to it than that. Obviously the first thing to decide is with what categories of aircraft one must deal—single-seat fighter, heavy day bomber, naval dive bomber and so forth. Then one must decide what are the desirable qualities to look for in each category of aircraft before any assessment can be attempted.

First things first; the respective categories. First of all there are four broad divisions of aircraft: land-based strategic and tactical types; ship-borne types, and transports. Strategic aircraft are those long-range types whose operations are designed to influence the disposition and the numbers of the enemy's forces which can be brought to the battlefield, wherever that may be. Tactical aircraft are those designed to intervene over the battlefield itself, both in defence of main



The Bristol Beaufighter X tops the bill as a land-based torpedo-bomber. It would also stand top as a night interceptor fighter—a class which the author considers as not worthy of inclusion.

bases and acting as cover and support to surface forces. The ship-borne types are all those designed to be flown from ships at sea, whether carriers or other classes of war or merchant ships. The transports—landplanes and flying boats,are self-evident.

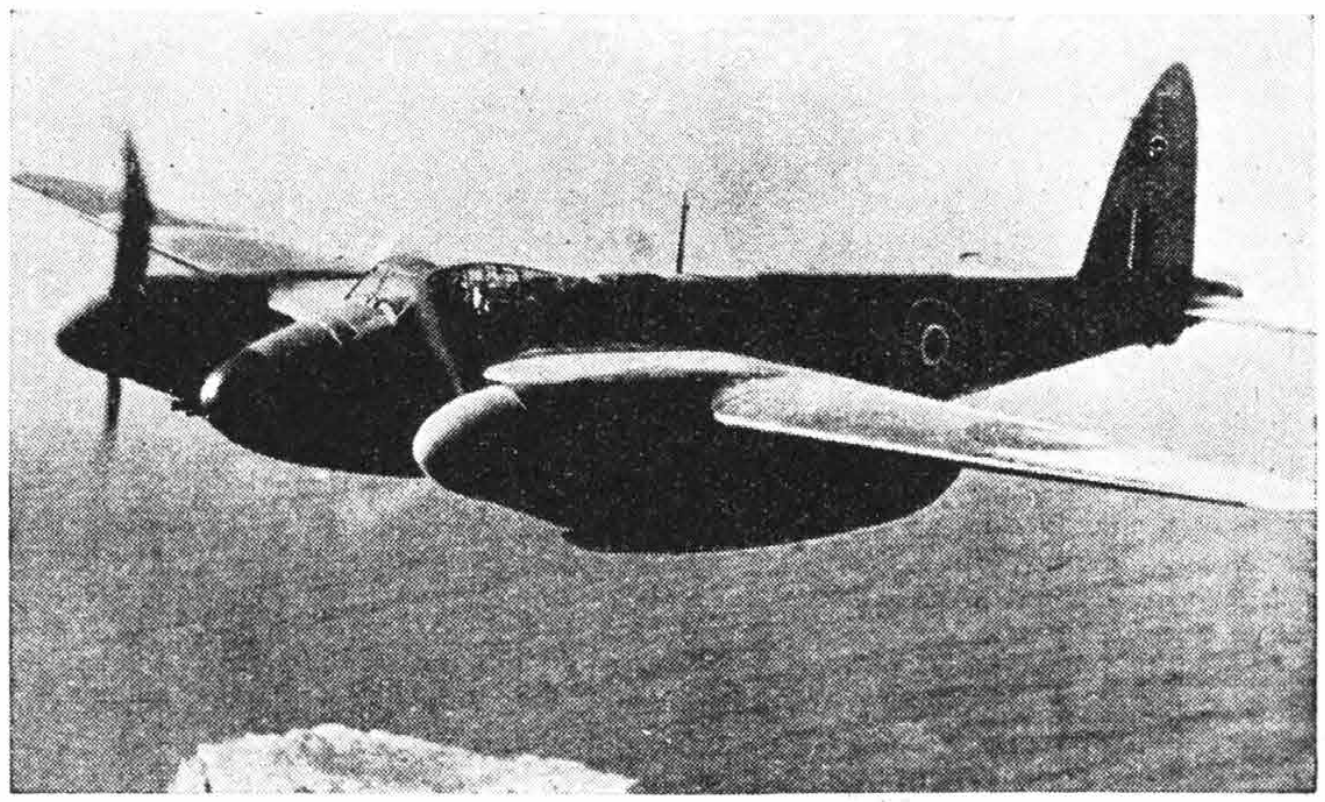
In each of these four main divisions there are, obviously, different classes of aircraft for different specialised purposes. Let us set them down and at the same time put down against each of them the quality which, combined with other all-round attributes, is the chief requirement for success in the particular job—such as a good eye for a baseball batter.

1. Four types of aircraft are important for strategic operations:

	Major Requirements
(a) Long-range heavy day bomber	defence, range.
(b) Long-range heavy night bomber	bomb-load, range.
(c) Day and night reconnaissance bomber ...	speed, range.
(d) Long-range ocean patrol-bomber (anti-sub.)	range, load.

2. For tactical missions there are eight important categories:

	Major Requirements
(a) Single-seat single-engine dog-fighter (low and medium altitudes)	speed, manœuvrability.
(b) Single-seat single-engine dog-fighter (high-altitude)	speed, ceiling.
(c) Single-seat fighter-bomber	speed, bomb-load.
(d) Single-seat escort fighter	range, speed, manœuvrability.
(e) Bomber-destroyer	firepower, speed.
(f) Night intruder fighter	speed, range, firepower.



In three classes, reconnaissance bomber, bomber-destroyer and night intruder fighter, the De Havilland Mosquito gets more than 90 per cent of marks.

(g) Two-engine attack-bomber (and tank-buster)	firepower, speed, load.
(h) Land-based torpedo-bomber	range, speed, manœuvrability.

3. Ship-based aircraft may be divided into four main categories:

	Major Requirements
(a) Single-seat naval interceptor fighter ...	speed, climb.
(b) Single-engine naval dive-bomber	bomb-load, speed.
(c) Single-motor naval torpedo-bomber ...	speed, manœuvrability.
(d) Naval escort fighter	range, speed.

In the transport categories there is scope for an almost unlimited number of types of aircraft, according to the routes to be operated and the local conditions along them. For generalised purposes the types of transport required can, perhaps, be boiled down to six main categories. They are:

	Major Requirements
Landplanes	
(a) Long-range ocean transport (3,000 miles in still air)	payload, ton-miles per gal.
(b) Medium-range, high-capacity transport (1,500 miles in still air)	payload, ton-miles per gal.
(c) High-speed, medium-capacity personnel transport (1,500 miles in still air) ...	speed, ton-miles per gal.
(d) Short-range, single-engine "rough-rider" transport (600 miles in still air)	take-off ton-miles per gal.
Seaplanes	
(a) Long-range ocean transport flying-boat (3,000 miles)	payload, ton-miles per gal. per hr.
(b) Short-range air-sea rescue and general purpose amphibian (1,000 miles in still air)	payload, ton-miles per gal. per hr

In all that gives 22 different categories of aircraft. And although this does not make full provision for many types of aircraft which are doing fine war work—such as the "grasshoppers," the catapult seaplanes, any of the many classes of trainer or any gliders—nevertheless these 22 categories do cover all the more important types of aircraft required for operational flying in modern air war.

Desirable Qualities

Having decided on the various categories to be represented, the next important step is to determine in each category the qualities needed to give all-round excellence. For instance a single-seat fighter needs a first-class combination of speed, manœuvrability, rate of climb, high ceiling, range, fire-power, armour, ease of maintenance and low cost of production (reckoned in man hours). The requirements for a heavy night bomber are naturally rather different and include emphasis on bomb-load and range.

Perhaps the best way to look at this requirement of qualities is to imagine oneself at a conference called to select the best aircraft for a particular job. Represented at the conference are:

1. The Commander-in-Chief of Air Operations.
2. The air crew which is to fly the aircraft in action.
3. The ground crew which is to keep the aircraft flying.
4. The production engineer who has to build it in quantity.

Each will want different features. If the type under discussion is a bomber, the C.-in-C. will want the maximum possible bomb load which can be dropped on a target, and sufficient range to bring all targets within reach. The air crew will want speed, defence, and pleasant flying qualities, combined with a good ceiling to escape the worst of the flak. The ground crew will want ease of maintenance and the production engineer

THE WORLD'S BEST AIRCRAFT

will want simplicity of construction so that it is easy to build. Thus, in assessing an overall "quality factor" we must take account of all requirements—which will vary according to the purpose of operation.

Obviously, too, some factors are more important than others, and figure most prominently in the design. These are the qualities which have been termed the " major factors" in setting out the 22 categories required: defence and range for the day bomber, bomb load and range for the night bomber, and so on.

So far the problem is relatively straightforward. Now we come to the more detailed and the more complicated procedure. The thing to bear in mind is that we are attempting to make a fair and impartial assessment of the world's best aircraft in each of the categories specified—the aircraft best fitted to the job in hand. The principle is to compare the known performance and other qualities of each aircraft under review, against the best attainable in each particular. The approach should be made in a spirit of how much can be gained out of the formula in the way of eradicating biased opinion, and in checking judgment and not in the spirit of how much one can outwit it and promote freaks. In this way some most interesting results can be gained and I believe the method is reasonably foolproof.

After much experiment and detailed thought on the subject, the most satisfactory sequence of assessment appears to work out as follows:—

1. Split the aircraft under review into their essential categories.
2. Define the requisite qualities in each category from the points of view of C.-in-C., air crew, ground crew and production engineer.
3. Compare only like with like. Thus the Mosquito should not be assessed against the Clipper as a trans-ocean transport, though both have flown the Atlantic. Nor should the Fw190 be assessed against the Lancaster as a night bomber, though both have been used for this purpose.
4. Compare only on a basis of consistent figures. Thus if a range is quoted with external fuel tanks the speed must be quoted for the machine equipped with the tanks, and so on.

In making the detailed calculations I have been able to draw on restricted figures for various aircraft whose exact performance may not be published yet. Naturally those figures cannot be quoted here. If that puts into the estimate of results something of the atmosphere of the patent medicine whose prescription is a professional secret, then I must ask forgiveness and plead the unfortunate result of inevitable and essential wartime restriction. Nevertheless the results can be reached without telling the enemy any unknown facts because there are so many "unknowns" in each individual assessment that even the most brilliant German mathematician could not chase the missing "x"s. A "quality factor" of, say, 85 per cent. for the Spitfire IX could in no way reveal the exact top speed or rate of climb.

Major Factors

As a detailed example of the method of assessing the "quality factor" for any given aircraft, let us analyse the figures for an aircraft of 1939, where all the relative qualities are known and can be quoted freely. The same methods are applied to to-day's aircraft, except that the optimum figures of 1939 are exchanged for those of 1943-44.

As the illustration let us take the Messerschmitt Me 109E single-seat dog-fighter (1939) for operation at low and medium heights. We proceed as follows:

Major Factors	Best of 1939	Me109E Figure	Me109E Per cent. of best
1. Max. speed at 15,000 ft.	362 m.p.h. (Spitfire).	354 m.p.h.	98.0
2. Manœuvrability factor (wing-loading) ...	14.7 lb./ft.² (Gladiator).	32.1 lb./ft.²	45.8
SUBSIDIARY FACTORS			
3. Duration (50 per cent. power)	4.2 hrs. (Seversky P-35)	2.4 hrs.	57.1
4. Initial climb	4,800 ft./min. (CW-21)	3,100 ft./min.	64.6
5. Firepower	616 m.h.p. (Hurricane)	491 m.h.p.	79.8
6. Maintenance factor ...	16 (Curtiss Hawk " 75 ")	11	68.7
7. Production factor ...	5,100 man hrs. (Gladiator)	6,600	77.5
8. Vulnerability factor ...	3.0 (Hurricane)	1.0	33.3

So much for the percentage calculations. But the mere addition and averaging of the percentages is not enough. By that means an aircraft supreme in the major factor for its category, but low on other counts, would be unduly penalised, and vice-versa.

In each category the major factors are those in which real superiority is required if the aircraft is to be any good. Therefore the major factors should be assessed separately and, by a logical course, given twice the weight of any of the subsidiary factors, thereby assuring that an aircraft with poor major factors, but superior subsidiary factors, will not be assessed unduly high. The procedure then becomes:

1. Determine and assess the major factors.
2. Determine, add up and average the subsidiary factors.
3. Add major factors plus major factors again, plus average of the sum of subsidiary factors and then take average for result.

An Example

Applying this procedure to the example of the Me 109E we see that the two major factors work out as 98 per cent. and 45.8 per cent. The average of the sum of the subsidiary factors works out as 63.5 per cent. Thus we have from (3) the sum, 98 per cent. plus 98 per cent. plus 45.8 per cent. plus 45.8 per cent. plus 63.5 per cent.; all divided by five. The result—the quality factor—thus works out as 70.2 per cent. for the Me 109E on the standards of 1939

One or two points require clarification. Fire-power is calculated on the basis of "muzzle horse-power" (see *Flying*, July, 1943, page 66).

The maintenance factor is an effort to assess ease of servicing on a known background. A fair arrangement seemed to be to award points on the following system:

Single-engine = four points;
Air-cooled engine = three points;
Metal-stressed skin construction = five points;
Wood-stressed skin = three points;
Metal, fabric-covered = two points;
Wood, fabric-covered = no points;
Fixed undercarriage = two points;
Fixed-pitch airscrew = two points;
General maintenance reputation = four points.

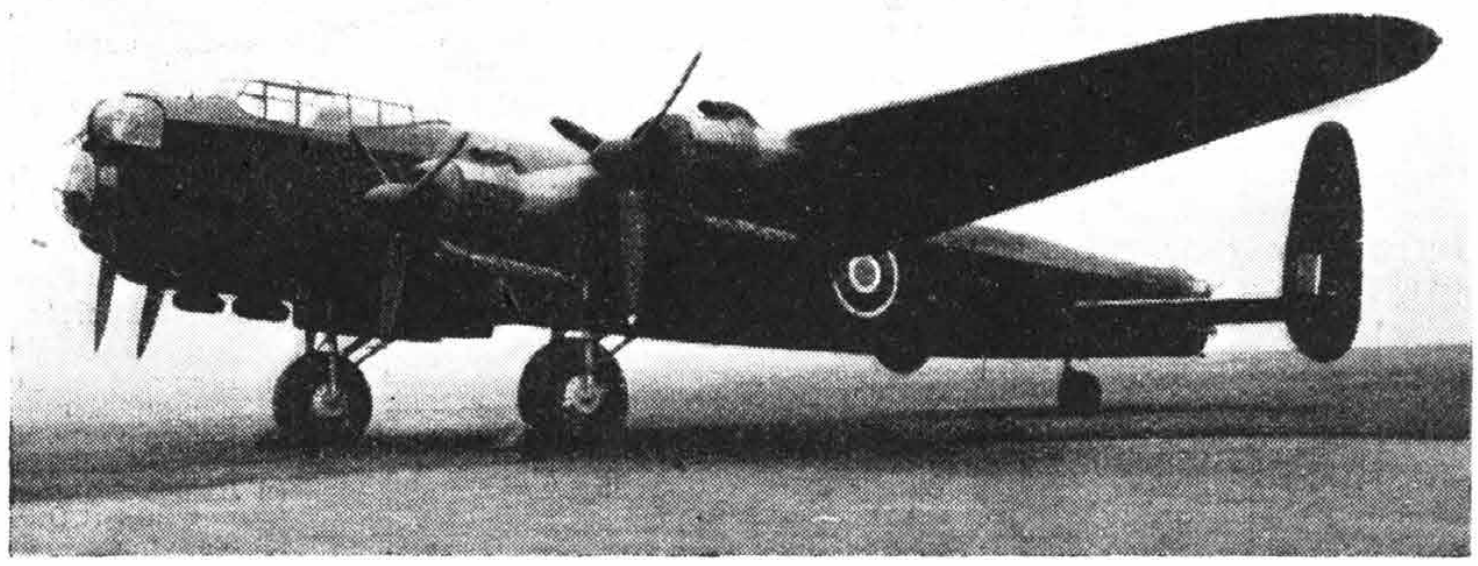
Thus, from the point of view of maintenance the maximum possible points would be 20, equivalent to 100 per cent.

The same general principle has been applied to gain a vulnerability factor. A maximum of ten points can be gained for the following contributions towards low vulnerability:

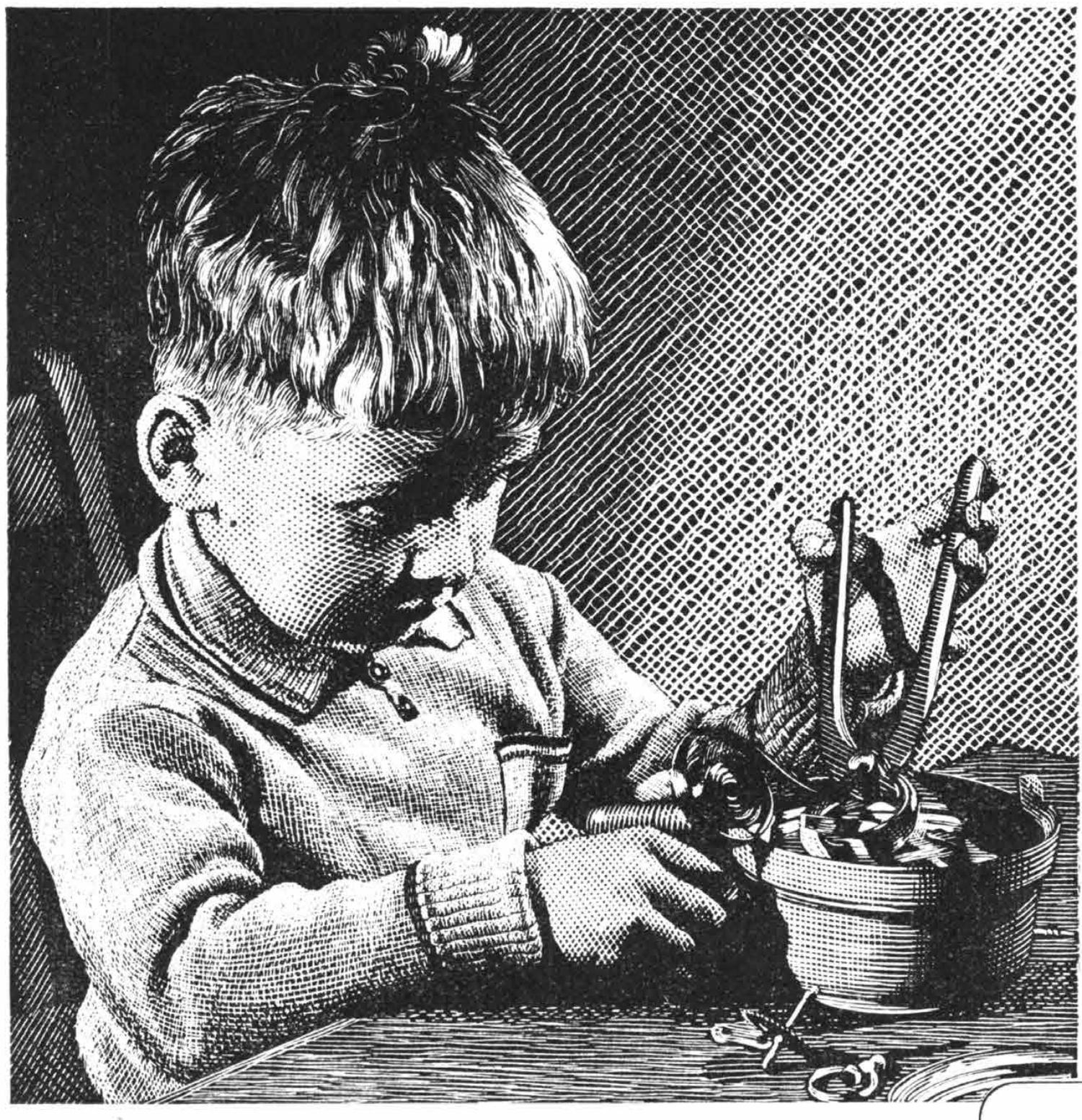
Armour plate = up to two points;
Protected fuel tanks = up to three points;
Multi-engines = up to three points;
Air-cooled motors = one point;
General layout = one point.

In practice this procedure and these details seem to give a fair appraisal of qualities. Applying these methods to the 22 categories against a standard of the highest obtainable figures of 1943-44, and varying the desirable qualities to suit the demands made upon the different classes of aircraft, we arrive at the final result. Each category of aircraft is assessed on at least two major factors and not less than five—and sometimes as many as seven—subsidiary factors, which include all those shown in the Me 109E example and also bomb load, ceiling, climb at 20,000ft., defensive power (emphasising turrets), range, ton-miles per gallon and payload for a given range.

In the assessment of the world's best aircraft on this basis, only aircraft which are in operational service and about which general details may be published have been included for selection. Nevertheless, some of the "ideals" for 1944 have been



Although given pride of place in the list of heavy night bombers, the Hercules engined Avro Lanchester II is only awarded 75.2 per cent. of marks.



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computed on more advanced figures than those of aircraft at present in service. In other words—although, for instance, the Boeing B-29 is not included in the assessment—the figures for bombers have been computed so that it could be included later without gaining a quality factor exceeding 100 per cent.

The complete list appears on this page. No enemy types qualify. I believe that most of the results will be endorsed by those who have had an opportunity to study the aircraft at first hand. I personally feel that I learned a great deal during an extensive tour of the aircraft industries in the United States and Canada which I was privileged to make recently, and I have been fortunate in having known the British aircraft industry intimately in both peace and war.

A few notes on some of the aircraft named in the list and on some of the categories considered may clear up one or two points, especially because two of the aircraft named are no longer in production. These two—the Boeing Clipper and the Chance Vought (formerly Sikorsky) VS-43B amphibian—are outstanding in their respective classes. None of the converted military flying boats come up to the all-round performance of the Boeing Clipper on long-range routes. The nearest rival is undoubtedly the Chance Vought Excalibur, although the German six-engined Blohm and Voss Bv-222 flying boat of about 50 tons loaded weight should not be forgotten. There can be no doubt that a cargo version of the Boeing Clipper, had it been produced, would have been of great value to the war effort.

The VS-43B appears to be well suited to duties as a general purpose and air-sea-rescue amphibian. Its rivals for this task, the primary need for which has been realised only comparatively recently, are the elderly Supermarine Walrus biplane and the Grumman Goose amphibian. Like the Clipper, the VS-43B would have been valuable in numbers.

Two of the other selections seem to warrant special comment. They are the Noorduyn Norseman and the Curtiss Helldiver. The Norseman, now in quantity production in Canada for the U.S. Army Air Forces as the UC-64A, stands in a class by itself. Originally designed for bush flying in Canada, it is straightforward and robust in construction, easy to repair and easy to fly into and out of confined spaces with a respectable load. For bringing up supplies behind advancing armies where airfields are not plentiful, for general hack work carrying up to eight men or spare engines and so forth, there is nothing flying which can equal it. The U.S. Army's Norseman are proving their worth.

The Curtiss Helldiver has had a chequered career. It was roundly condemned by the Truman Committee at a time when there were in it almost more bugs than aircraft. Much redesign has been done and production has proceeded in the U.S.A. and in Canada. Now I understand that the Helldiver is in operational service and doing well, fulfilling the promise which, until now, has lurked in the background but nevertheless has been there all along.

In the single-seat fighter class, the Mustang reigns supreme. With the Merlin engine its performance is exceptional, both low down and at heights above 30,000ft. Although the latest Airacobra is slightly faster at sea level, the Mustang makes up the leeway very rapidly, and at a few thousand feet, is ahead. Wing-mounted bomb racks give the Mustang a useful role as a fighter-bomber and also provide slings for long-range fuel tanks. In fact, although there have not been reports of Mustangs used for long-range daylight escorts yet, it gives promise of excelling all other aircraft at this job. Its quality factor on this count in fact works out at 86.3 per cent.

The Mosquito and the Liberator also shine among the galaxy of fine aircraft; the Mosquito combining speed with a shattering weight of fire in its fighter form, and range and bomb load in its bomber version. The Liberator now is more thoroughly defended than any other day bomber, and has a slight advantage in speed and load over the Fortress. Even so, the latest Fortress is a magnificent day bomber and stands up to punishment better than any other aircraft of its size now flying. When the B-29 "Super-Fortress" appears in action it will be a long way ahead even of the great types it supersedes—or rather reinforces.

At night the Lancaster II naturally comes out on top, the more powerful Hercules version having a slight advantage over the Lancaster I. Eight-thousand-pound bombs stow comfortably into its great bomb bay and its range and load-carrying qualities are at present unequalled.

And so on down the list, each aircraft selected having, in my estimation, qualities which place it ahead of all rivals for the job in hand. Perhaps one omission from the list of categories may be suggested: the patrol bomber flying boat. In fact, the land-based patrol bomber would seem to be able to cover most tasks of the flying boat with greater speed and load. If, however, a choice was required, the Short Sunderland stands out as the most successful and practical type yet operating. Although the Catalina has done and is doing a very fine job and the Coronada and Mariner now are both in service, the all-round estimate sets the Sunderland slightly ahead.

Naturally the list of 22 types does not claim to be either absolutely complete or infallible in its selection. Yet I sincerely believe that it presents a logical choice based on known data. Some people may quarrel with some parts of it—indeed, comments and criticisms will be both interesting and useful. And at the beginning of another New Year—in 1945—with the world perhaps looking forward into the peace and prosperity of a new Air Age, another such list in which civilian types will predominate should prove of interest.

Mr. Masefield has sent us the following paragraphs and table, which, he points out, were omitted from the article as (*Concluded on page* 155).

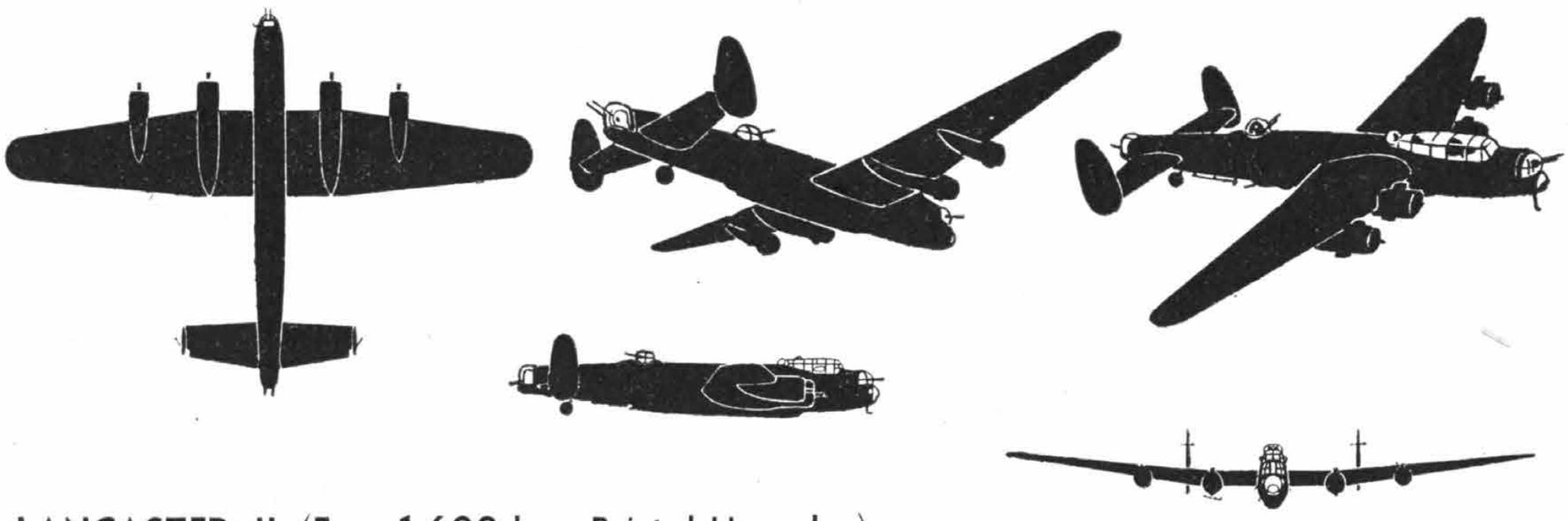
Aircraft	Type	Motors
1. Avro Lancaster II ...	Heavy night bomber	4 Hercules
2. Boeing Clipper (314A) ...	Ocean transport flying-boat ...	4 Cyclones
3. Bristol Beaufighter X ...	Land-based torpedo bomber ...	2 Hercules
4. Chance Vought VS-43B	General-purpose amphibian ...	2 Hornet
5. Consolidated Liberator (B-24J)	Heavy day-bomber	4 Twin Wasps
6. Consolidated Liberator (PB4Y-2)	Ocean patrol-bomber	4 Twin Wasps
7. Curtiss Commando (C-46)	Med.-range high-capacity transport	2 Cyclones
8. Curtiss Helldiver (revised version)	Carrier-based dive-bomber ...	1 Cyclone
9. De Havilland Mosquito...	High-speed day and night bomber	2 Merlins
10. De Havilland Mosquito...	Bomber destroyer	2 Merlins
11. De Havilland Mosquito ...	Night intruder-fighter	2 Merlins
12. Douglas Skymaster ...	Trans-ocean transport landplane	4 Twin Wasps
13. Grumman Avenger ...	Carrier-based torpedo-bomber ...	1 Cyclone
14. Grumman Hellcat ...	Carrier-based escort-fighter ...	1 Cyclone
15. Lockheed Lightning (P-38J)	Single-seat fighter-bomber ...	2 Allisons
16. Lockheed Lodestar (C-57)	High-speed personnel-transport ...	2 Twin Wasps
17. Noorduyn Norseman (VC-64B)	Short-range "rough-rider" transport	1 Wasp
18. North American Mitchell (B-25H)	Two-motor attack bomber ...	2 Cyclones
19. North American Mustang III	Single-seat dog-fighter (low-alt.)	1 Merlin
20. North American Mustang III	Single-seat dog-fighter (high-alt.)	1 Merlin
21. Republic Thunderbolt (P.47D)	Single-seat escort-fighter	1 DoubleWasp
22. Supermarine Seafire ...	Carrier-based intercepter-fighter	1 Merlin

Category	World's Best	Per cent. of 1943-44 Ideal	Some Types Considered
1. Heavy day bomber	Consolidated Liberator	78.4	B-17G, Lancaster, Ju-88, Do-217.
2. Heavy night bomber	Avro Lancaster II...	75.2	Halifax, Stirling, B-17G, B-24J, He-177
3. Day and night reconnaissance-bomber ...	De Havilland Mosquito	93.2	B-26, P-38J, A-20, Ju-88, Baltimore.
4. Long-range patrol bomber (anti-submarine)...	Consolidated Liberator	75.6	Sunderland, Catalina, Mariner, Lancaster, Coronado.
5. Low-medium altitude single-engine fighter ...	North American Mustang II ...	75.0	Spitfire IX, Fw-190, P-38, Me-109G, Typhoon, P-39Q, P-40.
6. High altitude single-engine fighter	North American Mustang II ...	91.4	P-47, Spitfire IX, P-38, Me-109G, Fw-190, P-39.
7. Single-seat fighter-bomber	Lockheed Lightning	89.2	Typhoon, Whirlwind, Fw-190, P-40, P-51.
8. Single-seat escort-fighter	Republic Thunderbolt	73.6	Lightning, Spitfire, Typhoon, Fw-190, "Hap."[1]
9. Bomber destroyer	De Havilland Mosquito (fighter)...	91.6	Typhoon, Spitfire, P-47, P-39, Ju-88, P-51.
10. Night intruder-fighter	De Havilland Mosquito (fighter)...	95.2	Beaufighter, P-61, P-70, Ju-88.
11. Two-engine attack-bomber (and tank-buster)	North American Mitchell ...	85.0	Hs-129, A-20, P-38, Whirlwind.
12. Land-based torpedo-bomber	Bristol Beaufighter X	90.0	Beaufort, P-38, Do-217, "Betty,"[1] B-26, Wellington, He-111.
13. Naval interceptor-fighter	Supermarine Seafire IX	95.2	Hellcat, Corsair, "Zeke,"[1] "Hap,"[1] Wildcat, Sea Hurricane.
14. Single-engine naval dive-bomber	Curtiss Helldiver	89.4	Dauntless, "Val."[1]
15. Single-engine naval torpedo-bomber	Grumman Avenger	75.8	Barracuda, Albacore, Swordfish, "Kate."[1]
16. Naval escort-fighter	Grumman Hellcat	92.8	Corsair, Seafire, Wildcat, "Hap."[1]
17. Long-range transport	Douglas Skymaster	91.8	Constellation, Stratoliner, Ju-290.
18. Medium-range high-capacity transport ...	Curtiss Commando	92.3	Skytrain, Ju-52, SM-82.
19. High-speed medium-capacity transport ...	Lockheed Lodestar	93.2	Flamingo, Electra, Q6, Envoy, Lockheed "14."
20. Short-range single-engine transport	Noorduyn Norseman	89.9	Fairchild "82," Bellanca Senior Pacemaker, Caproni Ca-111.
21. Long-range transport flying boat	Boeing Clipper	87.6	Coronado, Mariner, Short "G," Excalibur.
22. Air-Sea-Rescue and general amphibian ...	Chance Vought VS-43B	82.6	Walrus, Goose.

[1] The Japanese type in this category.

Studies in Recognition

Aircraft in F

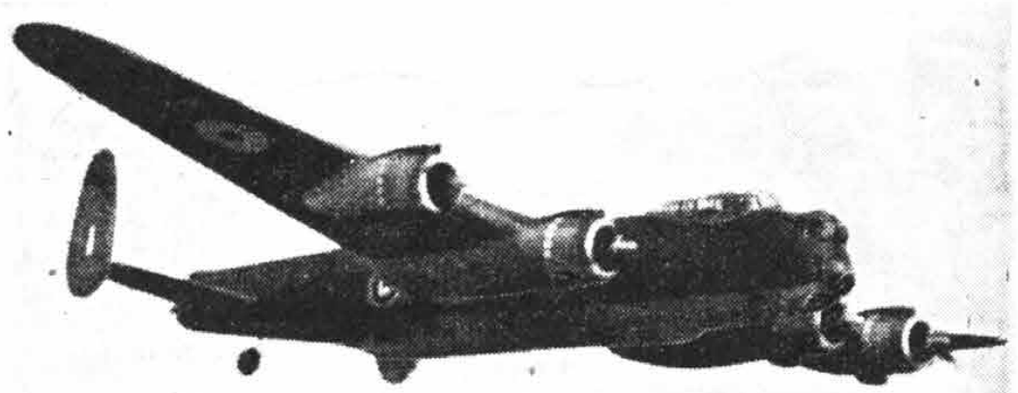


LANCASTER II (Four 1,600 h.p. Bristol Hercules)

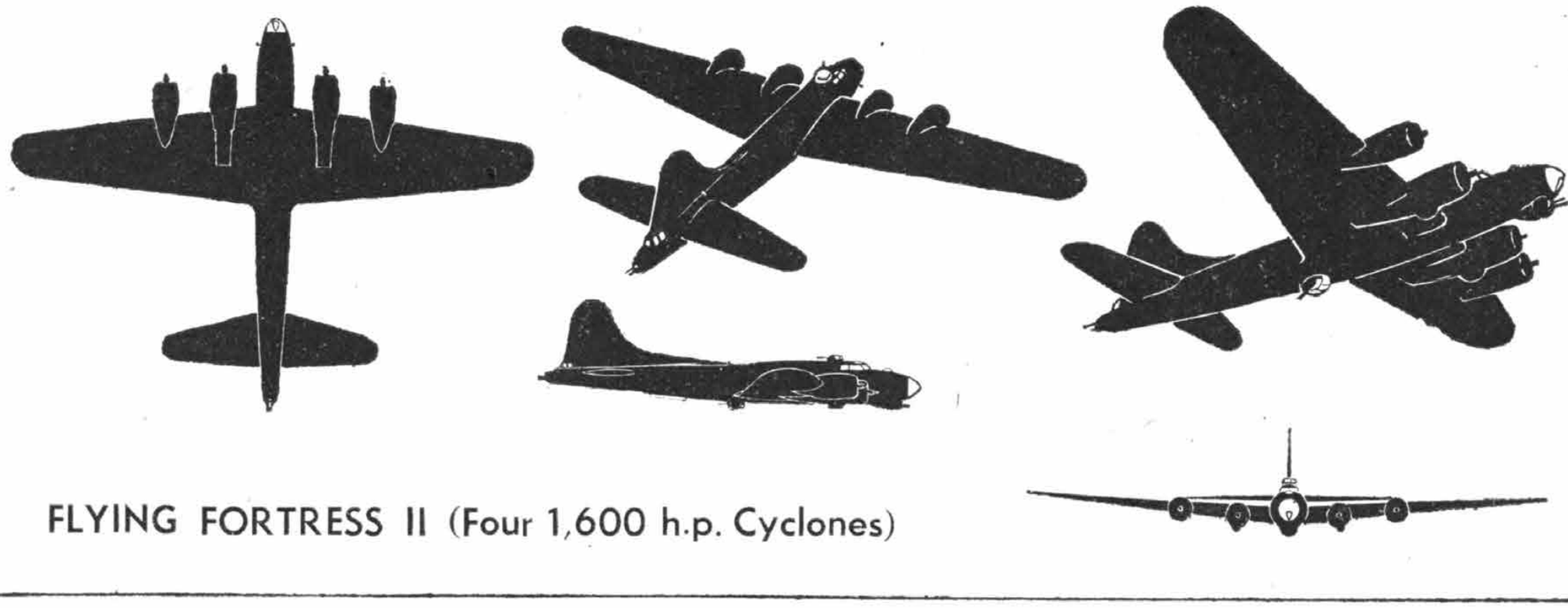
THE Avro Lancaster II is fitted with Hercules radial engines, instead of in-line Merlins.

With a maximum bomb-load of approximately 8 tons, the Lancaster's top speed is about 300 m.p.h., and maximum range approximately 3,000 miles, but not simultaneously.

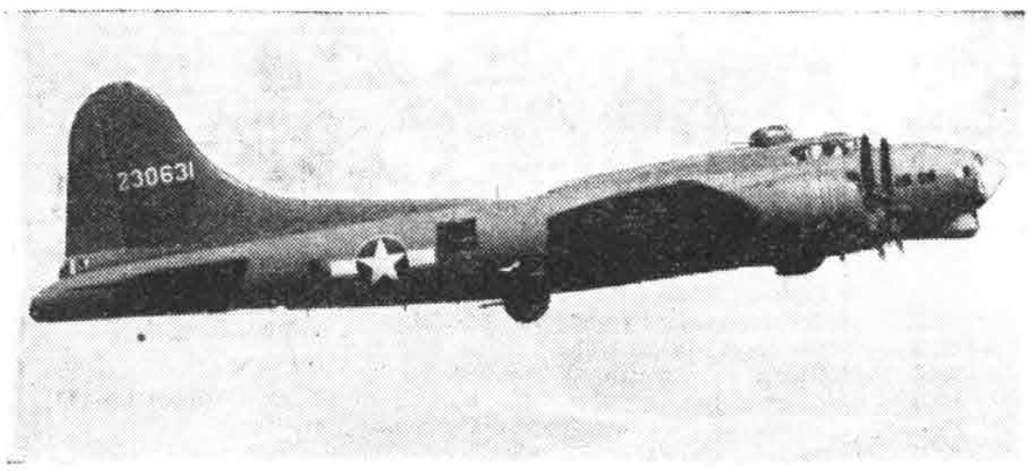
Armament consists of 0.303in. machine guns in nose, dorsal and tail power-operated turrets, and some Lancasters have been fitted with a ventral ball-type turret. Recognition points include mid-wings tapering to round tips from flat, rectangular centre-section, underslung nacelles with circular cowlings, deep narrow fuselage with raised cabin top, and tall egg-shaped twin fins and rudders. Some versions have a dropped bomb bay as shown; others preserve an unbroken under-line. Dimensions: Span, 102ft.; length, 69ft. 6in.; height, 20ft. 6in.; wing area, 1,300 sq. ft.



Avro Lancaster II Heavy Bomber



FLYING FORTRESS II (Four 1,600 h.p. Cyclones)

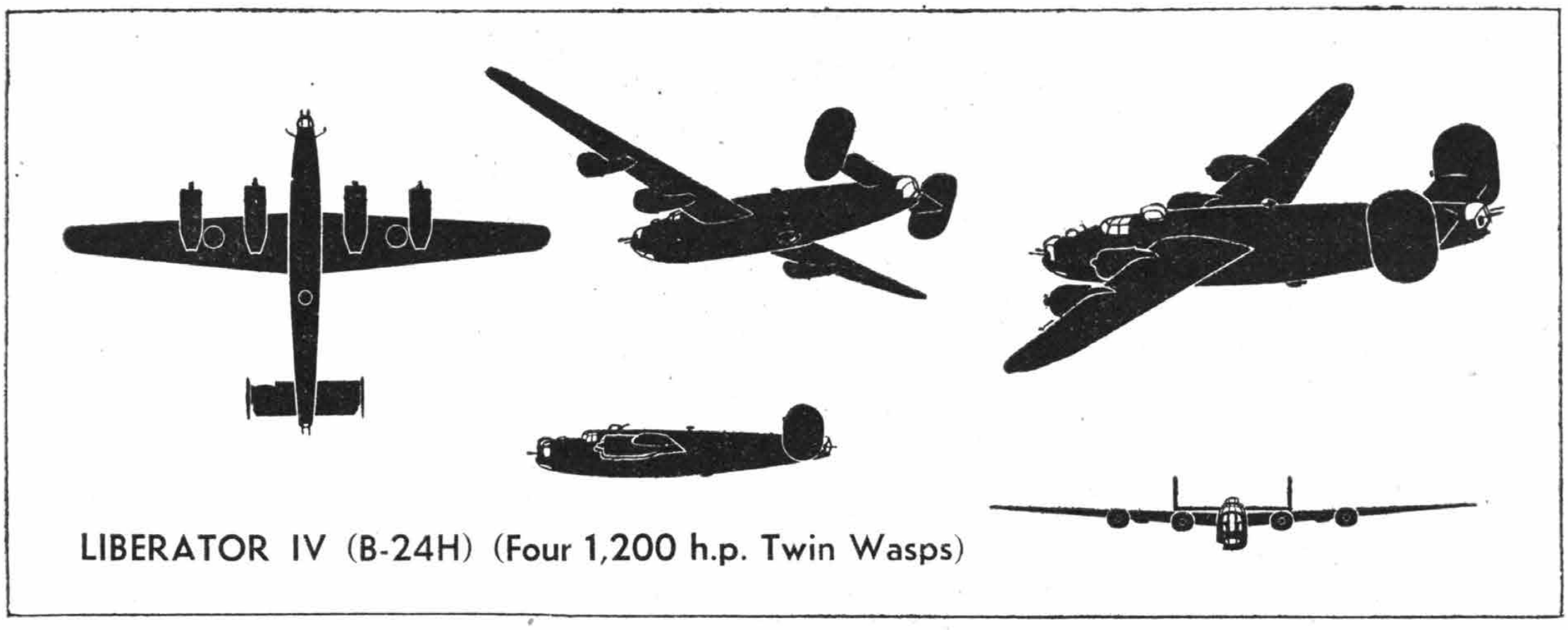


Boeing B-17G Flying Fortress II

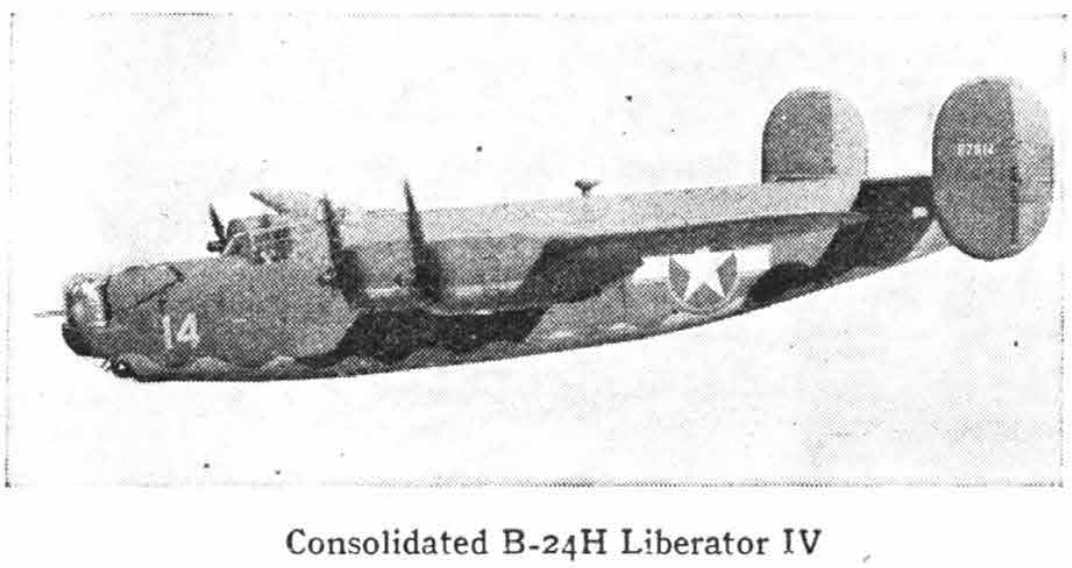
THE first example of the Boeing Flying Fortress II was the B-17E; then came the B-17F with an improved nose, after which the addition of a chin turret with a pair of 0.5in. machine guns produced the B-17G. Its four 1,600 h.p. Wright "double-row" 14-cylinder Cyclones are turbo-supercharged, giving it very good altitude performance and a top speed of about 300 m.p.h. Maximum range is about 3,500 miles, but maximum operational bomb-load is not more than 5 tons.

A total of thirteen 0.5in. machine guns are disposed in chin, dorsal, ball, and tail turrets and in the nose and waist. Chief recognition feature is the large area of fin and rudder, which includes an enormous dorsal fillet extending halfway along the fuselage. High aspect-ratio wings and tailplane taper to small round tips. Dimensions: Span, 103ft. 9in.; length, 73ft.; height, 15ft. 6in.; wing area, 1,418 sq. ft.

ying Attitudes



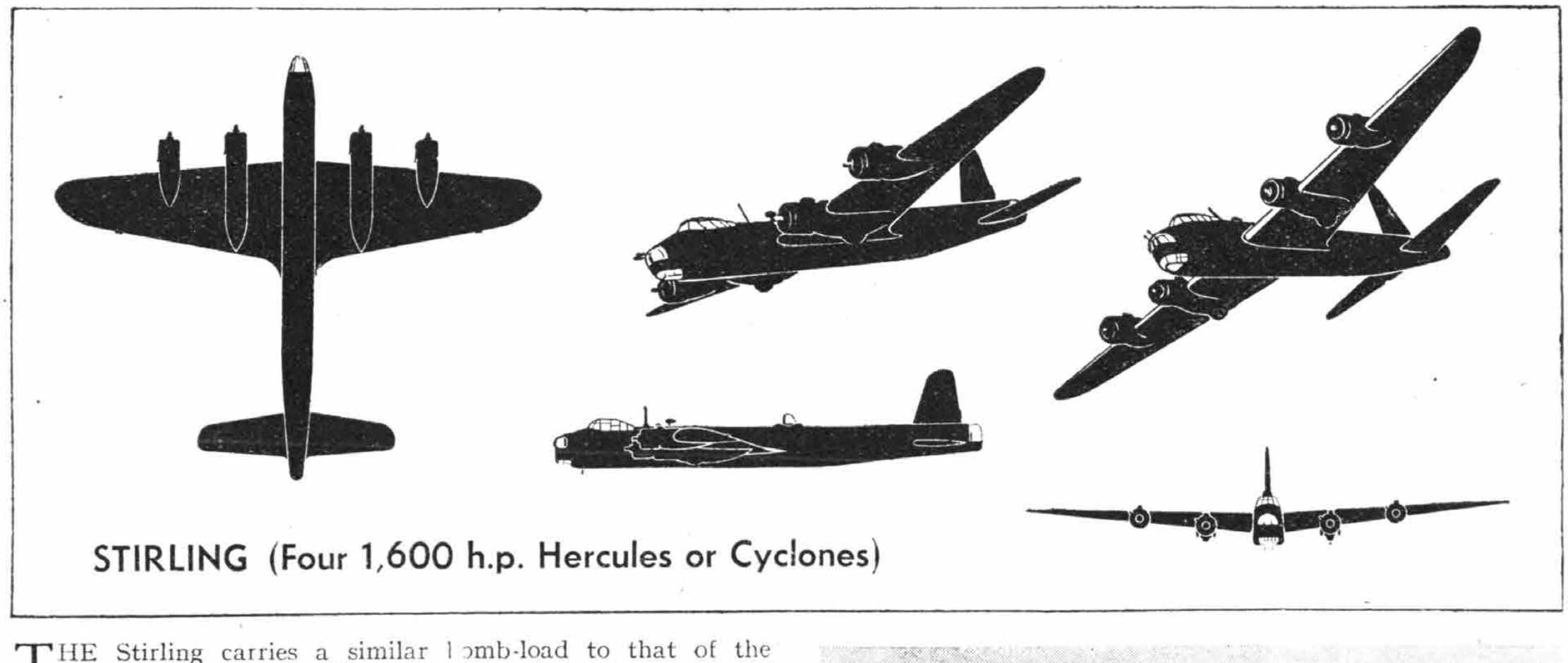
LIBERATOR IV (B-24H) (Four 1,200 h.p. Twin Wasps)



Consolidated B-24H Liberator IV

PROBABLY the most successful American long-range heavy bomber, the Consolidated Liberator IV (B-24H), is at least as well defended as the Fortress II and carries an 8,000 lb. (4 U.S. tons) bomb-load. Top speed and maximum range are about the same as those of the Fortress. The Liberator's armament now consists of nose, dorsal, tail and retractable ball power-operated turrets mounting 0.5in. machine guns.

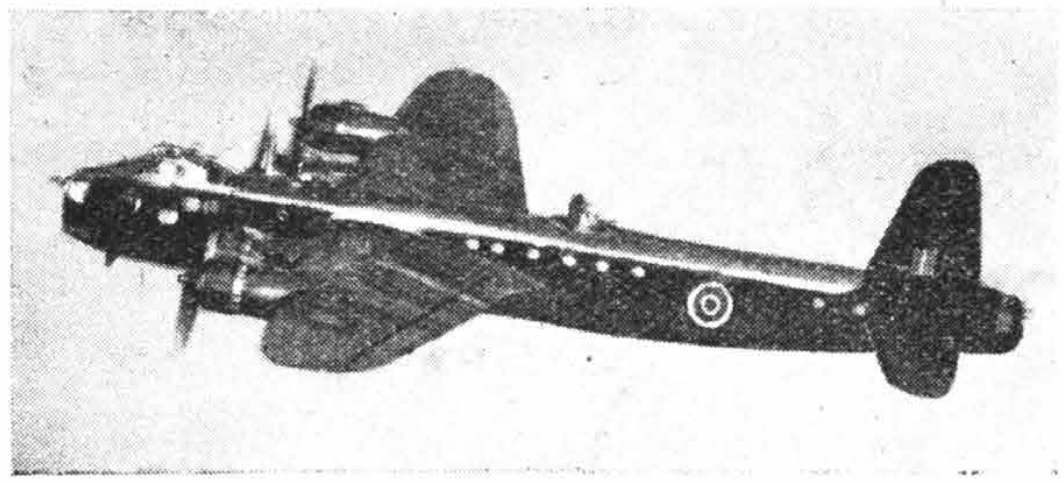
Four 1,200 h.p. 14-cylinder Pratt and Whitney Twin Wasp engines are mounted in oval underslung nacelles, which, with the exceptionally high aspect-ratio Davis high-wing, form prominent recognition features. The fuselage is deep and slab-sided, and the high rectangular tailplane carries large twin end-plate fins and rudders of symmetrical shape. A tricycle under-carriage is employed. Dimensions: Span, 110ft.; length, 64ft.; height, 19ft.; wing area, 1,050 sq. ft.



STIRLING (Four 1,600 h.p. Hercules or Cyclones)

THE Stirling carries a similar bomb-load to that of the Lancaster, and also has a top speed in the region of 300 m.p.h., but its maximum range is rather less, being something over 2,000 miles. Power is provided either by four 1,600 h.p. Bristol Hercules sleeve-valve radial engines, or Wright Cyclones of the same power, and the armament comprises three power-operated turrets at nose, tail, and dorsal position, together mounting eight 0.303in. machine guns.

Recognition points include long, angular fuselage with raised cockpit cover, tapered wings with small round tips and dihedral from the roots, tailplane of similar plan, and large single fin and rudder. The four engines are widely spaced on the wing, the inner pair being underslung, and the outer ones centred on the leading edge. Dimensions: Span, 99ft. 1in.; length, 87ft. 3in.; height, 22ft. 9in.; wing area, 1,460 sq. ft.



Short Stirling Heavy Bomber

Flying Boats

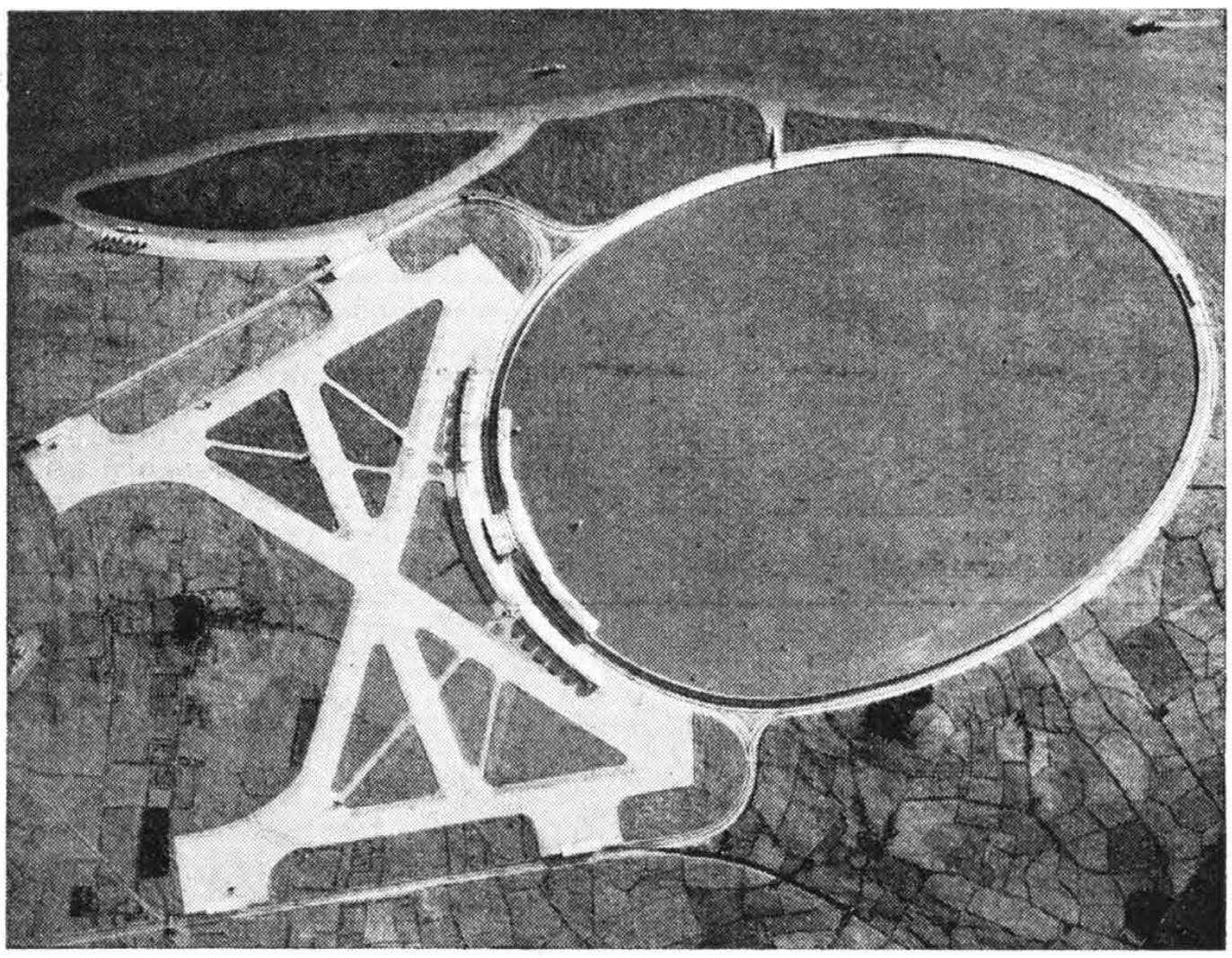
Mr. A. Gouge Discusses their Development and Possibilities : Need for Proper Terminal Facilities

SPEAKING to the London Association of Engineers last Saturday, Mr. Arthur Gouge, president of the Royal Aeronautical Society, gave a brief outline of the past history of the flying boat and compared the early types with their modern equivalents. He arrived at the conclusion that the change-over from biplane to monoplane resulted by itself in an increase in speed of about 75 m.p.h., although the increased wing loading had, of course, also played an important part.

Mr. Gouge used the argument that over long stages the advantage is with large aircraft, partly because of the greater passenger comfort made possible and partly on account of the operational saving in cost on such items as highly paid personnel, expensive radio equipment and instruments.

On the question of effect of size, Mr. Gouge pointed out that, since the size of a flying-boat hull increases as the cube root of the weight, the hull becomes relatively smaller as the weight increases, so that one of the disadvantages of the flying boat compared with the landplane will tend to disappear.

Examining the relative merits of large flying boats and large landplanes under the heads: load-carrying capacity, performance, operation and safety, Mr. Gouge arrived at some very interesting conclusions. For the same power loading, the load-carrying capacity depends almost entirely on structure weight. The landplane undercarriage is replaced by the weight of hull and wing floats of the boat. For a 100-ton flying boat these items would represent about 12-13 per cent. of the all-up weight, and for the landplane the undercarriage weight would be 13-15 per cent., so that the boat appeared to score a saving of about 2 per cent. The wing weight would not differ greatly in the two classes.



Aerial view of a model of the suggested Thames-side airport visualised by Mr. F. G. Miles and designed by Mr. Guy Morgan. Mr. Gouge referred to it as typical of what a modern airport should be.

Aerodynamic Efficiency

Mr. Gouge admitted that, aerodynamically, the flying boat is less efficient than the landplane on account of its hull shape, but recent researches had led to distinct improvements (fairing of main step), and still further improvements should be possible. He assessed the difference in performance, based on cruising speed, at 3 per cent. for a 100-ton aircraft, but if the 2 per cent. saving in structure was not "thrown away by absurd marine requirements" it would more than compensate for the lower cruising speed.

In the past the flying boat had done pioneering work, operating from rivers and lakes, with possibly only a buoy and a motor launch as terminal equipment. This had led some people to think that no financial outlay was necessary for a flying-boat terminal, while landplanes, it was taken for granted, should have large airports on which much money had to be spent. "Now why," Mr. Gouge asked, "should one expect to be able to run a real flying-boat service without some capital outlay? I suggest that the returns obtained from a service, whether flying boat or landplane, will be in a large measure proportional to the thought and capital spent on the seadrome or airport and on ground equipment and organisation." Mr. Gouge quoted Dr. Warner's Wilbur Wright lecture for examples of accidents, which showed how much safety depended upon first-class seadromes or airports. More than 50 per cent. of accidents were connected with landing or take-off.

Mr. Gouge made the suggestion that it might be possible to combine a seadrome with a reservoir, fresh water being suitable for flying boats and certainly needed for other reasons.

For aircraft of 100-ton weight and over, the facilities for flying boats comprised a dam or sea wall constructed to enclose an area of water two to three miles in extent. Once this was constructed the maintenance cost would not be great. On the other hand, a 100-ton landplane needs a concrete runway at least a foot thick, reinforced with steel, and some two miles in length. And one runway would not be enough. The maintenance of an airport is costly and continual. Finally, the problems connected with undercarriage design and retraction were very much more difficult than the flying-boat hull. "In fact," Mr. Gouge concluded that part of his talk, "the 100-ton flying boat presents no real problems, nor, for that matter, does a much larger one."

Turning to the subject of safety, Mr. Gouge continued: "Still considering only long-range aircraft, one glance at the map of the world will show how much of the flying time of these aircraft will be over water. In the case of the Atlantic crossing practically the whole of the time is spent over water, and in the case of the Empire routes about one-half, although this will, of course, depend on the exact route. Every endeavour is made in multi-engined aircraft to avoid forced landings, but some *will* take place. If you were in a flying boat you would stand a reasonable chance of surviving a forced landing at sea; the larger the boat the better the chance. The same cannot be said of a landplane. It needs the runway I have mentioned, and it is doubtful if it could land with safety at any place other than a terminal airport designed for it.

(*Continued on p.* 153.)

ROTOL

High Performance

'CONSTANT SPEED'
VARIABLE PITCH

PROPELLERS

fitted with

HYDULIGNUM

Blades

GREAT STRENGTH AND DURABILITY

FLYING BOATS

The boat could land with safety on any reasonable stretch of water.

"So from a safety point of view there is in my opinion no question that the large boat will in general be safer than its landplane counterpart, and the larger the boat the greater its safety.

"Referring now to a particular case for the use of large flying boats, the most recent flying boat is the American-built Mars, and from the published figures its all-up weight is in the neighbourhood of 70 tons. There is no British boat equivalent to this at the moment, but if we assume there is, what would we expect from it? We should expect it to be able to fly non-stop from London to New York, which means a still-air range of 5,000 miles when allowance is made for head winds. Its speed at 10,000ft. should be between 180-190 m.p.h. Its net pay load, after making allowance for crew and equipment, should be about 6-6½ per cent. of the total weight, which would amount to between 9,000 and 10,000 lb., if the total weight is taken as 150,000 lb.

"From these figures you will realise that our American friends have available at the moment flying boats capable of flying from London to New York carring a small percentage of useful load, with the necessary provision for passenger comfort. The cost of flying from London to New York will necessarily be high with a small net pay load.

Size and Weight

"Is it possible to increase the pay load percentage for the long-range case? I think it is, (a) by increasing the size and thereby obtaining the benefit of increased aerodynamic efficiency and the saving in weight to which I have already referred; (b) by flying at a greater height, which means greater speed and therefore less petrol reserve.

"Figures have been published recently which show that for a flying boat weighing 200,000 lb. the net pay load increases to 7½ per cent. Due to flying at 20,000ft. (which necessitates a pressure cabin) and increased efficiency, the cruising speed becomes about 230 m.p.h. The increase in pay load by using a larger flying boat is extremely important. If, for instance, the cost of a trip from London to New York was represented by 100 in the first case, then in the second case the cost would be 87, a decrease in cost of 13 per cent.

"By going still larger (within limits) the net pay load would still increase, and I estimate that a further 1 per cent. could be obtained by raising the all-up weight to, say, 260,000-270,000 lb., which brings the cost figure down to 77. I would not care to predict much further than this at the moment because large flying boats need large engines and so far as I know they are not available.

"The general conclusions I have given will, I believe, hold for considerably greater all-up weights. It is well known that much larger flying boats are under construction in the United States by a team of aircraft engineers under Mr. Kaiser of shipbuilding fame. If he is as successful in flying-boat construction as in shipbuilding, then we may expect some real flying-boat operations over long ranges. Personally, however, I think it is essential to keep the cruising speed as high as possible, which means large engines.

"The remarks I have just made with reference to large flying boats, though applied to ranges sufficient to cross the Atlantic, will apply to the long ranges necessary properly to operate the Empire routes.

"Before concluding, perhaps a few remarks about the application of the new power units to flying boats may be interesting. Jet engines can, of course, be fitted to flying boats and would have the effect of bringing the wing closer to the water and thus improve stability on the water. The present state of development, however, precludes the use of jets where long ranges are required. The advantages of the jet are so great that I am sure their development will be rapid. For the first time the aircraft engineer has had placed at his disposal an apparatus with the peculiarity that within limits the faster it moves the more efficient it becomes. An apparatus which has this fundamental advantage is bound to be developed, and must have very far-reaching effects on aircraft design.

"In conclusion, I would say that I consider it essential for this country to develop large flying boats for the long-range routes. The only things required to make them successful are: (a) modern landing facilities, and (b) the encouragement to design, construct and operate."

"JET" QUESTIONS IN THE HOUSE

THREE questions relating to the development of the jet-propelled aircraft were put to Sir Stafford Cripps, Minister of Aircraft Production, by Mr. Parker (Lab., Romford) in the Commons on February 2nd.

(1) How many existing firms, or their representatives, were approached by Grp. Capt. Whittle, or by the Air Ministry on his behalf, with a view to securing their participation or co-operation in the experimental development of the jet-propelled aircraft; in how many cases were such approaches unsuccessful; and in how many were the conditions proposed unacceptable?

(2) The nature of the advice given to Grp. Capt. Whittle as to the procedure he should follow with a view to securing the development of the jet-propelled aircraft; and at what date he was advised to approach aircraft companies?

(3) Whether, in the case of inventions, such as that of Grp. Capt. Whittle, the policy of his Department is to regard the reactions of firms interested in analogous developments as the best indication of the potentialities of an invention or an idea?

Sir Stafford Cripps replied: "Grp. Capt. Whittle was permitted to dispose of his invention subject to certain conditions, which included obtaining the consent of the Secretary of State for Air to any disposal of his rights and free Crown user if required. The Secretary of State was not asked by Grp. Capt. Whittle for consent to any disposal of his rights until Power Jets, Ltd., was formed in January, 1936. Grp. Capt. Whittle received no advice to approach particular aircraft companies, but consent was given to his application to form Power Jets, Ltd. Further, facilities were accorded him for the development of his invention by extending his stay at Cambridge University for a year, till June, 1937, in order to permit him to continue his work on the invention, and later by relieving him of his normal Air Force duties, in order that he might concentrate on this work, which he has done from that time onwards. The potentialities of inventions are assessed by technical officers of the Department, with the advice of independent experts if necessary. In the case of the Whittle invention a recommendation to explore the possibilities of encouraging the development of Whittle jet-propulsion systems was received from the Aeronautical Research Committee in May, 1937."

The next day, February 3rd, *Mr. Parker* asked the Minister of Aircraft Production why funds and facilities at the disposal of the Air Ministry were not at an early stage of Grp. Capt. Whittle's experiments devoted to the development of his ideas and, if necessary, to the construction of a prototype machine.

Mr. Lennox Boyd, Parliamentary Secretary, replying for the Minister, said that when it became apparent that Power Jets, Ltd., required financial assistance for further progress a contract was made with them for research and development work, and since March, 1938, their work had been substantially carried on with Government funds.

Mr. Granville (Ind., Eye): "Can he say whether at any time this very important technical development work was held up through lack of co-operation of his Department?"

Mr. Lennox Boyd: "Certainly not."

DR. LOCKWOOD TAYLOR'S NEW POST

HIS many friends in the aircraft industry will be interested to learn that J. Lockwood Taylor, D.Sc., has joined the King Aircraft Corporation of Glasgow as chief technical officer. This company was formed a couple of years ago by Mr. J. McEwan King, formerly of Aeroplastics, and is, needless to say, engaged on war work.

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.

JET PROPULSION

Action and Reaction

IN reply to Sywell, whose query, "How is Newton's Law fulfilled?" appears in your last issue, I would say:—

Consider a hollow cylinder, closed at both ends, and with a charge of gunpowder at the centre. Remote control is provided for firing the charge. Now place the cylinder in a vacuum and fire the gunpowder. To someone looking on, nothing has happened. Inside, the expansion of the gases has caused pressure to be applied to all the walls. This is even and in all directions, so there is no external movement.

Now remove one end of the cylinder and fire a fresh charge of gunpowder. The cylinder will be propelled away from the open end The force is being applied, by the explosion, to the closed end, but there is no corresponding reaction at the open end. The cylinder has an unbalanced force on it and moves accordingly. The force produces a given acceleration on the mass of the cylinder, hence satisfying Newton's Law. The reaction is the acceleration, and action and reaction are equal and opposite.

With Jet Propulsion there is a charge continually burning and a continued force on the closed end of the "cylinder." Hence motion forward. EDWARD HACK.

Comparison with the Rocket

IN reply to your correspondent "Sywell," I must state that he has an entirely erroneous conception of the Third Law of Motion. Jet propulsion and rocket propulsion are similar in that they depend upon the ejection of a portion of mass (m) at a velocity (v), this requiring a propulsive force (f) which must be countered by a force (F) acting in the opposite direction. These forces are, of course, developed by the burning of the fuel and the consequent molecular rearrangements. F is usually known as the thrust of the rocket or jet motor, and it imparts an acceleration to the mass (M) of the vehicle which gives rise to a velocity (V). If we call dm the increment of ejected mass, then the increment of velocity dV imparted to the mass M is connected by the relation.

$$M.dv = F = -v.dm$$

In a rocket v is usually constant and depends upon the chemical composition of the fuel and the design of combustion chamber and nozzle. In such rockets M varies considerably with time, and we arrive at an exponential expression for the final velocity. With jet-propelled aircraft this is not the case, however, as M remains virtually constant, due to the fact that the ejected mass is mostly air which has been scooped in at the nose of the machine. The rule still holds good, nevertheless, and the thrust developed depends upon the ejected mass and the velocity of this mass. It does not depend upon the ejected mass pushing against the air. If the latter were true, then we could also say that a normal aircraft depended for its thrust upon the slipstream pushing against the air at the rear.

Your correspondent's later sweeping statement concerning the functioning of a rocket *in vacuo* is similarly incorrect, because once again the thrust or force of reaction is given by the jet flow and the jet velocity, and does actually increase as the rocket leaves air and enters a vacuum. To quote a simple analogy, the rocket may be compared with a machine gun, shooting gaseous bullets instead of leaden ones. It is quite obvious that the recoil of such a gun is caused by the initial explosion of the powder in the cartridges, and not by the bullets and gases pushing against the air.

In conclusion, I wish to express the appreciation felt by the committees of the British Astronautical Societies for the way in which you have, so often, devoted space in your publication to the problems of jet and rocket propulsion.

D. H. BURGESS.
(For E. Burgess, President, Central Committee, Manchester Astronautical Association and Astronautical Development Society.)

Power and Efficiency

MANY correspondents seem to be vague as to how a jet propelled machine obtains its forward thrust. It does not seem to be generally realised that an orthodox aircraft does this in exactly the same manner by producing a slipstream. In fact, the wing of a plane is hardly different, obtaining lift from its downwash.

The theory that it obtains thrust by "pushing" on the air behind demands that the pressure in the slipstream must be greater than atmospheric. It would be more correct to say that it obtains its thrust from the pressure immediately behind the compressor. If the jet were "pushing" on the air, its pressure would have to be greater than atmospheric. However, the nozzles in steam turbines can eject steam at well below atmospheric pressure.

One correspondent attempts to work out the efficiency from the text-book example of a gun firing a bullet, which proves that the gun absorbs most of the energy. He forgets that an aircraft, unlike the gun in question, is moving at considerable speed.

If a machine-gun were mounted on wheels, and set off, the thrust on the gun would remain constant. But, the faster the gun went, the more power it would absorb, and therefore the more efficient it would become; since the energy in the explosive charges would be unaltered.

It must be remembered that power is proportional to thrust × speed.

The power and efficiency of a jet propelled or an airscrew aircraft can be calculated by working them out by an equation of energy.

Those who do not believe that action and reaction are equal and opposite (I refer to the great Contra-prop controversy) will probably make Newton do a few more circuits of his grave by disbelieving this.

If the mass of air absorbed and discharged per second = M lbs./sec., speed of aircraft = V ft./sec., and speed of slipstream = v ft./sec. (in opposite direction to V), then, relative to the aircraft, the total work done by the aircraft on the air must equal the energy in air after ejection minus energy in air before intake, per second. Thus:—

$$\frac{M}{2_g}(V + v)^2 - \frac{M}{2_g}(V)^2 = \frac{M}{2_g}(2Vv + v^2) \quad .. \quad .. \quad \text{(i)}$$

And, waste energy (residual energy in slipstream), per second

$$= \frac{M}{2_g}(v)^2 \quad .. \quad .. \quad .. \quad .. \quad .. \quad \text{(ii)}$$

∴ Useful work done on aircraft, per second
= Total work minus waste energy, per second

$$= \frac{M}{2_g}(2Vv + v^2) - \frac{M}{2_g}(v^2) \text{ (combining i and ii)}$$

$$= \frac{M}{2_g}(2Vv) \quad .. \quad .. \quad .. \quad .. \quad .. \quad \text{(iii)}$$

$$\therefore \text{Efficiency} = \frac{\text{Useful work}}{\text{Total work}} \times 100\%$$

$$= \frac{\frac{M}{2_g}(2Vv)}{\frac{M}{2_g}(2Vv + v^2)} \times 100\% = \frac{2V}{2V + v} \times 100\%$$

If $\frac{v}{V} = R$

$$\text{Efficiency} = \frac{2}{2 + R} \times 100\% \quad .. \quad .. \quad .. \quad .. \quad \text{(iv)}$$

(Refer to de Havilland's announcement in the issue of January 20th.)

From (iii), we get that the power absorbed by the aircraft (energy per second)

$$= \frac{M}{2_g}(2Vv) \text{ (ft. lbs./sec.)}$$

Therefore thrust

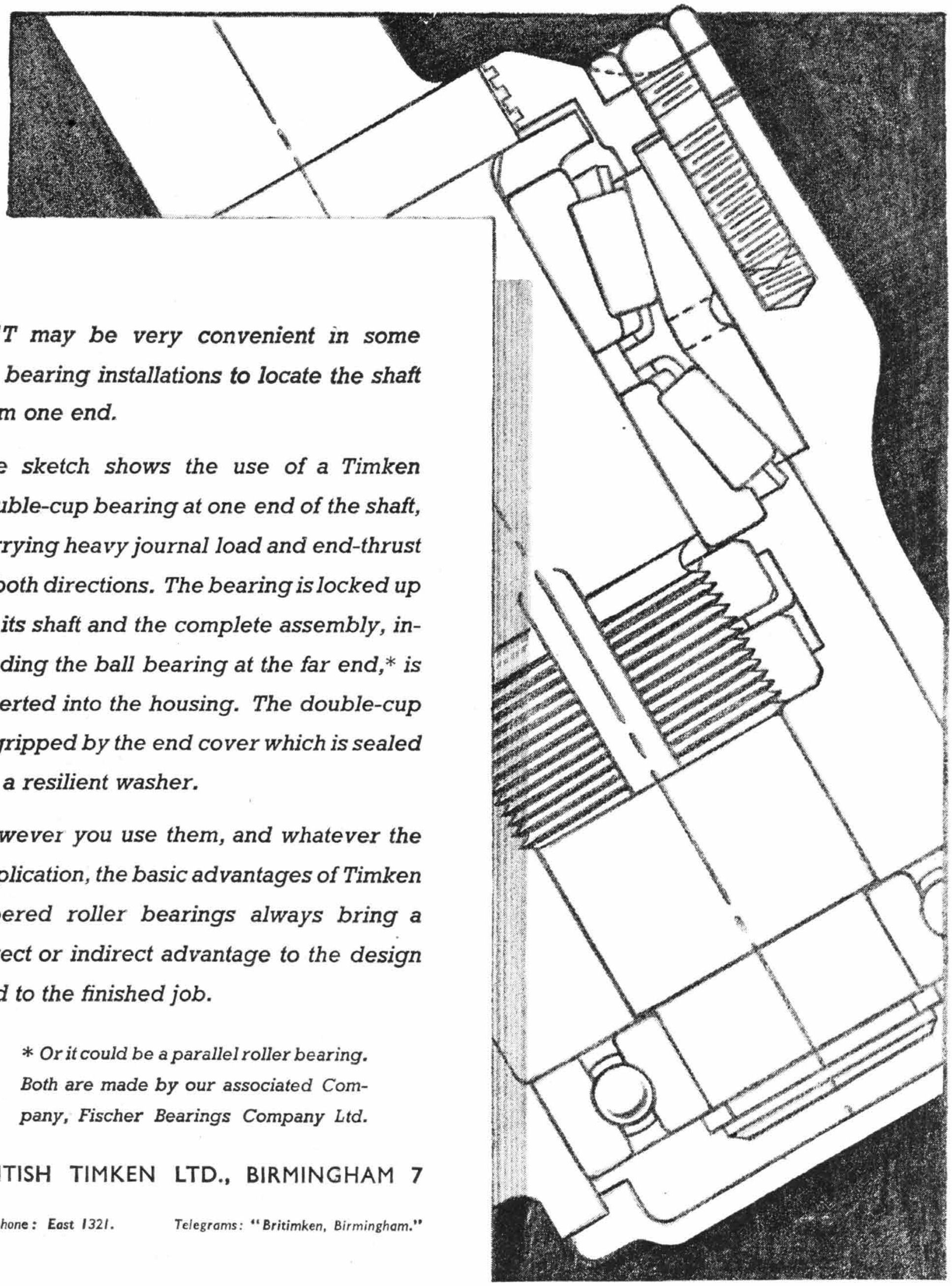
$$= \frac{M}{g} \times v \text{ (lbs.)} \quad .. \quad .. \quad .. \quad .. \quad \text{(v)}$$

From (iv) and (v), we can deduce that,

(*a*) If thrust = zero, i.e. v = zero.
Efficiency is 100%, but no work is done.

(*b*) If aircraft speed is zero, i.e. V = o.
Efficiency is zero, but thrust is produced.

(*c*) The greater the ratio of aircraft speed to slipstream speed, the greater the efficiency (i.e. R is a small).



IT may be very convenient in some bearing installations to locate the shaft from one end.

The sketch shows the use of a Timken double-cup bearing at one end of the shaft, carrying heavy journal load and end-thrust in both directions. The bearing is locked up on its shaft and the complete assembly, including the ball bearing at the far end, is inserted into the housing. The double-cup is gripped by the end cover which is sealed by a resilient washer.*

However you use them, and whatever the application, the basic advantages of Timken tapered roller bearings always bring a direct or indirect advantage to the design and to the finished job.

** Or it could be a parallel roller bearing. Both are made by our associated Company, Fischer Bearings Company Ltd.*

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CORRESPONDENCE

(*d*) If v is negative (i.e. in the *same* direction as the aircraft's motion).

Efficiency is greater than 100%, however thrust and power are negative (i.e. there is drag).

(*e*) Thrust is proportional to mass of air per second × slip-stream speed.

Therefore, to increase thrust it is necessary either to increase v and lower the efficiency, or to increase M. Unless it is possible for a jet machine to deal with as much air as an airscrew machine, it will be considerably less efficient at low speeds, and, to get the same take off as an orthodox machine, it will need very much greater power.

The chief advantages for a jet machine would appear to be:—

(*a*) A lighter power unit that is less efficient, giving better performance for short durations (i.e. when fuel load is not important).

(*b*) Efficiency at speeds where an airscrew would be hopelessly inefficient.

However, its range would be poor, as at speeds where its efficiency is high, the drag would also be high, and vice versa.

J. K. HAVILAND

Aeronautical Crystal-gazing

WE should all be grateful to E. H. Miles for his letter suggesting designs for jet-propelled aircraft. He at once enters the privileged company of crystal-gazers in aviation, of whom none holds higher place than the late Will Rogers.

Will reached his peak in anti-submarine suggestions. He advocated raising the temperature of the sea to boiling point, for, he averred, no submarine could exist submerged in such conditions. Agreeing with his thesis in idea, the question was then asked as to how to raise the temperature.

Said honest Will in a hurt voice: "Listen, *I* give you the Big Ideas—*You* work out the details."

Incidentally, what about a nice black searchlight to blot out the moon?

"FOUGUEUX."

Fuel from Decomposed Water

IN your issue dated January 27th "Typhoon" discusses the possibilities of broadcast electric power and enquires about other possible sources of power.

I have an idea that some time in the future some genius will find a way to speed up the process of electrolytic de-composition of water into its component parts of hydrogen and oxygen at any desired speed.

If it were possible now, what a boon it would be to the jet experimenters. I can visualise an aircraft with tanks full of water, one jet of which is de-composed and the resultant jets of hydrogen and oxygen burnt in the inner tubes of a jet engine. A second jet of water, injected into an outer tube surrounding the hot tubes, is instantly converted into steam and the whole mass, burnt gases and steam, ejected through the usual rear orifice.

A certain amount of the energy would have to be diverted, via a turbine or other means, to drive a dynamo to supply the electricity needed in the de-composing chamber. Such an engine, being independent of the atmosphere, would function at any height, even beyond the atmosphere.

When this becomes a practical proposition, there will be no need to buy oil from abroad or to delve for coal at home, as water is about the cheapest and most plentiful material in the world.

H. MUNDAY.

MERLIN MYSTERY

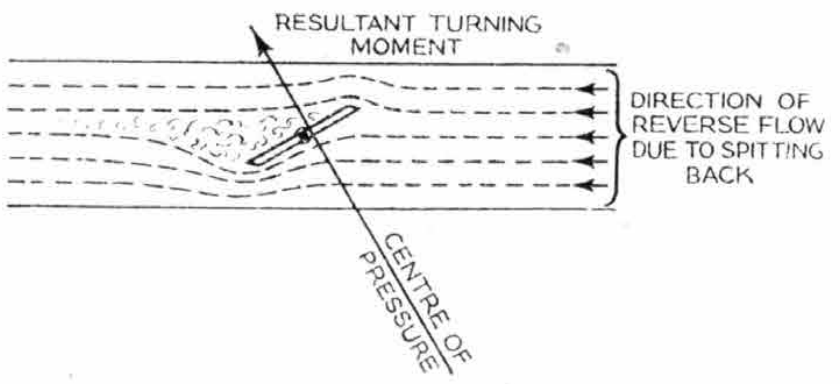
Spitting Back May Cause the "Kick"

I WOULD like to point out that a mag. drop cannot possibly cause a kick on the throttle controls unless spitting back in the induction system occurs. The drop in revs is caused by loss of power output due to inefficient combustion, the effect on the boost being insufficient to cause a kick on the controls. "Fitter 11.E" (*Flight*, December 23rd, 1943) may be used to large four-engined aircraft in which case spitting back may have occurred unnoticed.

A study of the aerodynamic properties of a butterfly throttle as depicted in the diagram shows that spitting back at low revs when the supercharger offers little opposition to the reversal of the flow tends to kick the throttle butterflies and cockpit levers back to the closed position.

The effect is similar to that of the airflow over an aerofoil except that it is considerably reduced by interference from the walls. Perhaps someone will oblige with more details of this interference.

It should be realised that if the boost control closes the butterflies it tends to push the cockpit control forward, and



vice versa. Hence suddenly induced high boost pressures will give a kick forward on the cockpit lever.

This condition may be obtained by:—

(1) Spitting back at high revs, and boost when the supercharger damps out the effect on the butterflies, but may not always be sufficient to give a kick forward.

(2) Changing the supercharger into high gear.

(3) Operation of the boost cut-out valve back to normal.

Bringing the boost cut-out valve into operation, and changing to low gear causes the lever to kick back.

The magnitude of the kick depends on:—

(1) The rate of change of pressure in the induction system, and the magnitude of that change.

(2) The moment of inertia, and friction of the controls between cockpit and gear box, as compared with that of the control between the gear box, and the butterfly.

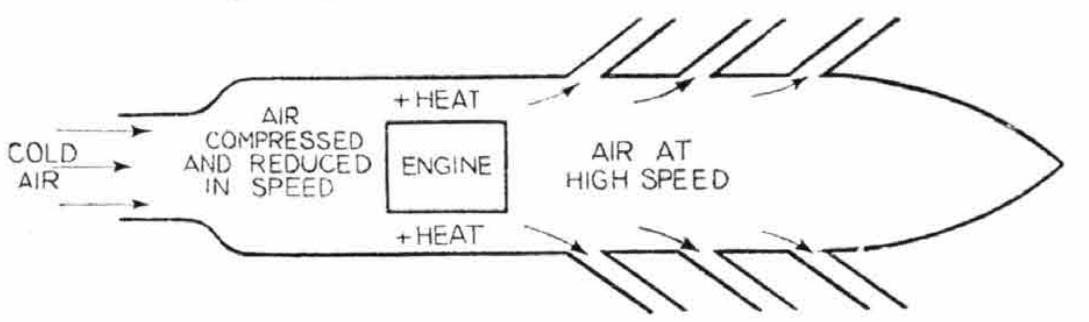
INTERESTED.

THE DUCTED RADIATOR

Heat Converted to Kinetic Energy

IN reply to the query put by a reader about the ducted radiator, the following may be of some use:—

Briefly, ducted cooling is a method employed to convert waste heat energy from the engine—heat energy that would otherwise be lost—into useful kinetic energy and so into thrust. The principle can be seen from the diagram.



Expansion of the incoming air occurs after entry to a high pressure (it might be more correct to call it a compression) and a low speed. This air is then heated on passing the engine, which gives the air a high speed.

The heat energy thus imparted to the air is recovered as thrust when this high-speed air is discharged to the rear through nozzles or gills.

The source of heat is immaterial—it may be the radiator, or engine, or even a flame (compare with the jet-propulsion engine).

R. SHOHAM.

THE WORLD'S BEST AIRCRAFT

(*Concluded from page* 149).

published in *Flying*, presumably in order to save some space.

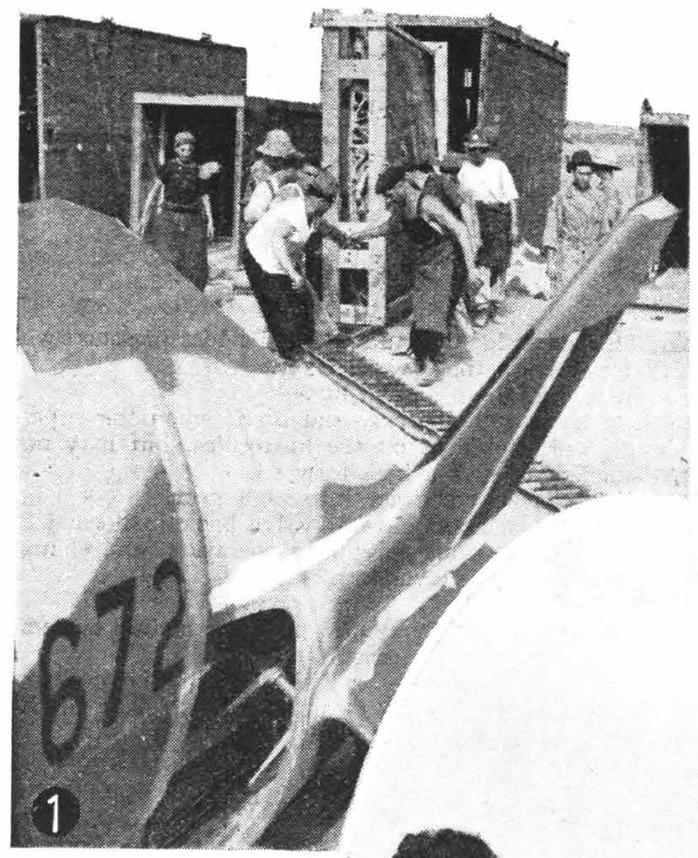
An analysis of the types of engine which power the 22 selected aircraft is of interest—for the engine is essentially the heart and the making of any aircraft.

The Rolls-Royce Merlin and the Wright Cyclone appear in six types, the Pratt and Whitney Twin Wasp in four types, the Bristol Hercules in two types, and the Allison and the Pratt and Whitney Double Wasp, Wasp and Hornet in one type each. These engines can be fairly said to represent the best in service in the world to-day.

Conclusion

Such a list is inevitably outdated quickly in the swift march of aeronautical progress. For instance, it is unthinkable that the great name and experience of Hawker will be long absent from the list of the "World's Best," the new Boeing B-29 holds out tremendous promise, the Martin Mars is just coming into service—new transports are impending and a new era is opening with the revelation of jet propulsion. If one could but see to-day a similar list as it might appear two years hence—what advances it would reveal. For the Air Age is in the future—not in the past or present.

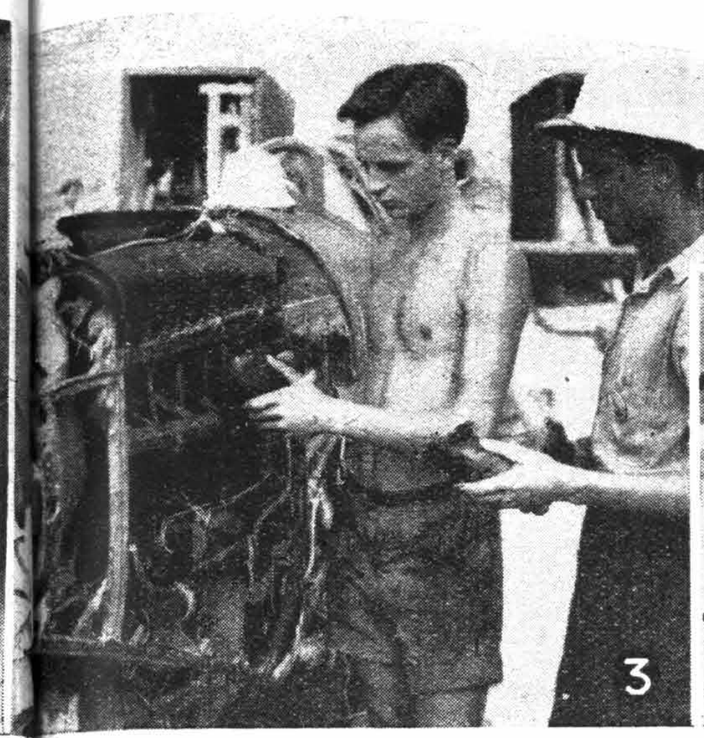
Spitfire Asembly at Casablanca

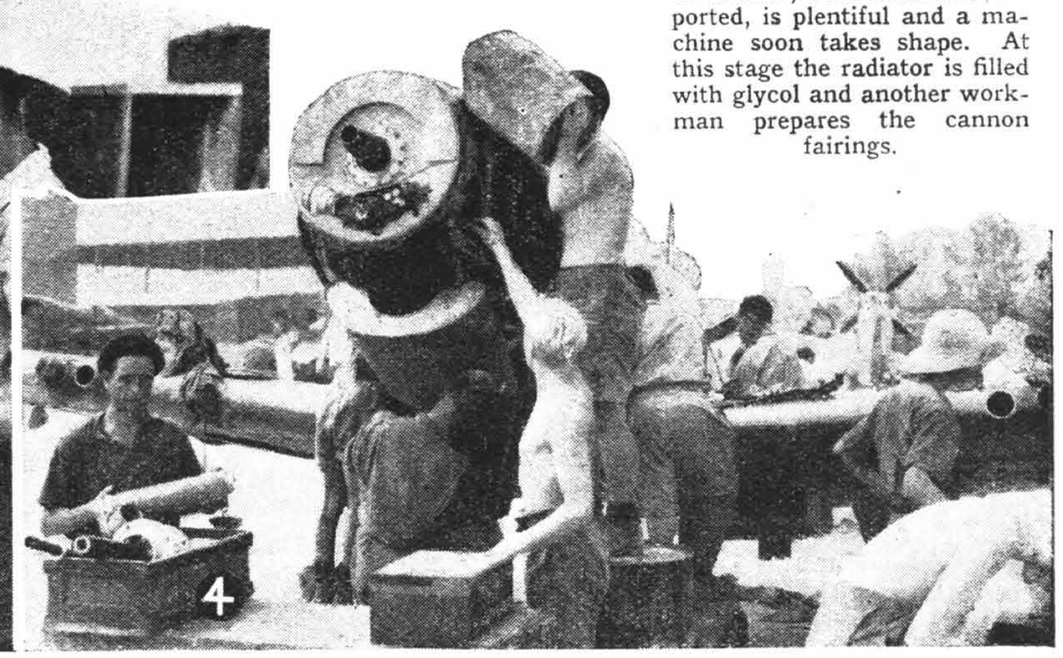


1. The Spitfires arrive packed in various sub assemblies. A wing is shown here being run out on rollers.

2. Bolting the tail unit on to the fuselage.

3. An R.A.F. fitter, with a local assistant, fits the exhaust stubs.

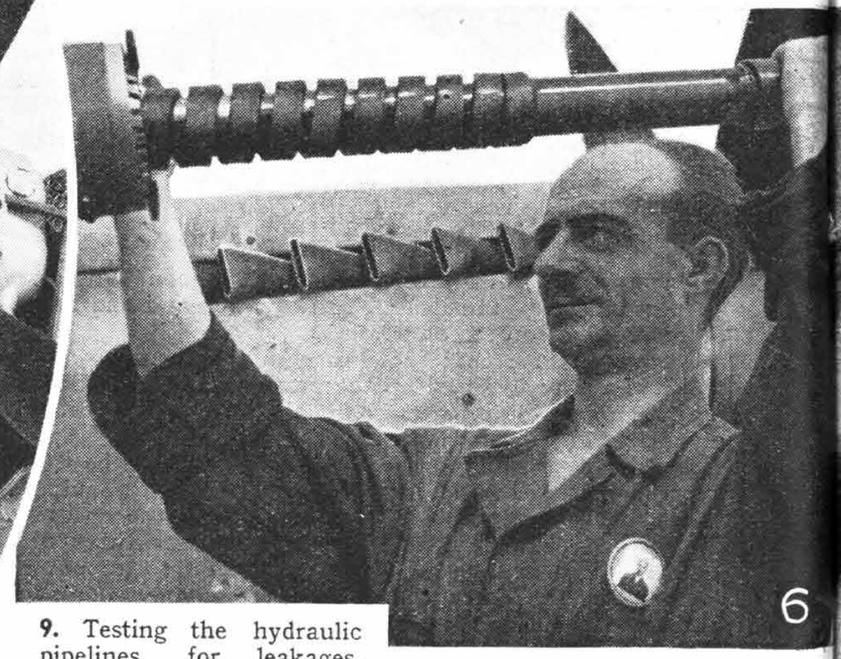


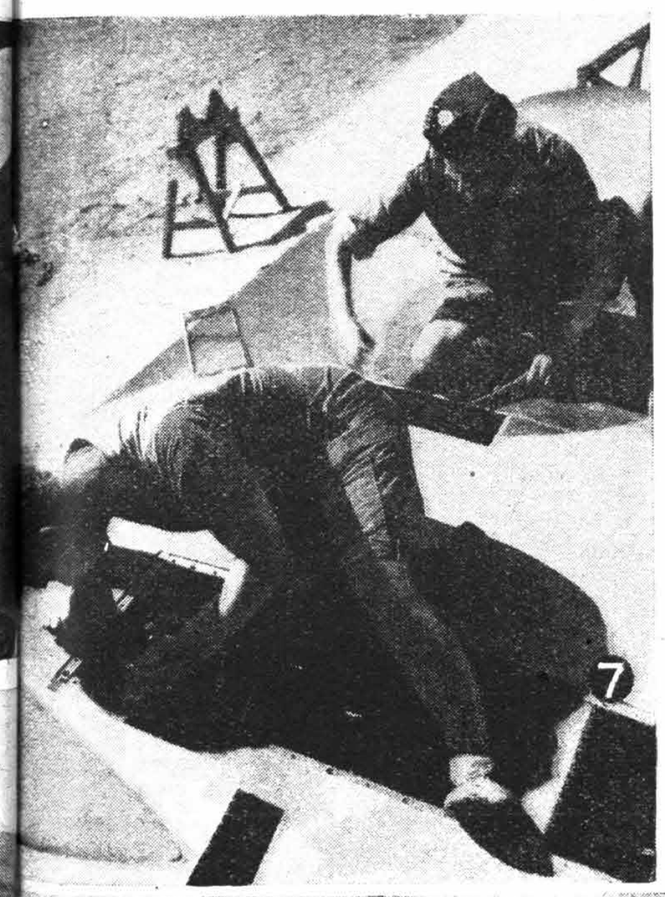


4. Labour, both local and imported, is plentiful and a machine soon takes shape. At this stage the radiator is filled with glycol and another workman prepares the cannon fairings.

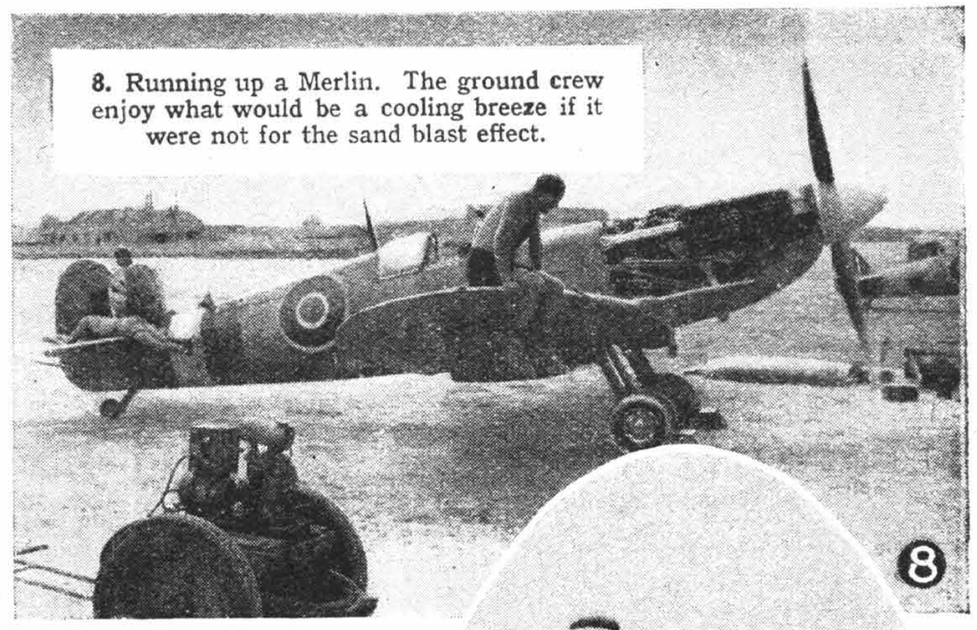
5. Assembling and adjusting the Rotol four-bladed airscrew is highly skilled work.

6. A local ex-cavalry man, now a mechanic, fits a starboard wing cannon. Note the identity photograph on his breast pocket.





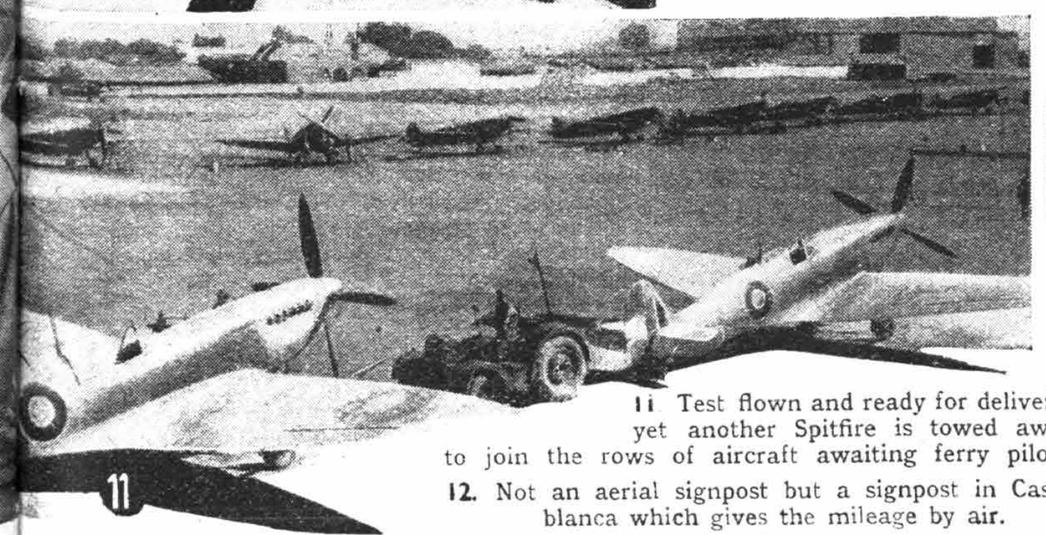
7. Adjusting and loading the wing guns which have to be carefully sighted to converge at a specified distance. The guns are then tested in the stop butts.



8. Running up a Merlin. The ground crew enjoy what would be a cooling breeze if it were not for the sand blast effect.

9. Testing the hydraulic pipelines for leakages. Everything must function perfectly before an aircraft flies.

10. After erection, the Spitfires are test flown, and a list of final adjustments given to the flight sergeant.



11 Test flown and ready for delivery, yet another Spitfire is towed away to join the rows of aircraft awaiting ferry pilots.

12. Not an aerial signpost but a signpost in Casablanca which gives the mileage by air.

Behind the Lines

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

Sabotage

THE Adler automobile factory in Copenhagen was destroyed by explosives and incendiary bombs. Five saboteurs armed with revolvers carried out this action.

Defence of Oil

A PRIVATE report from Budapest states that the Germans have sent to Ploesti special troops, including sappers, whose main task will be to defend the oil wells and blow them up should the Germans be unable to hold them.

Trying Hard

GERMAN aircraft workers are now working 11½-hour shifts in factories producing fighters. This was revealed by the German front reporter Heinz Riek in a radio interview with one of the workers in a factory, says Reuter.

The worker, whose voice resembled that of an old man, said: "I have been working in this industry for five years. Our work commences at seven in the morning and goes on until half-past six at night."

A German Alloy

A NEW aluminium alloy, says the D.N.B., has appeared on the market under the name of "Hydronalium." It combines the advantages of a low specific gravity and a high degree of strength with sufficient resistance to corrosion. This is shown not only in the case of sea water but also of soda and soap solutions, its resistance to which is considerably greater than that of pure aluminium and even than that of the formerly much-used aluminium alloys with copper and silicon. The new material is available in alloys suitable for pressing, forging, riveting and casting, as well as in metal sheets. As the metal sheets can be welded, entire motor-boats are already said to be manufactured by this process.

Drang nach Osten

IT is reported that 500,000 German evacuees from Berlin have been sent to Western Poland, many of them to Poznan.

Fokker

ACCORDING to an announcement of the Dutch Fokker aircraft factory, the dividend paid out to their shareholders for 1942 is the same as that paid out for 1941.

Competition

DURING a special competition week organised for their staff by the Junkers concern under the slogan "We improve further," the firm has received 312 proposals for different improvements. Of these, 106 applied to tools and equipment, 60 to aircraft parts, 38 to finishing processes, 28 to labour and 23 to organisation problems. 174 of the proposals received were passed as suitable for practical adaptation.

Another competition, under the slogan "Simpler and Quicker," produced 4,600 proposals, of which 27 per cent. were actually put into practice.

The aircraft industry is also reported to have adopted a thorough system of interchange of experience. At Junkers all useful improvements in tooling, equipment, processing and personnel training are recorded in detail, collected in a special file under the heading "Special Production Methods" and are then circulated.

ITALIAN JET-PROPULSION: The Caproni-Campini inspected by the Hungarian Military Mission at Guidonia. In November, 1941, the machine flew in 2½ hours from Milan to Rome. The average speed was 130 m.p.h. including stop at Pisa of unspecified duration.

Berlin

THE German-controlled Scandinavian Telegram Bureau reports that following the latest R.A.F. raid Berliners were given extra cigarettes, coffee, butter, meat and bread rations.

The Berlin authorities, it said, have issued notice to workers saying that reporting for duty after a raid was not an act of heroism as time off can only be granted in most urgent cases.

Traffic difficulties, resulting in slow journeys to work, are not an acceptable excuse for arriving late, it was added.

From the Luftwaffe

TWO of Germany's night fighter aces were reported by the German radio to have been killed in action, says Reuter.

They were Col. Manfred Neurer, credited with 64 night fighter actions, and his radio operator, Sgt. Gerhard Scheibe, who respectively held the Oak Leaves and the Knight's Insignia of the Iron Cross.

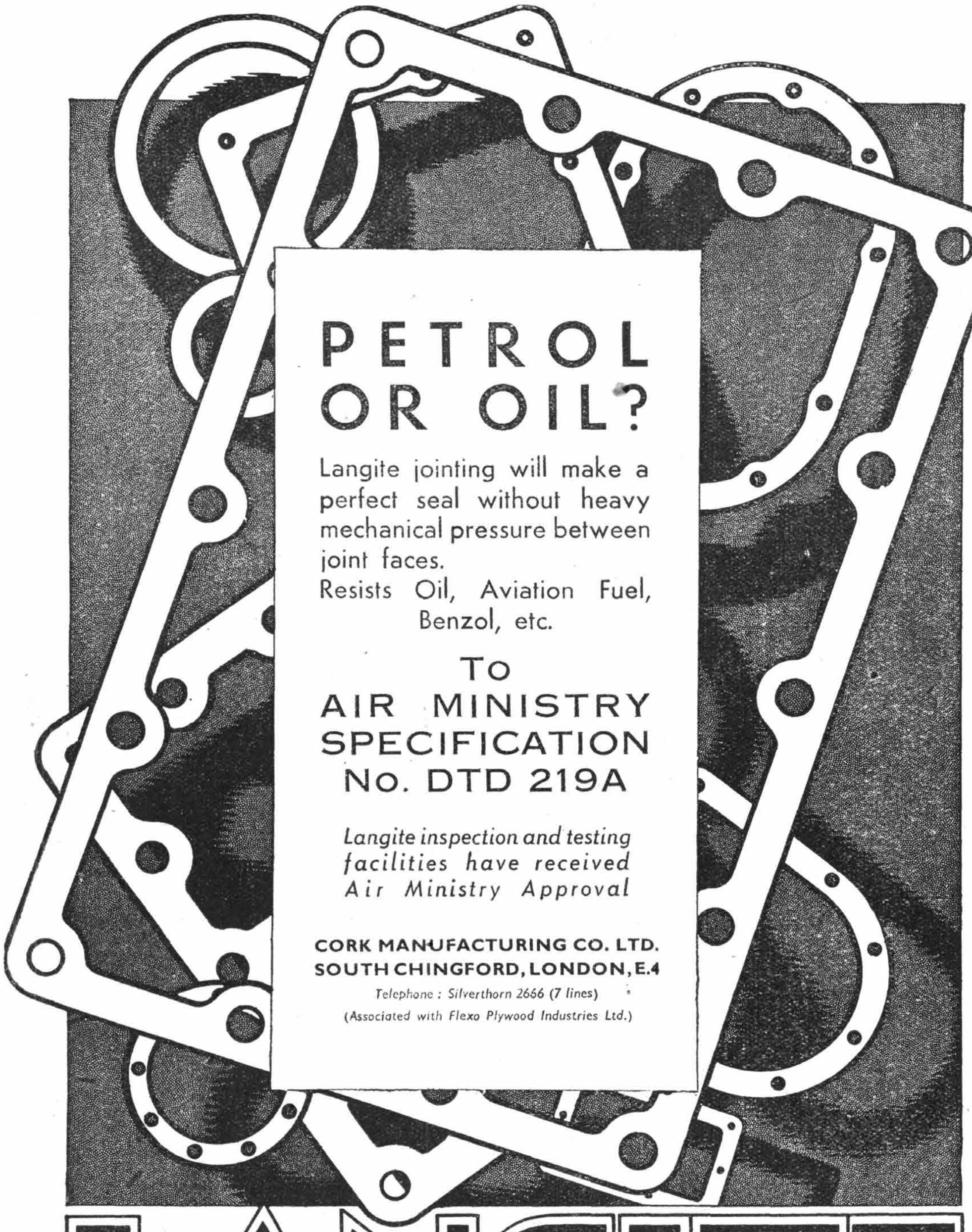
Another announcement said that Major Brandeis, who is credited with 180 air victories, has been killed on the Eastern front.

German Tactics

TRANSOCEAN announced the following details about the new German night-fighter methods, which have been developed by the successful night-fighter pilot, Col. (? Hermann). It is known that German night-fighter units formerly mainly used twin-engined multi-seater aircraft which operated in certain night-fighting areas. The method of Col. (? Hermann), which endeavours to make night-fighting more elastic, consists in using single-seater fighters such as have been used up to now for day fighting. The use of these aircraft of course meets with difficulties because there is no radio operator aboard to attend to navigation. But, thanks to technical inventions, it has been possible to overcome these handicaps, and the new tactics have become very effective.

These independently working single-seater fighters receive their directions from the ground base when attacking the enemy. They are used wherever British night bombers are flying and also over the targets of the enemy aircraft. These fast single-seater fighters are thus able to use their daytime tactics.

The successes of this night-fighting method were so surprisingly great—says *Transocean*—that they were developed more and more. "Lately a larger percentage of the aircraft shot down has been credited to the new method. The effect of the improved German night-fighting tactics is shown in the fact that the defence has succeeded in splitting up the British night bomber formations and depriving them of their dangerous concentrated effect. It seems justifiable to measure the success of air defence in this way, too, and not only by the number of aircraft shot down. When an intended attack is split up in such a manner that a considerable number of bombs are dropped on open fields instead of on inhabited areas, this is a result which is equal to shooting down some more bombers."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Resists Oil, Aviation Fuel, Benzol, etc.
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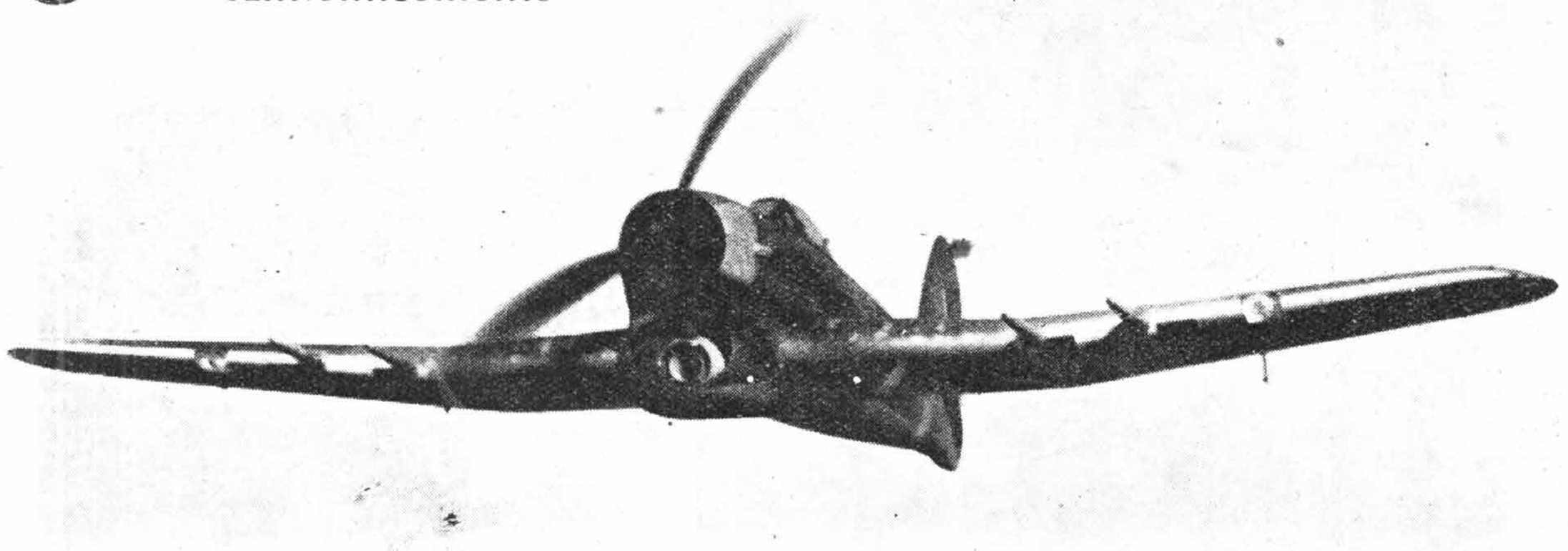


A Hawker Typhoon IB with the new "tear drop" cockpit cover.

Promotions

R.A.F.

GENERAL DUTIES BRANCH.

Air Vice-Marshal SIR KEITH L. PARK, K.B.E., C.B., M.C., D.F.C., is granted the rank of Act. Air Marshal. January 14, 1944.

Air Comdre. M. L. TAYLOR, C.B.E., A.F.C., is granted the rank of Act. Air Vice-Marshal. November 17, 1943.

Wing Commanders (temp. or war subs. Air Commodores) are granted the rank of Group Captain. December 1, 1943.

S. C. STRAFFORD, C.B.E., D.F.C.
A. P. DAVIDSON, C.B.E.
A. L. A. PERRY-KEENE, O.B.E.
W. A. B. BOWEN-BUSCARLET, C.B.E., D.F.C.
F. J. FOGARTY, D.F.C., A.F.C.
S. E. STORRAR, C.B.E.
S. D. MACDONALD, D.F.C.
T. M. WILLIAMS, C.B.E., M.C., D.F.C. (Act. Air Vice-Marshal).
V. E. GROOM, C.B.E., D.F.C. (Act. Air Vice-Marshal).
J. A. GRAY, C.B.E., D.F.C., G.M.
E. J. KINGSTON-MCCLOUGHRY, C.B.E., D.S.O., D.F.C.
W. E. G. MANN, C.B.E., D.F.C.
T. C. TRAILL, O.B.E., D.F.C.
J. D. BREAKEY, C.B., D.F.C. (Act. Air Vice-Marshal).
R. IVELAW-CHAPMAN, C.B.E., D.F.C., A.F.C.
L. DARVALL, M.C.

TECHNICAL BRANCH.

Air Comdre. J. R. CASSIDY is granted the rank of Act. Air Vice-Marshal. December 30th, 1943.

Wing Commanders (temp. Air Commodores) are granted the rank of Group Captain. December 1st, 1943

C. E. H. ALLEN, D.F.C.
C. N. F. BILNEY, O.B.E.
C. W. WEEDON, C.B.E. (Act. Air Vice-Marshal).
G. COMBE
W. E. THEAK.
A. F. LANG, M.B.E., A.F.C.
C. P. BROWN, C.B.E., D.F.C.

A.A.F.

BALLOON BRANCH.

Air Comdre. W. C. C. GELL, D.S.O., M.C., T.D., D.L., is granted the rank of Act. Air Vice-Marshal. February 1st, 1944.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Distinguished Flying Cross

Wing Cdr. R. E. BAXTER, R.A.F., No. 106 Sqn.
Wing Cdr. D. H. LEE, R.A.F., No. 620 Sqn.
Sqn. Ldr. F. S. POWLEY, A.F.C., R.A.F.O., No. 166 Sqn.
Act. Sqn. Ldr. R. D. CAMPLING, R.A.F., No. 7 Sqn.
Act. Sqn. Ldr. G. RYLE, R.A.F.V.R., No. 7 Sqn.
Flt. Lt. M. ROACH, D.F.M., R.C.A.F., No. 426 (R.C.A.F.) Sqn.
Flt. Lt. A. H. TOMLIN, R.A.F.V.R., No. 619 Sqn.
Act. Flt. Lt. E. S. ALEXANDER, D.F.M., R.C.A.F., No. 156 Sqn.
Act. Flt. Lt. D. MACK. ARNOT, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Act Flt. Lt. D. J. M. BALLINGALL, R.A.F.V.R., No. 7 Sqn.
Act. Flt. Lt. T. BURGER, R.A.F.V.R., No. 7 Sqn.
Act. Flt. Lt. D. P. CLEMENTS, R.A.A.F., No. 156 Sqn.
Act. Flt. Lt. J. A. B. CURTIS, R.A.F.V.R., No. 76 Sqn.
Act. Flt. Lt. J. J. DEVAN, R.A.F., No 426 (R.C.A.F.) Sqn

Sqn. Ldr. P. V. K. Tripe who has been awarded the D.F.C.

Act Flt. L. J. C. EADE, R.A.F.V.R., No. 156 Sqn.
Act. Flt. Lt. J. E. KELT, R.A.F., No. 78 Sqn.
Act. Flt. Lt. R. S. MACLEAN, R.C.A.F., No. 405 (R.C.A.F.) Sqn
Act Flt. Lt. J. C. MAXWELL, R.A.F.V.R., No. 625 Sqn.
Act. Flt. Lt. D. PETRIE, R.A.F., No. 78 Sqn.
Act. Flt. Lt. N. E. SHERWOOD, R.A.F.V.R., No. 83 Sqn.
Act Flt. Lt. W. F. SNEIL, R.A.F.V.R., No. 12 Sqn.
Act. Flt. Lt. F. S. WHITTLESTONE, R.A.F.V.R., No. 7 Sqn.
Act. Flt. Lt. D. T. WOOD, R.A.F., No 156 Sqn
F/O. G. ALLEN, R.A.F., No 158 Sqn.
F/O. G. W. A. AUSTEN, R.A.F.V.R., No 78 Sqn.
F/O. A. W. BLAKEMAN, R.A.F.V.R., No 83 Sqn
F/O. S. COLBERT, R.A.F.V.R., No. 156 Sqn.
F/O. F. W. CRAWLEY, R.A.F.V.R., No. 158 Sqn.
F/O. R. DIXON, R.A.F.V.R., No. 7 Sqn.
F/O. J. GRANGE, R.A.F.V.R., No. 161 Sqn
F/O. C. F. HAMILTON, R.A.F.V.R., No 156 Sqn.
F/O. C. L. HUGHES, R.A.F.V.R., No 427 (R.C.A.F.) Sqn
F/O. G. W. HUMPHRIES, R.A.F.V.R., No. 192 Sqn.
F/O. L. C. KEMP, R.A.F.V.R., No 158 Sqn.
F/O. O. G. LIGHTON, R.A.F., No. 12 Sqn
F/O. J. E. F. MITCHELL, R.A.F., No 207 Sqn
F/O. A. RODWELL, R.A.F.V.R., No 427 (R.C.A.F.) Sqn
F/O. E. G. ROSER, R.A.A.F., No 460 Sqn
F/O. R. E. SCHOLES, R.A.F.V.R., No. 101 Sqn
F/O. K. L. SHEPHERD, R.A.A.F., No. 460 Sqn
F/O. R. G. SNELLING, R.A.F.V.R., No 138 Sqn
F/O. F. L. SOUTH, R.A.A.F., No 101 Sqn
F/O. W. TALBOT, R.A.F.V.R
F/O. T. C. TREADWELL, R.A.F.V.R., No 77 Sqn
F/O. N. WATSON, R.A.F.V.R., No 12 Sqn.

Distinguished Flying Medal

Flt. Sgt. S. H. ASHWORTH, R.A.F.V.R., No. 1409 Flt.
Flt. Sgt. A. BARNETT, R.A.F.V.R., No 156 Sqn.
Flt. Sgt. A. W. BELTON, R.A.F., No. 83 Sqn.
Flt. Sgt. G. H. BRITLAND, R.A.F.V.R., No 78 Sqn.
Flt. Sgt. F. G. BROWN, R.A.A.F., No 460 (R.A.A.F.) Sqn.
Flt. Sgt. G. CLARK, R.A.F.V.R., No 149 Sqn.
Flt. Sgt. D. CRAIGIE, R.A.F.V.R., No. 100 Sqn
Flt. Sgt. C. E. DAVIES, R.A.F.V.R., No. 35 Sqn
Flt. Sgt. G. DUTHIE, R.A.F.V.R., No 76 Sqn
Flt. Sgt. L. R. FENWICK, R.A.F.V.R., No 158 Sqn.
Flt. Sgt. D. H. VENON, R.A.F.V.R., No. 101 Sqn
Flt. Sgt. G. B. HALBERT, R.A.F.V.R., No. 76 Sqn
Flt. Sgt. H. H. HOEY, R.A.F.V.R., No. 12 Sqn.
Flt. Sgt. H. I. HOWARD, R.A.A.F., No. 101 Sqn
Flt. Sgt. W. W. JAMES, R.A.F.V.R., No. 51 Sqn
Flt. Sgt. F. P. JERVIS, R.A.F.V.R., No. 156 Sqn
Flt. Sgt. H. JONES, R.A.F.V.R., No 76 Sqn
Flt. Sgt. G. E. MASON, R.A.F.V.R., No 156 Sqn
Flt. Sgt. J. C. METCALFE, R.A.F., No 207 Sqn
Flt. Sgt. S. J. PEARCE, R.A.F.V.R., No. 148 Sqn.

SERVICE AVIATION

The King has been graciously pleased to approve the following awards:—

M.B.E. (Mil.)

F/O. D. J. DINES, R.A.F.V.R., No. 276 Sqn.—One evening in August, 1943, F/O. Dines was the observer of an aircraft which, owing to engine failure, came down on the sea. The pilot sustained injuries to his head, and F/O. Dines, displaying initiative, took command of the crew. As a result of his untiring efforts the dinghy was eventually recovered from the wreckage. Then, in order to save an airman who was a non-swimmer, F/O. Dines swam over to a petrol tank which had broken loose and succeeded in getting the airman on to it temporarily. He eventually inflated the dinghy and assisted all the crew, including the non-swimmer, into it safely. By this time F/O. Dines was almost exhausted, but he immediately took control of the emergency rations and flares. All were rescued several hours later. The lives of F/O. Dines' comrades were undoubtedly saved by his courage and coolness in extremely difficult circumstances.

F/O. R. DUNLOP, M.B., B.Ch., R.A.F.V.R.—One afternoon in July, 1943, an aircraft crashed on landing and caught fire. The pilot and a passenger, who were the only occupants, were both thrown out of the cockpit and trapped beneath the wreckage of a wing. Cpl. Burton, assisted by two other airmen, attempted to rescue the occupants, but all were driven back by the heat. Undeterred, Burton made another attempt alone and this time succeeded in partially lifting the burning wreckage of the wing and he then dragged the pilot clear. F/O. Dunlop, a medical officer, had arrived at the scene of the accident, and on being informed that the passenger was still under the wreckage, attempted to release him. Whilst this was being done an explosion occurred, but F/O. Dunlop continued his rescue efforts and dragged the passenger clear of the aircraft.

George Medal

Hon. Flt. Lt. E. G. ACKERMANN, R.A.F.V.R.—For three years Flt. Lt. Ackermann has been employed on special duties both in this country and the Mediterranean area. He has completed his tasks often under most difficult and dangerous conditions and the results have been worthy of great praise.

Capt. C. E. L. ALLEN, S.A.M.C., attached to No. 24 (S.A.A.F.) Sqn.—One night in July, 1943, an aircraft with a crew of four collided with a stationary aircraft and two trucks when taking off. The bomber, which was carrying six 250 lb. bombs, burst into flames. Capt. Allen, the squadron medical officer, after instructing an orderly to bring a nearby ambulance to the aircraft, proceeded to the scene of the accident. Before he was able to get to the wreckage he saw one member of the bomber's crew stumble away to safety. Then the starboard petrol tank exploded. On reaching the aircraft Capt. Allen saw the pilot, who was injured and in a dazed condition, in the nose of the aircraft endeavouring to locate the observer. After forcibly removing the pilot, Capt. Allen groped in the nose of the bomber, but was unable to find the observer. He continued his search around and over the port wing, which was well ablaze, in an endeavour to find the two remaining members of the crew. Fully aware of the danger from the possible explosion of the bombs, Capt. Allen remained in the vicinity and finally, with an assistant, he removed the body of the gunner which was found lying partly under the wing beside the blazing fuselage. Shortly afterwards three of the bombs exploded.

F/O. G. H. DHENIN, M.B., Ch.B., M.R.C.S., L.R.C.P., R.A.F.V.R.—One night in October, 1943, an aircraft, which had sustained damage during an attack against Hanover, crashed near an airfield. The aircraft disintegrated on impact and immediately burst into flames. The rear gunner was injured and trapped in his crushed turret, being pinned down by the remains of the tail unit and the rear of the fuselage. A high explosive bomb was in the blazing wreckage some ten yards away from the gunner. F/O. Dhenin, the station medical officer, and Cpl. Lush, a gunner, hastened to the scene of the accident. Although fully aware that the heat might cause the bomb to detonate at any moment, F/O. Dhenin worked for over half an hour to relieve the injured airman's pain, and, assisted by Cpl. Lush, endeavoured to release him. Their efforts to extricate the gunner were, however, unavailing. A mobile crane was brought to the scene and the mass of wreckage was lifted clear of the ground. Displaying complete disregard for his own safety, F/O. Dhenin then crawled under the wreckage and released the trapped airman, thereby enabling other helpers to drag him to safety.

Cpl. N. GOULDIN, B.E.M., R.A.F.V.R., No. 1 Sqn.; Cpl. F. R. NORTH, R.A.F.V.R., R.A.F. Regiment; and L.A/C. F. A. WITHERS, R.A.F.V.R.—In August, 1943, four soldiers entered a minefield; three were killed instantly and the fourth was seriously wounded. Cpls. Gouldin and North, who are nursing orderlies, and L.A/C. Withers, who is a motor driver, immediately proceeded to the scene of the accident. To reach the injured soldier it was necessary to cross a canal and pass through barbed wire. Cpl. Gouldin, although unable to swim, entered the canal and with his two companions waded across. After crossing the barbed wire the rescuers penetrated about 16 feet into the minefield and reached the soldier, to whom they rendered first aid. Afterwards, carrying him on a stretcher, these airman recrossed the canal, with water up to their armpits and insecure footholds, and brought the soldier to safety.

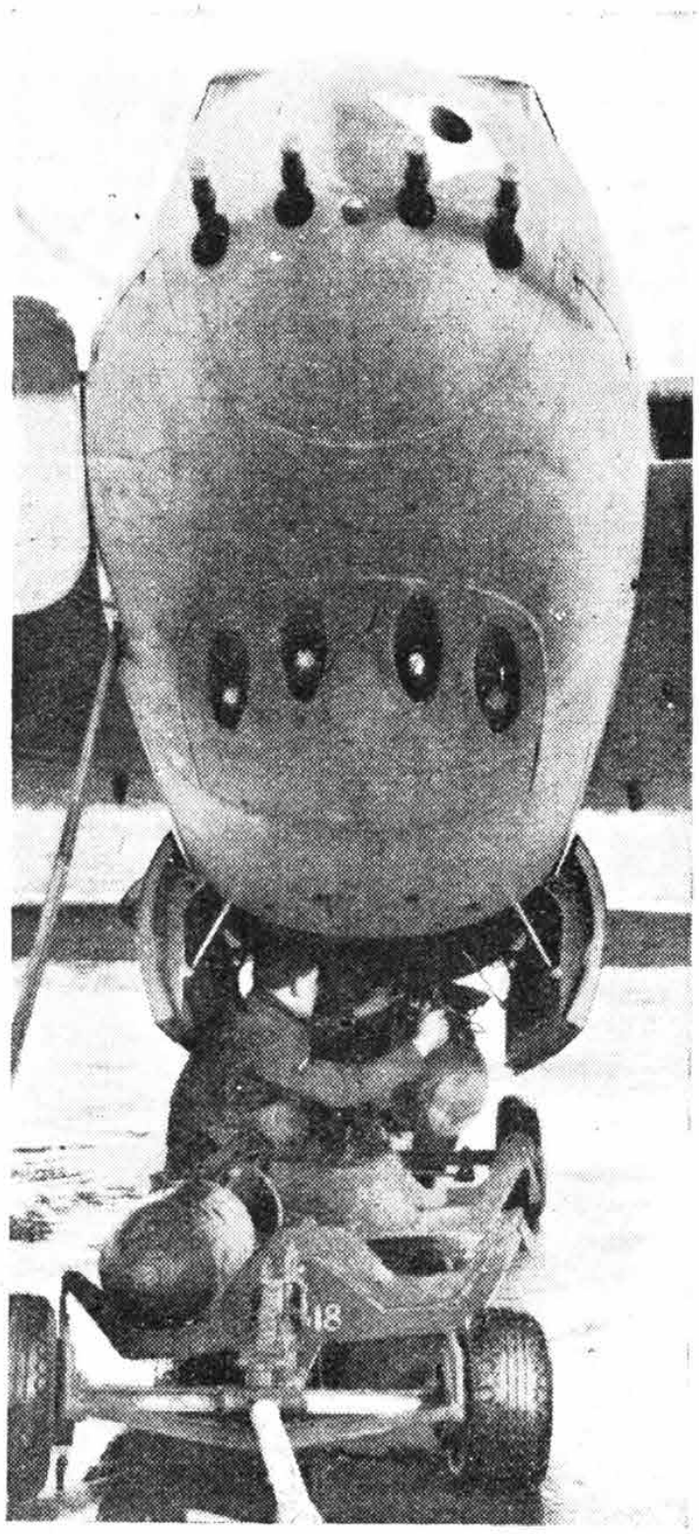
B.E.M. (Mil.)

Cpl. C. V. BURTON, R.A.F.V.R.—For citation see F/O. DUNLOP, M.B.E.

Cpl. W. J. LUSH, R.A.F. Regiment.—For citation see F/O. DHENIN, G.M.

Flt. Sgt. R. W. BROWN, R.A.A.F.—In October, 1943, an aircraft crashed near a R.A.F. station and burst into flames. Flt. Sgt. Brown, a flying instructor, immediately hurried to the scene of the accident. A passenger in the aircraft was badly injured and trapped in the blazing wreckage. Flt. Sgt. Brown, ignoring the danger from the ammunition which was exploding, ran into the flames, succeeded in releasing the passenger, and dragged him to safety. This prompt and gallant action undoubtedly saved the passenger's life.

Cpl. J. H. J. DAVEY, R.A.F.V.R.—One morning in September, 1943, a Baltimore aircraft, whilst taking off, crashed into a double pen in which two Blenheim aircraft were parked. One of the Blenheims and the Baltimore immediately caught fire. Cpl. Davey, a fitter, hurried to the scene, and, displaying complete disregard for his own safety, led three other airmen in a successful attempt to release the trapped pilot in the Baltimore aircraft. Cpl. Davey's prompt and gallant action undoubtedly saved the pilot's life.



ARMS AND THE MAN; The four .303 machine guns, four 20mm. cannon and 1,000 lb. of bombs which comprise the offensive equipment of a Mosquito fighter-bomber.

Roll of Honour

Casualty Communiqué No. 341.

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. R. B. Bainbridge; Sgt. J. Boxall; Sgt. F. Bramall; P/O. W. W. Cottle; P/O. R. A. Dabnor; Sgt. F. T. Dunn; F/O. P. J. Elldred; Sgt. R. H. Hodges; P/O. W. Hughes; F/O. L. Israel; Sgt. G. Johnson; Sgt. A. Taylor.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. T. R. Bayles; Sgt. F. N. Jay; Sgt. A. M. Park; Sgt. H. Rocknean; Sgt. T. H. Skelton; P/O. C. P. St. Leger; Flt. Sgt. J. McC. Tait; F/O. G. G. Tebble; Sgt. A. R. Veitch; Flt. Sgt. C. V. Walkinshaw; Sgt. R. E. S. Weddell; Sgt. R. G. Winchester; W/O. H. E. Wood.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. F. J. Allen; F/O. F. A. Alp; Sgt. J. D. Appleby; Sgt. A. E. Bagley; Sgt. W. G. Barnes; Flt. Sgt. T. Bentham; F/O. D. F. H. Biggane, D.F.C.; P/O. K. F. Butler; Sgt. E. Cadden; Flt. Sgt. G. J. Cassidy; P/O. H. G. Chuck; Sgt. E. W. Cook; Sgt. R. Cook; Sgt. W. Cram; Sgt. M. H. C. Crow; F/O. J. C. Davis; Sgt. W. Dunkerley; F/O T. N. Forster; Sgt. J. Fox; Sgt. R. D. Francis; Sgt. H. W. Frost; Flt. Sgt. C. J. Gascoyne; P/O. D. E. George; Flt. Lt. I. P. C. Goudge; Sgt. A. E. Graham; Sgt. J. W. Green; Flt. Sgt. P. J. Groom; Sgt. J. Hardman; Sgt. N. M. Hatch; Sgt. C. J. B. Hele; Sgt. H. P. Hunter; Sgt. W. Imrie; Sqn. Ldr. G. W. J. Jarrett; Sgt. S. Jepson; Sgt. J. A. Keighley; Sgt. J. D. Law; Sgt. R. H. Lawrence; Sgt. R. W. Lea; Flt. Sgt. A. Lowe; Sgt. D. E. McGill; Flt. Lt. B. H. McMichael; P/O. J. D. Mair; Flt. Sgt. F. C. Marsh; P/O. P. M. D. Marx; Sgt. T. A. Miles; F/O. W. A. Milne; Sgt. J. W. Moon; Act. Flt. Lt. A. H. Nichols; Act. Wing. Cdr. A. R. Oakeshott, D.F.C.; F/O. J. Parsons; P/O. R. L. Pickup; Sgt. H. C. Pont; Sgt. R. S. Richmond; Sgt. W. A. Roberts; P/O. J. K. P. Rumboll; Wing Cdr. J. H. Slater, A.F.C.; P/O. G. Smith; Sgt. W. J. Smith; P/O. D. M. H. Taylor; Sgt. M. E. Taylor; Sgt. K. A. Tester; Sgt. G. A. R. Town; Sgt. F. J. Trusler; Sgt. V. Wells; F/O. R. D. White; Sgt. N. Whitfield; Sgt. A. J. Wilkinson; Sgt. A. Wilson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—F/O. H. P. O'Brien.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—P/O. J. C. Wellsman.

WOUNDED OR INJURED IN ACTION.—Sgt. T. W. Brandon; Flt. Sgt. L. J. S. Whiteight.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. D. J. Bullock; Sgt. J. T. McC. Kean; P/O. T. Nicoll; Sgt. A. C. Spencer; Sgt. W. J. M. Templeton.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. H. R. Batten; Sgt. T. A. Bird; Flt. Sgt. P. G. Fletcher; Sgt. G. R. Frazer; Sgt. C. Horton; Flt. Sgt. H. V. Mason; Sgt. G. J. Palmer.

MISSING.—F/O. G. Ainsworth; Sgt. J. C. Arrowsmith; Sgt. D. R. Bailey; P/O. J. Barthelemy; Sgt. J. L. Brent; Sgt. J. F. Q. Brough; Flt. Sgt. F. E. Burton-Burgess; Sgt. J. M. Carruthers; Act. W/O. A. Charlesworth; Sqn. Ldr. A. F. Chisholm; Sgt. J. E. Corbett; Sgt. R. Cotterill; Flt. Lt. J. P. Crebbin, D.F.C.; Sgt. N. H. Cufley; Sgt. J. Dale; Flt. Sgt. S. J. Davis; Flt. Sgt. A. G. Dyson; Sgt. D. Ferguson; F/O. J. B. Fletcher; Sgt. R. W. Fontaine; F/O. J. Hampton; Sgt. R. Harper; Sgt. L. N. Harris; Sgt. J. Harvey; Sgt. C. Healey; Flt. Sgt. T. Hesseldon; Act. Flt. Lt. C. E. Hill; Wing Cdr. R. Hilton, D.S.O., D.F.C.; P/O. H. F. Hodges; Sgt R. N. De C. Hogge; Sgt. A. I. Hosie; Sgt. R. Ledsham; F/O. C. R. Leitch; F/O. J. E. Lovell; Sgt. H. A. Lucas; P/O. J. Marsden; Sgt. M. J. Martin; Sgt. E. R. E. Mountain; Flt. Sgt. T. Myerscough; F/O. C. W. Nunn; Sgt. A. A. Ough; Act. Flt. Lt. A. P. W. Pepper; F/O. J. G. Pilkington; F/O. R. K. Pulling; Sgt. J. W. Richardson; Sgt. P. Ringrose; Sgt. J. B. Shand; Sgt. A. E. Sly; Flt. Sgt. D. S. Smith; Flt. Sgt. H. Smith; P/O. J. W. Snook; Sgt. H. H. Stagg; Sgt. F. Thomas; Sgt. S. A. Thomas; P/O. S. P. I. Thomas; Sgt. F. Thrall; F/O. W. W. Thwaites; Flt. Sgt. B. G. Tucker; Flt. Sgt. E. R. Watts; P/O. P. V. Wilson; Sgt. F. R. Wise; P/O. E. G. Wright; Sgt. H. A. Wright; Sgt. L. G. Yorke.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. D. Durward; F/O. J. R. Harnwell; F/O. L. Jackson; Flt. Lt. W. McCarroll; Sgt. G. R. S. Riddell; Sgt. S. A. Spencer.

KILLED ON ACTIVE SERVICE.—F/O. J. W. A. Armstrong; Flt. Lt. A. S. Bancroft; F/O. R. H. Barber; Sgt. W. J. Bill; A/C.2 W. Brackenridge; L.A/C. E. G. Carter; Sgt. L. W. Coleman; L.A/C. W. T. D. Collins; Sgt. G. W. W. Crick; Sgt. R. Curnow; Sgt. P. G. Edyvean-Walker; Sgt. I. H. Hill; L.A/C. K. M. Hoare; F/O. J. H. Horne; F/O. H. E. Joyce; A/C.2 M. L. Lowther; F/O. J. D. Maddox; Sgt. H. B. Maxwell; W/O. E. Merralls, D.F.M.; F/O. H. Mitchell; L.A/C. E. F. Moore; Sgt. W. T. Muir; Sgt. R. A. Nichols; Flt. Lt. R. E. H. Northridge; Flt. Lt. J. G. Owen; Sgt. J. D. Owens; Sgt. A. B. Pilbeam; Sgt. K. C. Simmonds; Sgt. L. J. Somers; Sgt. N. R. Templeman; P/O. M. H. Watson; Flt. Sgt. M. L. Wolman.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—Wing Cdr. B. H. Jones; Flt. Lt. E. S. Knox.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. K. G. Ford; Sgt. E. B. Parr; Sgt. P. J. Smith; Sgt. L. C. Trent.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. J. J. H. Littlejohns; Sgt. F. W. Maskell; Sgt. A. Sinclair; Sgt. A. F. A. Smith.

DIED ON ACTIVE SERVICE.—Sgt. H. Brown; W/O. R. A. Harding; Cpl. A. Salisbury; L.A/C. W. C. Williams.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Act. Flt. Lt. J. H. Douglas, D.F.C.; Sgt. D. R. Fry; Sgt. D. Lamb; Sgt. H. N. McKinnon.

Royal Australian Air Force

KILLED IN ACTION.—P/O. P. F. Hughes; Flt. Sgt. L. Joyce; Flt. Sgt. P. J. Ratcliffe.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. E. J. Ding; Sgt. C. R. Townsend.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. A. L. Jones.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. E. Harrison; P/O. A. M. Lindsey.

MISSING.—Flt. Sgt. R. H. Campbell; Flt. Sgt. R. M. Conroy; Flt. Sgt. B. S. Haines; P/O. M. A. Line; P/O. W. J. Morecombe; Flt. Sgt. R. L. Nett; Act. Flt. Lt. L. A. Smith.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. L. S. Lauritz; Sgt. J. Treadgold.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. C. B. Smith.

Royal Canadian Air Force

KILLED IN ACTION.—W/O. L. F. Burke; Sgt. T. F. Clemenhagen; Flt. Sgt. G. W. Fordyce; Flt. Sgt. J. A. E. Munroe; Flt. Sgt. D. Willington.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. R. Milligan; Sgt. K. N. Read.

WOUNDED OR INJURED IN ACTION.—Sgt. A. C. Yule.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. W. R. R. Shore.

MISSING.—F/O. L. D. Dingley; Flt. Lt. S. W. Matthews; Sgt. H. T. Penfold.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. Ashwood; Sgt. K. D. Attwell; P/O. R. C. Burgess; Sgt. D. G. B. Day; F/O. N. E. Long; F/O. R. J. McCruden; Flt. Sgt. W. J. Mayo; Sgt. W. H. Oakley; P/O. D. M. Thew.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. G. W. Hankins.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. B. H. Pringle.

DIED ON ACTIVE SERVICE.—F/O. J. W. Downs.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Sgt. C. W. Hannah; Flt. Sgt. C. F. Thomas.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. H. V. G. Crawford; Flt. Sgt. G. G. Organ.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. A. A. Johnson.

MISSING.—Flt. Sgt. B. A. Burton; Flt. Sgt. J. S. S. Fleming; Flt. Sgt. H. L. R. Richards; Flt. Sgt. S. E. Simpson.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. T. Kemp; P/O. G. T. Lowe.

South African Air Force

MISSING.—Lt. P. G. F. Bailey; Lt. Col. J. F. Britz, D.F.C.; Capt. T. C. Murphy.

Casualty Communiqué No. 342.

Of the names in this list, 105 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. H. W. Addis; Sgt. J. R. G. Blamey; Flt. Sgt. H. F. Bovingdon; F/O. R. W. Brevitt; Sgt. A. W. Brown; Sgt. G. Bruce; Sgt. M. W. Cartmell; Sgt. L. G. Copsey; Sgt. J. K. Cubey; F/O. D. G. Davie; Sgt. D. A. Holt; Sgt. S. L. Ingle; W/O. G. J. S. Kerr; Flt. Sgt. D. Kirk; Sgt. R. S. Ledger; Sgt. G. W. T. Lucas; Sgt. I. B. Morgan; Sgt. J. H. Sharpe; Sgt. R. Smith; Flt. Sgt. W. M. Thomas; Flt. Sgt. W. E. Wood; Sgt. D. F. Wort.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. A. G. Coffin; Sgt. J. B. Corbett; Sgt. L. J. Daker; F/O. R. T. Douglas; F/O. H. Entwistle; F/O. W. J. Harding-Haydon; Sgt. T. Heslop; F/O. D. Makin; Sgt. E. L. Matthews; Sgt. E. Russell; Sgt. T. M. Scott; Sgt. W. Smith; Sgt. W. H. Thomson; Sgt. H. J. Warren; Sgt. R. Watkinson; F/O. H. W. Woodhouse.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. G. B. Alred; Sgt. D. S. Andrew; Sgt. S. J. Argent; F/O. R. A. H. Ayles; Sgt. H. W. Baldock; P/O. N. Bertram; Sgt. R. Bishop; Sgt. G. M. Boardman; Flt. Sgt. J. J. Britton; Sgt. J. Broderick; Flt. Lt. N. S. H. Brown; W/O. E. T. Bunt; Sgt. D. N. Bysouth; Sgt. G. H. J. Cash; Sgt. D. H. Clennell; Sgt. L. W. Clubley; Sgt. R. C. Cormacey; Flt. Sgt. G. A. Croall; Sgt. R. E. A. Dampier; Act. Flt. Lt. J. B. Darroch; P/O. G. K. Dearden; Sgt. A. R. Dove; Sgt. W. Forrester; P/O. E. V. Frankland; Sgt. A. J. Gordon; Sgt. E. Hill; Flt. Sgt. J. A. Holderness; Flt. Sgt. J. T. Houghton; Sgt. D. Hutt; Sgt. W. Jackson; Sqn. Ldr. W. G. Joy, A.F.C.; Sgt. P. R. Kimber; P/O. J. F. King; Sgt. G. C. Lake; Flt. Sgt. D. P. Langley; Sgt. R. Lankester; Sgt. E. Lees; Flt. Sgt. A. R. Lewis; Sgt. W. McCarron; Sgt. E. McGloin; Sgt. J. D. Miller; F/O. W. I. Moffat; Sgt. H. Mottershead; P/O. N. P. Orr; Flt. Sgt. P. G. Oyler; Sgt. K. S. A. Payne; F/O. S. Pearson; F/O. A. E. K. Perry; P/O. N. G. Price; Sgt. J. R. Pyper; Flt. Sgt. A. Rixon; F/O. A. J. Ross; Flt. Sgt. T. N. Sankey, D.F.M.; Sgt. W. E. Scanlon; F/O. A. G. Seymour; Sgt. F. C. Smith; Flt. Lt. P. R. Smith; Sgt. J. H. Strathearn; Sgt. E. G. A. Taylor; Sgt. W. Taylor; Sgt. R. H. Thomas; Sgt. A. R. H. Thompson; Sgt. K. D. Tookey; Sgt. E. G. Ufton; Sgt. P. A. Waller; Sgt. G. S. Walters; Sgt. S. F. Watt; P/O. H. Wheen; Sgt. E. A. Wright; Flt. Sgt. A. C. Yielder.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. J. Travis.

WOUNDED OR INJURED IN ACTION.—Sgt. S. T. K. Bowyer; Sgt. K. G. Hook; Flt. Sgt. K. G. Peters.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. Hamilton; Sgt. J. C. Hinks.

MISSING.—Sgt. H. C. Adams; Sgt. E. Ambrose; Act. Sqn. Ldr. D. C. Anset, D.F.C.; Sgt. G. E. Apps; Sgt. R. Atkins; Sgt. R. P. Atkinson; W/O. G. Ball; Sgt. F. W. Barrie; Sgt. S. A. Barton; Flt. Sgt. J. Beebe; Act. W/O. J. E. Bellamy; Sgt. D. H. Betts; F/O. L. F. Bickley; Sgt. C. T. Bowman; Sgt. G. H. Brittle; W/O. D. B. Brown; Sgt. H. Brown; P/O. W. Buckel; Act. Flt. Sgt. R. O. Buckle; Flt. Sgt. R. A. C. Burnett; Sgt. R. C. H. Cantin; Flt. Sgt. N. Carter; Act. Flt. Lt. W. A. G. Clark; W/O. D. S. Coutts; Flt. Sgt. G. W. Crowe; Sgt. G. S. Cunningham; Sgt. H. V. Dawe; W/O. F. B. Dixon; P/O. A. J. D. Eaves; Sgt. A. F. Edwards; Sgt. G. A. England; Sgt. R. A. F. Gilham; F/O. L. K. Gordon-White; Sgt. C. S. Graves; Flt. Sgt. J. C. Hamer; Sgt. H. C. Haslan; Flt. Sgt. A. E. Hickerton; Sgt. J. D. Higson; Sgt. S. W. Hitchman; Sgt. J. Hobbs; Flt. Sgt. D. J. Howlett; Flt. Sgt. R. R. Howlett; Sgt. J. K. Hughes; Sgt. H. P. Hurnell; F/O. J. H. Jackson; Sgt. T. R. Jackson; Flt. Sgt. E. G. Kirkland; Flt. Sgt. J. A. Knowles; Sgt. P. M. Lees; W/O. J. A. C. Lovis; Sgt. A. G. Luke; Sgt. A. McDougall; Sgt. F. Middleton; Flt. Sgt. D. J. A. Mitchener; F/O. A. E. Moule; F/O. D. Nichol; F/O. V. W. J. Nunn; Sgt. G. J. O'Brien; Flt. Sgt. R. J. O'Connor; Sgt. E. C. Powell; F/O. C. G. Richards; Act. Flt. Sgt. K. C. Richardson; Sgt. T. M. Robbins; Sgt. J. Robertson; Sgt. K. J. Robotham; Sqn. Ldr. G. A. Roden; Sgt. A. J. Rooney; Sgt. G. J. Saunders; Sgt. A. W. Savory; Sgt. R. A. Senior; P/O. P. J. MacI. Scott; F/O. T. J. B. Shearer; Flt. Sgt. J. K. Shewring; Flt. Lt. R. M. Smalley; F/O. A. B. Smeaton; Act. Flt. Lt. J. T. Smith; Sgt. S. F. Smith; F/O. R. J. T. Stirling; Sgt. C. S. Stockwell; P/O. G. J. H. Stokes; Flt. Sgt. J. Stones; Sgt. L. C. J. Street; F/O. K. J. Strong; Sgt. E. Sullivan; Flt. Sgt. H. L. Sweet; Sgt. R. Tarling; Sgt. J. Taylor; Sgt. R. H. Toulin; Sgt. H. A. Van Hal; Sgt. J. Walker; Sgt. W. Walton; Sgt. P. R. Webber; Sgt. J. A. Weston; F/O. D. C. White; Sgt. H. W. Whitmore; Flt. Sgt. J. Wilson; Flt. Sgt. K. B. Wooton; Sgt. E. G. Wyatt.

KILLED ON ACTIVE SERVICE.—Sgt. J. W. Anderson; Sgt. R. S. Bradbury; Sgt. S. G. Burton; F/O. D. M. Coates; F/O. U. J. G. Davison; Flt. Lt. F. S. Davies; L.A/C. C. S. Guttridge; F/O. F. E. Olive; F/O. W. Reid; F/O. J. C. Robertson; Sgt. E. Sowery; P. O. P. J. Spencer; Sgt. R. Spierling; Flt. Sgt. A. J. G. Thomas; Sgt. A. D. Wells.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Cpl. F. J. Gourlay.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. E. Bailey; F/O. J. A. Osborn.

DIED ON ACTIVE SERVICE.—Sgt D. M. Booth; Cpl. T. Haselden; P/O. C. Heyworth; W/O. J. A. Shand; L.A/C. F. W. Theobald; Sgt. C. J. Wilde.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED PRISONER OF WAR.—F/O. F. M. Davison.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. W. C. Bond; Sgt. J. Griffiths; Flt. Sgt. T. Lancashire; Sgt. G. P. Poynter.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. G. A. Dibley; L.A/CW. A. Murphy.

Royal Australian Air Force

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. J. P. H. Wallace

MISSING.—Flt. Sgt. G. McD. Curwood; Flt. Sgt. C. H. Edwards; Flt. Sgt. K. R. Fuller; Flt. Sgt. M. H. Hardy; Flt. Sgt. J. I. McKee; P/O. W. G. Moore; Flt. Sgt. R. S. Nelson.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. T. Newstead; Flt. Sgt. F. J. H. Turner.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. W. J. Lawrence.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. J. Stuart.

UP TO HER NECK IN IT : A rubber-suited and lifebelted W.A.A.F. flight mechanic of Coastal Command, ready to be one of a flying-boat handling party.

EX CATHEDRA : Sqn. Ldr. D. A. S. Colvin, commanding the Gold Coast fighter squadron in Italy, discourses from the bonnet of a jeep.

SERVICE AVIATION

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. E. C. Currie; P/O. J. D. Fairbairn; Flt. Sgt. A. E. Ferguson; Flt. Sgt. W. C. Love; W/O. R. W. MacDonald; P/O. K. F. Perera; Flt. Sgt. G. M. F. Stockwell.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. J. Crawford; Flt. Sgt. S. Smith.

MISSING.—Act. Flt Lt. R. Gardiner, D.F.C.; Flt. Sgt. J. G. S. Kavanaugh; F/O. W. J. Lawrence; F/O. H. K. Leiroy; Flt. Sgt. P. J. Martin; Flt. Sgt. V. L. Miller; P/O J. G. O'Dell.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. J. N. Milloy.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. A. M. Fraser.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. Archibald; Sgt. O. E. Collins; Sgt. R. C. Going; F/O. I. S. Johnson; P/O. A. G. Tolley; Sgt. J. A. Wilson.

MISSING.—Flt. Sgt. W. L. Carr.

South African Air Force

PREVIOUSLY REPOETED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Lt. A. Crosholt.

MISSING.—D. M. Garrter; Lt. E. K. West.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Air Mech. De Van Zyl.

KILLED ON ACTIVE SERVICE.—A. L. Bee; Capt. H. MacDonald; Act. Flt. Sgt. C. G. Motley; Maj. R. M. Perkins; 2/Lt. E. L. Saul.

Casualty Communiqué No. 343.

Of the names in this list 109 are second entries giving later information of casualties pubished in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. A. W. H. Atyeo; Sgt. A. H. Biggs; Flt. Lt. J. G. Brassington; Sgt. W. S. Bruce; Flt. Sgt. R. M. Buck; Sgt. R. W. J. Buckle; Flt. Sgt. S. Chapman; Flt. Sgt. J. R. Conlon; Flt. Sgt. J. Johnston; Flt. Sgt. T. Jones; Sgt. R. W. Laws; Sgt. J. H. Muir; Sgt. L. J. W. Shirvell; Sgt. A. D. Spiers; Sgt. J. W. Symons; Flt. Sgt. J. W. Thompson; Sgt. R. J. Wannell; Sgt. F. Williams.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. A. S. Blagden; Sgt. J. H. Bloxwich; Sgt. J. Burnside; Sgt. H. Buttrey; Sgt. M. L. Buxton; Sgt. T. Carter; Sgt. G. R. S. Cayless; Sgt. J. R. Coulsey; Sgt. H. D. Dawes; Sgt. W. A. Dutton; Sgt. R. Fletcher; Sgt. R. L. Godden; Sgt. J. G. Hole; Sgt. V. Horsley; Sgt. B. King; P/O. W. W. Kirkpatrick; Sgt. R. F. Middlebrook; Sgt. H. H. Mooney; Sgt. R. Percival; Sgt. L. G. Perkins; Sgt. J. D. Perrett; F/O. M. Savage; Sgt. J. J. Simpson; Flt. Sgt. A. Spence; Sgt. K. M. Taylor; Sgt. P. A. Toms; Sgt. N. M. Turnbull; Sgt. G. S. Underlin; F/O. A. E Whittaker.

PREVIOUSLY REPORTED MISSING. NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. L. J. Ackland, D.F.C.; Sgt. B. C. Ainsworth; Sgt. D. T. Anthony; Sgt. B. P. Ashcroft; Act. F/O. P. A. Ball, D.F.M.; Sgt. C. W. Bates; Sgt. D. L. Berresford; Sgt. C. N. Bonar; Sgt. C. Brennan; Sgt. S. C. Brown; Sgt. G. R. Burgess; Sgt. A. Campbell; Sgt. W. J. Carter; Sgt. J. T. Charlton; F/O. W. F. Coldwell; Sgt. S. Cordery; Sgt. E. D. Curling; Flt. Sgt. M. L. Durling; Sgt. T. Fazakerley; W/O. J. Friendly, D.F.M.; Sgt. R. E. Funnell; F/O. G. H. F. G. Gregory, D.F.M.; Sgt. F. Hanson; Sqn. Ldr. V. R. G. Harcourt; D.F.C.; Sgt. D. H. Harper; Sgt. W. G. Harvey; Sgt. W. D. Hawkins; Sgt. L. J. Hemus; P/O. F. Holland; Flt. Lt. J. V. Hopgood, D.F.C.; P/O. J. L. Irvine; F/O. N. C. Johnson; Sgt. D. V. Jones; Sgt. E. J. Letherbarrow; P/O. L. E. Lindsey; Sgt. F. Logie; Sgt. R. W. Lowther; Sgt. J. MacAulay; Sgt. G. B. McFarlane; Sgt. J. W. Minchin; Sgt. E. G. Quick; Sgt. J. Robertson; Sgt. P. W. B. Sanderson; Sgt. E. Shackleton; Sgt. A. P. Smith; Sgt. G. T. Still; Sqn. Ldr. G. G. Storey; Sgt. F. C. Swain; Sgt. L. J. Tate; Sgt. V. J. S. Tindale; P/O. T. O. Truscott; Sgt. P. A. G. Warwick; Sgt. J. Webb; Sgt. A. Wheatley; Sgt. D. W. Williams; Sgt. A. T. M. Wright; F/O. L. Young.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Sgt. R. Broadley.

WOUNDED OR INJURED IN ACTION.—Sgt. L. J. Collins; Flt. Sgt. C. R. Corbett; Sgt. A. R. Cottle; Sgt. R. Harries; F/O. W. T. Mennel; Sgt. M. V. Pink; Sgt. T. A. Wyllie.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. E. Ashman; Sgt. H. Bronsky; Act. W/O. R. Brunt; Sgt. R. W. Norley; Sgt. E. D. Wilson.

MISSING.—Sgt. H. W. Ambrose; Sgt. W. Archibald; Sgt. D. Ashworth; Sgt. P. A. Barnes; Flt. Sgt. C. Baynton; F/O. G. A. Beaumont; F/O. G. Booth; P/O. E. G. Bradley; Sgt. S. I. Canovan; Sgt. K. R. Carter; Sgt. R. H. Caudle; Flt. Sgt. W. C. Cheetham; Sgt. A. V. Collins, D.F.M.; Sgt. R. S. Colvin; Flt. Sgt. C. S. Cook; Sgt. R. J. Courtney; Sgt. H. Cropper; Sgt. E. W. Davies; Sgt. J. J. Duncan; F/O. W. A. Eagles; Flt. Sgt. J. A. Fowler; F/O. J. C. Graham; Sgt. J. Green; Flt. Sgt. F. H. Haegi; Sgt. P. C. Hagger; P/O. J. C. Harthill; Sgt. R. Hunter; Flt. Lt. G. O'F. G. Hyne; F/O. J. P. J. Jenkins; Sgt. W. Johnson; F/O. J. Kellett; Flt. Sgt. J. C. Kempsel; Sgt. T. Kerrigan; F/O. M. H. King; Flt. Sgt. E. W. Lawrence; P/O. A. M. Leonard; F/O. J. L. W. Logan; Sgt. G. E. G. Lucas; Sgt. M. J. Lynch; F/O. C. J. MacPherson; Sgt. A. Mavromatis; Sgt. W. R. Mead; Sgt. W. A. Meek; Sgt. R. A. Moodey; F/O. R. E. Mulcahy; Sgt. W. O'Malley; Sgt. P. J. Palmer; F/O. R. E. V. Pugh; Sgt. G. W. Prescott; Act. Flt. Lt. R. D. Rayment; F/O. A. W. Read; Flt. Sgt. J. T. Richards; Sgt. W. E. Ridge; Sgt. R. D. Roots; Sgt. F. A. G. Sage; Flt. Sgt. M. W. Saunders; Sgt. J. E. Searle; Sgt. C. L. L. Sherbrooke; Act. Wing Cdr. I. R. Stephenson; Flt. Lt. H. W. Street; F/O. H. G. Stuffin; Sgt. W. A. Taylor; Act. W/O. J. E. Thomas, D.F.C.; F/O. D. R. Vickers; Sgt. R. G. Vincent; Sgt. C. H. Walder; F/O. R. W. Welsh; Sgt. T. N. Whelan; P/O. R. T. Whitehead; Sgt. J. Williamson; Sgt. G. H. E. Willmott; Flt. Sgt. D. Wilson; Sgt. J. C. Wilson.

KILLED ON ACTIVE SERVICE.—Sgt. D. P. Aitken; Sgt. F. Atkinson; Sgt. J. Bell; Sgt. L. Blunt; Sgt. J. E. Bowen; Sgt. J. F. Burton; Sgt. S. Chadwick; Sgt. J. V. Curry; Sgt. H. L. Dean; Sgt. R. Fletcher; Sgt. T. Forrest; Sgt. W. J. Freeman; W/O. R. J. Fryer; Sgt. R. Ginsberg; Sgt. J. Gordon; Sgt. R. Hart; Sgt. J. B. Hebditch; Sgt. J. Hindley; Sgt. B. E. Hopkinson; Sgt. J. A. H. Hough; Sgt. D. G. James; Sgt. L. S. Jenkins; Sgt. L. Jones; Sgt. T. E. Jones; Sgt. N. A. Kenyon; F/O. D. Kuhnel; Sgt. L. Lee; Sgt. E. McCarthy; Sgt. A. MacIntyre; Sgt. R. T. McLean; Flt. Sgt. D. McMillan; Sgt. N. Martin; Sgt. J. F. Megran; Sgt. G. Miles; Sgt. G. B. Mills; Sgt. F. S. Quine; Sgt. F. J. Robinson; Sgt. F. W. Robson; A/C.2 G. F. Scott; Sgt. R. B. Sellars; L.A/C. R. C. C. Speller; Sgt. E. Stabler; Sgt. K. Vincent; Sgt. C. Wheeldin; P/O. J. V. Williamson; L.A/C. M. W. A. Williamson; Sgt. V. G. Wilson; L.A/C. E. A. Yarrow.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. E. J. Drew; L.A/C. J. R. Frankpitt.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. D. Hall; L.A/C. G. H. Jackson.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. J. Cunningham; P/O. P. Emmerson; Sgt. M. N. G. Swindle.

DIED ON ACTIVE SERVICE.—Sgt. R. Boak; A/C.1 S. Bradbury; L.A/C. C. Crane; A/C.2 W. I. Gregory; L.A/C. T. W. Grizzell; L.A/C. L. Ireland; L.A/C. D. Jordan; Flt. Lt. A. T. Leech; Flt. Sgt. A. Meehan; A/C.2 R. J. Moran; Cpl. A. N. Needham; L.A/C. W. H. Raine; A/C.2 M. Shaw; Cpl. F. H. Stanley; A/C.1 G. H. Tonkin; Act. Sgt. J. Wharton.

Arming 100 lb. incendiary bombs in the bomb bay of a Flying Fortress.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. T. F. Dimmock; Flt. Sgt. W. J. Tucker.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. H. I. C. Dent; Sgt. K. E. Fletcher; P/O. L. G. Gosper; Flt. Sgt. F. W. R. Green; P/O. A. M. Jensen; Flt. Sgt. A. Jowers; Flt. Sgt. J. F. Mell; Flt. Sgt. E. D. Milliken; F/O. H. L. Osborne; P/O. R. F. Peterson; Flt. Sgt. L. H. Watters.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. R. P. O'Dea.

MISSING.—Flt. Sgt. W. C. Andrews; Sgt. A. C. Glenwright; Flt. Sgt. J. F. Knapp; Flt. Sgt. L. P. Sanderson; F/O. D. S. Thom; Flt. Sgt. J. G. Wade.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. F. W. Greenwell.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. D. J. B. MacKay.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. K. R. Fallowdown; P/O. A. Grant; W/O. H. W. Johnson; F/O. H. S. Schellenberg; F/O. T. Thomson; Flt. Sgt. W. A. Valley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. A. F. G. Martin.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. R. R. Amey.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. H. R. Beswick; P/O. T. J. Brehn.

KILLED ON ACTIVE SERVICE.—F/O. K. W. Bolstad; F/O. R. W. H. Budd; Sgt. N. J. Collins; F/O. L. F. Cook; W/O. S. R. Doney; P/O. D. A. Dunlop; W/O. R. L. Forrester; P/O. J. L. Gibault; P/O. J. E. Harrison; Flt. Sgt. S. W. Litynesky; P/O. E. A. Merkley; F/O. H. W. Munro.

DIED ON ACTIVE SERVICE.—L.A/C. W. A. Davidson.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Sgt. J. Stewart.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. N. J. Moon; Flt. Sgt. A. H. Smith.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. K. R. Aicken; Sgt. J. H. Orr; P/O. G. A. Parkinson.

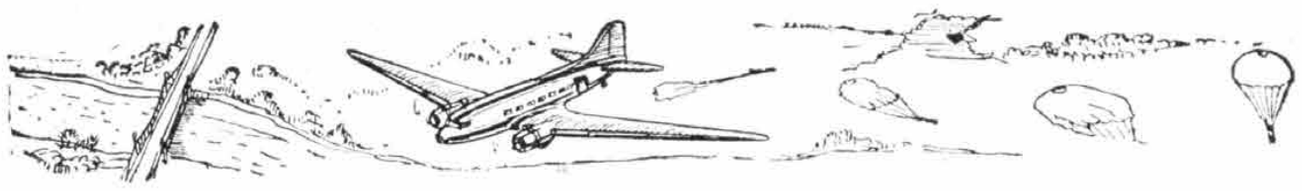
MISSING.—F/O. A. F. Lissette; F/O. A. J. Sykes.

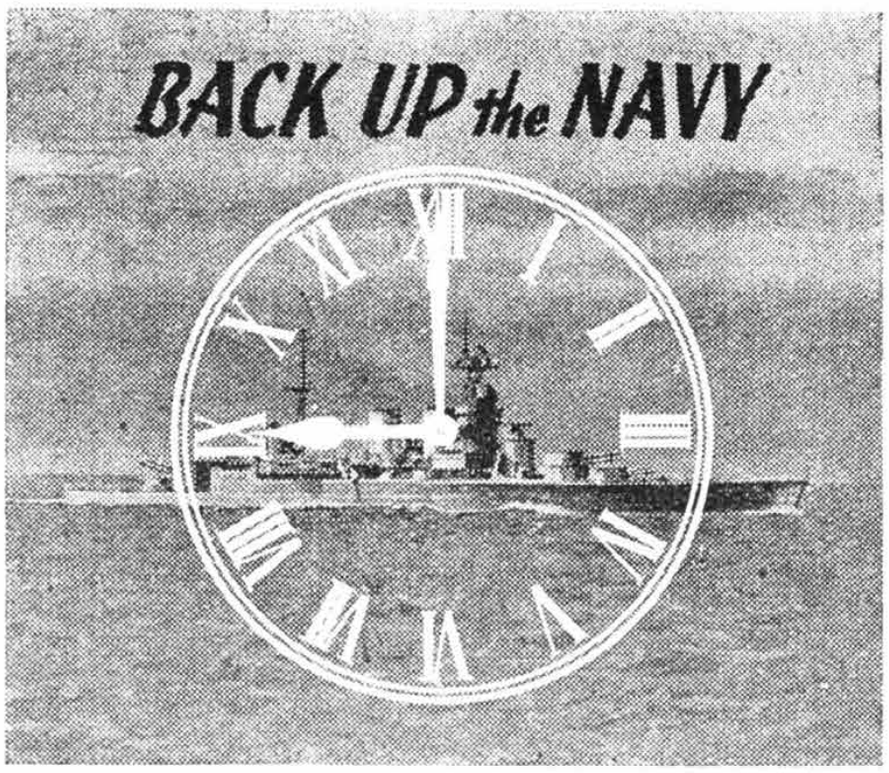
KILLED ON ACTIVE SERVICE.—Flt. Sgt. C. T. B. Fail.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. B. H. Broadhead.

South African Air Force

MISSING.—Lt. L. G. E. F. Cash.





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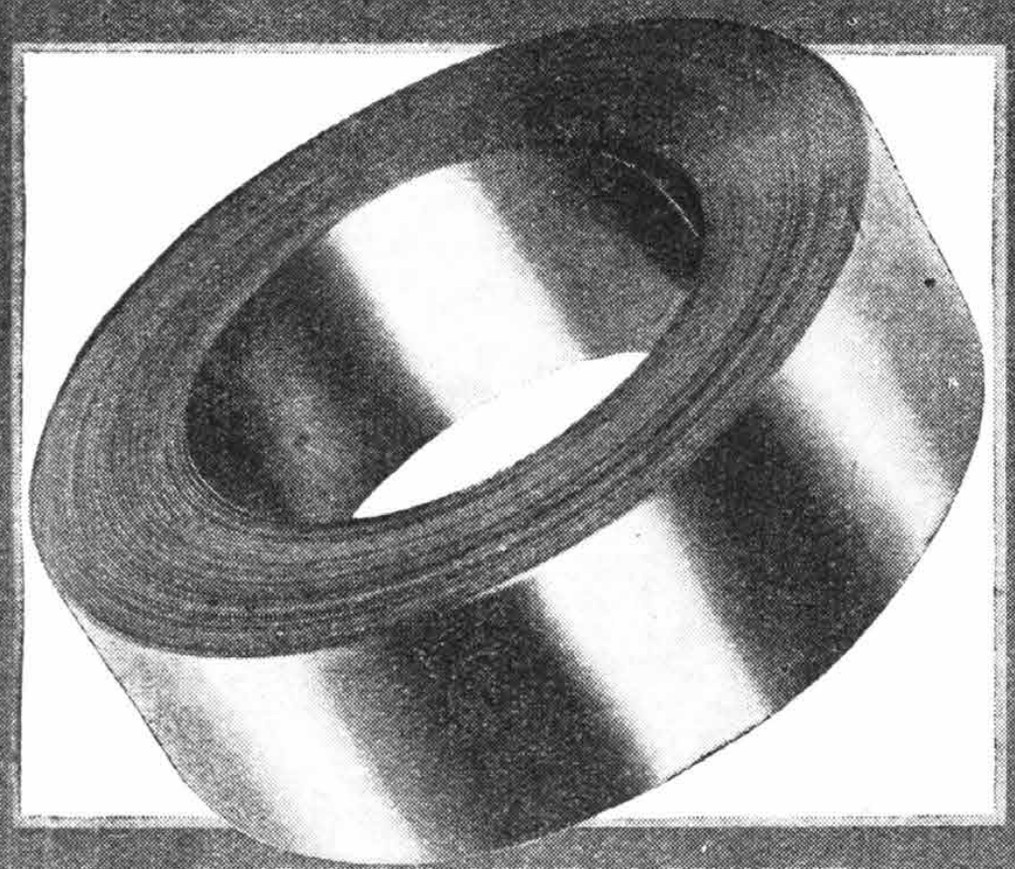

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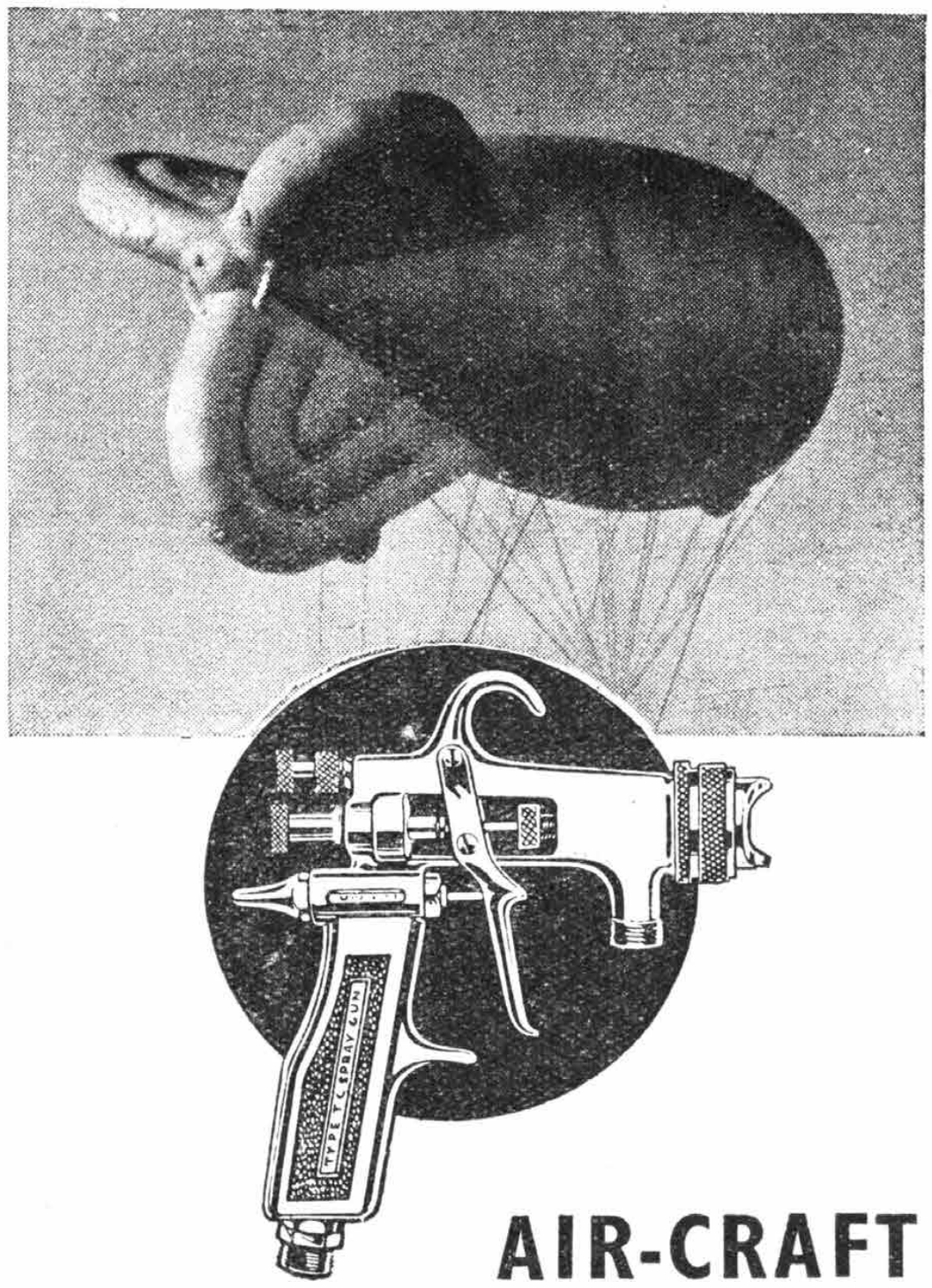

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