Contributors

No. 1805
Vol. XLIV

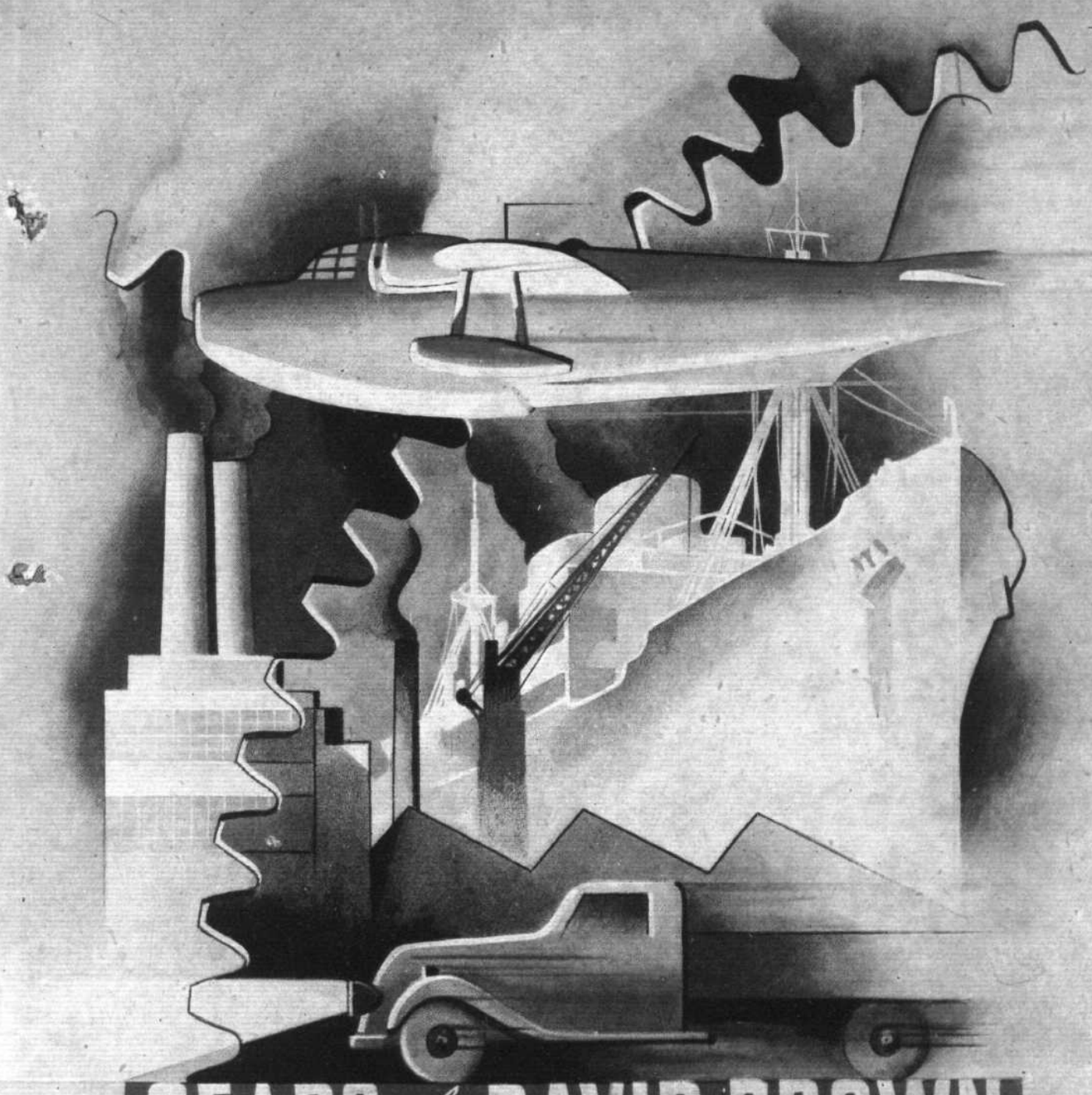
FLIGHT

1/-

and
The AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

JULY 29th, 1943



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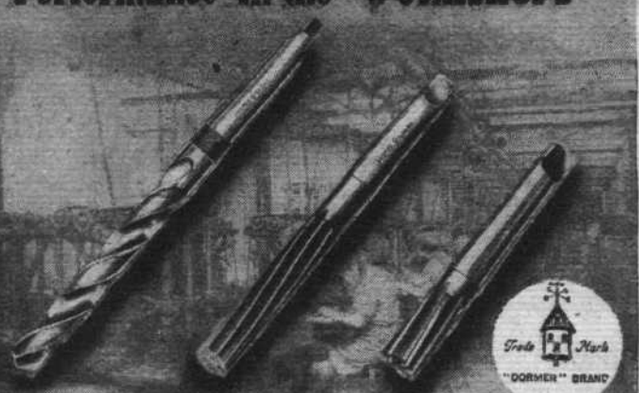

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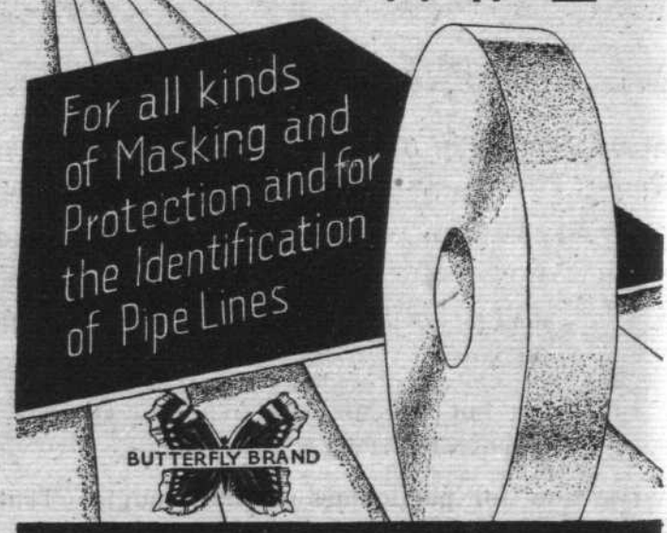

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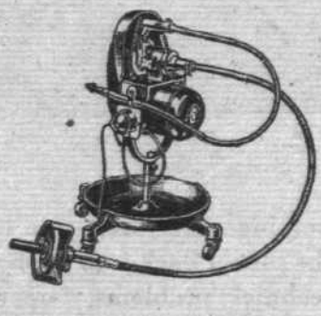

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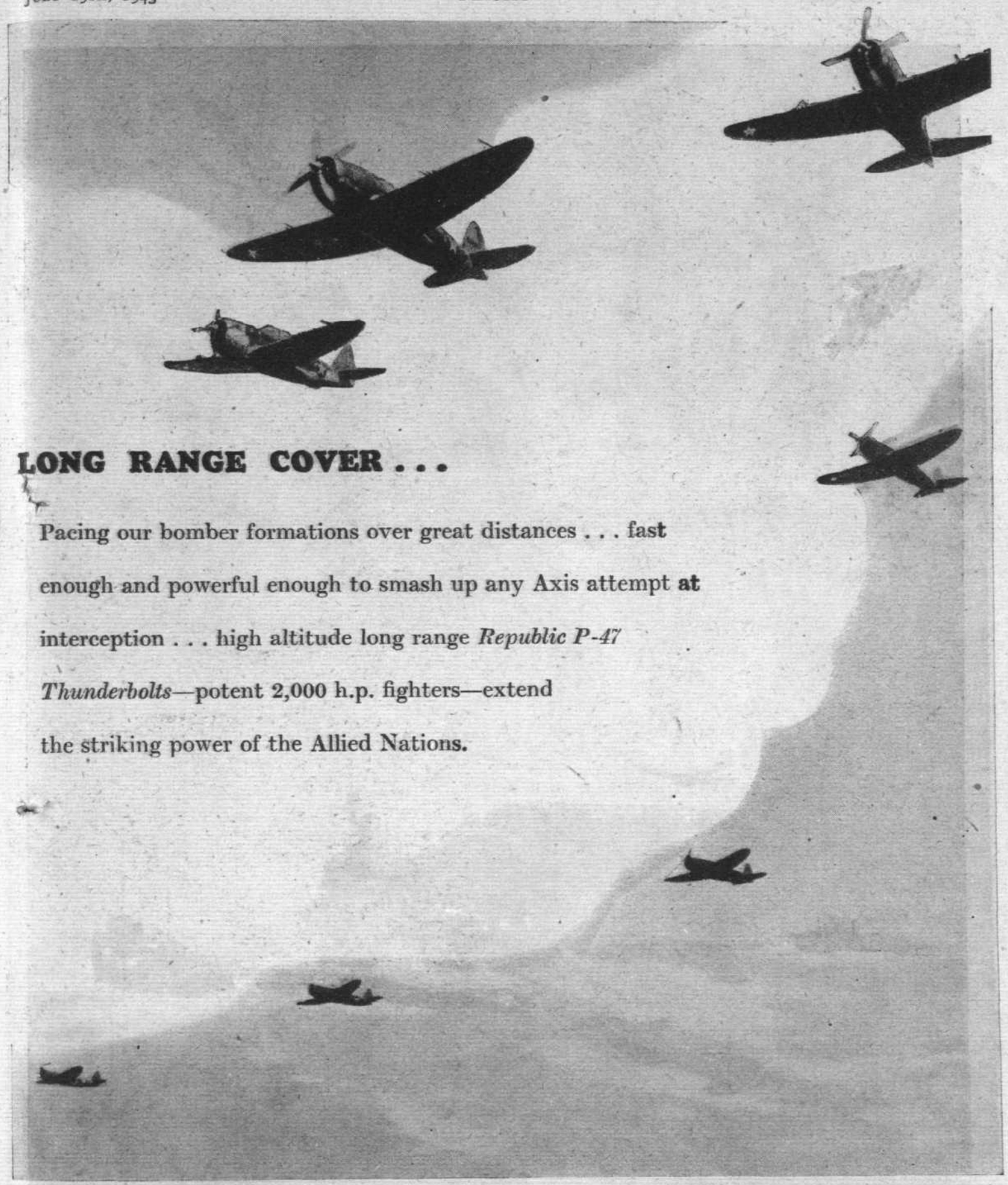

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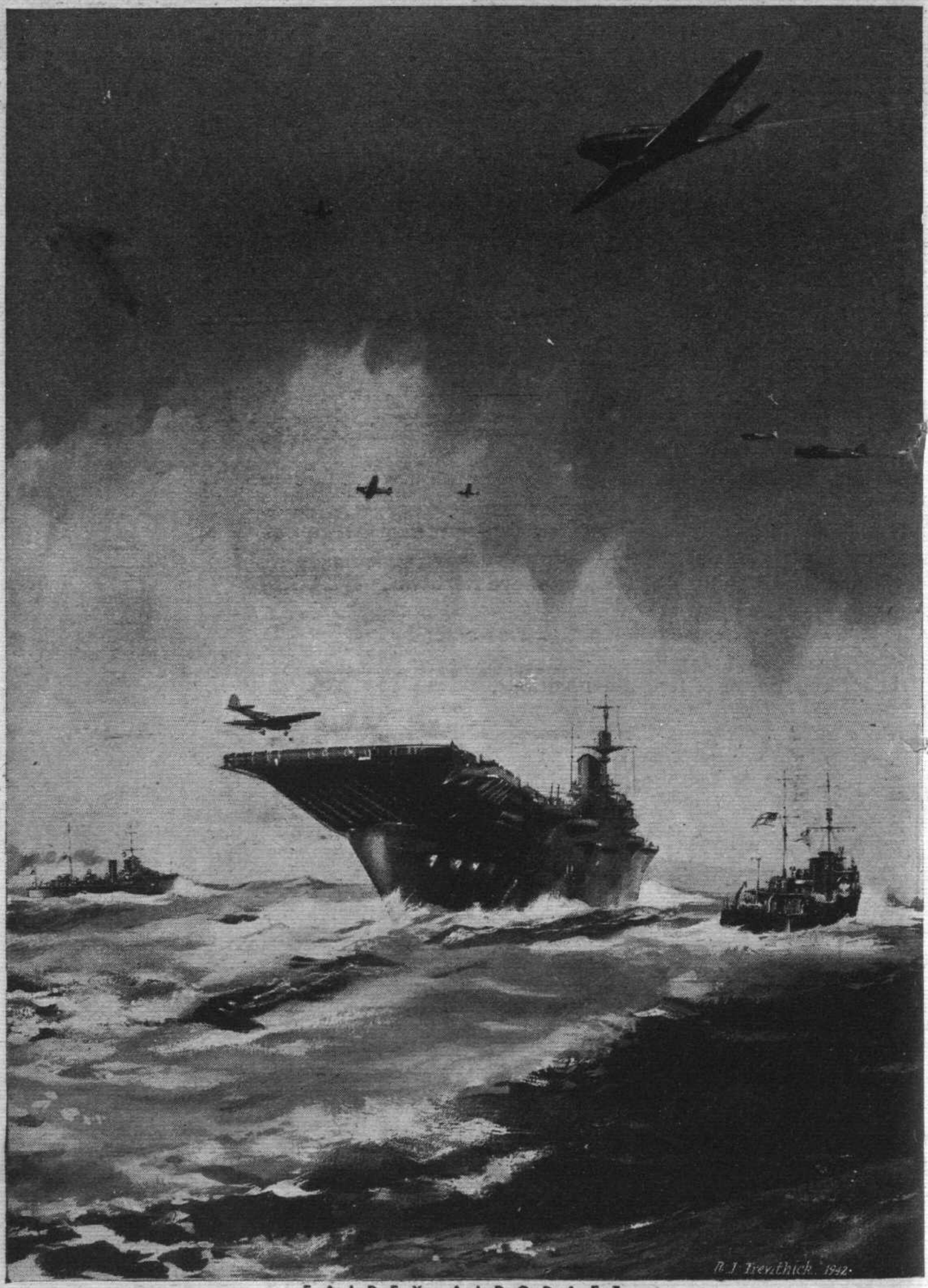

FAIREY AIRCRAFT

FLIGHT
and
The AIRCRAFT ENGINEER

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The Outlook

Airborne Troops in Sicily

THE Allied landing in Sicily was the greatest experiment in combined operations as yet attempted. The practice raids on Dieppe and elsewhere had provided some experience, and the wonderfully successful landing in North-West Africa was of the nature of a dress rehearsal. All three provided training for the staffs in organising this most complex of all warlike operations.

Whereas the combined work of Navy, transports, Army and air cover could all be based on a certain degree of experience, the employment of airborne troops in Sicily was still almost a novelty to the British and American leaders. Parachute troops had been used by the British in the Tunisian campaign with varying degrees of success, but glider-borne troops had not been used by us before in actual warfare. Both types of airborne contingents were used by British and Americans in the invasion of Sicily, and so useful were they that General Montgomery has said that their work saved the British section of the invaders seven days. The Americans, whose arms were somewhat different from those of the British, held up an enemy tank attack and prevented it from reaching the beaches. The experiment, therefore, can be put down as a striking success.

Nevertheless, it can hardly be supposed that an experiment based on so little practical experience was so perfect in every respect as future operations may be expected to be. Undoubtedly lessons will have been learnt, and when they have been studied and digested the conclusions will be applied in other invasions which are still to come.

Parachute troops and glider-borne troops have different characteristics, and the conditions of each operation have to be studied before the decision is taken to use either or both. Gliders require reasonably level ground on which to land, whereas parachute troops are less particular. On the other hand, the latter are apt to be scattered during the drop, and they have to spend some time in extracting equipment from canisters and then forming up before they become a complete fighting unit. The glider men come down as a small, compact unit, and bring all the necessary weapons and equipment with them.

These pros and cons have to be considered in each particular case, having regard to the job to be done, the nature of the country, and the dispositions of the enemy. Sicily has provided the first full-scale experiment, and if it is found that mistakes were made, at least they did not result in anything but very light casualties to the warriors from the air.

The Bombing of Rome

IT is always useful to try to forecast the line which enemy propaganda will take, and it would not be at all surprising if the Italians were to recall the British threat that if Athens and Cairo were bombed reprisals would at once be made on Rome. They might argue that as Cairo had not been bombed there was a moral obligation on the United Nations not to bomb any part of Rome.

As a matter of fact, some bombs *were* dropped on the environs of Cairo, and when the Prime Minister was asked in the House whether that would automatically bring our threat into operation, he replied that Cairo had not been bombed, but only some military targets on the outskirts.

That is also what has happened in Italy.—Rome, the ancient capital of the Roman Empire; Rome, the centre of the Catholic form of Christianity; Rome, the shrine of those historical monuments which are (as the Allied

leaflet said) "the glory not only of Rome but of the civilised world"—that Rome has not been bombed. The attack was directed only on military objectives and was intended to save the lives of Allied soldiers, not to take the lives of Italian civilians. Every possible care was taken to confine the damage to those targets, which were quite legitimate military objectives. Such objectives may be attacked again, perhaps even before these words are published.

The Pope has stated that one ancient and beautiful church, that of San Lorenzo without the Walls, has been damaged. The *bona fides* of His Holiness will not be called in question, and any such accidental damage will be regretted as much by the United Nations as by the Italians themselves. The leaders of the Allies who ordered the raid were inspired by no thoughts of revenge for the destruction of Coventry Cathedral and many other churches and precious buildings in England, Holland, Yugoslavia, and elsewhere. The loss of such monuments is a loss to all humanity (except to the modern Huns), and the British and Americans are the last to desire to add to the total of destruction. For the British to destroy buildings which they revere quite as deeply as any Italian can do in revenge for Coventry Cathedral would be to punish themselves quite as heavily as the enemy.

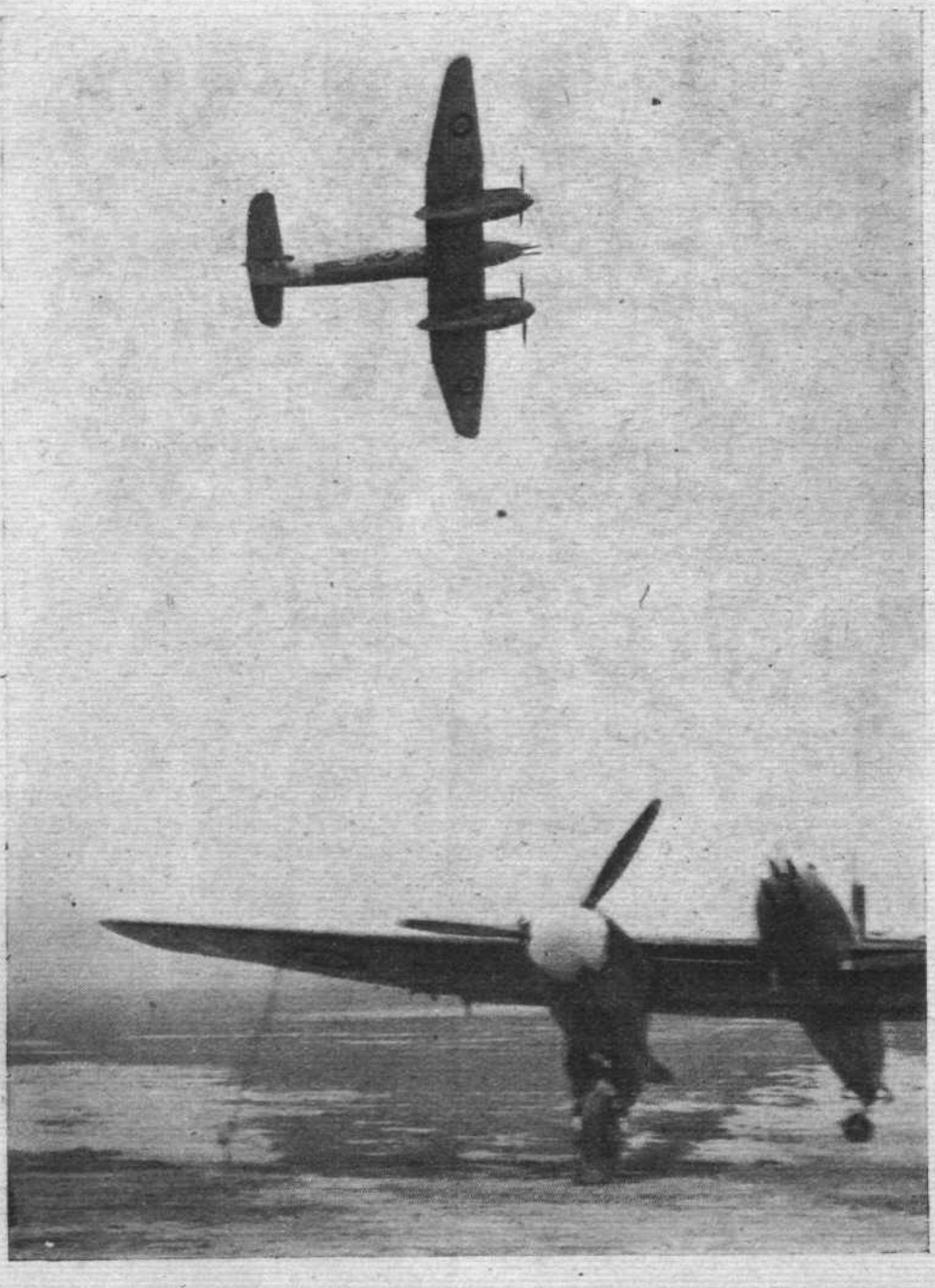
CONTENTS

Mussolini

BENITO MUSSOLINI, ex-journalist, ex-socialist, ex-soldier, became dictator of Italy in 1922, and for 21 years he has ruled Italy as an autocrat. Some of his internal administration has been good; much of it has been tyrannous. In foreign affairs he set himself to restore the ancient Empire of Rome, and for this he relied mainly on the novel instrument of air power, backed by a powerful Navy in which speed was one of the outstanding characteristics. Somewhat curiously, he decided that carriers were not necessary in the Mediterranean, which he believed he could control by securing chains of bases for land-plane bombers.

His policy towards the air was not, however, consistent. At first he devoted much energy towards Italian air development. He learnt to pilot an aircraft himself, and travelled much by air. He established the *Regia Aeronautica* as a separate Service, being the first foreign ruler to copy the British model, and he gave it a uniform almost identical with that of the R.A.F. He encouraged the brilliant Italian aircraft designers, and maintained a High Speed Flight in the Air Service. In 1926 the Italian team won the Schneider Trophy from the United States. The High-Speed Flight then went on to establish several successive world records for speed. In Mussolini's conquest of Abyssinia the air played a great part.

Then, unaccountably, he neglected to keep the equipment of his Air Force up to date, and when it came to grips with the R.A.F. it proved a broken reed.



CLIMBING TURN: A Westland Whirlwind shows its paces over its home station. Originally developed as an interceptor-fighter, the Whirlwind is now employed on low-strafing.
"Flight" photograph.

READY FOR THE NEXT SHOW: Refuelling a Mosquito from a Butterfield tanker.

WAR in the AIR

The Fighting in Sicily : Japanese Island Bombed : General MacArthur's Offensive : The Russians Press On

THE first impression sent back by war correspondents from Sicily was that the Italians were fighting more determinedly there than they had in Africa, and this had been expected. Though it is true that Sicily is an island, yet it is always counted as part of Italy, and the Italian troops were, therefore, defending their own soil. Later advices, however, have contradicted the early impressions, and it now appears that the Italian soldiers are ready to surrender in large numbers, and when placed under the command of German officers they have frequently mutinied, and in some cases have shot the German C.O. The prisoners taken seem only too happy to be out of the war, while the Sicilian peasants have welcomed the Allied troops quite cordially.

When troops are not in good heart, and are not fighting *pro focis et aris*, as the Russians were at Stalingrad and elsewhere, few things can have such an effect on their desire to escape with their lives as continuous bombing and machine-gunning from the air. This the garrison of Sicily has had to endure to the utmost. The Allies simply command the air over Sicily, and the Axis aircraft ceased some time ago to be able to dispute that mastery. Before the fall of Tunisia the Germans had concentrated a strong fighter force in the Mediterranean area, but it has suffered severe casualties, including large numbers of machines destroyed on the ground, and there is reason to believe that most of the survivors were deliberately withdrawn to fight again elsewhere. It was not long after the landing that Spitfires began to use airfields in Sicily.

To many readers of newspapers the Western, Mediterranean and Russian fronts are three separate areas, but to Hitler and Göring, who have to allocate their limited number of troops and aircraft to one or another critical point, the three fronts must present one problem. The paucity of fighter defence in Sicily suggests that they have written off that island as a bad debt, and perhaps Italy itself is now considered as hardly "worth the bones of a Pomeranian Grenadier." The meeting of Hitler and Mussolini a few days ago suggests that the Duce must be insistent in his appeals for German help, and everyone may guess for himself what sort of satisfaction he obtained from the Führer.

Nevertheless, Axis bombers have attempted some sort of protest, though their fighters may be elsewhere. On July 19th there was a fairly heavy and concentrated raid by night on Malta, and some damage was done and casualties caused. Protective fighters went up, but had no luck in shooting down any of the raiders. Probably most of Malta's fighter squadrons have moved on to Sicily. The port of Augusta, just south of Catania, is within easy range of Italian bombers, and has received some attention from them. It had not suffered much from Allied shells and bombs, and soon became a useful port of disembarkation for the in-

WAR IN THE AIR

vaders, though of less importance than Syracuse. Defences against air attack have been arranged at these ports.

Defences, however, have not availed much at Naples and other ports in Southern Italy, which Air Chief Marshal Tedder continues to hit regularly and heavily. Railways and airfields have lately been the main targets, thus keeping down the danger of a resurrection of Axis air power and the reinforcement of troops in Sicily and Southern Italy.

A Kurile Island Bombed

IT was perhaps only a straw in the wind, but the bombing by American Army Liberators of the island of Paramushir, in the Kurile chain of islands, was a very welcome incident. Though it is 1,200 miles to the north-west of Tokyo, it is still genuine Japanese territory, not one of the recent conquests, and it is also a naval base. The Liberators probably flew from Attu, which was recently recaptured by the Americans from the Japanese.

Again have U.S. naval forces shelled Kiska, in the Aleutians, without drawing any fire in response from the batteries on the island, and the suggestion has been made that since the loss of Attu the Japanese on Kiska may be short of ammunition. Kiska has also been bombed, but in that most foggy region of the earth it is rarely easy to see results.

Down to the South, Japanese attempts to reinforce their troops in the Solomons have been repelled by the U.S. Navy and by aircraft. The enemy has lost three cruisers, 13 destroyers, a submarine-chaser, five cargo ships and one tanker, all definitely sunk, in the first three weeks of July. The American losses were one cruiser and two destroyers.

There is still a considerable amount of fighting in the air, as well as bombing by both sides, but the Allies are undoubtedly on top, and Gen. MacArthur is no longer confined to defence of Australia by bombers alone. In fact, he is not on the defensive at all, but pressing forward in the attack.

Airborne Troops in Sicily

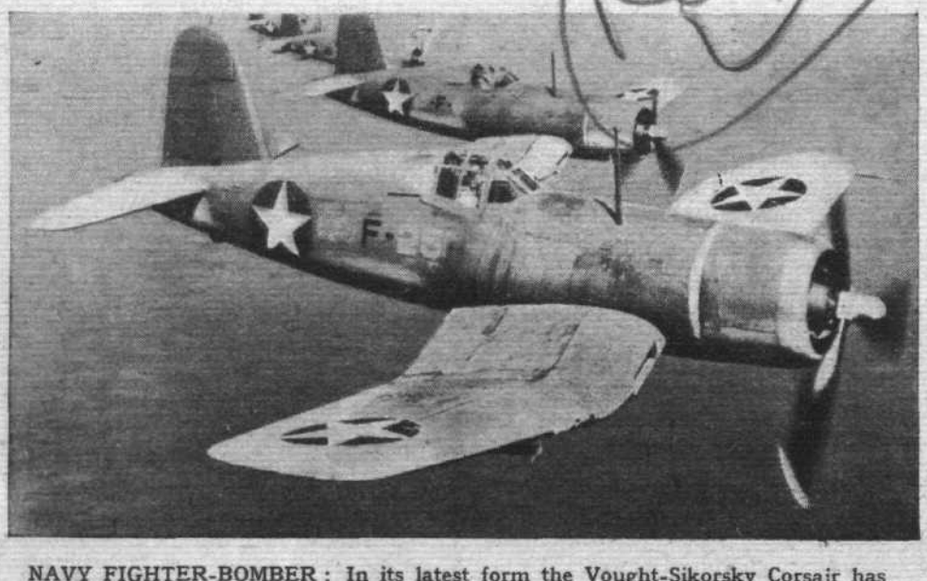
MAJOR GENERAL J. M. SWING, an American officer on the staff of General Eisenhower, returned from Sicily to this country on his way to Washington and gave some information about the work of U.S. airborne troops at the time of the invasion. Both parachute troops and glider-borne troops were landed, and the gliders used were Wacos and Hansas. The organisation of the landings was a very complex affair, and the pilots of the aircraft had quite a difficult job. They had to avoid flying by night over the sea-borne Army, whose naval escort would certainly have fired at any aircraft which flew over them. No risks could be taken of enemy bombers masquerading as friends. However, after the airborne troops had landed in front of the American soldiers, naval ships off the shore, doubtless directed by air observers, fired on the enemy tanks advancing against the airborne advance guard, which incident, Gen. Swing said, was probably the first time that cruisers and monitors had taken part in a tank battle.

The arms taken by the Americans in their gliders proved to be of great importance. Some had special weapons which may be described as anti-tank rifles, and they proved extremely useful in a dangerous emergency. One combat team had 75 mm. howitzers with them, and they knocked out many tanks, including some "Tigers." Had the enemy's armour succeeded in reaching the beaches before the American Army troops had established themselves the position might have been serious, but the airborne men held them off and averted that danger. It is somewhat of a revelation to know that airborne troops could hold up an attack by armour.

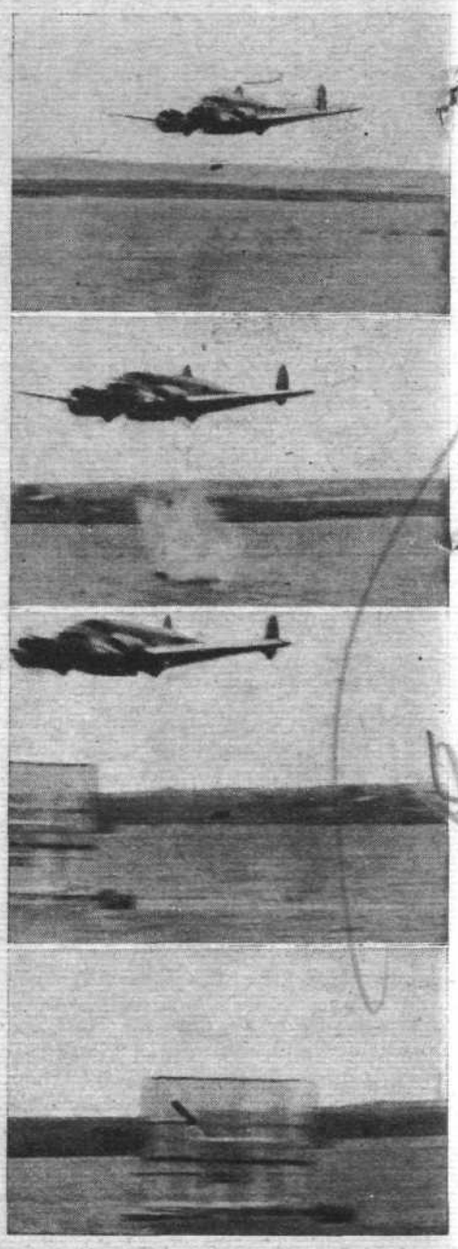
As for the men of the British airborne division, General Montgomery said that their work on the front of the Eighth Army had advanced the whole operation by a week.

The Russian Offensive

THE Russian counter-blow was admirably timed. The Germans had failed badly in their attempt to break into the Kursk salient, and their efforts petered out at exactly the moment when General Eisenhower started his invasion of Sicily. Whether the Germans at once withdrew forces from the East is not yet certain, but at any rate the Russians took the tide



NAVY FIGHTER-BOMBER: In its latest form the Vought-Sikorsky Corsair has external bomb racks under the wings.



SKIP BOMBING: A demonstration by a Beechcraft AT-11 showing how a bomb can be bounced off the surface of the sea to hit a ship between wind and water. This form of attack was originally developed by Hurribombers.

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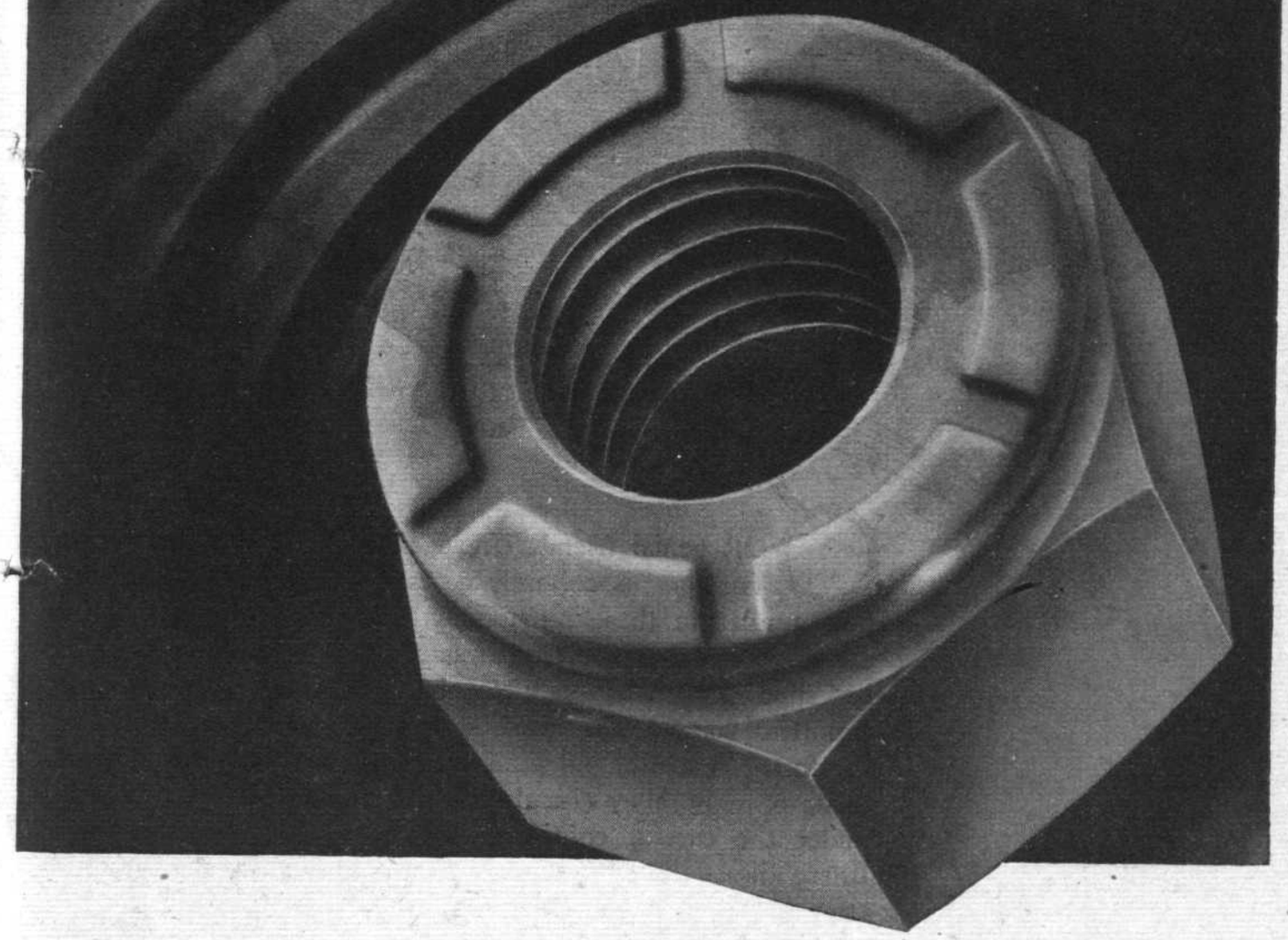

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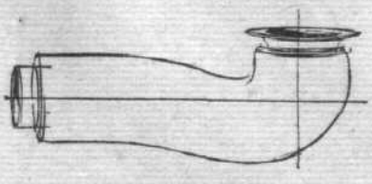

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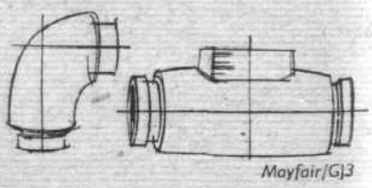


Mayfair/GJ3

WAR IN THE AIR

ENEMY AIR LOSSES TO JULY 24th

	Over G.B.	Continent	Middle East	N.W. Africa
July 18	0	8	0	18
,, 19	0	1	1	11
,, 20	0	0	0	6
,, 21	0	0	0	4
,, 22	0	0	0	24
,, 23	0	0	1	16
,, 24	0	1	0	3
	0	10	2	82

Totals: West, 7,124; Middle East, over 5,480; North West Africa, 2,605.

CONSOLIDATION: Rolling the airfield at Pachino. This was the first Sicilian airfield to be captured by the Allies. The Italians had ploughed it up before retreating.

on the flow as the German effort ebbed.

All accounts lay emphasis on the great work of the Russian artillery. It seems to have played the chief part in driving back the German thrust, and its numerical strength and accuracy of fire came as a surprise to the Germans. Doubtless the Russian air arm played its part in the pitched battles, but its main role apparently was to bomb the back areas of the enemy and disorganise his communications and relief arrangements. The railway stations behind the German front were heavily bombed, and that must have meant that many bodies of reinforcements intended to relieve tired formations in the firing line were late in arriving. The Russian pressure continues as we write.

An Eventful Week-end

EVENTS have crowded on to each other so rapidly during the last week-end that a commentator is left almost dizzy. Of course, the resignation of Mussolini overshadows everything else in importance, but it is for diplomatic writers to gauge its exact significance and probable results. This jackal of Hitler has brought ruin and humilation on his country, and his career of autocratic power comes to an end amid the crashing of Allied bombs on many parts of Italy, while Sicily is as good as lost, the African Empire entirely gone, and many hundreds of thousands of Italian soldiers, sailors and airmen are prisoners of war in the hands of the Allies. The most important arsenals and factories of Italy have been bombed to destruction, the railway communications badly interrupted, the population is grievously short of food, the Navy discredited, and the once fair name of Italy reduced to a mockery. Among the many fiascos which have marked the régime of Mussolini as a War Lord, his request to Hitler that the *Regia Aeronautica* should be allowed to have the honour (save the mark!) of bombing Britain into submission in 1940 was almost the most cynically bumptious and the most ignominiously futile.

The week-end saw a remarkable advance by the Allies in Sicily. The Eighth Army is acknowledged by friends and foes to be the most potent instrument of land fighting on either side, and was naturally given the toughest task, namely, that of advancing on the right of the line where enemy resistance was sure to be the most difficult to overcome. The Germans put up a very tough fight on the plain to the south of Catania. The Americans, "a hundred per cent. better than they were in North Africa," as General Alexander said, had an easier task on the left, but they made magnificent use of it, and their speedy capture of the western ports of Marsala and Trapani were fine pieces of campaigning, only surpassed by the still finer dash up to Palermo. Italian troops surrendered to them by tens of thousands. Palermo's harbour will not be bombed again by the Allies.

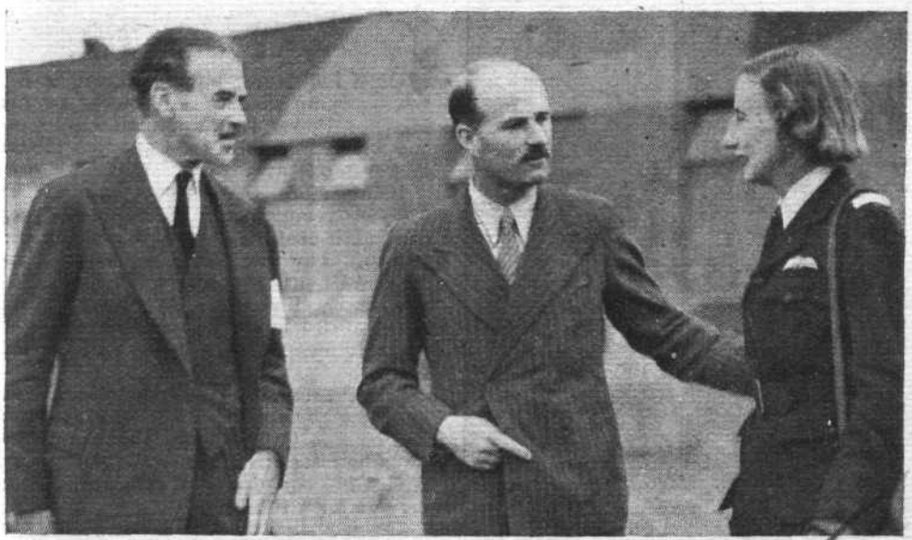
BRITISH & U.S. AIR LOSSES to JULY 24th

	Over G.B. A'crft.	Continent B'brs.	Continent F'trs.	Middle East A'crft.	N.W. Africa A'crft.
July					
18	0	2	6	0	4
19	0	0	1	0	9
20	0	0	1	0	6
21	0	0	0	0	2
22	0	0	0	0	6
23	0	0	1	17	4
24	0	13	0	0	2
	0	15	9	17	33

Totals: West, 6,810; Middle East, about 2,191; North West Africa, 945.

Lancaster bombers which had attacked the electrical grid system in Northern Italy a few days before, and had then flown on to Africa for a rest, bombed the important port of Leghorn on their return flight to Britain, without losing a single machine.

In the North and West of Europe, the week-end saw British and American bombing raids on Hamburg, and American raids on Kiel and Heroya, in Norway. On Saturday night last Bomber Command made its biggest raid of the war to date, when within 50 minutes 2,300 tons of bombs were dropped on Hamburg. Next day the Americans followed this up with precision bombing by daylight. Saturday also saw a long-distance daylight raid by U.S. aircraft on Heroya, 65 miles south-west of Oslo, where there is an aluminium plant, and on submarine works at Trondheim.



COINCIDENCE: Mr. Alan Butler, chairman of the De Havilland Co., introduces Mrs. Butler to Mr. R. G. Casey, Minister of State. Mr. Casey was visiting a De Havilland factory, and Mrs. Butler, who is a senior pilot of A.T.A., was collecting a Mosquito for delivery to the R.A.F.

HERE AND THERE

Extension of Airgraph Service

THE Postmaster-General has announced that airgraph letters are now being accepted for addresses in St. Pierre and Miquelon.

The charge for airgraph letters addressed to personnel of the Forces and the Merchant Navy is 3d., and for those addressed to civilians 8d.

Expert Schoolboy Spotter

IVOR BOURNE, a junior member of St. Paul's Spotters' Club, Worcester, is now training other spotters. This 13-year old schoolboy accurately recognised 123 out of 125 British, German and Italian aircraft and is the youngest boy in the country to hold a first-class plane-spotter's certificate.

Kill That Falcon

THE Order making legal the taking or destruction of peregrine falcons or their eggs by approved authorised persons is now extended in its operation to cover Lundy Island and the Welsh counties of Brecknock, Cardigan, Carmarthen, Flint, Glamorgan, Merioneth, Montgomery, and Radnor.

The object of the Order is to prevent, as far as possible, the severe losses caused by peregrine falcons to homing pigeons employed by the R.A.F.

R.Ae.C. Staff Holiday

IN order to give the staff a short holiday, the Royal Aero Club Committee has decided to close the club, with the exception of the bedrooms, for nine days from Saturday, July 31st, to Sunday, August 8th, 1943, both days inclusive.

Breakfast will be served to those members sleeping in the club, but no other meals and no drinks will be served during the period of closing. Full facilities will be available again on Monday, August 9th.

New Argentine Trainer

THE Industria Metalurgica y Plastica Argentina, more briefly known as I.M.P.A., is producing a new trainer, the Impa RR-11.

A low-wing, two-seater monoplane, it is powered by a 65 h.p. flat-four Lycoming engine which gives it a top speed of 100 m.p.h. As it cruises at 95 m.p.h., its duration of five hours provides an operational range of 475 miles.

R.N.Z.A.F. Air Chief

AIR COMMODORE ISITT is to become Chief of Air Staff and Air Officer Commanding the Royal New Zealand Air Forces, with the temporary rank of Air Vice-Marshal, and thereby becomes the first New Zealander to hold the post.

He is to succeed Air Vice-Marshal R. V. Goddard, who will return to the Royal Air Force after the term for which he was seconded to New Zealand has expired.

Fighter-Dive-Bomber

THE fitting of dive brakes to the Mustang, so that it can combine the advantages of dive bombing with the ability of a fighter to take care of itself, was recently reported to have been tried out for the first time in action over Sicily, apparently with good results.

This variation of the Mustang, known as the A-36 in the U.S.A.A.F., has four hydraulically-operated dive brakes, two below and two above each wing, and its normal diving speed with them in operation is reported to be 450 m.p.h. One bomb rack is fitted to each wing, and these can be used for carrying auxiliary fuel tanks, instead of bombs, when long fighter range is required.

The A-36 has the Allison engine and mounts four 0.5in. machine guns, two synchronised to fire through the airscrew disc and two in the wings. Its dive-bombing equipment is said to add less than 200 lb. to the normal gross weight. Mustangs are also reported now to be carrying 20 mm. cannon.

Parachute Record

A 20,000 ft. delayed parachute drop, which is believed to constitute a world's record, has been made inadvertently by a young R.A.F. pilot, Francis Brown, of Canterbury, New Zealand. Whilst flying through a monsoon storm to the Burma front, he was thrown against the controls and either fell out, or baled out instinctively.

On regaining consciousness he found he had fallen 20,000 ft. with unopened parachute and was then about 3,000 ft. up. He pulled the ripcord of his parachute and landed safely on a small island, where the villagers after giving him refreshment took him to hospital.

It was discovered that Brown's chief injury was burst bloodvessels behind the eyes.

Fruitful

PEACHES ticketed at several shillings apiece in some shops are being absolutely given away compared with the prices fetched by other fruit during a Wings for Victory week held recently at an A.F.U. in the West Midlands.

Four bananas raised £620 and four lemons went for £500.

Other luxuries auctioned in the officers' mess during a dance included a bottle of whiskey, which fetched £500, and a tame goose, which added no less than £785 to national savings.

Altogether this A.F.U. raised a total of £6,569 during the week. Good show!

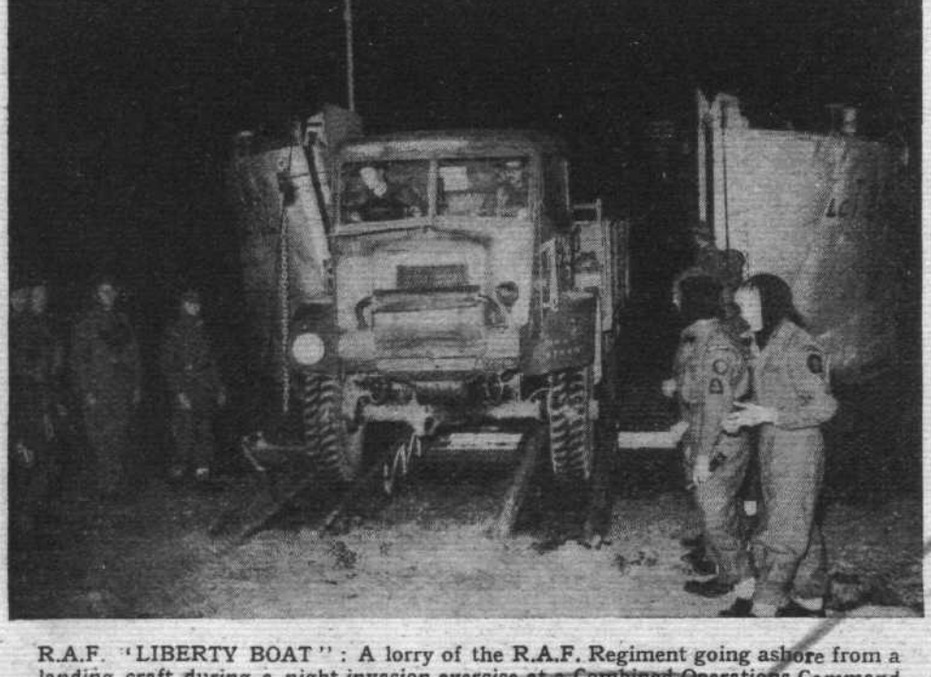
More Power to 'Em!

SOME impressive figures about the Air Training Plan were disclosed by Air Minister Power in his annual report on the R.C.A.F. before the Canadian House of Commons at Ottawa.

Using more than 10,000 aircraft, it flies an average of 2,006,626 miles per day and costs about $40,000,000 per month. The number of schools has increased from the 74 originally planned to 154, and well over 50,000 aircrews of all nationalities have been passed out, the monthly output rate being still on the increase.

Mr. Power also mentioned that there are some 40,000 R.C.A.F. personnel serving outside Canada, and that for every Canadian serving in more than thirty R.C.A.F. squadrons there are eleven serving with the R.A.F.

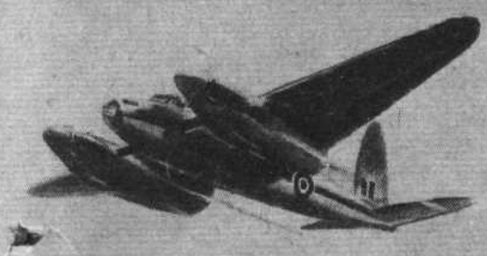
Incidentally, he confirmed that the proposal to change the name of the "British Commonwealth Joint Air Training Plan" to that of "Combined Training Organisation" has been dropped.



R.A.F. 'LIBERTY BOAT": A lorry of the R.A.F. Regiment going ashore from a landing craft during a night invasion exercise at a Combined Operations Command Training Centre. The familiar naval phrase has a special application now that the liberation of enslaved Europe is beginning.

Associated Press

Even gashed by flak *like this!*



This de Havilland propeller went on pulling and brought a Mosquito IV safely back from the Jena raid on May 27th.

".....flak in bright red streams .....unhealthily close.....picked out tall building.....released bombs at point-blank range..... sheet of flame hundred feet high .....yanked stick back to climb over target....port prop. received direct hit.....a violent explosion .....things were hot.....seemed a miracle the aircraft could keep in the air.....tracer shells..... dodging and twisting for dear life.....vibrating considerably .....clear of balloons and target able to survey damage.....fairing pierced close to radiator and tank.....holes in fuselage..... inter-com packed up....fortunately temps. remained constant..... vibrations got no worse....decided need not feather.....on return journey two more defended areas .....violent evasive action full throttle fine pitch.....arrived at base.....aircraft behaved magnificently.....large hole through middle port engine bearer but vital parts sound.....repairs will take a few days."

It did not have to be feathered.

DE HAVILLAND PROPELLERS *get you home!*

THE ARMY DIVES IN!

A new Curtiss warplane wears the Army colors—an attack bomber, the A-25—whose speed and destructive power will count decisively in assuring final victory. Builder of the first airplanes ever designed specifically for dive bombing tactics, Curtiss-Wright is proud that the Army Air Forces have chosen this weapon which adapts these tactics to Army offensive operations.

SECOND PRINTING: Send 10¢ for your copy of this fascinating 96-page history of aviation By Assen Jordanoff, author of "Your Wings", with illustrations of current fighting types. Airplane Division, Dept. M, Curtiss-Wright Corporation, Buffalo, N. Y.

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Corporation
AIRPLANE DIVISION

FIRST
Since the Birth of Aviation

1927 • U. S. Army—A-3—An attack type powered by a Curtiss D-12 Engine. Designed specifically for ground strafing and low altitude bombing.

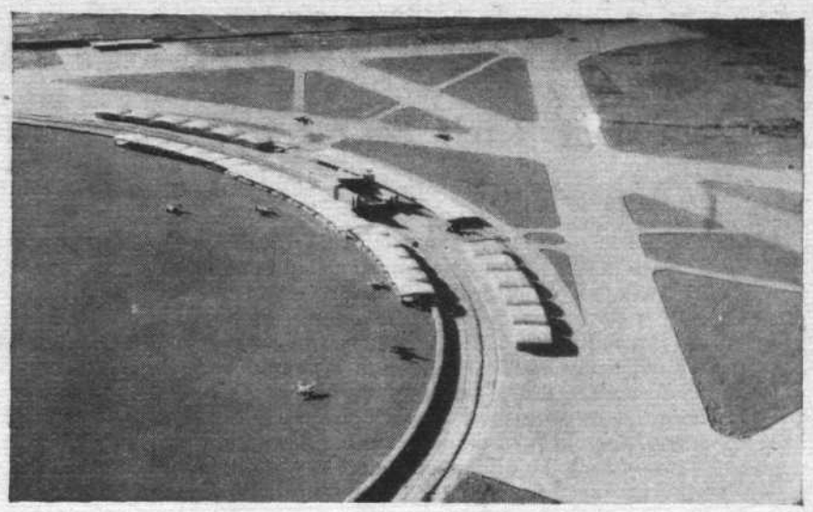
1932 • U. S. Army—A-8—An early low-wing monoplane type powered by a Curtiss Conquerer engine. Increased speed and heavy bomb capacity were improved characteristics.

1934 • U. S. Army—A-12—A Wright Cyclone furnished added power. Slots and flaps permitted low altitude maneuvers at slow speed. Machine guns in wheel fairings aimed downward.

1937 • U. S. Army—A-18—First twin-engined airplane (two Wright Cyclones) designed as attack-bomber. Bombs were carried internally. The nose housed four machine guns or a fast firing cannon.

Thinking of the Future

F. G. Miles Suggests £20 Million Airport on the Thames



The main airport buildings are located between the airfield and the lagoon. Rail and road connections link with existing facilities in the district.

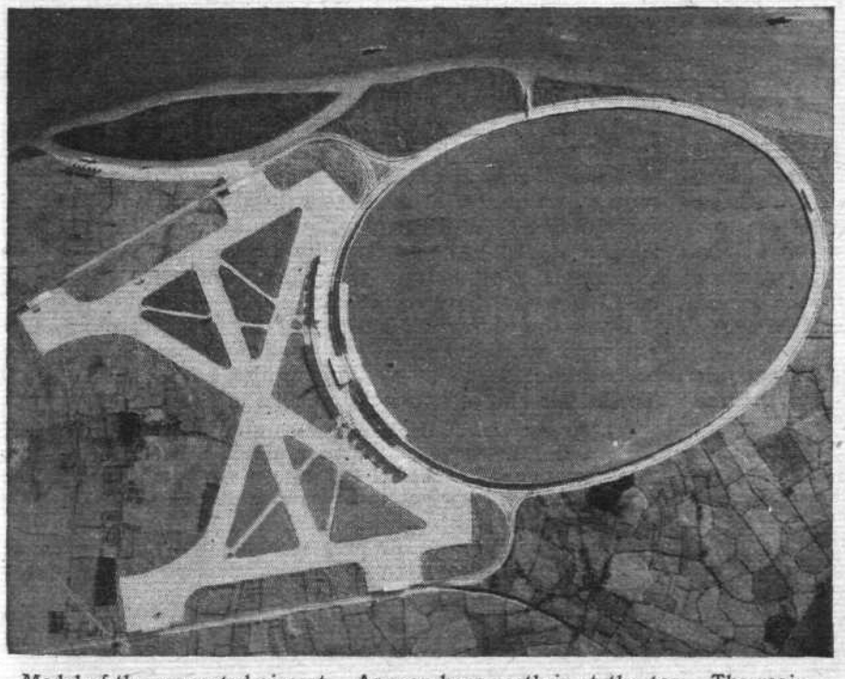
PAST experience has shown that, in aviation, however large one builds, however one tries to anticipate future requirements, that which seemed lavish yesterday becomes inadequate to-morrow. Mr. F. G. Miles, chairman of Phillips and Powis, Ltd., was doubtless very sensible of this fact when he began to think of the sort of airport which London will want after the war. Taking as his basis the sort of aircraft that can be foreseen for the next ten or fifteen years, he began with the assumption that runways some 2½-3 miles long will be required. In view of the still unsettled question as to whether landplanes or flying boats, or both, will be used for long-distance air routes in the years to come, he included in his scheme an artificial lagoon large enough to serve for the taking off and alighting of any flying boat that can be foreseen at present.

Site on the Thames

Gradually the general scheme was evolved, and Mr. Guy Morgan, of Guy Morgan and Partners, architects and engineers, undertook the detail design. Not because the particular site is the only possible one, but because there is a certain air of unreality about a scheme based upon generalities, the layout was based upon a part of the Kentish coast, opposite Canvey Island, and lying roughly between Cliffe and Allhallows, the flat nature of which lends itself admirably to the project. It should be made clear that no authorities have been approached and no attempt made to ascertain the actual value of the land in question. This, however, is not expected to be excessively high in view of the nature of the land.

Our photographs show a scale model of the suggested airport. The longest runway (2½ miles) lies in the direction of the prevailing winds, running from south-west to north-east. The main airport buildings are situated between the airfield and the artificial lagoon. This arrangement would have the advantage of single control, economy of structure and rapid transport. On the banks of the lagoon are hangars into which the flying boats could be towed for loading and unloading, and the landplanes would have their corresponding hangars on the edge of the airfield.

The three main transport services—air, rail and road—have been catered for in the main buildings. They are on three levels, vertically superimposed. This arrangement reduces the lateral movement of passengers and freight to about 100 yards. Confusion between passenger and road traffic is eliminated by an elevated road level which serves the passenger terminal above the railway station. Car and road transport parking is provided under cover between the road and rail levels. Ramped approaches lead direct from the main perimeter.



Model of the suggested airport. As seen here north is at the top. The main runway runs from south-east to north-west. It is about 2½ miles long, as is also the major axis of the elliptical lagoon.

Existing road and rail services in the locality would form links with London, which could be reached in about half an hour by fast train. Near the site is an existing cement works which would reduce transport during the construction of runways and buildings. The layout has been so planned that construction could, if deemed necessary in the interests of caution, be done in stages. This applies not only to the airfield but to the lagoon. If it were deemed doubtful that the latter would be necessary, use could be made to begin with of a tidal basin, the actual take-offs and landings being on the estuary itself.

It is estimated that the cost of the complete scheme would be in the neighbourhood of £20 million. In these days of war expenditure that represents roughly the cost of the war for a day! But even on a peace-time basis, Mr. Miles points out that up to the beginning of the war we had spent about £15 million on commercial aviation. If the lagoon were omitted, the cost would be reduced by something like £4 million.

It is estimated that the airport would handle eight million passengers a year, plus a large volume of freight.

Oil Aeration and Frothing

A Resumé of Their Source and Effects : Prevention Rather Than Cure

By G. A. CAMPBELL, A.M.I.Mech.E., A.F.R.Ae.S.

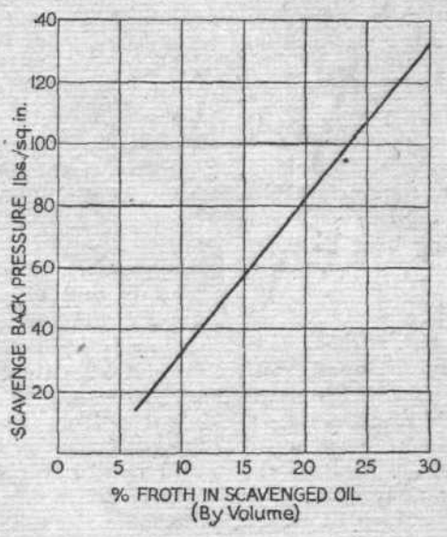
AERATION has been present in practically all dry sump engines ever since aircraft-engine development began. Very little attention was, however, given to this phenomenon, principally because the degree of aeration present was insufficient to cause any alarm or seriously to affect the functioning of the lubrication system.

In the modern aircraft engine, however, of larger size and power, which has to operate at much higher altitudes than its predecessor, the effect of oil aeration is much more pronounced. Loss of engine oil-pressure due to the engine oil pump having to pump froth instead of pure oil, the bursting of oil tanks due to excessive pressures being generated by the aerated oil in the tank, have not been infrequent occurrences in the past.

Numerous other examples, such as the surging of hydraulic airscrews and the erratic operation of other accessories which depend on the engine lubrication system, could be cited as examples of what very often happens when the lubrication system becomes badly aerated. Having mentioned the effects of oil frothing and aeration we will now investigate the source of its formation.

Excess Scavenge

First, in all dry-sump engines it is essential that the scavenge pump must be of larger capacity than the engine pressure pump. In actual practice the capacity of the scavenge pump or pumps will vary approximately from 30 per cent. to 100 per cent. greater than the capacity of the engine pressure pump according to the type of engine, i.e., radial or in-line. Furthermore, since the engine pump delivery is controlled by a pressure relief valve, the engine pressure pump is not always called upon to give its full capacity, which means that the excess capacity of the scavenge pump is relatively increased, as a result of which the scavenge pump may at times be pumping at least 60 per cent. of air and blow-by gas from the engine.



The amount of oil taken into solution is a function of the back-pressure on the scavenge-pump.

In most engines the oil that drains into the engine sump is free from aeration, the exceptions being engines fitted with additional internal scavenge pumps which are arranged to discharge into the engine sump. These latter pumps, however, usually only handle a small proportion of the main engine oil circulation, and, as will be seen later, since these pumps also operate at a low back-pressure, the degree of aeration caused by them is usually insufficient to worry about.

The main engine scavenge pump picks up oil and air from the engine sump and delivers a mixture having three distinct phases:—

(*a*) Oil containing air in solution.
(*b*) Air-oil froth in which the air is in a fine state of subdivision
(*c*) Comparatively large air bubbles.

Phase (a) is termed "aerated oil" and is responsible for at least 80 per cent. of the subsequent froth.

It will be seen from the graph on this page that the amount of air taken into solution is a function of the back-pressure on the scavenge-pump. On British and American installations it is usual to fit oil coolers in the scavenge return line, and in some instances the scavenged oil is passed through the carburettor jacket and throttles in order to prevent icing. Scavenge back-pressures up to 60 lb./sq. in. are frequently encountered, particularly when starting up from cold.

When the oil reaches the oil tank and the back-pressure is released, the air which has been forced into solution with the oil immediately begins to come out of solution and form a very stable froth; a simple analogy to this is the soda-water syphon.

This froth may cause considerable pressure to be built up in the oil tank due to its high resistance to flow through the vent pipe, and is also sufficiently stable to pass into the feed-line and pass into the engine pressure-pump; this reduces the volumetric efficiency of the pump, and if the pump has insufficient reserve capacity a fall in engine oil-pressure will result.

As may be expected, the rate of collapse of the froth created will vary with the viscosity of the oil, and experience has shown that temperatures of 70 deg. C. and over in the oil tank cause a sufficiently rapid collapse of the froth to prevent excessive pressures being built up in the oil tank, but do not prevent the passage of froth into the feed-line.

Froth in the Feed Line

The latter condition is aggravated further by the use of partial circulators, or "hot pots," in the engine oil-tank. The object of these devices is to obtain more rapid warming up of the oil when starting from cold, by reducing the amount of oil in circulation. Consequently, in an installation having an oil-tank capacity of 30 gallons the actual amount of oil in circulation will only be approximately three gallons. On the other hand, the engine oil circulation may be as high as 1,000 gallons/hour, which means that the oil in the "hot pot," or partial circulator, is being circulated through the engine at the rate of over five times per minute. It will be seen, therefore, that the time interval during which the air can be separated from the oil is very small, and for this reason, together with the fact that the froth concerned is of a very stable character, most types of air/oil separators fitted into the oil-tank are unsuccessful. Furthermore, any form of mechanical separators cannot be successfully applied to the oil between the scavenge-pump and the oil-coolers, since the air in solution would be unaffected.

From the above résumé it will be seen, therefore, that wherever aeration and oil frothing is experienced the policy to be adopted should be "Prevention rather than Cure." To do this one of two requirements is necessary.

(*a*) To remove all the back-pressure on the scavenge pump, and thus keep the amount of air which may go into solution with the oil down to a minimum value which will be insufficient to cause any defects in the installation.

(*b*) To prevent any air ever reaching the scavenge-pump, and thus irrespective of back pressure no aerated oil can be formed.

System (a) is used on many German installations and is achieved by having the oil coolers in the oil feed-line instead of in the scavenge system. By this arrangement the scavenged oil is discharged directly back into the oil-tank at low back-pressure through a comparatively large-

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OIL AERATION AND FROTHING

diameter pipe. A circulating pump is then used to force the oil from the oil-tank through the oil-coolers into the main engine pressure-pump. As will be noticed, this system requires the use of an additional pump and drive, and for this reason is known as the "three-pump system." Two further advantages claimed of this system are:—

(i) The efficiency of the coolers is increased since the quantity of oil going through them is controlled by the capacity of the circulating pump and not by the engine oil circulation.

(ii) Due to the engine pressure-pump being pressure fed by the circulating pump, the volumetric efficiency of the main engine pressure-pump is improved upon, particularly at high altitudes.

Item (b). This method of preventing air ever reaching the scavenge system is achieved by means of maintaining the scavenge-pump inlet "drowned" at all conditions. There are several ways of achieving this, but they all more or less comprise a by-pass valve in the scavenge oil return pipe, and when the level of oil in the engine sump falls below a predetermined level the by-pass valve opens to return a proportion of the scavenged oil back into the engine sump to regain the oil level required. For this reason this method is known as "the constant-level oil sump." It is not possible here to go into details of the various methods of achieving this, but this system is a complete preventative of any aeration occurring in the oil system, regardless of the back-pressure.

In the past the trend has been for the engine makers to leave the design and layout of the oil system in the hands of the aircraft constructors, and the writer wishes to stress that the only answer to lubricating-oil aeration problems lies in a major design change in the engine scavenge system, which must be developed as part of the engine and is the engine maker's responsibility.

Considerable efforts in this direction have been made of late by the various engine manufacturers concerned, particularly the Bristol Aeroplane Co., who have carried out exhaustive investigations into the various aspects of the problem.

MODESTY OVERDONE

Bristol's "Bunny" Butler Brought Out of Hiding

FOR something like twenty-five years Mr. L. F. G. Butler has succeeded in dodging the light of publicity. The result has been that, although "Bunny" Butler, as he is affectionately called, has been a well-known and greatly respected figure in the British aircraft industry during all that time, the world at large, one may say, did not know him.

We on *Flight* first met him in 1918, when he was chief designer to the Cosmos Engineering Co., formed that year to manufacture the Cosmos Mercury 14-cyl. double-row radial air-cooled engine. Mr. Butler never *would* consent to having his name made prominent. A casual mention now and then was all that could be achieved, and even that had to be done almost by stealth. We feel that it is highest time that credit long overdue should be given publicly to the man to whom Bristol aircraft engines owe so much.

Mr. L. F. G. Butler served his apprenticeship with Brazil Straker, of Bristol, where, with Mr. A. H. R. Fedden (now Sir Roy Fedden), he took part in the design of the first Straker Squire cars. After a brief period with the Rolls-Royce company he returned to Brazil Straker as chief draughtsman. His first design was the Mercury engine, mentioned above, and when the Cosmos Engineering Co. was formed in 1918 Mr. Butler became chief designer. At that time Mr. Fedden, as he then was, was technical director.

In 1918 it became necessary to submit to the Air Ministry a design for a nine-cylinder radial air-cooled engine. By working all through the night Mr. Butler had a drawing ready the next day. This drawing is dated "April 16th, 1918," and still hangs in Mr. Butler's office. The engine later became famous as the Jupiter.

One or two Jupiters were built by the Cosmos Engineering Co., but in 1920 the firm went into liquidation, and the designs and staff, including, of course, Fedden and Butler, were taken over by the Bristol Aeroplane Co., Ltd., who formed a special aircraft engine department.

Perhaps the most exciting moment in his career was when, at 3 o'clock in the morning, Mr. Butler was present to see the Jupiter complete its first 50-hour type test. Present also was Mr. Rowbotham, now Bristol engine director, who at that time was A.I.D. inspector in charge.

As chief designer (Sir Roy Fedden was chief engineer) of the Bristol engine division, Mr. Butler has been responsible for such famous types as the Jupiter, Lucifer, Pegasus, Mercury, Taurus, and Hercules engines.

Mr. L. F. G. Butler

Mr. Butler remained as chief designer of Bristol aircraft engines until 1941, when he was appointed technical advisor. A serious illness some time ago has now, we are glad to say, been completely overcome, and Mr. Butler has been restored to normal health. It is to be hoped that his great ability and wide experience may be available to the aircraft industry for many years to come.

W.A.A.F. PAINTS R.A.F.

A/CW. ELVA BLACKER, who has exhibited at the Royal Academy, the Paris Salon, and the Scottish Academy, is serving as a transport driver in the W.A.A.F. at a Fighter Command station in South-East England, and in her spare time has been painting portraits of famous pilots for the W.A.A.F. Art and Handicraft Exhibition, which opened last Saturday at the National Portrait Gallery, London, and will remain open until August 31st.

Among her subjects are Wing Cdr. Deere, D.S.O., D.F.C., and Bar, who has destroyed nineteen enemy aircraft, and Sqn. Ldr. Charles, D.F.C., who shared in the destruction of Biggin Hill's 1,000th German aircraft, which was announced a short time ago.

Before the war A/CW. Blacker had an art and photographic studio in her native town of Sutton, Surrey, where she specialised in miniature portraits. Three of these were accepted one year by the Royal Academy. Her subjects have included Mr. George Bernard Shaw and Miss Nancy Price, the well-known actress. Miss Price, incidentally, opened an exhibition for her in Bond Street in 1938.

In A/CW. Blacker's room at the station are hung dozens of portraits—in charcoal and in oils—of famous pilots who have sat for her since she joined the W.A.A.F. a year ago.

"Being in the Service has given me ideal opportunities," she said. "The pilots are grand sitters. They are considerate, and they are amusing critics, too."

Entries for this exhibition have been received from W.A.A.F. sections all over the United Kingdom. Among the exhibits are oil and water-colour paintings, charcoal drawings, tapestry work, intricate embroidery of original design, exquisite needlework, pewter, jewellery, and professional-looking toys.

Many of the officers and airwomen have worked under difficulty to complete their entries. They have snatched moments of their spare time to carry out delicate work, and have used a lot of ingenuity to obtain materials—often from discarded or otherwise useless scraps.

The Wright Brothers

An Authorised Biography at Last

THOSE interested in the birth of flight have been waiting, ever since the Wrights came to France and demonstrated that the aeroplane was no longer a myth but had actually arrived and must be reckoned with in the history of mankind, for an authentic account of their early struggles. It has appeared at last.*

Kelly, the author of the biography, was a newspaper reporter on the *Dayton Journal*, who was fortunate in living at Xenia, near Dayton, Ohio, when the Wrights were flying in 1905, but he was unfortunate in not recognising that the Wrights' flying only eleven miles away was a matter which merited investigation.

One interesting chapter in the biography brings out clearly that although the Wrights were making flights up to 38 minutes at Huffman's Pasture, located between Dayton and Xenia, the inhabitants of the district did not consider these flights of any particular importance in view of the fact that Santos Dumont was flying his dirigible in Paris for equally long periods before millions of people.

Many attempts have been made during that 40 years' period to secure permission from Mr. Orville Wright to set down in an authorised biography the various steps through which the birth of the aeroplane passed, but all these attempts to write an accredited history have failed, chiefly owing to the desire of Mr. Wright to write that history himself.

It is fortunate that Kelly has at last secured permission and the assistance of Mr. Wright to dig up, out of the files so carefully preserved by Mr. Wright in Dayton, the particulars and records to make a most interesting biography of the brothers and their work. The result has been the publication of this book, which will enable future generations to go to this authoritative source for particulars of what happened during the evolution of the aeroplane.

The most interesting feature in the book, which will be appreciated largely in Europe, is the account of how the Wrights, in their very open manner, described their invention to Chanute. Chanute, in his desire to further aeronautical progress, went to his native France and gave an address on the Wrights' gliding experiments of 1901 and 1902. By January, 1904, no fewer than six gliders of the Wright 1902 type were being built in France as a result of the data furnished by Chanute.

This gave Voisin his start towards becoming a famous aircraft manufacturer. It was on the Voisin machine that the French industry commenced and resulted in Santos Dumont flying the first power machine to be flown in Europe in October, 1906. Later Captain Ferber made clear in the *Aerophile* that whatever was accomplished in French aviation at that date was all a direct outgrowth of information about what the Wrights had accomplished in America.

Kelly goes on to describe how French efforts at aviation grew until the time when Wilbur Wright brought his aircraft to Le Mans in 1908 and demonstrated to the French nation, and the visitors who came from England and from all Europe to Le Mans, that flying had, indeed, arrived.

Wilbur Wright, when he flew at Le Mans in 1908, had no difficulty in outflying all the copyists who were making short flights based on such particulars as were obtained from time to time in the interval between the news of the first Wright successes and the demonstrations by Wilbur at Le Mans in 1908.

The biography describes the Wrights' experiences in the Patent suits in America, Germany and France, in all of which judgment was given for the Wrights as the pioneers in the art of flying.

Kelly terminates his interesting story with a reference to the efforts made to set up the late Secretary Langley, of the Smithsonian, as the builder of the first machine capable of flight, and mentions the lecture delivered by Griffith Brewer before the Royal Aeronautical Society in October, 1921, which exposed the fraudulent nature of the Hammondsport Tests.

Kelly is careful to absolve Langley from making any such claims, and he gives full credit to Dr. Abbot, the present Secretary of the Smithsonian Institution, for his courageous recantation of the claims made by the Smithsonian. He emphasises his regret that statements were repeatedly made by officers of the Institution that the Langley machine was flown in 1914 without mentioning the fundamental changes which had been made to the machine at Hammondsport for the purpose of the later tests. G. B.

*The Wright Brothers: A Biography, Authorised by Orville Wright, by Fred C. Kelly, (430 pages, Harcourt Brace & Co., New York. $3.50).

ROTOL TAKES TO THE WATER

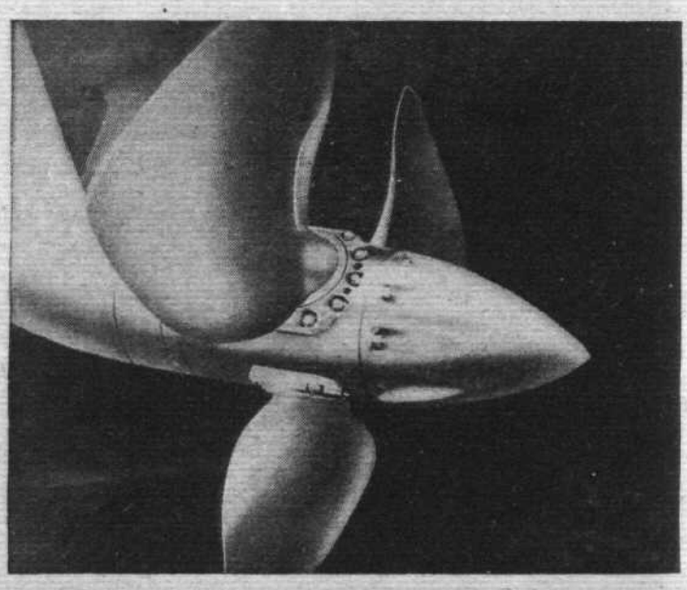
First V.P. Marine Propeller

IN view of the tremendous progress made in recent years in the development of variable-pitch airscrews it is scarcely surprising that at long last the possibilities of the application of the v.p. principle to marine screws should have occurred to the Navy and to other seafaring folk. When the demand arose, the Rotol firm was ready to tackle the new problems arising out of the very different working conditions, and in a very short time, as such progress is measured, the variable-pitch marine screw has been made a reality.

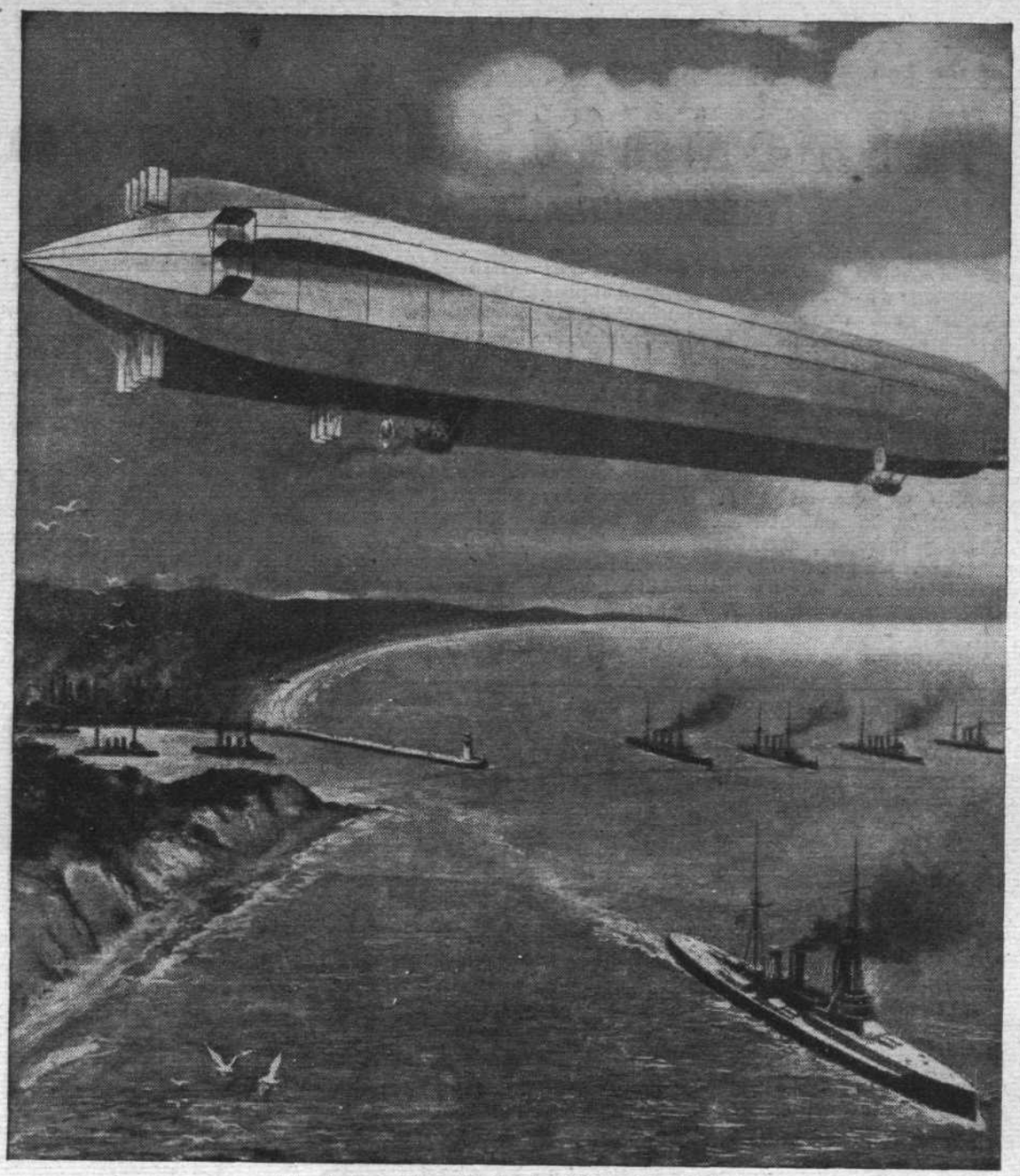
For a vessel operating during most of its journey at one particular speed, the advantage of the v.p. screw is probably not great, but where traffic is largely unidirectional, so that on one trip the vessel is loaded and on the other it is in ballast, considerable advantages may be expected. For certain operating conditions, when a vessel has to steam for considerable periods at reduced speed while at others it runs at full speed, the v.p. screw again scores on fuel economy and the ability to run the engine always at its most favourable speed.

A considerable saving in weight, cost and complication should also attend the use of v.p. screws, since reversing gear or a separate reversing engine can be done away with. On twin-screw vessels the extra manœuvrability might almost eliminate the need for tugs.

The Rotol v.p. marine screws can be operated electrically or hydraulically.



A Rotol variable-pitch, fully feathering and reversible-pitch marine propeller for any engine of approximately 1,000 h.p. Development of other sizes is in hand.



The first airship built for the Navy, launched at Barrow-in-Furness, May 22nd, 1911

WHEN WE WERE YOUNG

Nineteen hundred and eleven saw also the launching of Cellon; but that was not a matter of public interest. Yet though it could not be foreseen at the time, it was a matter of national interest, for Cellon is playing no small part in the country's war effort. The industrial progress of the past thirty-two years is reflected accurately in the development of Cellon.

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Aircraft Types and

MESSERSCHMITT Me 108 B TAIFUN

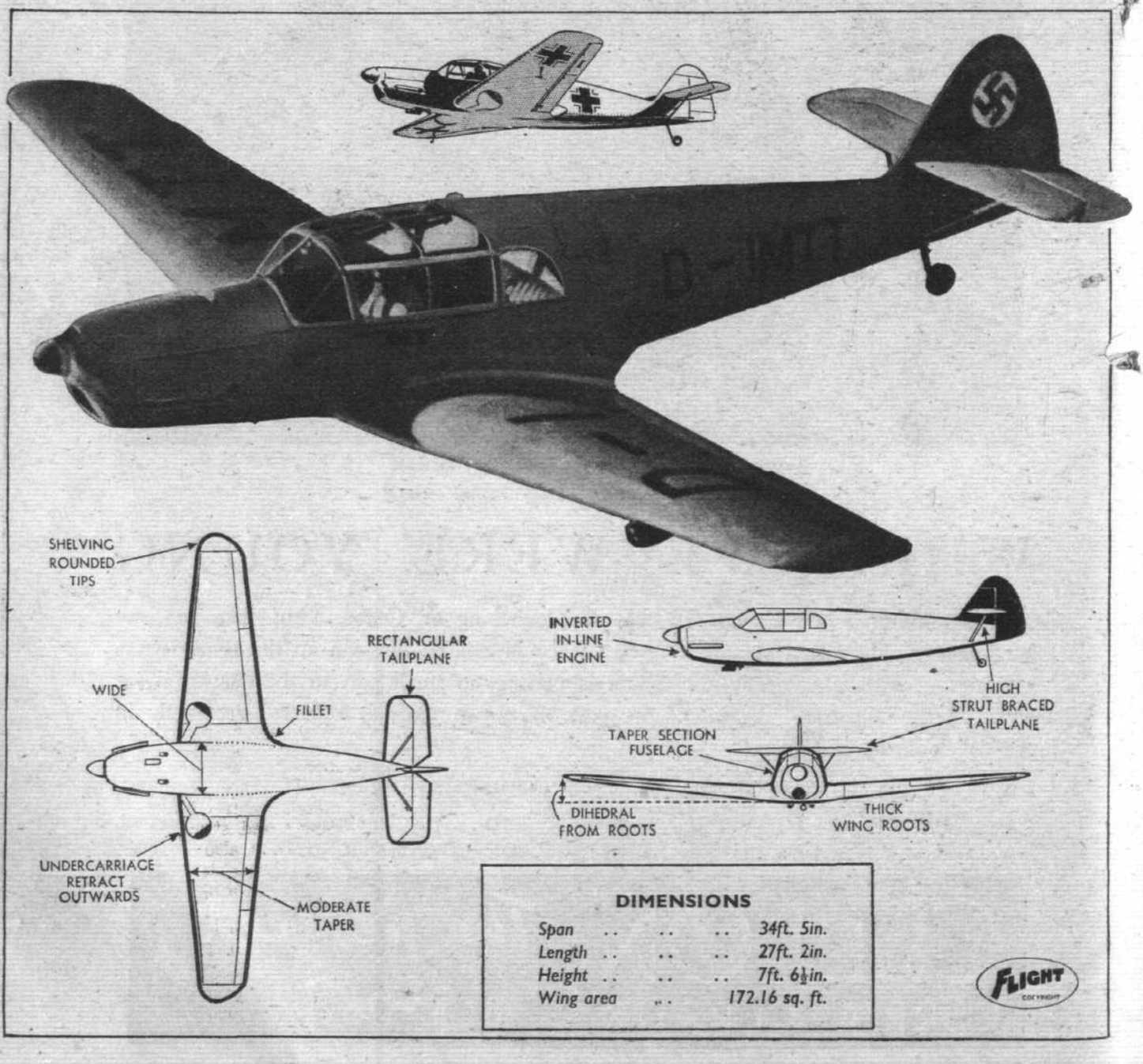
THE science of aircraft recognition probably reaches its trickiest stage when outline and markings appear to contradict each other, and captured enemy machines with R.A.F. roundels flown in this country or behind Allied lines in an overseas theatre of war, though by no means a common sight, are seen often enough to make many a spotter's heart miss a beat.

It is, perhaps, not generally known that a number of Messerschmitt Me 108B four-seater communication aircraft were in service with the R.A.F. in Great Britain during the earlier stages of the war, on general communication duties, and we understand that at least one of these is still in use. Possibly there are several still flying.

Their superficial resemblance to Me 109 fighters has, no doubt, caused more than one roof-top alarm button to be hastily pressed before the reassuring R.A.F. markings were noticed.

The wings and tail unit of the Taifun, which in the R.A.F. is known as the Aldon, are almost identical with those of the fighter, the difference lying in the fuselage and engine. The former is, naturally, very much wider, since it provides a four-seater cabin, while the engine is an Argus eight-cylinder inverted V type air-cooled engine of 270 h.p., which gives it a top speed of 196 m.p.h. and a cruising speed of 187 m.p.h. The Aldon, in fact, was probably the fastest aircraft of its class ever used on general communications duties.

The Me 108 series began as long ago as 1936, and was, in fact, the natural ancestor of the Me 109 fighter type. All-metal construction is employed in both fuselage and wings, light alloy stressed-skin covering being used throughout except for fabric-covered control surfaces. Plain slotted trailing-edge flaps and Handley-Page slots to the leading-edge are fitted. The wings fold for easy stowage and the undercarriage retracts outwards and backwards.



DIMENSIONS

Span	*34ft. 5in.*
Length	*27ft. 2in.*
Height	*7ft. 6½in.*
Wing area ..	*172.16 sq. ft.*

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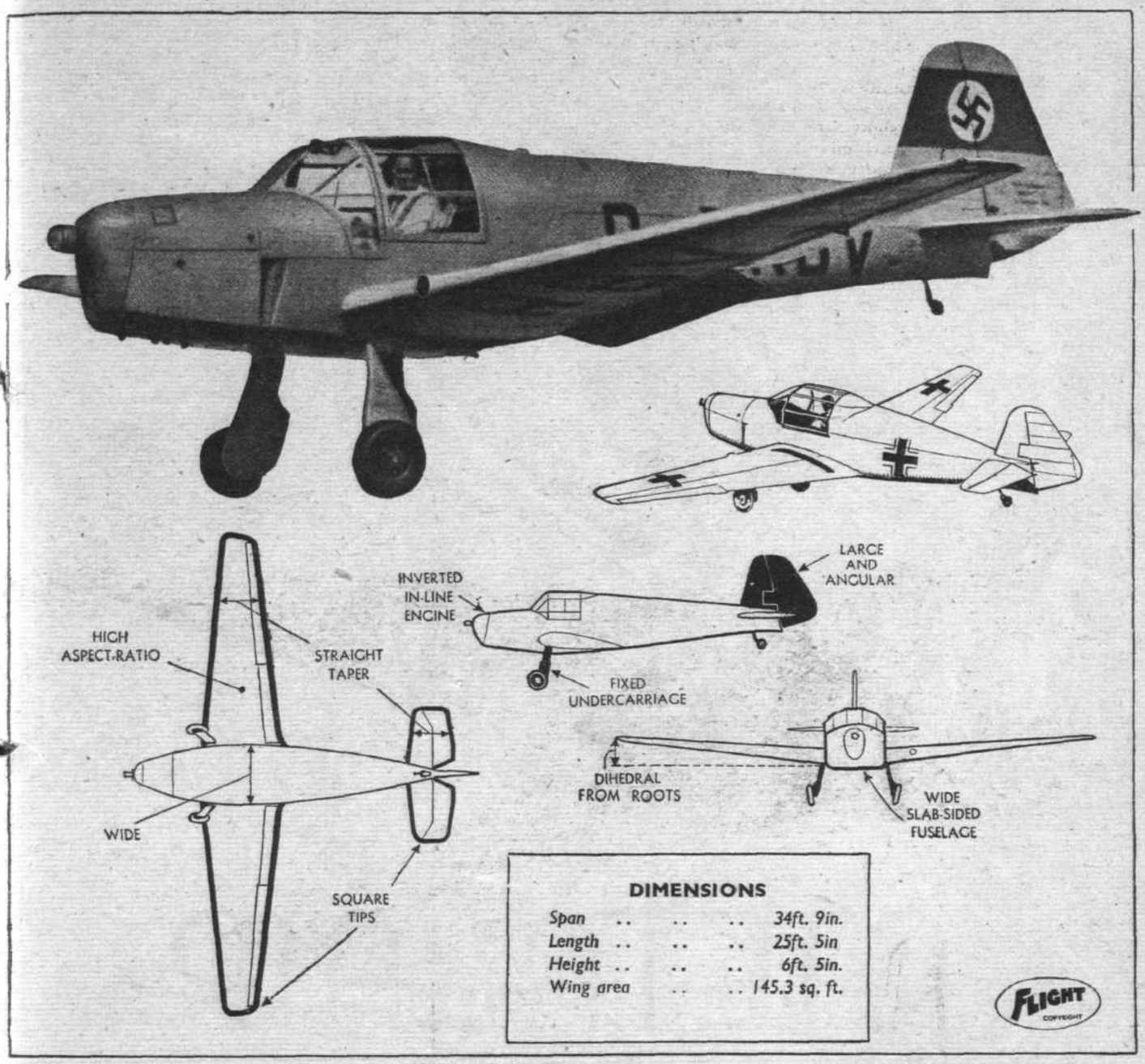
Their Characteristics

BÜCKER Bü181 BESTMANN



VERY similar in size and general appearance to the Taifun (except that it has a fixed undercarriage), the Bücker Bü 181 Bestmann is widely used at the flying training centres of the *Luftwaffe*, and considerable numbers of this type are believed to be in service; it can, in fact, be described as the German parallel to our own ubiquitous "Maggie."

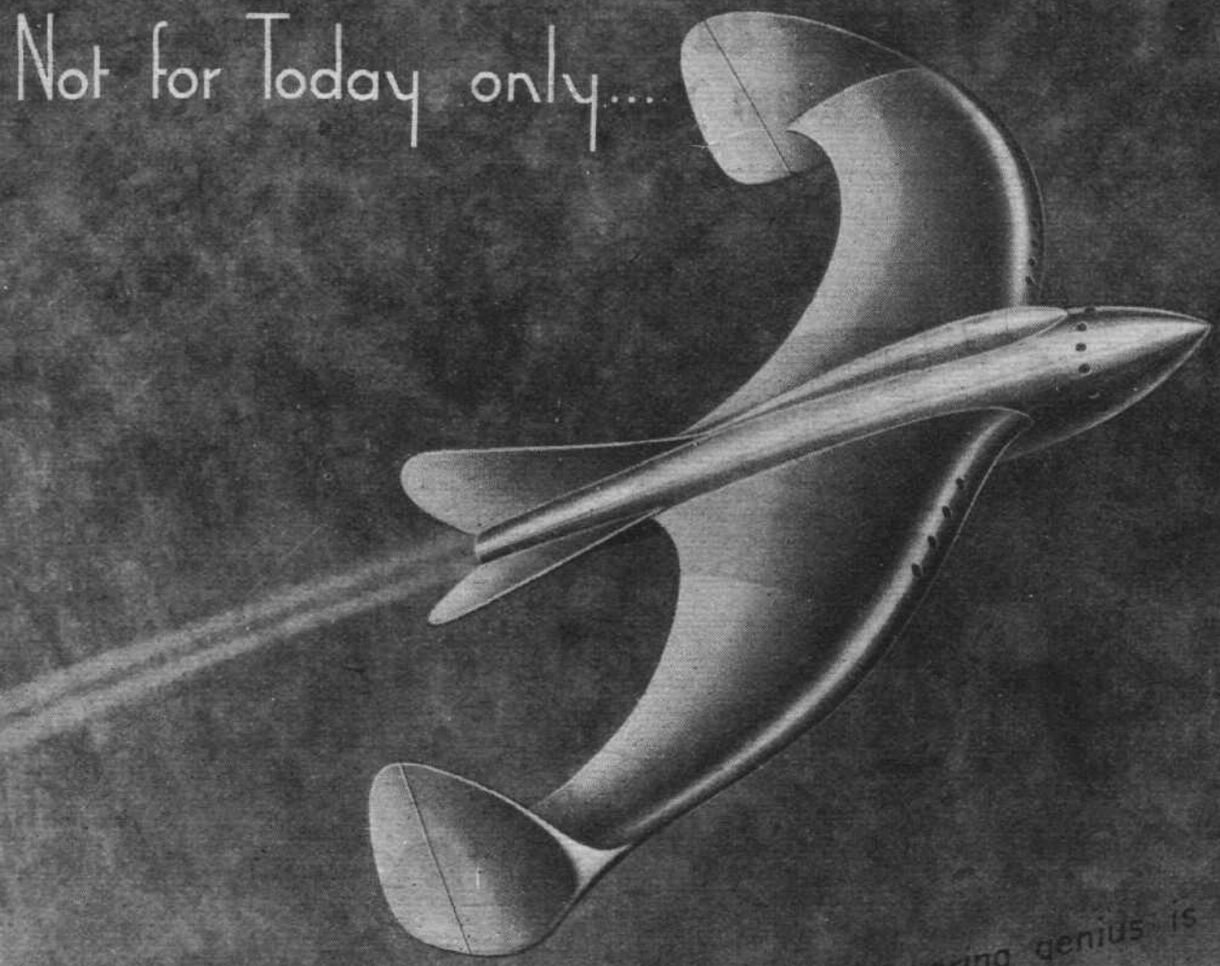
Students of recognition may, perhaps, say that there is little need for them to make themselves familiar with a German trainer, but the Bestmann is also used as a light two-seater communications type, and the day may not now be far ahead when those in the Services will once more be fighting on Continental soil—even on German soil—and the declining strength of the *Luftwaffe* may well result in types not intended for "front line" service being necessarily used for duties which will bring them into contact with the Allied forces.

Powered by a Hirth four-cylinder inverted, in-line, air-cooled engine developing 85 h.p. at 2,360 r.p.m. and 105 h.p. at 2,530 r.p.m. for take-off, the Bestman has a top speed of 133 m.p.h., a cruising speed of 120 m.p.h., a service ceiling of 16,400ft. and a range at operating speed of 500 miles.

Mixed wood and metal construction is employed, the fuselage being a fabric-covered structure of welded steel tube, and the wings of wood also with fabric covering. The tail unit is a welded tubular structure, fabric covered. Trailing-edge flaps are fitted, bringing down the landing speed to 45 m.p.h.

It may be useful at some future date to know that not all Bestmanns are enemy aircraft, for the type is also used as an elementary trainer by the Swedish Air Force, to whom it is known as the Sk 25 primary trainer. These are now being manufactured in Sweden.

Not for Today only...



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Plywood and Plastics—II

Moulded Plywood Construction : Characteristics of Wood Veneer : Effects of Moisture Content : Glue Spread

By W. NICHOLS, A.R.Ae.S.

(Continued from page 102, July 22nd, 1943)

MORE recent developments have introduced an entirely new type of plywood, different in appearance and application and manufactured under widely different methods. This class of manufactured wood is known as laminated or impregnated wood. Whereas the grain of the plies in plywood are arranged at 90 deg. or 45 deg. to each other, in laminated wood the grain of the successive veneers run parallel to each other, or nearly so. Laminated wood is usually produced in plank form and not sheet form as with plywood.

For the structurally important parts of aircraft the British industry uses plywood of the latter variety, manufactured to B.S. Specification V3, which calls for plies of birch (European or sweet or yellow) or rock maple. Strength properties of this material are given in Table 5, compared with those for a similar plywood prior to the use of modern synthetic adhesives; the superior characteristics of the modern material should be noted.

A further specification, D.T.D.427, covers the ordinary commercial qualities of plywood made from various timber for lightly stressed aircraft parts. In addition, there is also a B.S. Specification V.34 for plywood for use on unstressed parts, much more elastic in choice of timber.

TABLE 5.—TENSILE STRENGTH OF BIRCH 3-PLY, lb./sq. in.

Material		Parallel to Grain	Normal to Grain	45 deg. to Grain
Plywood cemented with organic glues.	Ult. tensile stress	10,000–12,000	6,500–7,500	4,000–4,500
	Elastic modulus	1.2×10^6	0.7×10^6	0.3×10^6
Plywood cemented with Tego film glue.	Ult. tensile stress	15,000–16,000	8,000–9,000	6,000–6,500
	Elastic modulus	1.7×10^6	0.95×10^6	0.5×10^6

Unfortunately, three-ply wood is far from being isotropic. The pronounced grain structure of the wood precludes this. From Table V it will be noted that the tensile strength of three-ply wood at 45 deg. to the grain is less than half that parallel to the grain. Actually, in the former case failure always occurs due to shear along the grain. Modern applications to plywood structures can, to some extent, overcome this difficulty, and will be referred to later.

A plywood structure, however, distributes the fibre strength of the wood, greatly reduces swelling and shrinkage and eliminates to a large extent the possibility of the material splitting. The durability of such a material is largely dependent upon the bonding medium. Phenolic and urea resins have been applied to the veneers as dry powders, in solution or emulsion, and, more recently, in "film" form.

Laminated Compressed Wood

An important factor in obtaining maximum adhesion with synthetic resins in plywood manufacture is the control of the moisture content before hot-pressing. This point is dealt with under the characteristics of wood veneers. Developments in the use of cold-curing synthetic resins as the bonding medium are also taking place.

After plywood, the next step in improving natural wood was to minimise the effect of the grain structure on its strength properties. The compressive strength of most woods is approximately half the tensile strength, a characteristic which is due to instability of the grain fibres under compressive loads. Consequently, it was conceived that if the pores and cells in the wood could be filled with a substance having a good compressive strength/weight ratio, some degree of uniformity in strength might result. One of the many types of synthetic resins available was chosen, and much of this early research work was conducted in Germany. Impregnation of solid timber was not a success, due to the difficulty of inducing the resin to penetrate into the timber more than a few hundredths of an inch below the surface. The idea was then conceived of impregnating thin veneers with resin. These experiments eventually led to the production of laminated compressed wood, which in this country is manufactured to Specification D.T.D.370, birch veneer being the only timber allowed.

In Table 6 representative strength characteristics of natural birch wood, cresol synthetic resin and laminated birch wood compressed and impregnated are compared. It will be noticed that the natural wood has a high ratio of tensile to compressive strength, and that the cresol synthetic resin has nearly the same ratio inverted. The effect when combining the two materials is therefore to produce a third, having compressive and tensile strengths substantially equal to unity.

By thoroughly impregnating seasoned wood veneers with phenol-formaldehyde resin, drying and hot pressing together, the material produced results in both the wood and the resin losing their separate identities, and the result is a new product of interesting properties.

After preliminary seasoning, the wood veneers are processed under heat in a press to remove "free" water. A batch of dried veneers are then loaded into metal cages and placed within an impregnating vessel. The vessel is next evacuated in order to complete the removal of any free moisture left in the wood. An alcohol solution of phenolic resin is added and pressure applied to the vessel. After thorough impregnation, the veneers are removed and submitted to action of heat and vacuum in another vessel in order to remove the alcohol.

Balanced Properties Due to Resin Used

Hot pressing is carried out in multiple daylight steam-heated presses, the required number of veneers being packed between the platens. Hot-pressing reduces the thickness by about 30 per cent. or more, and the temperature and pressure used are carefully controlled in order

TABLE 6

Properties	Natural Solid Birch 15 per cent. Moisture Content		Impregnated and Compressed Laminated Birch (Synthetic Resin)			Cresol Synthetic Resin
Specific gravity	0.70		1.0			1.2
Density (lb./cu. ft.) ...	44		62			75
				Normal to Grain		
	Parallel to Grain	Normal to Grain	Parallel to Grain	Normal to Veneers	Parallel to Veneers	
Ult. tensile stress (lb./sq. in.)	21,000	—	22,000	—	2,000	5,000
Ult. compress stress (lb./sq. in.)	8,500	1,500	21,000	8,000	7,500	22,000
Ult. shear stress (lb./sq. in.)	2,500	1,500	4,000	—	2,000	—
Elastic modulus E ...	1.8×10^6	—	3×10^6	—	—	0.7×10^6
Modulus of rupture (lb./sq. in.)	15,000	—	25,000	—	—	—
Impact value (ft./lb.) .	—	11.5	—	6.5	7.5	—
Tensile/sp. gr.	3.0×10^4	—	2.20×10^4	—	—	—
Compress/sp. gr.	1.21×10^4	—	2.10×10^4	—	—	—
E/sp. gr.	2.57×10^6	—	3.0×10^6	—	—	—

PLYWOOD AND PLASTICS—II

to get uniform and consistent material. The phenol formaldehyde resin used has high compressive strength and low tensile strength, and therefore the impregnated and bonded wood has considerably improved and balanced properties. Increase in strength is accompanied by an increase in specific gravity, influenced by the percentage of resin present and the curing pressure. Increase in s.g. produced by increased pressure raises the tensile strength at a greater rate than the compressive strength, whilst the s.g. increase resulting from higher resin content raises the compressive strength at a greater rate than the tensile strength. By variations of the method of manufacture, the strength characteristics can be varied between wide limits. The graph in Fig. 3 shows the effect of higher specific pressures upon ultimate strength, and the curves in Fig. 4 show the result of varying pressures used upon original thickness.

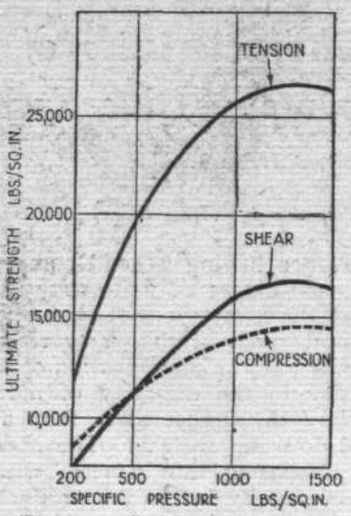

Fig. 3. Laminated compressed wood. Effect of higher pressures upon ultimate strength.

Increasing the density also serves to lock the wood fibres in the compressed condition, and prevents an elastic return to the original volume.

A material produced in a similar manner and incorporating differential pressure (that is to say, pressure between parallel platens of a pile of veneers with a pile thicker at one end than the other) is used for the manufacture of wooden airscrew blades which have to withstand high stresses at the root or hub end; such stresses taper off along the blade length to zero at tip.

Moulded Plywood Construction

Examples of wood veneer bonded and impregnated with synthetic resin in the manufacture of wood airscrew blades are to be found in the Rotol Jablo wood blade produced from a series of laminated compressed boards built up of Canadian birch veneers shown in Fig. 5. The Rotol Weybridge wood blade uses "Jicwood" material; the properties of which are given in Table 7. It is made from laminated compressed boards produced from birch veneers for the highly stressed root portion of the blade and is illustrated in Fig. 6. A more recent development in this sphere is the Hydulignum wood blade, which also uses compressed boards produced from Canadian birch veneers. The Hydulignum process differs from all others in that the planks are compressed edgewise as well as flatwise.

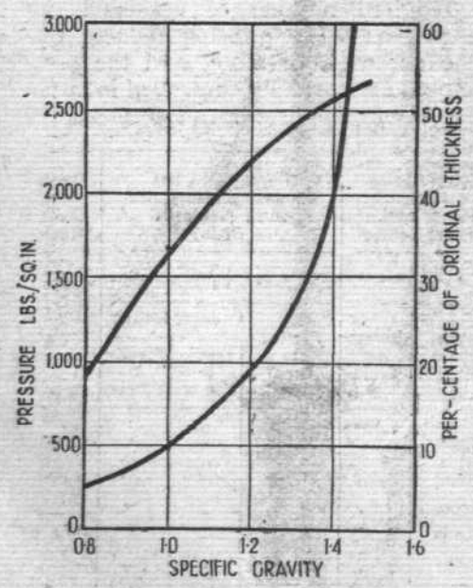

Fig. 4. Laminated compressed wood. Result of varying pressure upon original thickness.

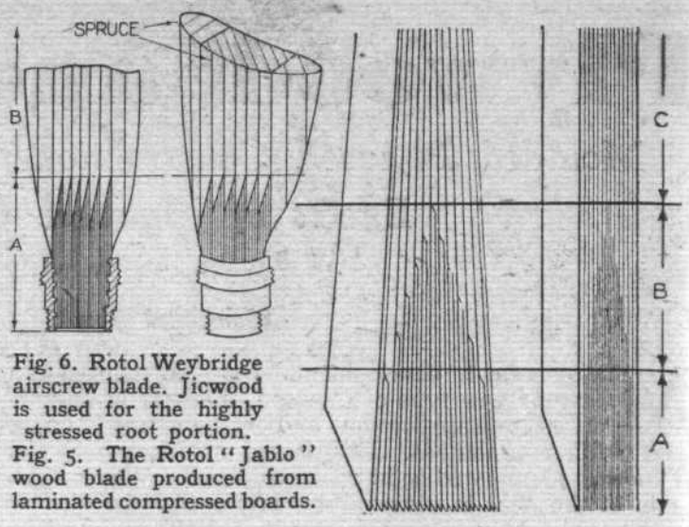

Fig. 6. Rotol Weybridge airscrew blade. Jicwood is used for the highly stressed root portion.

Fig. 5. The Rotol "Jablo" wood blade produced from laminated compressed boards.

TABLE 7.—PHYSICAL PROPERTIES OF COMPRESSED AND IMPREGNATED "JICWOOD"

	Tensile	Compression	Shear	"E" Modulus ×10⁶ lb.	Spec. Gravity
	Tons per sq. in.				
Compressed Jicwood	21.3	11.8	3.3	4.3	1.36
Impregnated Jicwood	9.0	5.5	2.25	2.0	0.9

These latest developments in manufactured wood with such a favourable change in strength characteristics through increase of density are perhaps analogous to the alloying and heat-treatment of metals to improve their qualities, and it certainly gives to woodworkers the opportunity to meet design requirements that were quite beyond the range of normal wood.

Even so, this variety of wood is strictly confined to specific purposes, and does not meet entirely the requirements of the aircraft engineer in converting from metal-stressed skin construction to wood construction upon similar lines. In this respect the disadvantages of natural wood have had to be overcome by somewhat different methods resulting in the use of wood veneer in the form of resin bonded and impregnated plywood for moulding the main component parts of a complete aircraft. This recent and most important development in aircraft engineering is dealt with in the following sections of this article, also data and characteristics relating to various species of wood veneer and the importance of moisture content control before finally dealing with some problems of design.

The tendency for a return to wood construction of aircraft has been made possible, to a great extent, by the superior qualities and durability of plywood aided by the versatility of the modern syntheic adhesives which, during recent years, have become available.

Earlier sections of this article dealt with the characteristics and application of such adhesives to wood veneer in the manufacture of plywood panels and impregnated compressed woods, leading up to the more recent and important development in the history of aviation: moulded plywood construction, aided by the plastic element.

Manufacturing Processes

Natural plywood cannot be forced into compound curvatures or sharp single curvatures in one direction without setting up initial stresses which would make it entirely unreliable for aircraft purposes.

On the other hand, the recent development of resin-bonded and impregnated plywood has all the characteristics of an ideal aircraft material. Several processes are already being used successfully for moulding complete aircraft of the trainer class and for component parts of much larger aircraft in the form of wing tips, bomb-bay doors,

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Hawker Typhoon—The world's most formidable fighter. Powered by a single Napier Sabre engine and armed with either four 20 mm. cannon or twelve 0.303 machine guns.

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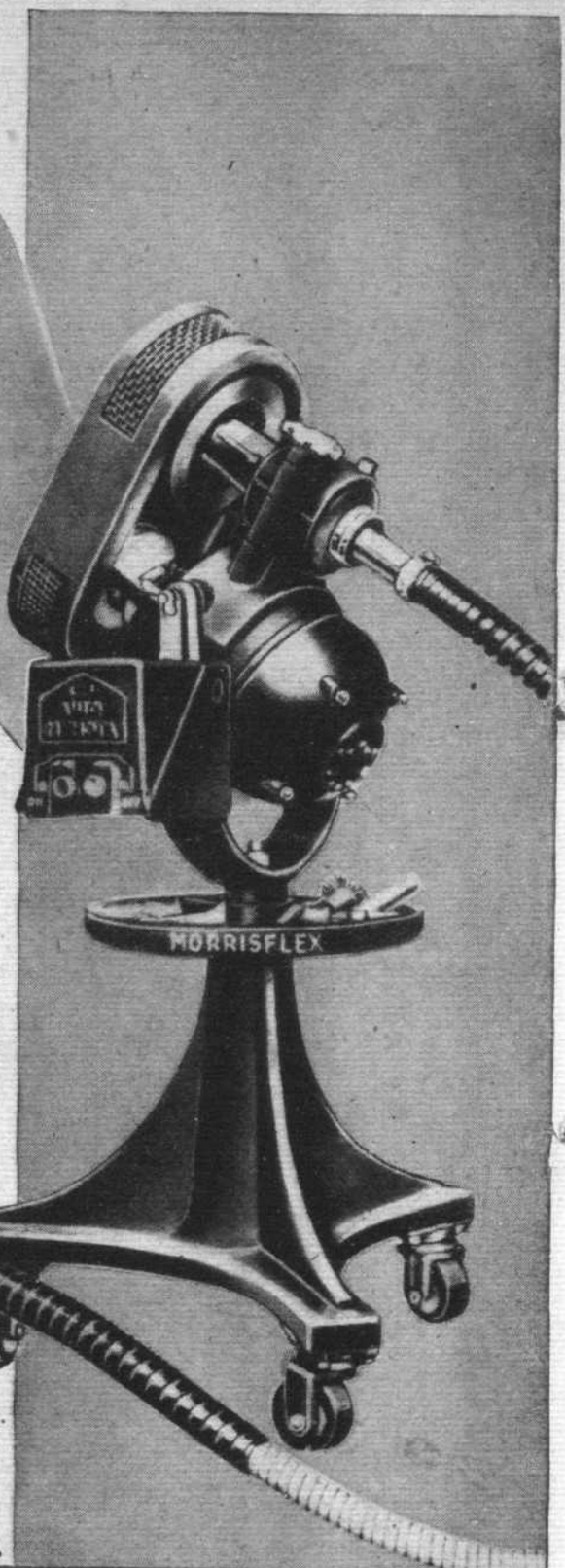

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PLYWOOD AND PLASTICS—II

floors, seats, tanks and other units. Aerodynamic efficiency, largely dependent upon external form and finish, is achieved with marked success with this technique, which undoubtedly will be used extensively in the post-war development of civil aviation.

The manufacturing processes involved have already been reviewed at intervals in past issues of *Flight*, so that only a brief description need by given here. In moulding aircraft and component parts in plywood the fundamental principle is the use of heat and fluid pressure applied simultaneously. During the moulding process the wood veneers become impregnated with synthetic resin, which fluxes under the application of heat and is forced by pressure into the wood fibres. The operation is performed with the plywood in contact with a suitable mould. When, after the curing period, the resin has set, a plywood unit of the required shape is obtained.

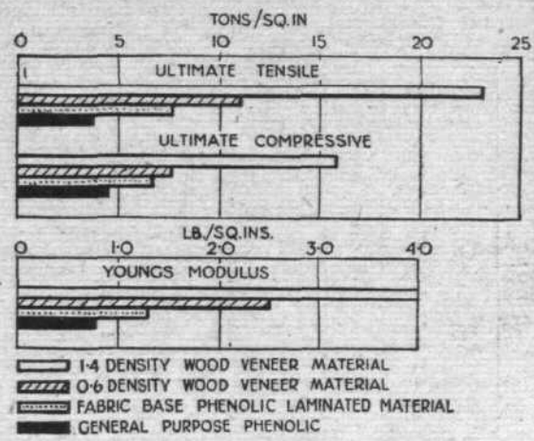


Fig. 7. Comparison showing the superior characteristics of wood veneers with other plastic materials.

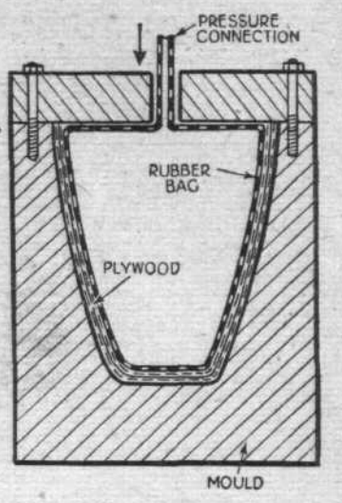


Fig. 8. Completely enclosed forms may be moulded by the internal moulding process shown above.

In most cases fluid pressure is obtained by means of an inflated or deflated rubber bag which is used either as the male or female member of the mould. Pressure supplied by this means develops in a direction everywhere normal to the surface of the work, irrespective of curvature. For certain complex forms veneer sheet is not always practicable. In such cases narrow strips are sometimes used, cut to tapered, trapezoidal or triangular form where necessary to facilitate the forming of the final shape.

Use of Hot- and Cold-setting Adhesives

More recently veneers have been impregnated prior to "laying-on" the mould, a practice associated with the manufacture of laminated plastic materials. In either case the veneers are bonded by the hot process with a thermo-setting adhesive. This, it is claimed, gives improved durability and has greater moisture resistance. In contrast to this, however, the Langley Aircraft Corporation, in the construction of their twin-engined plywood aircraft by the Vidal process, selected Vinyl thermo-plastic resins for the bonding agents as being the most satisfactory over the required temperature range of 40 deg. C. to +160 deg. C. Due to the fact that thermo-plastic resins can be reworked it would appear that their use will facilitate repairs and more convenient servicing.

In general, the use of hot-setting adhesives is advocated for panels and the cold-setting type for the production of heavier frames or final assemblies. This is recommended because of the danger of damaging the outer wood by over-heating when the hot-setting type is used, the cure time being proportional to the thickness of the members. The necessary steam heat and pressure for moulding the plywood are obtained by using autoclaves, which are relatively easy and cheap to construct.

In America such autoclaves are some 8ft. in diameter and up to 35ft. in length. It is understood that larger equipment is in course of construction, so that limitations of the process which at present confine its application to complete light aircraft and trainer types may be removed.

The use of moulded plywood offers all the advantages of moulded plastics, and many of the difficulties which accompany the use of the latter material disappear. Its superior qualities in comparison with other plastic materials are grouped in the chart, Fig. 7. The weight of plywood is even lower than that of plastics, and the vibration-damping properties of this material are well known. The application and future development of this modern technique to aircraft engineering is indeed promising, and for that reason will be approached later from the design point of view.

In this country Merron, Ltd., and Renn's Shaped Ply, Ltd., are engaged in this class of work and employ both the external mould and the internal rubber bag method. By the internal method it is possible to produce completely enclosed forms, such as the cylindrical or conical units, shown in Fig. 8, as the bag is collapsible and can be withdrawn after releasing internal pressure.

Among the successful processes operating in America are Duramold, Vidal and the Timm Aeromold process. Moulding the supporting structure integrally with the plywood skin is a characteristic feature in certain of these processes, in which the following are among the advantages claimed: Fire resistance (since the thickness of the plywood skin will resist the effects of heat longer than a thin light-alloy skin), freedom from pulsation; external rivet heads and overlapping joints, combined with a superior finish which improves aerodynamic efficiency. Typical examples of the process are illustrated in Fig. 9. It is conceivable that a high-speed aircraft of this construction could be quite a good deal faster than a similar aircraft of metal construction.

From what has been written it will be noticed that apart from the plastic element the use of wood veneer predominates throughout in these latest applications of wood to aircraft engineering, and it becomes equally essential to study the characteristics of such material.

The production of veneer offers several distinct advantages to the manufacturer in addition to the engineer. For example, thin planks and veneers can be seasoned much more rapidly and economically than ordinary timber; sliced or rotary-cut veneer gives greater yield per log, as there

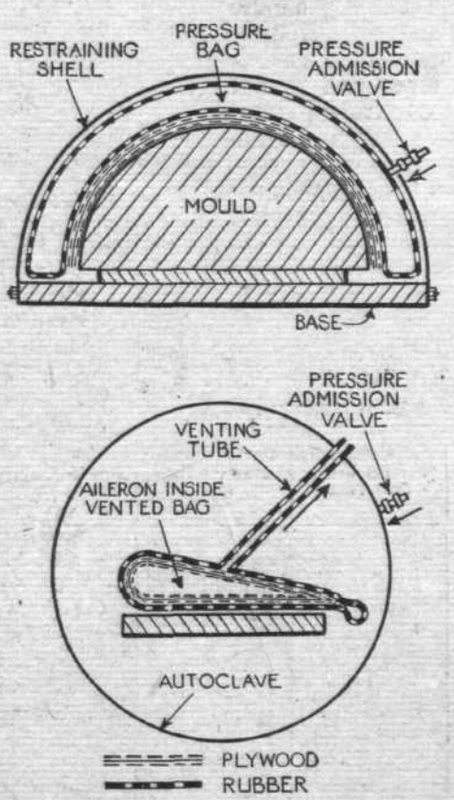


Fig. 9. Moulded plywood construction. Top: The inflated bag method, positive pressure. Bottom: The deflated bag method, vacuum pressure.

PLYWOOD AND PLASTICS—II

TABLE 8
A COMPARISON OF IMPORTANT WOODS USED IN THE MANUFACTURE OF PLYWOOD

Species	Average Value Spec. Grav.	Per cent. Walnut
Group 1. High Density Woods :		
Beech	0.64	116
Birch	0.62	113
Maple	0.63	115
Group 2. Medium Density Woods :		
American (Black) Walnut	0.55	100
Douglas Fir (Coast Type)	0.48	87
Douglas Fir (Mountain Type)	0.43	78
African Mahogany	0.45	82
Cuban Mahogany	0.59	107
Mexican Mahogany	0.45	82
Nicaraguan Mahogany	0.48	87
Peruvian Mahogany	0.55	100
Group 3. Low Density Woods :		
Yellow Poplar	0.40	73
Spruce—Sitka	0.40	73
Spruce—Eastern Red and White	0.41	75

TABLE 9
EQUAL THICKNESS

Group No.	Thickness	Wt.	Bending Strength	Stiffness	Shock Resistance	Wt. lb./cu. ft.
1	1.00	100	100	100	100	44
2	1.00	82	82	83	76	36
3	1.00	64	66	80	45	28
EQUAL WEIGHT						
1	1.00	100	100	100	100	—
2	1.22	100	122	152	93	—
3	1.57	100	164	311	71	—

A comparison of the strength of wood on a thickness and weight basis. All values in these tables are relative.

is no saw-waste and it can be handled and transported faster and cheaper. The strength properties of most importance can be emphasised in laminating, and likewise a combination of several species of wood can be arranged in one pre-fabricated unit.

The veneer used in all forms of plywood is generally sliced off a log revolving in a lathe, and may well be regarded as a circumferential plank. Due to the fact that the stem of a tree generally has a taper and is not accurately circular, the veneers are not cut truly parallel to grain. The want of parallelism between length of grain and length of veneer can reduce the strength wherever it occurs. Recent experiments in riving off veneers that are exactly parallel to the grain have met with success, except for the fact that cutting can be wasteful, due to irregularities in the grain producing a proportion of spoiled sheets. Veneer produced in this manner is referred to as "rotary-cut," and is almost exclusively employed in this country in the manufacture of plywood. The B.S.

TABLE 10
STRENGTH PROPERTIES AIRCRAFT STRUCTURAL PLYWOOD

Species Name	Spec. Grav.		Column Bending Modulus Parallel to Grain of Face Plies		Mod. of Elasticity Parallel Grain Face Plies		Tension Parallel Grain of Face Plies		Splitting Resistance
		Per cent. Walnut	lb. sq. in.	Per cent. Walnut	lb. sq. in.	Per cent. Walnut	lb. sq. in.	Per cent. Walnut	
Group II. Medium Density Woods :									
American Walnut	0.59	100	12,660	100	1,740	100	8,250	100	100
Douglas Fir	0.48	82	9,340	74	1,530	88	6,188	75	121
African Mahogany	0.52	88	8,070	64	1,260	72	5,370	65	No data
"True" Mahogany	0.48	82	8,500	67	1,250	72	6,390	77	No data
Group I. High Density Woods :									
Beech	0.67	114	15,390	121	2,150	123	13,000	157	122
Birch	0.67	114	16,000	126	2,260	130	13,210	160	130
Maple	0.68	115	15,600	123	2,110	121	10,190	123	148
Group III. Low Density Woods :									
Poplar	0.50	85	8,860	70	1,540	89	7,390	89	66
Sitka Spruce	0.42	71	7,710	61	1,370	79	5,650	68	100

A comparison of strength properties of three-ply panels (Data based on tests of plywood, all plies being one species). As the number of plies per panel is increased there is a little change in the strength relationship between species.

TABLE 11

Wood	Bending Strength per cent.	Stiffness per cent.
Grain lengthwise	100	100
Grain crosswise	6	5
3-ply Plywood :		
(a) Grain outerplies lengthwise	82	96
(b) " " crosswise	17	9
5-ply Plywood :		
(a) Grain outerplies lengthwise	67	81
(b) " " crosswise	30	25
7-ply Plywood :		
(a) Grain outerplies lengthwise	60	73
(b) " " crosswise	34	33

Above values based on material (plywood) in which all plies are same thickness and same kind of wood.

Specification for plywood also permits veneers to be sliced or sawn from the log, providing the samples from stock of the finished plywood can pass the test laid down.

The thickness of veneers may vary from extremely thin sheets of 0.01in. thick, but with most species of timber it is difficult to obtain rotary-cut veneers of less than 0.05in. thick.

Very little information is available to the designer on the characteristics of the numerous species of wood veneers. As a result the American Walnut Manufacturers' Association recently prepared and distributed a compilation and analysis of important data on each of the woods in considerable use. Abstracts from this publication are of particular interest. The species of timber are divided into three groups: high, medium and low-density, and the characteristics are compared as a percentage of those for walnut.

In Table 8 a comparison of the important woods used in plywood construction has been tabulated. A comparison of the strength of wood on a thickness and weight basis for the three groups are given in Table 9. Table 10 gives a comparison of strength properties of three-ply panels, the data having been based upon plywood tests in which all plies were of the same species. It is stated that as a number of plies per panel are increased there is little change in the strength relationship between species.

The data in Table 11 are especially interesting, and show the effect of the run of the grain of the outer plies on bending strength and stiffness. These values are based on plywood in which all plies are of the same thickness and same species. The values quoted in these tables should receive consideration in the design of components, particularly where the properties of stiffness and shock resistance are important.

Tangential and Radial Shrinkage

It should be noted that the less dense, Group 3, woods are far more stiff on a weight basis, but they have a much lower rating in shock resistance compared with other woods. By a well-thought-out combination of the several woods upon this basis, the best and most consistent results may be obtained.

Before dealing with that most important aspect, moisture content, some observations on the shrinkage of wood are worth attention. All woods shrink more tangentially parallel to the growth rings than radially (perpendicular to the growth rings). An ideal wood for aircraft purposes would be one in which a low percentage was combined with a low ratio between the amount of shrinkage in either direction. The optimum ratio would be 1.0 indicating that the wood shrinks an equal amount in both directions, a condition never found in any species.

In the subsequent issue the question of radial and tangential shrinkage is continued. Moisture content, its effect upon the modulus of elasticity and the effect of grain angle upon this latter property is also dealt with prior to finally concluding with some fundamental design data.

ROTOL

ROTOL

VARIABLE PITCH PROPELLERS

in service with the

R·A·F *and* FLEET AIR ARM

Life depends on a silken thread

THE CATERPILLAR CLUB

Membership for Life

The Caterpillar Club was founded in 1920. There is only one qualification for membership: it is reserved exclusively to those who have saved their lives with Irvin Air Chutes.

The only class of membership is life, and the sole privilege, its continued enjoyment.

Prior to the present war, the number of enrolled members exceeded two thousand but it is believed that many who are qualified have not reported their eligibility.

Already, many of the personnel of the flying services engaged in the war have successfully used their Irvin Air Chutes in extreme emergency and, as it goes on, the membership of the Caterpillar Club will expand week by week.

Leslie L. Irvin, inventor of the Irvin Air Chute and founder of the Caterpillar Club, is anxious that the records of the Club be kept as complete and up to date as possible. He therefore invites all who are now, or who may become, eligible to communicate with him.

Their names will be recorded in the Club Register and on the gold Caterpillar which is sent to each member on enrolment.

LESLIE L. IRVIN, THE IRVING AIR CHUTE OF GREAT BRITAIN LIMITED
LETCHWORTH, HERTS, ENGLAND

Technical Training

Post-graduate Research : Flying Instruction for Engineers

THE second meeting organised by the Royal Aeronautical Society to continue the discussion on the education and training of aeronautical engineers was held on Friday, July 23rd, at the Institute of Mechanical Engineers. The meeting was animated by the same spirit of interest and keenness as the previous one, and the chairman, Dr. Roxbee Cox, had to keep an eye on the clock to steer the discussion towards the draft of a broad and generally acceptable future plan.

Many speakers from different spheres of aeronautical work expressed their views on the training of apprentices, the need for post-graduate research and a better organisation of future aeronautical training. While some of them thought that existing facilities should be but extended, the general feeling was that a centralised institution, whether under the name of an aeronautical university or some other suitable title, was the call of the hour.

It was rightly urged that an institution of this kind should combine the advantage of academic research training with adequate facilities for flying and practical research work. In general, most speakers emphasised the necessity to include in the training of aeronautical engineers a period of practical workshop experience. Whether such experience should be obtained before the young student embarked upon his theoretical studies, or whether it should be done during or after the completion of his theoretical course, the views differed. Yet it can be said that the feeling was unanimous as to the inadequacy of a training limited to the academic side of the subject.

In this connection it is noteworthy that the need was expressed by many speakers for an even closer collaboration between the training institutions and the industry than is at present the practice, and a number of suggestions to that end were put forward. Again, a point strongly expressed by some participants was the need for actual flying experience for the future areonautical engineer, and the need to include flying training in the general aeronautical curriculum.

Interesting views on the training of apprentices came from a number of speakers with practical experience in this field. Typical of the go-ahead and keen spirit which animates our industrial apprentice school was their opinion that the days of the night classes are gone, and the urge is for day training which seems to be an already accepted trend in the industry.

The widening of aeronautical training facilities will no doubt depend largely on the attitude which will be taken by the Government towards such plans, and the extent to which it will be interwoven in the general pattern of post-war planning policy. Rightly, it was emphasised that the realisation and success of such schemes will also depend on the number of available instructors and on the opportunities offered to young women and women who take up aeronautical engineering as their career.

The lengthy training, the hard work that is required from the student, and the importance of the aeronautical engineer in the general economy of the nation, justify the demand that his profession should be placed on a footing not lower than that of other professions.

A central institute for the training of aeronautical engineers—the creation of which we have urged in this journal—an Aeronautical University, as it were, combining the various sides of practical and theoretical training fields, would go a long way towards establishing a uniformity of the higher training. The active and lively participation in discussions sponsored by the Royal Aeronautical Society gives one the confidence that a practical plan which emerges slowly from them will be translated into terms of reality.

PLAN ENGINEER'S PEACE NOW

SPEAKING at a meeting of the Engineering Industries Association in London last week, Sir Roy Fedden covered much of the ground with which he had previously dealt in talks to the aircraft industry specifically. On this occasion he was, of course, addressing engineering industries generally.

If Great Britain were to maintain a leading place after the war it was necessary that we should revolutionise our basic thinking. If we made full use of our national flair for engineering, and if we so trained and upgraded industries that we could take steps forward into entirely new realms, we should be able again to lead the world in those branches which particularly suited our needs.

"We constantly hear," Sir Roy said, "that this is an engineer's war. It must certainly be an engineer's peace, and I believe that now is the time to begin to think about being better prepared for it than we were for war."

Our higher engineering training, although sound technically, was for the most part seriously out of date. There was a tendency to lay too much stress on the theoretical and mathematical basis and not give enough attention to the practical and production side.

Sir Roy concluded by suggesting that it might be profitable to set up a council of engineering institutions to consider the whole matter. From this council could be established panels to deal with the various aspects and to work out a plan. He suggested that there should be a suitable mixture of youth, age, business and technical elements.

BOOK REVIEWS

"Unsung Heroes of the Air," by A. H. Narracott. Frederick Miller, Ltd. 7s. 6d. net.

MR. W. P. HILDRED, Director-General of Civil Aviation, has written a foreword to Mr. Narracott's latest book, but the book is by no means confined to the war work of civilian pilots. The work of B.O.A.C., Air Transport Auxiliary, the Atlantic Ferry, the test pilots of aircraft firms, and other civilians are given some of the credit which they deserve, but the work of many branches of the R.A.F. which is less spectacular than bombing and fighting is also described. Among those who do important jobs with no hope of decorations for gallantry are flying instructors, members of the Met. Flights, the Handling Squadron, and the Ferry Command.

Mr. Narracott has many good stories to tell about most of his unsung heroes, and he must have gone to immense pains to collect all the details of various incidents and adventures which he recounts. Above all, this book is a notable contribution to the history of the second world war, and as such deserves a place in every war library.

"Aero-Engines for Students," by R. A. Beaumont, A.F.R.Ae.S. George Allen and Unwin, Ltd. 5s. net.

A BOOK for those who have already mastered the elementary principles of the internal combustion engine but desire that further essential knowledge of design and construction necessary for personal advancement. An insignificant appearance due to wartime restrictions is the one fault with this book, which ably describes and illustrates the various types, construction, supercharging, lubrication, etc., of modern aero-engines. An excellent stepping-stone recommended to the serious student before embarking upon a more advanced study of the subject.

Topics of the Day

Formula for Freighters

A Word About the "Flying Train" Idea : An Uneconomical Project : "Indicator" Looks, Not Over-optimistically, Into the Future and Discusses the Time-space Continuum

MY stupidity may be immense, but I cannot for the life of me see any technical advantage in what the newspapers allude to as "flying trains." In wartime, of course, the towing of gliders, for the carriage either of troops or of war material to points behind or even beyond the existing front line, is a very good thing. Gliders are cheap and can be temporarily or permanently discarded without a twinge of conscience; they land slowly and are, therefore, not likely to hurt the crew or damage the cargo in a crash landing; and it is comparatively easy to learn to fly them with tolerable efficiency. The system permits, too, of the continued use of the expensive "power unit" and its still more expensive crew. It would certainly not be possible to train a powered glider crew in their duties, both as airmen and fighting men, even if the crash-landing losses of power units and instruments could be countenanced.

But, quite apart from the physical aspects involved, it seems to me to be utterly silly to consider using "glider trains," for short- or long-distance work, in peacetime conditions. Nobody is going to tell me that a "train" consisting of one expensive and specialised aircraft and one or more wooden gliders is ever going to be as efficient—considered either as a weight-lifter or a distance-coverer—as a specially designed freighter. In peacetime conditions we are not considering crash landings at the terminal, and it would not be difficult to design a compromise type which, power for power, would have nearly double the weight-carrying, volume-incorporating, and distance-covering capabilities of any "flying train."

Furthermore, you would need only one crew for the outfit rather than a series of worried and harassed chaps not one of whom could put in an automatic pilot for a spell. This may, of course, be merely a technical difficulty, and there is probably no reason why the outfit should not be designed so that the flying part is more or less automatic. If not, there would soon be a long string of pilots at the Central Medical Establishment suffering from organ-stop eyes and neuroses of various kinds. Incidentally, the performance put up by the crews on the recent crossing has not, I feel, been sufficiently stressed. It was terrific, and far more impressive than any pole-squatting marathon chap's or refuelling record-breaker's efforts; and far more useful, too.

Wing and Power Loading

When the time *does* come to plan a layout for a long-range freighter, the difficulties will certainly be considerable, and it will be necessary to go in for a great deal of heavy compromise. During the few years before the war there was a considerable tendency for ignorant people to sing the praises and the possible uses of very light aircraft which, by their very nature, would be practically useless. It is all very well to produce a little machine which, on a calm day, will cruise at 90 m.p.h. and land at 25 m.p.h. or so on a tennis lawn, but this same aircraft would be almost unhandleable on rough and windy days and its ground speed up-wind would be little more than that of a car of the same power.

On a larger scale, the same sort of difficulties would be encountered if the projected freighter were too lightly loaded and too slow. We shall want something with a cruising speed of at least 150 m.p.h., and nowadays the landing speed needn't be much lower than 65 or 70 m.p.h.; in fact, if it is much lower, pilots will find difficulty in handling it in bad weather conditions. During this war our ideas of what is easy or difficult in the way of approach or landing speeds and characteristics have considerably changed—and so have the average lengths of runways.

The freighter will, in fact, be quite similar to any other commercial type, with the speed sacrificed for hold-capacity and weight-carrying. As such, provided that the consignees don't demand too much in the way of average speed, it will still be a very much more economical and useful device than any "flying train." Incidentally, the recently published figures for the Messerschmitt make it anything but a so-called "powered glider," though it is slow as aircraft speeds go nowadays. That expression should only be used for the genuine article—a glider which has a motor to assist it to stay in the air, but which is either towed or rocketed off the ground. For that matter every aircraft is a "powered glider," and the expression is meaningless.

New Prime Movers

Though we are all gifted with a degree of what used to be called "second sight," it is difficult to see clearly the real future of air transport. In any case, it is inextricably linked up with the war and its results. It is still possible that—though the human race will, of course, survive and be perfectly happy—the war will go on for so long that the world's supply of raw materials will dry up, and that the cost of flying will be prohibitive to any but those who *must* go by air on international or State errands and in State-owned communication aircraft. That is an unnecessarily and unlikely black outlook, but I do not feel th this is the moment for coming out with too rosy and sometimes almost naïvely boyish prophecies.

After all, though new forms of power will undoubtedly be discovered to make up for any shortages, it took the old earth some millions of patient years to manufacture the deposits of coal and oil, and the supplies are by no means inexhaustible when they are being used up at the sort of rates necessary in a major modern war. Matter is indestructible and the components of these sources of power are still available, but they were piled up through millions of years when there was no appreciable consumption. We, the spendthrifts, are the children of generations of misers.

There is nothing to prevent us from making combustible material of one kind or another from trees and vegetation and what-not, but these grow slowly and the material obtained will be much more costly in labour and time than that we have been so accustomed to dig or suck from the earth. In those brighter moments of "second sight" I can see very clearly that the humans are spending what they can never replace, and the race may have to return to the simpler life for a few million years. I am, personally, not too seriously disturbed by the prospect; in short, I don't think it matters a hoot. In any case, the human race has conclusively proved itself, as a race, to be unworthy both of material goods and scientific achievement.

These moments of clear vision are rather peculiar and, to me, seem to presage a possible day when the human mind will be able to grasp the at present ungraspable. As in Shaw's "Back to Methuselah," the power may come quite suddenly through an entire generation, after being signalled by a few abortive individual jumps. Most of us have the brief experience of being able almost to understand the infinite. Very brief the experience is, and it is always impossible to explain in words one's ideas to anyone else.

Words don't appear to "fit" and cannot successfully be used to pass on even plain Einsteinic conceptions of space and matter.

To take a fairly simple example, I seem to have very little difficulty in visualising a universe which is, so to speak, finite and infinite at the same time, but I have the greatest possible difficulty in explaining what I mean to anyone else. It is necessary to use examples and word pictures which by no means convey the same impressions to the hearer.

Of course, my conception may be quite absurd, but it seems to fill the bill for me. After all, if matter and the space in which it has its existence, bend round continually there *can* be no "outside"—it simply doesn't exist in any measurable time or space form. As I've said, one may have a perfectly satisfactory and sometimes temporary understanding, but it is quite impossible to put it across; the physicists and others, who really do know what they are talking about, rarely make any attempt to explain in any medium but formulæ, such intangible mysteries.

All of which is by way of being a ramble, and is a clumsy attempt to suggest that really such things as the future of air transport, important and vitally interesting though it may be, and the associated future of power supplies are not of vital importance. If it IS necessary to ease up on mechanical progress, man's ingenuity may be given a very necessary chance to re-orientate itself, and man's morality to man certainly needs that chance. It will do the human race nothing but good to be forced to live simply, and to deal in conceptions rather than concrete advancements for a few hundred years while sanity is regained—if the race ever had such a thing.

And, in the meantime, it is usefully amusing to plan for a better mechanical future in the air without being too infernally optimistic about it and while preparing to be happily disappointed if things don't go with quite the expected swing. There are always sailplanes!

INDICATOR.

Crank-handle S.O.S.

Emergency Transmitters for Ditched Airmen

THOUSANDS of sets of a small emergency radio transmitter designed to speed the rescue of airmen forced down at sea have been produced for the U.S. Army Air Forces by Bendix Aviation, Ltd., of North Hollywood, California, and reports of ocean rescues made possible by the equipment are already being received.

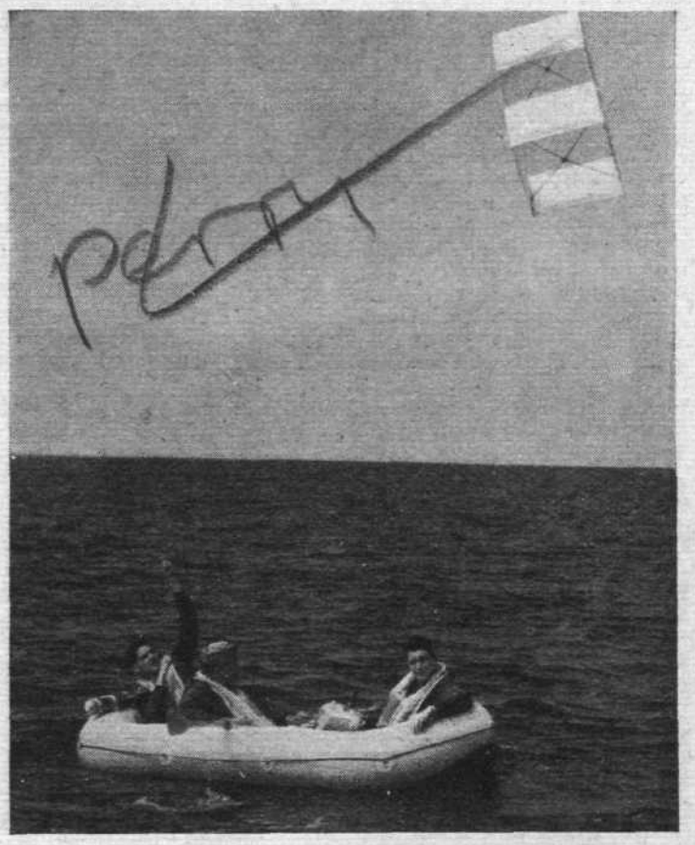
Engineers of the U.S.A. Signal Corps at Wright Field aircraft radio laboratory contributed various ideas and data toward development of the apparatus, which is operated simply by turning a hand crank to generate an automatic S-O-S signal having an effective range over an area of 100,000 square miles. The transmitter, which weighs only 33 lb., including all accessories, has a modified hour-glass contour, which gave rise during the period of secret designing to its being christened the Gibson Girl.

The complete equipment includes, in addition to the transmitter, two deflated 5ft.-diameter balloons and a collapsed box kite to be used for raising an aerial to a height of 500ft. in, respectively, a calm or a light wind and in a wind of high velocity. Other items are two chemical hydrogen generators which, when immersed in water, release the gas for inflating the balloons; a spare roll of aerial wire; a signal light, and two instruction books. These are packed with the transmitter in two buoyant, waterproof bags painted bright yellow for easy discernment in the water. Power for the signal light is supplied by the manually-operated generator.

The bags are intended to be dropped by parachute from an altitude of about 500ft. In tests, the balloons are said to have shown ability to remain aloft a full week under adverse weather conditions.

The transmitter is provided with webbing straps for securing it to the legs of an operator, and has mounted on the crankshaft a system of gears and discs that spell out the S-O-S distress code of dots and dashes. It is pretuned to the international distress frequency of 500 kilocycles. An operator need not know the radio sending code, but an experienced operator can transmit any desired messages. An indicating light, when shining brightly, shows that the transmitter is calling loudly for assistance, and a rescue ship or aircraft equipped with a radio compass can follow the signal to its source. The signal light can be used for illumination as well as for signalling at night to an approaching ship or aircraft.

Use of the equipment is not confined to aircraft crews, for it can be dropped by parachute to anybody in a lifeboat or on a raft, to keep a rescue craft informed of their location. A possible development of its use which at once suggests itself would be with the Air/Sea Rescue Service's "Samaritan Spitfires," which were described in last week's issue of *Flight*. One can imagine circumstances in which the dropping by parachute of one of these emergency transmitters, after the ditched pilot had received his dinghy, might usefully hasten his ultimate rescue.



PRACTICE LAUNCH: In this obviously posed picture, a dinghy crew demonstrate the kite method of raising the aerial of the Gibson Girl emergency S.O.S. transmitter.

The complete emergency equipment with its container and parachute.

Behind the Lines

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

Teutonic Migration

R.A.F. raids over Germany do not only pulverise the industries, but also sow seeds of chaos and moral disruption on the German home front, and these side-effects of air war attract more and more the attention of the German Press.

A bitter tone permeates an account published in the *Essener National Zeitung* of present conditions in Essen; and it is clear from this description that the havoc and chaos reigning in the city begin to tell on German nerves. "A refuge (says the paper) is not a home; the desire for one's own hearth grows with the lapse of time since the catastrophe. Then one was glad enough to save one's bare life . . ." Requisitioning of houses and flats has reached its maximum limit. The only other way to provide housing is the rapair of damage, but this depends on the quantity and speed of labour and material supplies. But both are difficult to procure: under the influence of weather the damage increases because neither the employed labour nor the material are adequate to repair even the most necessary with the required speed.

"Only a further increase of the Reich's assistance can help here" cries the paper. But the third Reich has many calls on its labour reserves. There is the Russian front and Italy, the Fortress of Europe to guard, and the industry and the repair of plants in the Ruhr. The demands of the civil population thus recede to some insignificant place.

To cope with the situation, the Government announced some time ago that it would meet the expenses of each family leaving Essen. And the Teutons are not shy of migrating: "Under the influence of events the willingness to leave Essen is growing" says the Essen paper modestly. But here again there is a bottleneck: labour and transport for removal are scarce. "As always, when something gets short, the man with better connections gets the advantage to bring his chattels under a roof, while the quiet and modest ones wait."

The municipality had to take over all transport firms, and the applications for removal to other cities are so numerous that in the beginning of May the *Essener National Zeitung* estimated that all transport facilities were booked five months ahead and remarked: "In reality the desire to leave Essen is even considerably greater than expressed in figures, as many citizens do not have the right connections to find accommodation elsewhere in the Reich."

Again help is wanted from the Reich: "We repeat, therefore," says the *Essener National Zeitung*, "our urgent request that auxiliary labour, especially packers, porters, etc., should be placed at the disposal of our city from outside the town."

Grounded Icarus

THE fate of France's world-famous airmen has been as sad as that of their country. Some of them have been killed in action, some of them resigned themselves to commonplace occupations; to others Vichy was an acceptable escape, a continuation of their world symbolised by the apéritif and the sporting elegance, and for which they took up arms even against their old comrades from Flanders.

Jean Dagnau, of the Air France African services, the famous one-legged skipper—the other leg he left behind at Verdun—was shot down in Flanders on May 17th, 1940. A month later the same fate overtook Maurice Amaux, several times winner of the Coupe Deutsch de la Meurthe.

Henri Guillaumet, considered after Mermoz as France's most successful South Atlantic pioneer, was a victim of an accident to a Farman machine which he flew to bring Chiappe to Syria.

Jean Assolant, who was the first Frenchman to cross the Atlantic in 1929, is reported to have been shot down by a Spitfire in May, 1942, in an air combat over Diego Suarez.

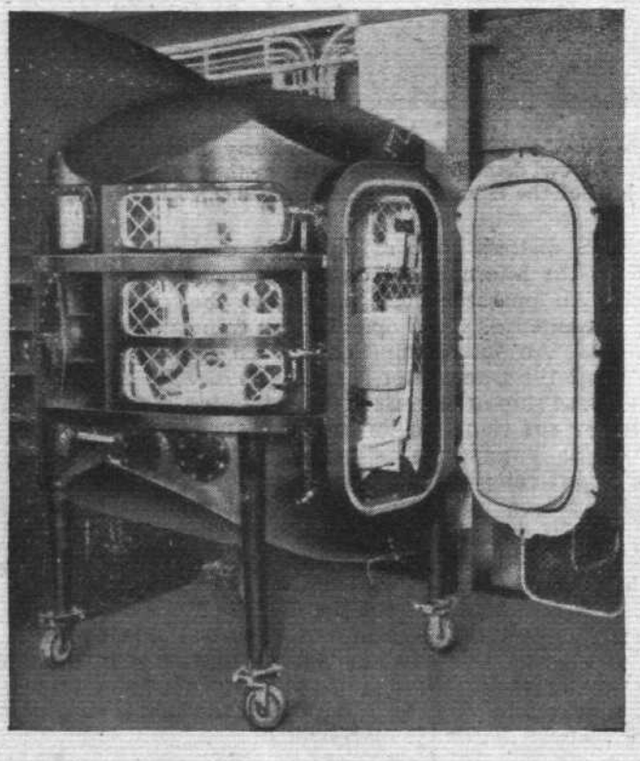
Codos, the "inseparable" of Rossi, was in Algiers during the Allied invasion and was previously engaged in blockade running with Air France mail aircraft from Marseilles over the Mediterranean and Sudan to Jibuti. Commodore Rossi himself, who in 1933 established the world's long-distance record, New York-Beyruth, stayed behind in Paris and in his flat in Champs Elysees schemes future air developments.

Michel Detroyat, the "*grand Michel*," the aerobatic master, reduced his speed to the performance of a hansom. After the armistice he established a horse cab taxi firm in Paris. Recently he became Petain's and Laval's pilot and on July 21st Paris Radio reported that he had been injured in a crash.

After flying over the Himalayas and Cordilleros Dieudonné Coste, previously of the Hispano-Suiza of Paris, settled down in the Mont-Dore Valley, in the heart of France, where he has taken charge of a small funicular leading up to the Pic de Sancy, the highest peak in *Massif Central*.

The previous chief pilot of the Dewoitine aircraft firm, Marcel Doret seeks oblivion in a small county estate in the *Haute-Garonne*, to which he retired with "Whisky," his mascot dog.

Finally, the feminine Icarus is groundbound, too: Maryse Bastie is reported to be a hospital nurse in Paris, and Maryse Hilz became a milliner in Aix-en-Provence.



ALTITUDE STUDY: A pressure chamber used by *Luftwaffe* research men for self-experiments with the effects of rapid pressure reduction at which climbing speeds and altitudes were simulated.

Suggestion

A GERMAN worker, from Dortmund, named Heigeborn, has been sentenced to three years' penal servitude for suggesting publicly that a monument in honour of Goering should be erected in the Ruhr district.

Gumi Pitypang—

THE Hungarian Government is reported to be cultivating the rubber-yielding dandelion (Kok-sagys) on 800 allotments. The cultivation of this plant, which has been renamed *Gumi Pitypang*, is to be extended to 15,000 allotments to provide for the entire needs of the country.

—And in Roumania

A SPECIAL service has been established in Bessarabia supplying technical advice, machinery and seeds for prospective cultivators of kok-sagys.

Jap Chief

LT. GEN. PRINCE GIN LI has been appointed Commander-in Chief of the Japanese Army Air Force. He succeeds Lt. Gen. Kumaichi Teremoto.

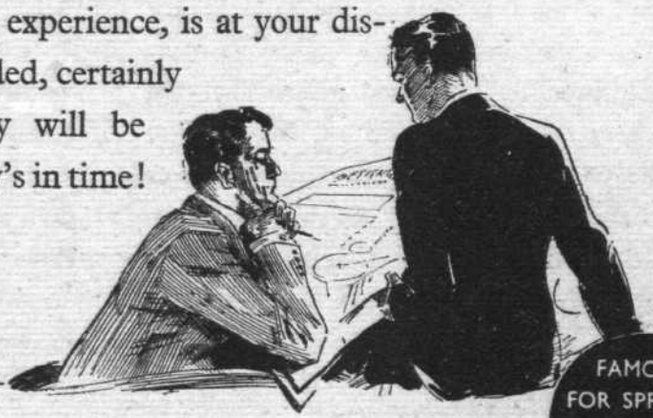
From Germany

THE Berlin correspondent of the *Dagsposten* says that it is no longer necessary to ask where is the *Luftwaffe*. An indirect answer is provided by a Berlin commentator who said that air fighting over Sicily and the eastern front absorbs the major part of the *Luftwaffe*.

In itself, this statement from German circles is an indication of the reserves of the German Air Force.

Planning for action...

Perhaps you, too, are Planning for Action; engaged on engineering projects which necessitate the use of more and yet more Spring-operated mechanisms. Designers and engineers should consult Terry's about these Springs—preferably while the job is still at the drawing-board stage. Terry's Research Department, backed by 88 years of accumulated experience, is at your disposal. Errors must be avoided, certainly maximum Spring efficiency will be secured, if you consult Terry's in time!



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TERRY'S *for springs*

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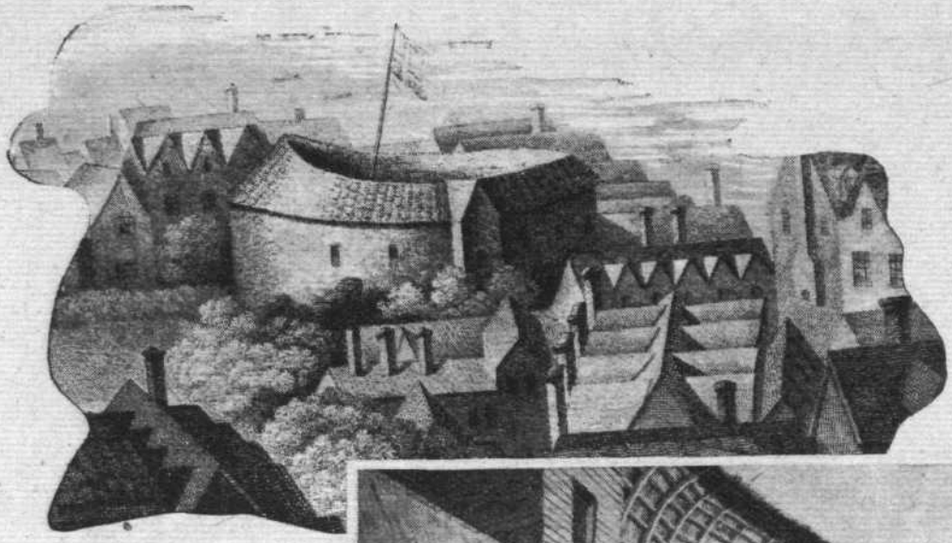

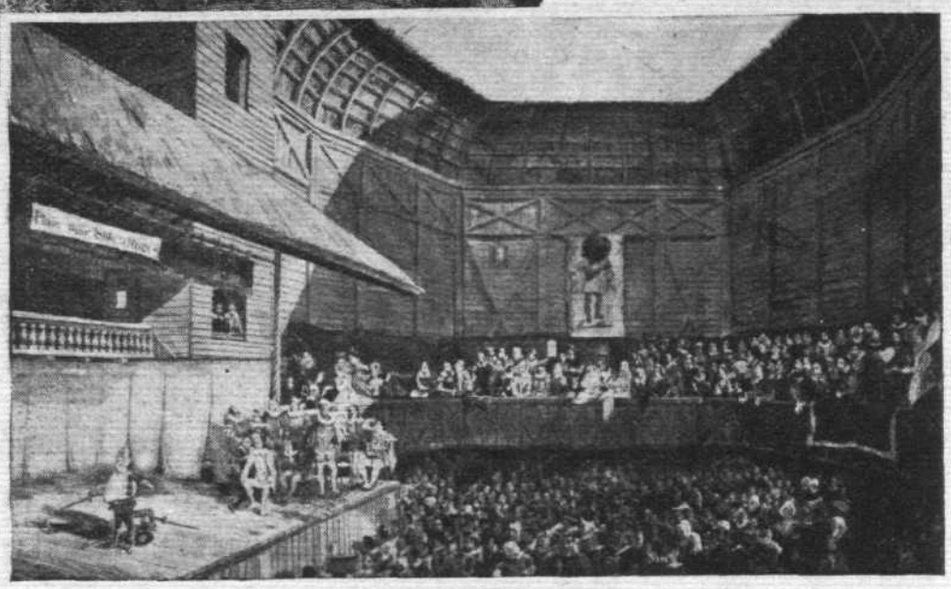

THE GLOBE THEATRE, BANKSIDE

In England at the beginning of the 17th century The Globe represented the height of achievement in theatre construction. It is recorded, incidentally, that a contemporary theatre, The Fortune, "cost £550, whereas The Globe cost £600; but The Globe was painted and the former was not." In size The Globe was 43 ft. wide and just over 39 ft. deep, including a retiring room at the back; it was 32 ft. high from floor to ceiling.

It was a very popular theatre and one supposes from the records that it was much more comfortable and convenient than most other theatres of the time. The interior view above, by Pycroft, shows us how the theatre appeared in Shakespeare's day; the exterior is from an engraving of an extensive view of London by Hollar, 1647.

About 1644 The Globe was pulled down during the suppression of places of entertainment by the Puritans.

for Steelwork in theatres of the future

Boulton & Paul Limited

STRUCTURAL ENGINEERS

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¶ *This advertisement is one of a series which briefly traces, from earliest times, the structural development of the theatre and places of entertainment, according to the "fashion" and requirements of the entertainment demanded.*

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.

REVERSIBLE-PITCH AIRSCREWS

Far Less Power at Negative Angles

YOUR correspondent "Driver" has apparently lost sight of the fact that airscrew blades are of aerofoil cross section.

The efficiency of any airscrew is its quality of absorbing the power output of the engine and converting it into thrust effort with as small a slip loss as possible.

When the pitch angle of the blades is changed to give negative thrust the (normally) rear flat "pitch" face of the blade becomes, to all intents and purposes, the leading face, and the (normally) camber face becomes the rear face. Under these conditions the thrust effort of the airscrew for a given engine power output would be incomparably lower than the thrust effort for the same power output with a positive pitch angle. Thus, although a measure of deceleration will be obtained by reversing the pitch, "Driver's" contention that it would be of the same order as the acceleration under normal operating conditions is somewhat faulty. This is presupposing that the negative and positive pitch angles are similar for a given power output.

"B. HAMPTON-COURT."

ELEMENTARY FLYING TRAINING

Gliding and Climbing Turns

IN reading through the small but excellent handbook "Elementary Flying Training," which has recently appeared on the bookstalls, I—and probably some others among your readers—have been puzzled to reconcile two statements which occur in the section dealing with steep turns and gliding turns.

On page 92 it is said that "In a gliding turn the aircraft is descending in a spiral path, but the spirals followed by the two wings are not identical, that of the inner wing being steeper. The inner wing, therefore, has more downward movement relative to its forward movement than has the outer wing. Both wings are, of course, moving downwards by the same amount, but the outer wing has farther to go, in the same time, in its circular path than the inner wing. Therefore, although the angle of attack of both wings is increased by the downward component of the relative airflow, the angle of attack of the inner wing is larger than that of the outer wing."

This seems to be a satisfactory and clear explanation, and one from which pupils will easily draw the correct conclusion that bank has to be "held on" in a gliding turn.

Confusion may arise in the minds of many pupils, however, when they encounter, on page 93, the statement that, in a climbing turn "the outer wing, besides moving at a greater speed than the inner wing, is on the outside of the spiral and, therefore, meets the airflow at a greater angle of attack than does the inner wing. This is because its relative movement is more forward and less upward than is the case with the inner wing. It is just the reverse of the conditions in a gliding turn."

This second statement seems flatly to contradict the argument used in the case of a gliding turn. Perhaps one of your readers can solve the difficulty and provide a consistent theory to cover both types of turn?

N. GIBSON.

SCIENTISTS AND THE COMMUNITY

Practical Idealism versus Politics

AS one to whom the letter in *Flight* of July 1st signed by Professors Pickard, Finlay, and Bragg directly applies, I should like to reply to it, although the subject may not have a direct connection with aircraft.

The wealth of a nation does not depend so much on the actual natural resources available as upon the way in which they are developed. A few years ago Britain was partly struck with poverty and unemployment, not because resources were lacking, but because the people in charge of them did not know their business. To-day, although we are fighting a war, a scientific planning of our activities enables a reasonable standard of living to be maintained by the entire country, and this could be further improved by even better organisation.

By scientist is meant the person who reasons in a logical way, starting from experimental facts, so that any conclusions he arrives at will be consistent with the rest of our experience and so that he can make certain predictions about reality. Anyone who acts and reasons in a non-scientific way—i.e., allowing his own wishes, or dogmatic policy, or inaccurately estimated evidence to determine his conclusions—is likely to make mistakes and obtain results not corresponding to the facts.

The politician is a man concerned with taking such measures as will enable the community to achieve certain results, for example, security, high standard of living, and ultimately happiness in all its forms. Therefore, from the technical side the politician should be a scientist.

To-day we understand by politician a person who supports a certain policy in his method of government; this implies that, whether his policy is good or bad, he is not truly scientific. A non-scientific politician advised by scientists may apply wrongly this advice, or apply it to his own ends.

From the ethical and moral side the argument in favour of a scientists' government is even stronger. The scientist makes every attempt to remove from his work personal influence and tries to give every fact due consideration, and my experience of scientists is that they are as kind and morally good as the best in society.

The scientist is therefore likely to allow a far more varied and interesting world to develop than any politician would, as his doctrine, however perfect, is nevertheless tied to one school. It is also wrong to connect a scientist with a materialistic outlook; some of the greatest scientists are idealists. Science is a means of dealing with problems of experience, but a good scientist will allow full freedom of thought on philosophic probems beyond the range of experimental investigation.

To refuse to allow the scientist to direct our affairs will mean that some non-scientific clique, some "ism" of one kind or another, may finally get a stranglehold on the world and tie us down to one philosophy and one way of life.

N. BARRACLOUGH,
President, Science (Research) Society.

SAILPLANE EFFICIENCY

Pros and Cons of Pendulum Elevators

MR. J. D. WALSH appears to have wasted some of your valuable paper on a misunderstanding. The misleading term "pendulum elevator," peculiar, I believe, to the sailplane world, simply means a tail which is all elevator, there being no fixed tailplane. It is emphatically *not* an elevator controlled by a pendulum!

The so-called—or miscalled—pendulum elevator has been used on a number of very successful sailplanes, on account of its lightness and low drag, although in the latter respect it has probably nothing much on a really well designed and constructed orthodox tail. The objection to it is that it does not confer inherent stability on the aircraft in the absence of the pilot's controlling hand. One notices no difference in ordinary flying, the pendulum type being just as pleasant as the other, but, of course, if one lets go of the stick, or if one's brain lets go of one's hand, so to speak—due, for example, to getting into difficulties in a cloud—it may be disadvantageous, since the elevators have no tendency to return to any neutral position. Or rather, the tendency, when present, is not sufficient to be useful.

As for the term "weathercock stability," which also seems to amuse Mr. Walsh, I think this term is more descriptive and accurate, if less high-falutin', than "directional stability (static)," though both mean the same thing, namely, that the yawing moment due to sideslip is positive. However, an aircraft may have directional stability, in this sense, and yet be quite incapable of maintaining a constant direction, owing, for instance, to spiral instability.

Bringing Mr. Lawson into the picture, I have no doubt that he will eventually tell the expectant world that his dihedral tail provides sufficient weathercock stability; that is all right, but he will have to think of a good answer to the question of yawing control; there are three fairly obvious ones, and possibly others. The possibility of recovery from a spin would need investigating, too.

W. E. HICK, M.B., B.S.

SERVICE AVIATION

Originally designed for metropolitan defence only, the Spitfire is now operating on almost every front of the global war.

Royal Air Force and Fleet Air Arm News and Announcements

Awards

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

Second Bar to Distinguished Flying Cross

Act. Wing Cdr. J. R. D. BRAHAM, D.S.O., D.F.C., No. 141 Sqn.—Wing Cdr. Braham has destroyed 11 enemy aircraft, whilst his more recent achievements include a damaging attack on a U-boat and another attack on a motor torpedo boat, which was set on fire.

Bar to Distinguished Flying Cross

Sqn. Ldr. J. L. BECK, D.F.C. R.A.F.O., No. 159 Sqn.—Sqn. Ldr. Beck has repeatedly led formations of aircraft many hundred of miles over enemy territory in daylight and pressed home his attacks in the face of intense enemy opposition. On one accosion, he was instrumental in destroying a very large quantity of petrol in tanks at a time when such supplies were of vital importance to the enemy.

Act. Flt. Lt. D. W. MCCORMACK, D.F.C., R.A.A.F., No. 615 Sqn—Flt. Lt. McCormack has been actively engaged on operations in India since October, 1942. He has achieved excellent results on long-distance sorties over difficult country. In attacks on Mandalay and Akyab, despite considerable opposition he allowed no obstacle to deter him from completing his tasks successfully.

Act. Sqn. Ldr. R. J. C. GRANT, D.F.C., D.F.M., R.N.Z.A.F., No. 485 (N.Z.) Sqn.—This officer has completed a very large number of sorties, and has displayed exceptional keenness, a fine fighting spirit and great devotion to duty. He has destroyed at least eight enemy aircraft.

Distinguished Flying Cross

P/O. C. S. MARCEAU, R.N.Z.A.F.

Act. Sqn. Ldr. J. M. O. DYER, No. 159 Sqn.—This officer has led formation raids on Benghazi, Tobruk and other targets in the Middle East. On one occasion, to act as a diversion to other forces attacking Benghazi, this officer made 14 bombing runs over the target. On another occasion, when attacked by three enemy night fighters, he shot down one in flames, probably destroyed a second and damaged the third in a 35-minutes battle.

Act. Sqn. Ldr. A. E. HOUSEMAN, R.A.F.V.R., No. 2 Sqn.—This officer joined the squadron in June, 1940. His courage and determination on numerous sorties over the Dutch and German coasts, while on low flying photographic operations, have produced effective results.

Maj. S. F. DU TOIT, S.A.A.F., No. 4 (S.A.A.F.) Sqn.—This officer has completed a large number of operational sorties in both fighter and fighter bomber aircraft. During this period he has displayed leadership, courage and determination and has destroyed three enemy aircraft in combat.

Flt. Lt. G. KENNING, No. 2 Sqn.—On eight occasions this officer has taken low altitude photographs over highly defended areas on the Dutch coast. The results of these missions have been very valuable, bearing witness to the high standard of efficiency with which he invariably operates.

Act. Flt. Lt. P. G. LOUIS, D.F.M., R.A.F.V.R., No 615 Sqn.—Flt. Lt. Louis has taken part in a large number of low level attacks on targets in Burma, eleven of which he has led. In February, 1943, this officer completed a low level operation at night in the course of which he destroyed or damaged enemy road and river transport and silenced a machine gun post.

Act. Flt. Lt. T. S. W. TOWELL, D.F.M., No. 159 Sqn.—Flt. Lt. Towell is now on his second tour of operational duty. He has flown on a very large number of operational sorties. Several times Flt. Lt. Towell has flown his badly damaged aircraft safely back to base.

F/O. W. L. DOBBIN, R.C.A.F., No. 104 Sqn.—This officer has completed bombing operations over Germany, Tobruk, Sicily and North Africa. Throughout all these missions he has displayed the utmost keenness to locate and bomb his target accurately. In March, 1943, whilst attacking Sfax, F/O. Dobbin's aircraft was severely damaged by anti-aircraft fire. Undeterred by this, he continued and bombed the objective successfully.

F/O. E. DONOVAN, R.A.F.V.R., No. 14 Sqn.—In February, 1943, F/O. Donovan was leader in a sub-formation of bombers that took part in a highly successful attack against enemy shipping in Melos Harbour. Although his aircraft was severely damaged by anti-aircraft fire, this officer flew on and pressed home a low level attack against a 1,800-ton vessel. The greater part of the return journey was made in darkness; nevertheless, F/O. Donovan handled his badly damaged aircraft with such skill that a safe landing was made.

F/O. G. W. CLARKE-HALL, R.A.A.F., No. 14 Sqn.—This officer has completed a series of very successful operations. In June, 1942, he took part in a destructive sortie against Heraklion which effectively prevented many German aircraft from attacking an Allied convoy bound for Malta. In February 1943 he took part in a very successful raid on Melos Harbour, where he destroyed a large merchant ship.

F/O. J. JACKMAN, R.A.F.V.R., No. 162 Sqn.—This officer has taken part in numerous operational flights, which he has invariably completed with the utmost efficiency, courage and determination.

F/O. R. W. LAPTHORNE, R.A.A.F., No. 14 Sqn.—In June, 1942, this officer participated in a very successful night intruder operations against Heraklion. A month later he was wounded in the forehead during an attack against Mersah Matruh. Displaying great courage and determination, although nearly blinded by blood, F/O. Lapthorne concentrated on instrumental flying and made a safe landing. On a more recent occasion this pilot attacked a large merchant vessel loaded with oil, causing it to catch fire and sink in the harbour.

F/O. A. W. PROCTOR, R.A.A.F., No. 59 Sqn.—In August, 1942, despite intense anti-aircraft fire, this officer made a successful attack on an enemy vessel. Some of his bombs were seen to explode astern of the ship's wheelhouse and black smoke poured from it. In September, 1942, he displayed similar disregard for his personal safety while attacking a large escorted enemy ship. During this strike he secured four hits, and the vessel was left disabled. In addition to these raids, F/O. Proctor has completed several anti-submarine patrols.

Lt. R. F. PERCIVAL, S.A.A.F., No. 12 (S.A.A.F.) Sqn.—This officer has led the squadron on many occasions, showing exceptional skill and leadership. In all respects Lt. Percival's tour of duty has been most meritorious.

P/O. H. C. RIDLEY, R.A.F.V.R., No. 14 Sqn.—Since the commencement of the campaign in the Western Desert in November, 1941, P/O. Ridley has taken part in many daylight combing sorties against enemy tanks and mechanised transport, as well as some night bombing raids against targets in Crete. In addition, in January, 1943, he flew on several offensive reconnaissances in the Aegean Sea, and obtained some excellent photographs. On February 21, 1943, P/O. Ridley was leading observer of a formation of bombers that attacked shipping in Melos Harbour.

P/O. L. A. TRIGG, R.N.Z.A.F., No. 200 Sqn.—This officer has taken part in a large number of shipping reconnaissances and convoy escorts. In March, 1943, he was detailed to provide anti-submarine escort to a convoy that was being attacked by several U-boats. When in the vicinity of the convoy, P/O. Trigg sighted an enemy submarine, and although in an unfavourable position, delivered a vigorous and effective attack. Two days later he sighted another U-boat and immediately made a determined attack, one of the depth charges exploding on the bow of the enemy vessel.

W/O. B. C. COATES, D.F.M., No. 159 Sqn.—As navigator/bomb aimer W/O. Coates has participated in a large number of operational sorties. He always shows great determination, and presses

FROM THE MILES MAILBAG . . . NO. I.

- After putting the engine right he was able to take off . . . .

Contd.

the MILES HAWK TRAINER, MARK II, which was delivered to Mr. Franco Bianco, Punto Arenas, Chile, in 1936.

During one of his flights his engine cut, and he had to choose between landing on trees, or in a lagoon. He decided to choose the latter. The lagoon fortunately was not very deep and the water only covered the wings. The machine was in the lagoon for 2½ days before it could be moved. While we did not anticipate that the wood-work would suffer very greatly we advised him to examine the glue joints and spars very carefully.

On getting the machine out of the water and putting the engine right, it was found that the airframe was still in perfect condition, and he was able to take off without any further repairs being necessary.

We have not heard recently from him, but in 1939 we heard that the machine was still behaving very well.

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home his attacks regardless alike of both anti-aircraft fire and enemy night fighters.

Wing Cdr. G. A. V. CLAYTON, No. 240 Sqn.—One night in April, 1943, this officer led a detachment of aircraft on a special operation which demanded great skill and determination. Much of the complete success which was obtained can be attributed to this officer's sterling work.

Act. Flt. Lt. G. W. WILLIAMS, R.A.F.V.R., No. 70 Sqn.—This officer has completed many sorties, and has always displayed outstanding determination to achieve success. On one occasion, after bombing a troop concentration, he attacked a number of vehicles with gun fire from a low level. On other occasions he has attacked transport with destructive effect.

F/O. L. C. GOSLING, R.C.A.F., No. 229 Sqn.—This officer has completed a very large number of sorties, including attacks on airfields, port installations and industrial targets. In air combat he has destroyed four enemy aircraft and damaged others. In one engagement he shot down two Ju. 88's which were escorting two merchant vessels.

Hit by Incendiary

F/O. E. G. REDMAN, R.A.F.V.R., No. 149 Sqn.—One night in May, 1943, F/O. Redman and Flt. Sgt. Cozens were navigator and pilot respectively of an aircraft detailed to attack Dusseldorf. Whilst over the target area the bomber was hit by falling incendiary bombs. The navigator's cabin was wrecked, the front turret was rendered unserviceable, while an oil tank was pierced and much equipment was damaged. The aircraft went out of control and lost considerable height before Flt. Sgt. Cozens succeeded in regaining control. Some movable equipment was jettisoned, and little height was gained as course was set for base. Displaying great skill, Flt. Sgt. Cozens flew the damaged bomber to this country and accomplished a safe landing in the face of many difficulties. Throughout the return flight, F/O. Redman gave his pilot valuable assistance, plotting an accurate course in spite of extremely adverse circumstances.

Act. Sqn. Ldr. (now Wing Cdr.) J. R. RATTEN, R.A.A.F., No. 453 (R.A.A.F.) Sqn.—This officer has competed a large number of sorties, and has led the squadron, and often the wing, with great skill. Sqn. Ldr. Ratten has destroyed one and shared in the destruction of another enemy aircraft.

Act. Flt. Lt. J. W. E. HOLMES, R.A.F.V.R., No. 263 Sqn.—This officer has taken part in many operations, during which attacks have been made on such targets as airfields, gun positions and military installations.

F/O. J. P. COYNE, R.C.A.F., No. 263 Sqn.—This officer has completed numerous sorties, involving low-level attacks on airfields, dock installations and rail communications. His courageous leadership, tenacity and keenness have been inspiring.

Act. Flt. Lt. A. S. WOOLNOUGH, R.A.F.V.R., No. 158 Sqn.—This officer has completed a second tour of operational duty during which he has attacked targets in both Germany and Italy, including Genoa, Turin, Berlin, Hamburg, Kiel and the Ruhr valley.

Act. Flt. Lt. A. E. W. WYNYARD, R.A.F.V.R., No. 57 Sqn.—During his first tour of operations as a rear gunner, Flt. Lt. Wynyard completed sorties over such targets as Essen, Hamburg, Kiel and Bremen. On several occasions he has been attacked by enemy night fighters and by the accuracy of his fire has driven off the attackers. He has destroyed one enemy aircraft.

F/O. S. C. B. ABBOTT, R.A.A.F., No. 464 (R.A.A.F.) Sqn.—F/O. Abbott has taken part in a large number of operational sorties, including the combined operations at Dieppe and the low-level daylight attack on Eindhoven. On the latter occasion one engine in his aircraft was damaged while crossing the enemy coastal defences prior to the attack. Although this engine was almost useless, he continued to the target which was successfully bombed.

F/O. W. G. APPS, R.A.F.V.R., No. 61 Sqn.—This officer has flown on a large number of successful operational sorties during which his navigation to targets at Turin, Milan, Nuremburg, Spezia and Berlin has been of the highest order, while his fine co-operation with the air bomber has enabled many excellent photographs to be obtained.

F/O. W. R. CHALK, No. 61 Sqn.—This officer's operations have included attacks on the heavily defended targets in the Ruhr and Berlin. In addition, he participated in the daylight attacks on Le Creusot and Milan. On one occasion F/O. Chalk's fine commentary enabled his pilot to manœuvre the aircraft and thus destroy an enemy night fighter.

F/O. F. J. CHITTENDEN, R.C.A.F., No. 424 (R.C.A.F.) Sqn.—As wireless operator this officer has successfully completed a very large number of operational sorties, the majority of which have been against strongly defended targets, including Berlin, Hamburg, Rostock, Cologne, Kiel, Wilhelmshaven, Bremen and the Ruhr.

F/O. F. S. COCKER, R.A.F.V.R. No. 3 Sqn.—An enthusiastic operational wireless operator, F/O. Cocker has completed twenty-eight operational sorties against some of the most heavily defended targets in Germany.

F/O. A. T. COVACEVITCH, R.A.A.F. No. 78 Sqn.—F/O. Covacevitch has participated in attacks on many of the most strongly defended centres in enemy territory including Genoa, Turin, Berlin, Hamburg and Cologne. During all of his missions he has proved himself to be a real asset to his crew.

F/O. F. G. DAVY, R.A.F.V.R.—Since completing an operational tour, F/O. Davey has taken part in anti-submarine sweeps and air/sea rescue operations. He has continued to display keenness and enthusiasm of the highest degree and his navigational skill, particularly in adverse weather and when on air/sea rescue work, has enabled his captain to return safely to base in the most hazardous circumstances.

F/O. F. R. DERRY, R.A.F.V.R., No. 101 Sqn.—F/O. Derry has completed a tour of operational duty during which he has displayed outstanding ability as a navigator, combined with a strong sense of duty and determination to complete his allotted task.

F/O. R. F. FRIEND, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—An outstanding navigator, F/O. Friend has completed a large number of operational sorties, many of which have been against the very heavily defended targets of the Ruhr and Berlin.

F/O. A. B. HOUSTON, No. 487 (N.Z.) Sqn.—As an airman during the campaign in Abyssinia, F/O. Houston completed many daylight operations. His conduct, during his escape from French Somaliland, after his aircraft had made a crash landing, was most creditable.

F/O. H. W. F. JENNINGS, R.A.F.V.R., No. 218 Sqn.—This officer, a first-class navigator of great determination, invariably guided his aircraft to the allotted target, even in the most unfavourable circumstances. His trips have included raids on many of the most heavily defended towns in Germany and he has visited Turin on three occasions.

The crest of one of the Norwegian squadrons operating with the R.A.F. "Trygg Havet" means "Guarding the Seas."

F/O. M. A. KEDDIE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—F/O. Keddie has taken part in a large number of sorties against targets in Germany and Italy, including the heavily defended areas of the Ruhr and Berlin.

F/O. J. C. LASCELLES, R.A.F.V.R., No. 61 Sqn.—F/O. Lascelles has completed numerous operational flights many of them to heavily defended targets in Germany and Italy. On all these sorties he has displayed great skill and courage.

F/O. J. A. MAGUIRE, R.N.Z.A.F., No. 161 Sqn.—F/O. Maguire has completed a large number of operational sorties. A keen enthusiastic gunner, he has always displayed a high standard of devotion to duty.

F/O. A. F. MINNIS, R.A.F.V.R., No. 75 (N.Z.) Sqn.—F/O. Minnis, a first-class operational navigator, has taken part in many sorties, during which he has displayed a fine fighting spirit. His sorties have included five raids on Lorient.

F/O. C. F. ORMEROD, R.N.Z.A.F., No. 75 (N.Z.) Sqn.—An excellent navigator, F/O. Ormerod has completed a large number of operational sorties. He has participated in raids against the most heavily defended towns in Germany.

F/O. G. A. PATRICK, R.N.Z.A.F., No. 149 Sqn.—This officer has participated in operational missions against enemy targets, which have included attacks on the heavily defended centres of Essen, Hamburg, Bremen and Berlin.

F/O. J. F. REED, No. 51 Sqn.—This officer has served with both Coastal and Bomber Commands. He has completed numerous sorties over enemy territory in Europe, including attacks on such strongly fortified targets as Berlin, Essen and Munich. He has also taken part in a large number of anti-submarine patrols.

F/O. V. ROLFE, R.C.A.F., No. 426 (R.C.A.F.) Sqn.—This officer has, on various occasions acted as squadron navigation officer when his extremely able navigation has been a material factor in the successes achieved. F/O. Rolfe has participated in many minelaying operations.

F/O. B. F. SMITH, R.A.F.V.R., No. 156 Sqn.—F/O. Smith has successfully completed numerous sorties against enemy targets in the Western Desert, Greece and Germany. He also took part in two "1,000 bomber" raids.

F/O. J. M. SMITH, R.N.Z.A.F., No. 467 (R.A.A.F.), Sqn.—This officer has participated in a large number of operational sorties, most of which have been against very heavily defended targets. He also took part, in adverse weather, in the successful daylight raid on Danzig and in the daylight attack on Le Creusot.

F/O. W. J. SMITH, R.A.F.V.R., No. 156 Sqn.—This officer has participated in a very large number of operational sorties against targets in Germany and the Middle East. A skilled and determined navigator, he has consistently displayed courage and devotion to duty.

F/O. G. SPEDDING, RA.F.V.R., No. 50 Sqn.—As wireless operator, F/O. Spedding has taken part in many successful sorties against some of Germany's most heavily defended targets. He also participated in the daylight raid on Le Creusot. He has secured some excellent photographs.

F/O. G. A. SWEANY, R.C.A.F., No. 405 (R.C.A.F.) Sqn.—In October, 1942, this officer participated in a low-level attack on Flensburg. The following month, while on an anti-submarine patrol, an attack was made on an enemy submarine and two minesweepers in the Bay of Biscay, the submarine suffering severe damage in consequence, despite heavy opposition from anti-aircraft fire. F/O. Sweany has flown on eleven anti-submarine patrols.

F/O. N. THORP, R.C.A.F., No. 207 Sqn.—On occasions when wireless aids have failed, this officer has contributed materially to the success of the operations by his superb navigation. F/O. Thorp took part in the daylight operations against Le Creusot and Milan, where has excellent low-level map-reading was of great assistance. In addition, he has participated with success in raids on all the most heavily defended German targets.

Distinguished Flying Medal

Flt. Sgt. G. A. COZENS, No. 149 Sqn.—For citation see F/O. Redman, D.F.C.

Flt. Sgt. R. T. D. DOAK, R.N.Z.A.F.

Flt. Sgt. M. A. COLLINS, No. 226 Sqn.—In air operations this airman displayed courage and fortitude in keeping with the highest traditions of the R.A.F.

Flt. Sgt. C. A. O. LAWRENCE, No. 12 Sqn.—One night in April, 1943, this airman was the captain and pilot of an aircraft engaged on an operation. During the flight the bomber was raked by gunfire from an enemy fighter, which badly wounded the rear and mid-upper gunners. Flt. Sgt. Lawrence dived steeply to evade the attacker, and, when levelling out, the port aileron broke off. The aircraft, which had sustained damage, became difficult to control, but, in spite of this, Flt. Sgt. Lawrence displayed great skill and determination in accomplishing the return flight to this country, where he effected a masterly landing at the nearest airfield.

Sgt. K. BRECKON and Sgt. G. FERRELL, both of No. 103 Sqn.—Sgts. Breckon and Ferrell were pilot and mid-upper gunner respectively of an aircraft which attacked Dortmund one night in May, 1943. On the return flight the aircraft was subjected to repeated attacks by an enemy fighter. Although his turret was rendered unserviceable early in the combat, Sgt. Ferrell operated it manually, at the same time giving his captain a commentary on the attacker's movements. In spite of his difficulties, Sgt. Ferrell eventually delivered a well-directed burst of fire, and shot the attacker down. Soon after crossing enemy coast one of the bomber's engines caught fire and became unserviceable, while a little later another engine ceased to function. Despite this, Sgt. Breckon flew on, and, although a third engine became unserviceable as the English coast was reached, he succeeded in gaining an airfield, where he executed a masterly landing without the aid of flaps.

Sgt. V. H. NEW, No. 166 Sqn.—This airman has completed 28 sorties. He has invariabliy displayed great determination in pressing home his attacks, while on several occasions his fine airmanship has been responsible for the safe return of his aircraft.

Flt. Sgt. J. N. MURRAY, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—Flt. Sgt. Murray has taken part in many successful operations against the enemy. These have included a number of sorties against Berlin and targets in the Ruhr, where most heavy opposition is encountered. He displayed exceptional skill in securing photographs of the target areas.

Flt. Sgt. W. J. MUSSON, No. 51 Sqn.—Before being posted to this squadron, Flt. Sgt. Musson was engaged on daylight anti-submarine patrols in the Bay of Biscay. On one occasion he was the navigator of an aircraft which made a successful attack on an enemy U-boat. More recently this airman has participated in attacks on some of the enemy's most heavily defended targets, including Berlin, Duisberg Essen, Frankfurt and Stettin. In April, 1943, Flt. Sgt. Musson was detailed for an attack on Stettin. One engine of his aircraft failed when some 110 miles off the target, but, guided by this airman, the objective was reached and bombed.

Flt. Sgt. R. J. NOONAN, R.N.Z.A.F., No. 15 Sqn.—Flt. Sgt. Noonan has completed numerous operational missions as wireless operator/air gunner. The targets have included Frankfurt, Bremen, Cologne and Turin.

Flt. Sgt. J. T. O'BRIEN, No. 161 Sqn.—This airman participated in the Bruneval paratroop raid with great success, and also in many other missions, including attacks on the Gnome Works, Poissy, Genoa, and a number of anti-submarine patrols. On one occasion, this airman spent 38

hours in a dinghy 400 miles from land, and was eventually rescued owing to the exactness of the information as to his position which he sent by wireless.

Flt. Sgt. D. J. PENFOLD, No. 50 Sqn.—Flt. Sgt. Penfold has participated in attacks on some of Germany's most heavily defended targets and in the two daylight raids on Le Creusot and Milan.

Flt. Sgt. E. PRESTON, No. 97 Sqn.—As air-gunner/wireless operator, this airman has completed numerous sorties against the most heavily fortified industrial targets in Germany and Italy. These have included successful attacks on Hamburg, Bremen, Essen and Cologne. On one occasion he participated in a daylight attack on Brest.

Flt. Sgt. F. L. RICHARDS, No. 192 Sqn.—As rear gunner, Flt. Sgt. Richards has shown outstanding keenness, energy and a fine fighting spirit. His cheerfulness and exemplary character have been a source of inspiration to his fellow gunners.

Flt. Sgt. (now P/O.) J. ROBERTSON, No. 97 Sqn.—This airman has completed a tour of operational duties, during which he has participated in attacks on many of the enemy's most heavily defended targets in Germany and Italy. He also took part in the daylight attacks against Danzig and Le Creusot.

Flt. Sgt. C. ROBINSON, No. 97 (R.C.A.F.) Sqn.—This airman, as air-gunner, has participated in a large number of attacks against the most heavily defended German and Italian targets. He also took part in the daylight raids on Le Creusot and Milan.

Flt. Sgt. F. G. ROSHER.—Over a long period Flt. Sgt. Rosher has participated in a very large number of operational sorties against some of the enemy's most heavily defended targets.

Flt. Sgt. A. M. SANDERS, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—Flt. Sgt. Sanders has participated in a large number of operational sorties over Germany, Italy and occupied France.

Flt. Sgt. K. C. SAW, No. 97 Sqn.—This airman has taken part in a large number of operational sorties against the most heavily defended German and Italian targets. He also participated in the daylight attacks on Brest, Danzig, Le Creusot and Milan.

Excellent Photographs

Flt. Sgt. R. D. SEARLE, No. 207 Sqn.—On all the operational missions in which he has participated, Flt. Sgt. Searle has displayed skill and determination as a bomb-aimer. His efficiency has been outstanding and amply proved by the excellent photographs secured on many occasions. In addition to attacking many of the most heavily defended targets in Germany, he has also taken part in the daylight operations against Milan and Le Creusot.

Flt. Sgt. L. SHIEL, No. 50 Sqn.—As wireless operator, Flt. Sgt. Shiel has taken part in many successful sorties, including the daylight raid on Le Creusot. He has also obtained some excellent photographs.

Flt Sgt. P. N. SIDDONS, No. 44 Sqn.—On one occasion, when his aircraft had been damaged by enemy action, this airman was instrumental in enabling it to return to base safely. Flt. Sgt. Siddons has participated in attacks on some of the enemy's most important and highly defended targets, including Berlin.

Flt. Sgt. K. J. STEVENS, R.A.A.F., No. 57 Sqn.—Flt. Sgt. Stevens has taken part in many operational sorties, including attacks on some of the enemy's most heavily defended targets, such as Berlin and Essen.

Flt. Sgt. F. SUCKLING, No. 97 Sqn.—This airman has taken part in a large number of operational sorties against targets in Germany and Italy. He also participated in the daylight raids on Danzig and Le Creusot.

Flt Sgt. W. THACKRAY, No. 103 Sqn.—Since being posted to this squadron in July, 1942, Flt. Sgt. Thackray has completed numerous sorties over enemy territory. His sorties have included flights to Berlin, Essen, Hamburg and many other heavily defended targets in Germany.

Flt. Sgt. W. V. VIRGO, R.A.A.F., No. 10 Sqn.—At various times this airman's aircraft has sustained severe damage from the ground defences, but neither this nor adverse weather has deterred him from completing his task wherever possible. He has made several effective attacks on Berlin and Essen. On one occasion his aircraft was repeatedly attacked by an enemy fighter. By skilful airmanship he enabled his rear gunner probably to destroy the assailant by an effective burst of gunfire.

Flt. Sgt. G. E. WILLIAMS, R.C.A.F., No. 61 Sqn.—This airman has completed a large number of sorties as captain of aircraft. On one attack on Bremen he spent 40 minutes over the objective in order to identify the target visually. On his last sortie his aircraft was severely damaged by anti-aircraft fire and crashed into the sea.

Flt. Sgt. F. A. WONHAM, No. 61 Sqn.—Flt. Sgt. Wonham has participated in a large number of operational sorties, which have included attacks on Berlin and Essen. His cheerful confidence and ability in guiding the aircraft over the target, despite heavy opposition, have greatly contributed to the success attained by his crew.

Flt. Sgt. (now P/O.) W. WOODHOUSE, No. 57 Sqn.—Flt. Sgt. Woodhouse is a navigator of exceptional ability, who has participated in attacks on many of the most strongly fortified areas in enemy territory. He has displayed courage and determination of a very high order, and his skill has contributed to the success of many sorties, which have included raids on Berlin, Genoa, Cologne, and the daylight raid on Milan.

Flt. Sgt. (now P/O.) J. M. WYLLIE, No. 158 Sqn.—Flt. Sgt. Wyllie has a long record of operational flying, first in Coastal Command and latterly in Bomber Command, where he has taken part in attacks on some of the enemy's most heavily defended targets, including Genoa, Turin, Hamburg, Bremen, Karlsruhe and Stuttgart. On more than one occasion he has flown his aircraft safely back to base when damaged by anti-aircraft fire.

SERVICE AVIATION

Act. Flt. Sgt. A. E. BIRD, No. 35 Sqn.—Flt. Sgt. Bird has proved himself to be an extremely efficient and capable air gunner. His coolness in the face of the strong opposition encountered over such targets as Bremen, Berlin, Turin and Cologne has been exemplary.

Flt. Sgt. T. J. MCINTYRE, No. 83 Sqn.—Many of this airman's sorties have been against the enemy's most heavily defended targets, including Berlin, Hamburg, Essen and Bremen. In July, 1942, he was wireless operator in an aircraft which, when returning from a daylight raid on Danzig, was attacked by enemy fighters. Flt. Sgt. McIntyre's excellent running commentary enabled his pilot to evade the attackers.

Flt. Sgt. W. D. PADDY, No. 83 Sqn.—This airman has completed numerous operational sorties, many of them against very heavily defended targets both in Germany and Italy. On a sortie to Berlin in January, 1943, one engine of his aircraft failed. Flt. Sgt. Paddy's cool and prompt action resulted in the captain being able to evade the searchlights and anti-aircraft fire, sustaining very little damage to the aircraft.

Sgt. T. J. ADAMSON, No. 78 Sqn.—As bomb aimer Sgt. Adamson has completed numerous operational sorties, some of which have been over the most heavily defended areas of Germany.

Group Capt. Strang Graham, M.C., who was for some years Service overseer at the Handley Page works, has been awarded the George Medal. The official citation appeared in our issue of last week.

Sgt. H. J. ANDERSON, R.C.A.F., No. 405 (R.C.A.F.) Sqn.—Sgt. Anderson has taken part in numerous operational sorties against targets in the heavily defended industrial areas of Germany. He has also flown on a number of anti-submarine patrols. In October, 1942, while on a low level attack on Flensburg, Sgt. Anderson's aircraft was illuminated by searchlights and subjected to a heavy concentration of anti-aircraft fire. Although wounded in the leg, with calm courage he continued with his duties, saying nothing of his wound until half way home.

Sgt. C. M. ARRIETA, No. 10 Sqn.—This navigator, an outstanding member of a very successful crew, has never failed to direct his aircraft to the target and back to base. On one occasion Sgt. Arrieta was forced to abandon his aircraft by parachute, and in December, 1942, his bomber was attacked simultaneously for ten minutes by two enemy fighters, one of which was destroyed.

Sgt. R. J. ATKIN, No. 156 Sqn.—This airman has at all times displayed navigational ability of the highest order. His skill and efficiency have been invaluable on numerous operational missions, some of them against heavily defended targets such as Berlin, Spezia and Cologne.

Sgt. W. T. BATSON, No. 50 Sqn.—This airman has completed a very creditable tour of operational duties. In the course of his operational flights he has attacked many of the most heavily fortified German and Italian centres, and also took part in the daylight raid on Le Creusot.

Sgt. I. BLAIR, No. 90 Sqn.—Sgt. Blair has completed two tours of operational duty, in the course of which he has attacked enemy targets in the Middle East, and more recently of the heavily defended targets in the Ruhr.

Sgt. R. BAINES, No. 7 Sqn.—Sgt. Baines has taken part in a large number of operational sorties against some of the most heavily defended targets in the Ruhr area and Western Germany.

Flt. Sgt. H. REID, No. 159 Sqn.—Flt. Sgt. Reid has been a great asset to his squadron as a flight gunnery leader. His coolness and efficiency during many operational sorties have set an outstanding example to all air gunners.

Flt. Sgt. R. L. SOMMERVILLE, R.N.Z.A.F., No. 104 Sqn.—Flt. Sgt. Sommerville has completed a large number of bombing raids. During an attack on Tripoli in January, 1943, he pressed home his attack, securing many hits on the objectives in spite of intense and accurate anti-aircraft fire.

Flt. Sgt. J. STANTON, No. 159 Sqn.—During the numerous operational sorties which this airman has completed he has distinguished himself by his coolness and courage under fire. Flt. Sgt. Stanton's ability as a fighting controller when attacked by enemy aircraft has, on four occasions, been largely instrumental in the successes achieved.

Sgt. W. T. GUNN, R.N.Z.A.F., No. 159 Sqn.—Throughout his duties with this squadron Sgt. Gunn has displayed outstanding skill and courage as an air gunner. During one operation in November, 1942, his turret was badly damaged by cannon fire from a Japanese night fighter. In spite of this, he continued to fire, and probably destroyed his assailant.

Sgt. G. D. TAYLOR, No. 113 Sqn.—This airman has been employed continuously on operational flying since July, 1941. Amongst his many sorties have been a number of raids in the Middle East, including convoy protection in the approaches to Malta and attacks on targets in Burma.

Two Engines Damaged

Sgt. J. MCCROSSAN and Sgt. J. T. WILKINSON, both of No. 50 Sqn.—Sgts. McCrossan and Wilkinson were pilot and flight engineer respectively of an aircraft detailed to attack Wuppertal. Before the target was reached the aircraft was hit by anti-aircraft fire which rendered one engine ineffective and damaged another. Some height was lost but Sgt. McCrossan continued to the target and bombed it. The aircraft was again hit and much equipment was damaged, including the hydraulic system which prevented the bomb doors from being closed. The aircraft rapidly lost further height. All movable equipment was jettisoned and sufficient altitude was maintained to enable Sgt. McCrossan to cross the enemy coast at 500 feet. Displaying superb airmanship, he eventually reached base. During the return flight Sgt. Wilkinson displayed great skill and resource and proved of considerable assistance to his pilot.

Sgt. J. H. RANK, No. 77 Sqn.—One night in May, 1943, Sgt. Rank was captain of a bomber which was detailed to attack Wuppertal. When nearing the target the aircraft was hit by heavy anti-aircraft fire and damage was sustained which rendered the bomber difficult to control. Shortly afterwards the rear gunner reported the approach of an unidentified aircraft, and in most harrassing circumstances Sgt. Rank was compelled to take evasive action. Still pursued, he pressed on to the target and made a successful and determined attack. Photographs showed that his bombs fell on the aiming point. During the attack the pursuing aircraft was evaded and course was set for base, where a difficult landing was made with superb skill.

Sgt. J. M. MCK. WILLIAMS, R.C.A.F., No. 77 Sqn.—One night in May, 1943, Sgt. Williams was rear gunner in an aircraft which took part in an attack on Dusseldorf. During the bombing run over the target the bomber was twice attacked by a Ju. 88. Violent evasive action was taken and the aircraft went out of control but control was regained and course set for base after height of some 5,000 feet had been lost. Later Sgt. Williams sighted two Me. 109's flying a parallel course with the bomber, one on the port side and the other on the starboard side, and he gave avoiding directions to his captain. As the bomber was turned Sgt. Williams sighted a third enemy fighter climbing to attack. He brought his guns to bear on the attacker and with a short and well-directed burst of fire caused the enemy aircraft to break away emitting smoke and flames. The remaining enemy aircraft did not then attack.

Sgt. (now P/O.) J. L. CUNINGHAME, No. 106 Sqn.—Sgt. Cuninghame flew on his first nine sorties in the capacity of air gunner, and on one occasion his watchfulness and accurate fire drove off a succession of enemy fighters which attacked his aircraft near the target. He later qualified as an air bomber, and since then he has participated in numerous raids. Hamburg, Cologne, Munich and Essen are amongst some of the targets this airman has attacked, in addition to Italian objectives. He also took part in the daylight raids on Le Creusot and Milan. In July, 1942, whilst directing his pilot on the bombing run over Hamburg, his aircraft was severely damaged by anti-aircraft fire, and Sgt. Cuninghame, with other members of the crew, was wounded. Smoke was seen to be coming from the bomb doors, but, despite his wounds, this airman, with his legs held by the navigator, leaned out of the escape hatch to investigate.

Sgt. J. A. DAY, No. 61 Sqn.—As wireless operator Sgt. Day has successfully participated in numerous operational sorties, including Essen and Berlin. Throughout he has been keen, efficient and reliable in his work, winning the complete confidence of his captain.

Sgt. J. R. BURKE, R.C.A.F., No. 97 Sqn.—This airman has taken part in many operational sorties, a number of which have been attacks against the most strongly defended centres in Germany and Italy. He also participated in daylight raids on Danzig, Le Creusot, and Milan.

Sgt. S. G. BURTON, No. 103 Sqn.—Sgt. Burton

has obtained some excellent photographs. This airman has completed numerous successful operational sorties, including attacks on targets at Milan, Essen, Munich and Spezia.

Awards of Foreign Decorations

THE KING has granted unrestricted permission for the wearing of the undermentioned decorations, conferred on the personnel indicated in recognition of valuable services rendered in connection with the war:—

Conferred by the President of the United States of America

Air Medal

Act. Sqn. Ldr. A. H. W. BALL, D.S.O., D.F.C.
Flt. Lt. M. C. B. ANDERSON, D.F.C.
Act. Flt. Lt. R. C. BUCHANAN, D.F.C., R.N.Z.A.F.
Act. Flt. Lt. D. M. MCKENZIE, R.C.A.F.
F/O. H. W. CLYNE, R.A.F.V.R.
F/O. E. R. COWAN, D.F.C. (now deceased).
F/O. W. F. RAINS, R.A.F.V.R. (now missing).
P/O. W. M. O. JONES, R.A.F.V.R.
P/O. J. R. MYLES, R.C.A.F.
Flt. Sgt. B. J. O'CONNELL, R.A.A.F.
Flt. Sgt. J. P. IREDALE.
Sgt. K. B. FORBES.
Sgt. J. F. SAMSON.
Sgt. R. M. TAYLOR, R.A.A.F. (now deceased).

Conferred by the President of the Republic of Poland

Polish Cross of Merit (Second Class)

W/O. R. W. G. PILLER.
Sgt. C. E. F. BENZON.

Roll of Honour

Casualty Communiqué No. 258.

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, 57 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. F. R. Beech; Flt. Sgt. H. F. Burney; Flt. Sgt. H. L. Carter; P/O. J. A. G. Cobb; Flt. Sgt. S. A. Coggin; F/O. S. A. Coles; Sgt. J. D. Collinge; Sgt. C. H. Fisher; Sgt. R. A. Frost; Flt. Sgt. W. H. Goodrum; Sgt. J. P. V. Hargest; Sgt. J. S. Howard; Sgt. T. A. Jamieson; Sgt. J. McK. Leslie; Sgt. W. B. McCallum; Flt. Sgt. W. G. McGhee, D.F.M.; F/O. C. H. Norton; Sgt. R. P. M. Parker; Sgt. S. E. A. Russell; Sgt. K. Steels; Sgt. H. J. Stephenson; Sgt. P. H. Ward; Sgt. C. W. Waterer; F/O. D. J. Webb; Flt. Sgt. H. A. Worthington; Sgt. D. Wurr.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. W. Barber; Sgt. G. W. Butterworth; F/O. G. P. King; Sgt. W. Nicoll.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. D. W. Ashworth; Flt. Sgt. K. G. Baugh; Sgt. J. Berry; Sgt. H. Bloor; Sgt. M. Boyle; Sgt. H. M. R. Broadhead; Sgt. E. Cartwright; Sgt. B. Chadwick; Sgt. H. F. Clarke; Sgt. B. E. Coffey; Sgt. H. Cooke; Sgt. M. Collins; Sgt. W. E. Collis; Flt. Lt. A. W. Court; Flt. Sgt. W. F. Crampton; P/O. J. R. Cruickshank; Sgt. A. Danby; Sgt. E. Edwards; Flt. Lt. A. Fleming; Sgt. D. J. Green; Flt. Sgt. D. Hatton; Sgt. F. R. Hipwell; Sgt. N. Jackson; Sgt. D. C. Johnson; Flt. Sgt. H. E. Kemball; Flt. Lt. C. C. King; Sgt. G. Lake; P/O. M. J. R. Larcher; Flt. Lt. J. T. C. Long; Sgt. W. A. McLeod; Sgt. P. G. A. Malin; Sgt. G. S. Mills; Sgt. C. J. Morgan; Sgt. N. T. Owen; Sgt. W. D. Palmer; Sgt L. P. Plum; P/O. W. Ross; Sgt. E. O. Smith; Sgt. W. R. Smith; Sgt. H. Sproston; Flt. Sgt. J. K. Stone; P/O. P. J. Voyzey; Flt. Lt. E. Walker Sgt. H. T. Willig; Sgt. T. C. Woodhouse.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. T. H. Billingham; F/O. E. A. Mould.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. A. L. Cowan; P/O. S. F. N. Neal; Sgt. T. J. Nichols.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. H. B. Little; Act. Sqn. Ldr. D. F. Wykeham-Martin, D.F.C.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. D. Baxter; Sgt. P. R. J. Blake; Sgt. R. E. Bragg; F/O. I. B. Brown; F/O. T. Brown; Act. Sqn. Ldr. H. D. R. L. Campbell, D.F.C.; Sgt. D. Cram; Sgt. R. Dewey; Sgt. A. J. Gearing; Act. Flt. Lt. R. Grey; Sgt. S. B. Hawley; Sgt. M. F. Hewitt; Sgt. K. S. Hobkirk; Sgt. J. A. C. Jacobs; Sgt. R. D. Matches; Sgt. E. W. J. Mead; Sgt. E. L. Orchard; Sgt. E. Pritchard; Sgt. J. G. Steele; Sgt. G. G. Steer; Sgt. P. Stephens; Sgt. C. Stringer; Sgt. N. E. Taylor; Sgt. J. C. W. Thompson; Sgt. H. Walsh.

MISSING.—Sgt. A. Armstrong; Sgt. M. Bates; Sgt. K. F. Bell; P/O. H. Broadbent; Sgt. E. G. Brown; Sgt. J. A. Brown; Sgt. J. Buntin; Sgt. R. Burridge; P/O. H. Catch; Sqn. Ldr. W. W. Cave, D.F.C.; P/O. C. W. Clarke; P/O. G. Davies; Sgt. S. F. Dean; Sgt. N. Douglas; Sgt. W. Duthie; Sgt. W. Eddington; Sgt. E. A. Evans; Flt. Sgt. H. W. Evans; Sgt W. G. Farrell; Flt. Sgt. S. C. Fermor; Sgt. D. C. Ferris; Sgt. K. Forster; Sgt. B. R. Fyfield; Sgt. R. M. Gibbney; Sgt. H. Goddard; Sgt. R. A. Green; Sgt. J. Greenfield; Sgt. F. C. Greening; Sgt T. E. Hamley; Sgt. W. F. W. Hards; Sgt. R. Y. Herd; Flt. Sgt. J. A. Heather; Sgt. W. J. Holman; P/O. E. Hough; F/O. A. Hunt; P/O. F. H. Huntley, D.F.M.; Sgt. C. H. Hurle; Sgt. N. E. Jones; Sgt. L. Leake; Flt. Lt. J. H. Loder, D.F.C.; F/O. I. L. L. MacLeod; Sgt. C. A. Mangion; Sgt. B. Moody; Sgt. D. F. Moon; Sgt. R. M. Morris; Sgt. W. O'Neill; Flt. Sgt. L. R. Ott; Sgt. J. C. Owen; Flt. Lt. P. Parnham, D.F.C.; Sgt. P. G. Polkinghorne; F/O. G. D. Priestley; Sgt. E. Rabjohn; Sgt. J. Reddish; Sgt. P. C. W. Rich; Sgt. W. A. Roberts; Sgt. B. Sainthouse; Sgt. G. H. Saxton; Flt. Sgt. R. B. Shepherd; Sgt. A. Simpson; Sgt. J. Somerville; Sgt. F. D. Stannard; P/O. H. J. Summers; Sgt. A. Stott, D.F.M.; Sgt. E. J. Stuart; Sgt. J. E. Taylor; Sgt. S. R. Tinkler; Sgt G. Tsitselis; Sgt. J. C. Young.

KILLED ON ACTIVE SERVICE.—L.A/C. D. D. Ashcroft; Sgt. O. Bacon; Sgt. T. J. Beresford; Sgt. J. S. Birkett; Sgt. E. L. Clark; P/O. G. H. Cone; Flt. Sgt. H. A. Defreitas; Sgt. E. Fenwick; Sgt. A. McD. Gardiner; L.A/C. G. E. V. Garratt; Sgt. A Grant; P/O. L. G. Gray; Flt. Lt. T. A. Gray; Sgt. W. G. Hutchinson; Sgt. H. J. Kelly; Sgt. G. S. Lee; Sgt. J. D. Leonard; Sgt. S. M. Marfleet; Sgt. W. Mason; P/O. M. J. Meatyard; Sgt. R. A. Page; Sgt. R. M. Parker; F/O. J. W. Robb; Sgt. A. W. Sayers; Sgt. F. H. Scanlan; Sgt. R. E. Stephens; Sgt. L. R. Thomas; F/O. A. C. Warnock.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. M. L. A. Meehan; Cpl. F. Ullathorne; A/C.1 W. S. Watts.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. N. D. Harrison; Sgt. E. T. Rees.

DIED ON ACTIVE SERVICE.—L.A/C. R. Batcheldor; L.A/C. R. W. Carlier; Cpl. J. S. Edgar; L.A/C. R. Foote; Cpl. G. C. Hall; A/C.2 W. G. Harris; Sgt. E. W. J. Horton; L.A/C. T. V. Lawrence; L.A/C. R. Lowry; A/C.1 W. J. McMullen; Cpl. H. V. Napier; Act. Flt. Lt. A. G. Onley; L.A/C. J. M. Philmister; L.A/C. F. Underwood.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. J. S. Mackie.

MISSING, BELIEVED KILLED IN ACTION.—P/O. A. E. Horne, D.F.M.

MISSING.—Flt. Sgt. E. D. Chalmers; Sgt. F. W. Morgan.

KILLED ON ACTIVE SERVICE.—P/O. R. J. Fiscaline; F/O. T. A. Ley.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. A. R. Cocks.

DIED ON ACTIVE SERVICE.—Cpl. B. D. Gough.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. S. G. Cleveland; W/O. J. McK. Main.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. G. E. Eichar.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. K. J. Aronson; Sgt. E. T. Hunking; Sgt. D. A. Macaulay; W/O. N. McH. Moore; Flt. Sgt. J. L. Roach.

MISSING, BELIEVED KILLED IN ACTION.—F/O. H. D. Beattie; Sgt. W. Le R. Bovaird; Sgt. W. H. S. Buckwell; F/O. W. W. H. Cornelius; Sgt. J. M. Farrell; P/O. D. W. Frazer; Sgt. J. McL. Harrison; Sgt. R. E. Hart; Sgt. A. E. Hurteau; Sgt. A. A. Kew; Sgt. W. E. O'Halloran; Flt. Sgt. J. Palmer; Sgt. R. E. L. Ratelle; Sgt. W. A. Simonett; P/O. L. A. Stinson; Sgt. R. C. Weedy.

MISSING.—Sgt. A. E. Atkinson; Cpl. H. S. Butler; F/O. H. V. Coulter; Sgt. W. J. N. Duggan; F/O. J. D. Erzinger; Sgt. C. G. Gowen; Sgt. D. I. Harvard; P/O. T. J. Hughes; P/O. H. M. Ivatt; Sgt. J. H. S. Joannette; Sgt. J. H. Johnston; P/O. J. W. Lennox; Sgt. W. R. Macdonald; Sgt. N. R. McKinley; Act. Flt. Lt. L. B. Madden; P/O. M. Q. Moffatt; P/O. C. D. Myers; Sgt. R. A. Newton; Sgt. W. B. Nichol; Sgt. F. J. Payne; Sgt. W. J. Reid; Sgt. J. R. Richmond; Sgt. E. C. Smith; Sgt. F. W. Walkerdine; Sgt. F. R. Windibank.

KILLED ON ACTIVE SERVICE.—Sgt. A. Darby; F/O. R. H. Hurton; P/O. J. D. McDonell; Sgt. J. S. Measor.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. P. B. Robertson.

Royal New Zealand Air Force

MISSING.—F/O. P. R. Galbraith; P/O. T. Sampson.

WOUNDED OR INJURED IN ACTION.—Sgt. W. D. Smellie.

KILLED ON ACTIVE SERVICE.—F/O. H. S. Shearer.

South African Air Force

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. M. Koff.

MISSING, BELIEVED KILLED IN ACTION.—Capt. A. G. M. Budd; Lt. J. Sadler; Flt. Sgt. C. R. Woods.

Flt. Lt. D. G. Richardson Cox, who has been awarded a Bar to his D.F.C. He has seven aircraft to his credit.

Casualty Communiqué No. 259

Of the names in this list, 98 are second entries

Hirst; Air Comdre Sir H. N. St. V. Norman, Bt.; in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. J. Currie; F/O. D. Hirst; Air Cmdre Sir H. N. St. V. Norman, Bt.; Sgt. H. Roper; Flt. Sgt. T. Routledge.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. R. L. Albery; P/O. R. F. Birley; Sgt. M. W. Booth; Sgt. G. A. Doman; Flt. Sgt. D. H. Freeland; Flt. Sgt. F. G. Green; Sgt. A. E. Grounsell; Sgt. H. Hancocks; Flt. Sgt. E. G. Hayhoe; Sgt. J. Hockenhull; P/O. D. W. Lennard; Sgt. R. C. Loombe; Sgt. J. E. R. Lyons; Sgt. L. F. Meadows; Flt. Sgt. A. F. Potts; Sgt. A. Priestley; Sgt. F. Roberts; Sgt. K. P. Stibbs; Sgt. J. McR. Wallace.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. N. J. Alecock; W/O. E. K. A. Anderson, D.F.M.; Sgt. H. W. Bending; Sgt. D. M. Bowd; Flt. Sgt. P. C. Cato; Sgt. D. G. Colley; Flt. Sgt. R. C. F. Charlton; Sgt. S. Coulson; Sgt. R. Crawley; P/O. J. S. Dicker; Sgt. J. Entwistle; Sgt. J. G. Ferris; Sgt. R. W. A. Follett; Sgt. E. A. Harry; Act. Sqn. Ldr. P. F. Hickling; Sgt. C. E. Hayward; Sgt. J. Holland; Sgt. J. Holmes; Sgt. H. C. Hood; Sgt. V. Howe; Sgt. W. W. Hughes; Sgt. J. S. James; Flt. Sgt. S. King; Flt. Sgt. W. H. P. Knight; Sgt. R. McGregor; Sgt. G. A. McIntyre; Sgt. W. C. McLeish; Flt. Lt. I. Maitland, D.F.C.; Sgt. R. L. Millbank; P/O. J. D. Moffat; Flt. Lt. A. F. A. Osborn, D.F.C.; Sqn. Ldr. V. R. Paterson, D.F.C.; Sgt. J. W. Platt; Flt. Sgt. F. Ransom; Sgt. F. J. Robinson; F/O. N. J. Stabb; Sgt. G. Stead; Sgt. J. Stewart; Sgt. A. R. Taylor; Sgt. F. Tooth; Flt. Sgt. A. Wale; W/O. C. Wathey.

WOUNDED OR INJURED IN ACTION.—F/O. R. F. Clayton; Sgt. J. A. Dick; P/O. R. W. Lewis; Sgt. W. Walker.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. J. W. Edwards; P/O. L. S. Maif.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. W. P. Baxter; Sgt. A. Benson; Sgt. A. J. Brockway; Sgt. F. M. Chaffey; Sgt. H. W. Fields; P/O. D. Gartery; Sgt. N. Gillies; Sgt. R. C. Hall; Sgt. M. A. Harrison; P/O. W. D. Hawkes; Sgt. J. F. Hinds; Sgt. T. W. Shadgett; Sgt. J. Smith; Sgt. E. S. Tompkins; Sgt F. Warburton; Sgt. C. W. H. Westwood.

MISSING.—Sgt. C. C. Adams; Sgt. F. V. G. Alloway; Sgt. R. H. Ancell; F/O. D. M. A. Banton; Sgt. E. H. F. Barker; P/O. J. K. Barrett; Sgt. A. M. H. Black; Sgt. G. L. Bottomley; Act. Flt. Lt. C. C. J. Bowyer; F/O. P. C. C. Bradley-Drayton; Sgt. N. R. Burrows; P/O. R. Christy; Act. Flt. Lt. A. D. Coldicott, D.F.M.; P/O. J. W.

Coleman; Sgt. C. H. Cousins; Sgt. A. G. Dale; Sgt. H. R. Dick; P/O. R. Donnan; F/O. I. C. Duthie; Sgt. N. R. Elford; P/O. D. A. N. Evans; Sgt. G. J. Evans; Sgt. G. R. Evans; Sgt. W. R. Fairey; Sgt. M. J. Flaherty; Sgt. K. J. Frost; P/O. M. J. D. Fuller; Act. Sqn. Ldr. P. Garrard, D.F.C.; Sgt. D. A. Genever; Sgt. H. J. Gibbs; F/O. M. Gluck; Sgt. J. Grant; F/O. T. H. Green; Sgt. S. Groom; Sgt. J. Guterman; Sgt. L. G. Hadden; Sgt. I. E. G. Hall; Sgt. R. M. E. Harrison; Sgt S. D. Hirst; F/O. W. E. L. Morse; Sgt. J. F. Hughes; Sgt. J. R. Johnson; Flt. Sgt. T. B. Johnston; P/O. T. G. H. Lewis; Sgt. S. McGlory; Sgt. J. Marriott; Sgt. R. Marsden; P/O. E. L. Marsland; Sqn. Ldr. H. E. Maudslay, D.F.C.; P/O. J. W. Methley; Sgt. E. S. Morris; Sgt. G. R. Nipper; P/O. W. Ottley; Sgt. J. Parr; P/O. J. McK. Paulsen; Sgt. C. J. Percival; Flt. Lt. L. J. Porter; Sgt. R. G. Pritchard; P/O. A. W. L. Pruce; Act. F/O. H. G. Randell; Sgt. C. Ray; P/O. C. McL. Reid; P/O. E. D. Rex; Flt. Lt. G. Rhys; P/O. J. E. Rigby; F/O. R. Richards; Sgt. A. E. P. Rochester; Sgt. C. F. Ryall; Sgt. H. S. Scott; Sgt. C. R. Shields; Sgt. T. W. T. Stoddart; Sgt. H. J. Strange; Sgt. F. Tees; F/O. I. W. Thomas; Sgt. H. B. Thompson; F/O. W. J. Tytherleigh; Sgt. J. H. Uden; Sgt. H. G. C. Waite; Sgt. D. H. Warburton; Sgt. A. W. Whiteoak; Sgt. A. E. Whittal; Sgt. F. A. Williams; Sgt. R. F. Williamson; F/O. H. S. Winchester; Flt. Lt. H. F. Withy; Sgt. E. Wright.

KILLED ON ACTIVE SERVICE.—A/C.2 W. S. Anthony; Sgt. W. H. Bastable; P/O. D. R. Cooper; A/C.2 P. L. Corner; P/O. A. S. Gibson; A/C.2 T. Hayde; Sgt. F. W. Hennessey; L.A/C. J. Howlett; L.A/C. J. Ireland; A/C.2 A. J. P. Lohoar; A/C.2 F. H. B. Porter; A/C.1 C. D. Puisford; L.A/C. H. R. Roberts; Cpl. H. Simmonds.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. A. G. Grant.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. W. R. Bean; A/C.1 A. King; Flt. Lt. L. A. Martin; W/O. H. J. Morson, D.F.M.; F/O. J. F. Wright.

DIED ON ACTIVE SERVICE.—Sgt. P. Bentley; A/C.1 D. W. Pepper; A/C.2 A. R. Best; L.A/C. C. H. E. Evason; A/C.2 R. C. Fuller; L.A/C. W. H. James; L.A/C. J. R. Lawson; Act. Sgt. F. J. H. Marshall; A/C.2 W. Monaghan; Cpl. J. K. N. Munro; L.A/C. A. F. Phillips; L.A/C. H. G. Stafford; A/C.2 E. T. W. White.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. A. S. Williams.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. R. E. N. Butcher; Sgt. E. R. Eva; F/O. R. H. H. Hosband; Sgt. A. C. Rich; Sgt. H. C. Thompson.

MISSING.—F/O. A. M. Harvey.

KILLED ON ACTIVE SERVICE.—Sgt. R. F. Fenton; Sgt. N. M. Gray; F/O. R. B. Hitchcock; Sgt. J. F. McMahon; Sgt. G. A. Mills; Sgt. V. L. Pope; Sgt. W. R. Swan.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. P. H. Dawson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. L. M. McCormack.

Royal Canadian Air Force

KILLED IN ACTION.—P/O. D. J. Jay.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. G. E. C. Coldron; Sgt. R. Grabek; F/O. L. I. Smith; Wing Cdr. J. D. Twigg.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. G. Brasnett; Flt. Sgt. J. J. Carey; F/O. A. L. MacGillivray; Sgt. A. I. McDonogh; P/O. V. M. Morrison; Flt. Sgt. A. H. Robitaille; Flt. Sgt. J. W. Sanderson; Sgt. R. C. Stuart.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. A. Rotenberg.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. G. R. Gowling; Sgt. A. S. Green; Sgt. J. F. J. P. Prieur.

MISSING.—Sgt. G. Bancescoe; Sgt. P. H. Brand; Sgt. A. P. Cottam; Sgt. H. A. Crouse; Sgt. E. K. Edwards; Sgt. L. R. Fadden; Sgt. H. G. Freeman; P/O. J. A. Guy; Sgt. A. E. Hagan; F/O. D. C. Hanna; P/O. F. P. Harrison; Sgt. R. W. Jennings; Sgt. W. Q. Johnson; Sgt. J. P. D. Leclerc; Sgt. R. O. Leonard; F/O. H. N. Lyons; Sgt. L. C. McCracken; Sgt. R. C. McRae; Sgt. C. N. Magnuson; Sgt. J. O. Mander; Sgt. J. Martin; Sgt. W. A. McNair; Sgt. W. C. Sutton; Sgt. J. R. Stewart; F/O. R. A. Urquhart; Sgt. M. E. Zapfe.

KILLED ON ACTIVE SERVICE.—Cpl. D. R. Chalmers; Sgt. R. R. Courtney; L.A/C. E. O. M. Gilbert; Flt. Sgt. A. Irvine; Sgt. A. C. Matheson; Sgt. F. J. Matier; Sgt. J. G. O'Gorman; Cpl. R. F. Pelrine; Cpl. W. G. Wood; Cpl. R. C. Woods.

DIED ON ACTIVE SERVICE.—Sgt. H. C. Ferguson.

Royal New Zealand Air Force

KILLED IN ACTION.—Sgt. K. Burchard.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. F. Lumsden; F/O. J. M. Paape; Sgt. G. E. Martin; Sgt. R. F. Swindlehurst.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. T. S. Barclay; Flt. Sgt. L. T. Cairns; Sgt. R. P. Coppersmith; W/O. A. J. Cowlrick; Sgt. I. I. Friend; Sgt. W. G. L. Inglis; Flt. Sgt. C. V. McPherson; Sgt. W. W. Morgan; Sgt. L. I. Stewart; Sgt. A. H. Thomson; Flt. Sgt. E. Waple; Sgt. R. J. Warring.

South African Air Force

MISSING, BELIEVED KILLED IN ACTION.—Capt. J. R. Lanham.

KILLED ON ACTIVE SERVICE.—Lt. I. W. Young.

DIED ON ACTIVE SERVICE.—Lt. T. G. Nicholas.

Casualty Communiqué No. 260

Of the names in this list 103 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. J. C. Comyn; Sgt. T. Cox; Sgt. E. B. Hill; Sgt. F. R. Lane; P/O. G. G. Pizey; Sgt. G. Poppleston; Flt. Sgt. E. W. Rusby; Sgt. B. Sherry; Sgt. H. S. Taylor; Sgt. G. F. Ward; Sgt. H. H. Way.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. F. Birch; Sgt. A. T. Brunton; Sgt. Sgt. T. McC. Campbell; Flt. Sgt. A. W. Doughty; Sgt. D. C. Gosden; Sgt. R. L. Hill; F/O. N. A. Lavers; Act. Flt. Lt. R. H. Williamson; Sgt. S. A. Wills.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. P. J. Anderton; Sgt. N. V. Bickerton; Sgt. R. H. Brett; Sgt. J. Burke; Sgt. J. Connell; Sgt. J. J. Cooper; P/O. R. O. Cordall; Sgt. M. J. Dembrey; P/O. E. Evans; Flt. Sgt. J. Farrimond; Sgt. J. A. Fraser; P/O. W. A. J. Fuller; Sgt. R. B. Gadsdon; Flt. Sgt. A. S. Graeme-Cook; Sgt. A. F. Gregory; P/O. M. W. Groves; Sgt. R. T. Higgins; Sgt. J. C. Highfield; Sgt. J. A. Hughes; Sgt. F. J. James; Sgt. W. M. James; Sgt. H. G. Jones; Sgt. J. A. Knox; Flt. Lt. D. S. S. Low; Sgt. F. L. Luff; Sgt. E. J. McCann; Sgt. T. I. McKenzie; Sgt. C. A. B. McMullin; Sgt. D. T. Male; P/O. S. E. H. Morgan; Sgt. R. H. Moses; Sgt. H. A. J. Northcott; Sgt. A. Norregaard; Sgt. H. P. O'Dell; Sgt. A. O'Quinn; Wing Cdr. M. V. Peters-Smith, D.F.C.; Sgt. R. S. Pettican; Sgt. G. A. Prag; Act. Sqn. Ldr. F. H. Robertson; P/O. P. J. N. Robinson; Sgt. G. A. Russell; Sgt. W. Smith; Sgt. W. D. Smyth; Sgt. J. J. Southern; P/O. H. Taylor; Flt. Sgt. J. Thomas; P/O. G. L. Tudor; Sgt. B. Wilkes; Flt. Sgt. D. G. Williamson; Sgt. C. Wood.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. H. K. MacGregor; Act. Sqn. Ldr. D. W. A. Stones, D.F.C.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. L. P. Barnett; Sgt. L. W. Bolton; Sgt. M. J. H. Brookes; Sgt. A. H. Clark; Sgt. J. M. Hadfield; Sgt. R. A. Halestrap; Sgt. T. Jaye; Sgt. J. A. King; Sgt. W. C. A. Long; Sgt. A. J. L. Lyon; Sgt. A. W. McKillop; Sgt. J. I. P. Morgan; Sgt. G. Pegler; Act. Flt. Lt. D. P. Puddephatt; P/O. D. E. Sharpe; F/O. A. C. Smith; F/O. N. J. Stanford; Sgt. G. S. Walton; P/O. L. G. Waller.

MISSING.—Sgt. J. W. Avent; Sgt. E. G. F. B. Baker; Sgt. V. Bailey; Sgt. L. J. Beech; Sgt. W. G. Berry; Sgt. E. W. Betts; Sgt. L. S. Broomfield; F/O. L. G. Burgess; Sgt. H. W. Burton; Sgt. F. Butterfield; Sgt. K. G. Chilver; Flt. Lt. P. J. Connolly; F/O. G. W. Cooper; Sgt. L. G. A. Cooper; Sgt. H. W. Cox; Flt. Sgt. W. P. Daly; F/O. R. J. Davis; P/O. A. H. Eades; Sgt. W. M. Ewing; Sgt. J. S. Fletcher; Sgt. D. Galley; F/O. L. G. Gill; F/O. L. N. W. Goldspink; Sgt. K. H. Green; Sqn. Ldr. E. W. B. Griffiths; Sgt. T. H. Harvey; Sgt. E. J. Havnar; F/O. E. F. H. Heard; Sgt. B. G. Hickling; Sgt. E. J. C. Howard; Sgt. J. C. Howse; P/O. J. T. Hutchinson; F/O. R. Inwood, D.F.C.; Wing Cdr. D. V. Ivins; Sgt. R. J. Jackson; Sgt. C. McA. Jarvie; Sgt. A. W. Johnson; Sgt. A. Jones; Sgt. J. Kay; Flt. Lt. H. J. Knox; Sgt. F. E. Lee; Flt. Lt. L. C. Liddell; F/O. J. Lillie; Sgt. J. S. MacAdam; Act. Wing Cdr. D. Magrath; Flt. Lt. R. R. McSwiney; Cpl. M. Maley; Sgt. W. McCall; Sgt. C. Maltby; Sgt. W. H. Marshall; Sgt. F. C. Maxwell; Flt. Lt. B. L. N. Morgan; L.A/C. F. A. Moore; Sgt. W. H. G. I. Moore; F/O. F. W. Parke; Sgt. G. A. Parker; Flt. Lt. A. N. H. Peach; Flt. Lt. F. R. Philps; Sgt. J. T. Pooley; Sgt. D. A. Rayment; F/O. R. R. Reid; Flt. Lt. W. N. Riley; Sgt. A. K. Rogers; Flt. Lt. A. F. Rutherford; Sgt. J. J. Ryan; F/O. J. Simpson; Flt. Lt. B. A. Stoll; Sgt. M. B. Squires; Sgt. S. Sweet; Sgt. A. J. Taylor; Sgt. J. C. Tweed; P/O. J. H. Warner; Sgt. F. K. Whitall; P/O. A. N. Whitaker; Sgt. J. Wilkinson; F/O. S. Wilkinson; Flt. Lt. C. B. I. Willey, M.C.; F/O. D. S. Williams.

KILLED ON ACTIVE SERVICE.—Sgt. P. R. Annetts; F/O. A. C. Barrie; Sgt. F. D. Blower; F/O. A. H. Burton; Sgt. J. F. Cowburn; L.A/C. F. J. Crawford; Sgt. A. J. Francis; Sgt. M. Harker; Sgt. J. H. R. Harper; Sgt. R. Hartley; Flt. Sgt. A. T. Hawkins; Flt. Sgt. R. Judge; Sgt. P. G. Leach; L.A/C. J. Lemmon; Sgt. N. W. McMullan; Sgt. R. A. Martin; Cpl. A. Nelson; P/O. L. H. Parker; L.A/C. W. Parker; Group Capt. H. W. G. J. Penderel, M.C., A.F.C.; Cpl. A. Platt; P/O. H. Rhodes; Sgt. K. J. Sampson; Sgt. J. E. Sanderson; L.A/C. J. Seddon; Sgt. D. F. Smith; Sgt. B. N. Stephenson; F/O. J. V. Stuart-Duncan; F/O. P. S. Thomas; P/O. F. V. P. Turner; Sgt. J. Walker; Sgt. J. Walls; Sgt. G. H. C. Watkins; Sgt. A. J. Wheatcroft; L.A/C. P. G. Wilson; Sgt. L. C. Wright.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—W/O. S. W. Merryweather.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. D. R. Laddams; Sgt. E. S. Normore.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. D. Sullivan.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. R. A. Hartwell.

DIED ON ACTIVE SERVICE.—Cpl. T. Arnott; Cpl. C. Brinley; Sgt. R. W. Dackus; Act. Flt. Lt. F. W. Fisher; A/C.1 F. Gaskell; L.A/C. H. Hughes; Cpl. H. Moore; Sgt. W. F. Murrin; A/C.2 W. S. Oakes; Sgt. K. Smith; L.A/C. S. C. Warnes.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. N. C. Jones, D.F.M.; Flt. Sgt. G. Jowett.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.1 L. B. E. Wilton.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. A. R. McFarlane.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. C. S. Butcher; P/O. J. H. Moss.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. G. Hawes; Sgt. I. MacD. King; Sgt. W. Macphee; Sgt. V. O. Noonan; Sgt. W. M. Spongberg; Flt. Sgt. W. Stone; Sgt. C. M. Thorn; Sgt. N. White.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. G. V. Courtney; Sgt. C. H. A. Smith.

MISSING.—P/O. K. E. Mahoney; Flt. Sgt. J. F. Mills; F/O. E. L. Musgrave, D.F.C.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. I. I. Kliman.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. A. P. Ouellette.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. T. C. Blais; Flt. Sgt. I. B. Caryll; Flt. Sgt. J. C. Chiasson; Sgt. G. M. Clarke; P/O. G. A. Cooper; J. E. H. Emond; Sgt. D. Fenton; Flt. Sgt. H. Grover; Sgt. E. J. H. Gurr; Sgt. J. P. Jolley; P/O. J. D. Mullins; Flt. Sgt. J. V. Potter; Sgt. R. B. Prentice; Sgt. G. W. Roney; F/O. L. R. Scourfield; Flt. Sgt. J. M. M. R. Theberge; Sgt. T. A. Withers.

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

WOUNDED OR INJURED IN ACTION.—Sgt. J. T. Olsen.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. L. Arthur; Flt. Sgt. J. G. Brady; P/O. L. J. Burpee, D.F.M.; P/O. H. R. Drake; Sgt. Y. J. B. Guepin; Sgt. H. E. Forsyth; F/O. D. G. Fraser; P/O. W. T. Lewis, D.F.M.; Sgt. D. F. McDonald.

MISSING.—Sgt. M. E. Barker; Sqn. Ldr. F. H. Boulton; P/O. V. W. Byers; P/O. F. A. Duquette; Sgt. K. F. Fighter; Sgt. B. L. Haley; Sgt. G. B. Jackson; Sgt. J. McDowell; Flt. Sgt. L. E. McGee; P/O. G. McMillan; Sgt. D. C. Maxwell; Sgt. A. D. Monoghan; Sgt. E. J. Ramey; Sgt. G. W. F. Reynolds.

KILLED ON ACTIVE SERVICE.—Sgt. J. H. Collett; F/O. M. W. Collins; Flt. Sgt. D. E. Elliot; Flt. Sgt. M. J. S. Kerby; Act. W/O. G. W. Paul; Sgt. J. Piket; F/O. D. J. Smith.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. L. G. Davies.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. G. E. Reid; Flt. Sgt. K. F. Ryan.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. P. J. Hooper; F/O. E. M. Innes-Jones; Sgt. F. E. McKenzie; Sgt. M. L. McLeod; P/O. R. W. Morton; W/O. A. W. Osman; P/O. D. N. Potts.

South African Air Force

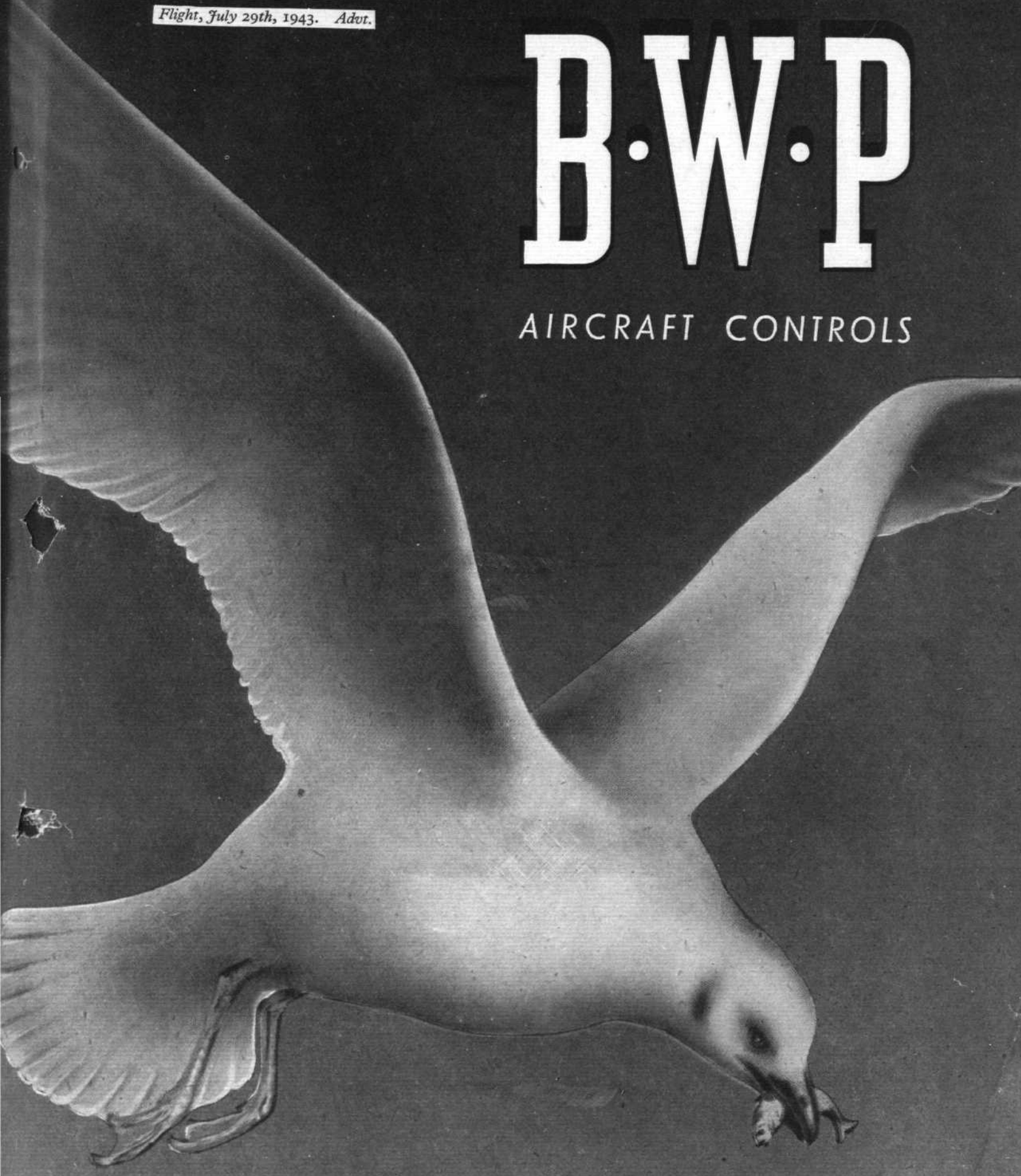
PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Lt. A. D. V. Morum.

KILLED ON ACTIVE SERVICE.—Lt. D. Davidson; W/O. Shearl.

Flight, July 29th, 1943. *Advt.*

B·W·P

AIRCRAFT CONTROLS



EVERYTHING UNDER PERFECT CONTROL

"BRITISH WORKMANSHIP AT ITS BEST"

"Bristol"

EXPERIENCE OF YESTERDAY
AND TODAY..... WILL PRODUCE
THE LEADING TRANSPORT
AIRCRAFT OF TOMORROW.

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